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CONTENTS

ANNALS OF THE UNIVERSITY OF ORADEA
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THE PRICE - A MARKETING TOOL IN THE CONTEMPORARY ECONOMY

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Abstract: The price - is a market instrument and an indicator of reality. He is one of the four classical marketing mix, which has the greatest influence in company activity since it affects profit, sales volume, market share and position that it occupied on the market, national economic context.
The price - is the only marketing mix variable that leads to profit, all other expenditures or investments are generating.
As an instrument of market and essential indicator of socio-economic reality, the price is "an amount of money that the buyer is willing and can offer in exchange for goods producer that it can offer" [5].

Key words: *price, market, marketing, profit, consumer, buyer*.

1. INTRODUCTION

In the economy, the price is determined by negotiation between producer and consumer, the manufacturer proposes negotiating a price to the consumer, but in the end matters the value that the consumer attributes to product. The price - plays a decisive role in the options of buyer, he is the one that gives a picture of what consumers should expect from a product.

In terms of manufacturers' price is the only variable of the marketing mix that produces incomes, it can be changed very quickly, unlike other elements of the mix, depending on the dynamics of demand, supply or competition.

Market price formation depends on the manager's ability to capitalize on the opportunities that the market offers them at a time. The price reflects the distribution policy, but is also an element of promotional activity, strongly influencing the brand image of a product.

Establishing the prices is a major problem faced by managers. Many companies fail to adopt an appropriate policy because of mistakes that are committed: after excessive cost orientation, non-review of prices at intervals to allow taking advantage of changes in the market price it is treated as a separate instrument of the marketing mix, without be considered an intrinsic component of the strategy of positioning the company in the market.

2. POLICY OBJECTIVES OF PRICE

The objectives an enterprise needs to offer them in the price, should be in accordance with others, established for other variables of the mix contributes directly to the achievement of strategic marketing objectives. It was revealed that profit is not the only reason of businesses and companies establish their multiple objectives related to: yield, safety, sales, competition, company image, etc., which uses appropriate strategies for implementation and associated tactics.

In my opinion the most common price policy objectives are:

1. Profit-related objectives:
   - Maximizing profit: means to get the most profit, the difference between income and outgoings to set a bigger price, but so much as the market can bear;
   - Obtaining satisfactory profits, the company is concerned for her future and wants to obtain

reliable and relatively stable profits over a long period of time.

2. Objectives related to sales: it aims when can be get higher profits by controlling the market, must be used the existing production capacity by increasing production but low unit costs, which contributes to higher overall profits.

• the volume and the value of increasing sales can bring up a large influx of short-term monetary return;

• the market quota is dependent on demand and it can track the product or product line. The price is an important tool through which realise the increase, reduction or quitting the market share held according to market conditions and the company policy.

3. Objectives related to competition: targeting fixing prices in relation to competitors if the company wants to subsist alongside them, or, if they are in leadership, might influence the tendency of price, because buyers are price sensitive. The price is used by powerful companies for many purposes: to win competitor customers, of new clients, like as a barrier against entry of new competitors or as the elimination of competitors.

4. Statusquo objectives - shall be following the situation when is wished to be maintained, therefore the stability of company or continuing favorable business environment that requires alignment to competition. This provides a relatively quiet environment in which the company is concerned to avoid decreasing sales, profits, competition and government impact.

5. Objectives of consumer - taking into account customer price sensitivity. There are two extreme categories of consumers: those very sensitive, the product that will change and those loyal, attached to a product that tolerates price increases. The company must know its customers well to avoid a reduction in their risk for a price movement.

6. Business objectives - have become important in recent decades because most products are capitalized through intermediaries by merchants. The manufacturer must be aware of his position before the dealer because there are situations in which the trader sets the product price.

7. Objective of forming of an image of the product and the market of company. In general the high price is associated in the mind of buyer with the quality, originality, uniqueness of product, which allows him to create and retain the image of the company. There is the possibility of forming a positive image and if the practices of low prices, which may reflect the situation better, stable, thriving the company.

8. The objectives of survival - shall be followed up by firms with high capacity can not adapt to change quickly to consumer demand or deepening competition.

9. Internal objectives of the organization may require short-term price changes, so in meaning of its increasing as well as in the sense of reducing, depending on the stage of product life cycle and the financial situation of the company.

Fixing the final price of the product (table1.Price fixing) will be, taking into account both internal aspects of the company, according to the objectives pursued price and production costs, as well as by external, they referrer to the market acceptance of product competition and regulations.

Table1. Price fixing

Internal aspects	**External aspects**
▪ *Policy objectives of price*	▪ *Acceptance by the market*
▪ *The cost analysis*	▪ *Competition*
	▪ *Settlements*

Final price

3. LINKED PRICE WITH THE PRODUCT MIX

Price setting is achieved differently when the product is part of a mix, in this case, the company will be looking for a price that would maximize profits for the whole product mix. Because in the structure of demand and cost of different products are interdependent, and these products are in greater from competition, price determination is a very difficult operation. In my opinion we can

distinguish the following situations:
• Price setting of the product line: by rulethe companies create product lines rather than individual products, for each setting a fixed price. If the price difference between two similar types of products is small (in the case of textile products apply to this model) the customer will be tempted to buy the most improved, which will contribute to increase the company profits, given that the difference price will be higher than the cost difference. If the price difference is higher, customers will purchase less improved product.[7]

In many cases, companies use price-mark well established for products covered by its own line. If, a clothing store for men can practice three different prices for men's suits: 300 RON, 500 RON and 750 RON, buyers will associate three suits of inferior quality, medium and superior of the three "price-marker" and, even if it increases all, men will buy all the costumes having price-mark "favorite" for them. The debt of company is to determine what quality a difference is perceived by the customer justifies the price difference and to act in accordance with customer preferences.
• Price fixing optional features: Many companies provide, along with the base product, and products or optional features. Setting of prices of these options is, a very difficult.

• Captive product priceing: Some products require the use of auxiliary or "captive" items. Manufacturers of the basic products practice usually have low prices for these items and higher mark-ups for auxiliaries.

However, it is dangerous to practice excessively high price for products "captive" products, as there may be "pirates" who will try to offer counterfeit goods at lower prices, dealer has the obligation to find a balanced price which has the buyer to motivate him and buy the product.
• Double price structure: Firms providing practice services, usually a fixed amount plus a variable fee to use the service.

• Pricing of derivatives: From a manufacturing process of products resulting, most times, a number of products. If the value is low and the actual cost of removing them is high, the base product price recovery will be influenced by these issues. The manufacturer will have to practice for any derivative, any price above the cost removing from the other and in a situation where there are consumers who want them; the price should reflect their real value. Any income received on account of derivatives will help company to practice the lower prices for the basic product, if the competition will be required.
• Pricing of product packages: in many cases, the vendors groups the products offering them to a global price. Because it is possible that customers may not have intended to acquire all components package savings they might get from buying all components must be large enough to make them take the whole package.

By definition the price has a dynamic character and the business environment in general, especially the market is constantly changing. Therefore, for the price, as element of the marketing mix to carry out its objectives, it should be amended to harmonize with other components of the marketing mix whenever the market demands. The manufacturer must estimate the feedback received from buyers and competitors in any price change in what enlargement or reduction directives, to act accordingly.

4. CONCLUSIONS

The strategy between price and other components of mix existing an organic unit. Thus, the price intervenes as contact element and amortization between product and environment which it is addressed between supply and demand. Purpose of promotional activity, the price is interfered with promotion, contributing to recover investments in this area, and by its level can replace some efforts of promotion or lead to their increase, due to the need of his argument, the possibility they offer to reward device distribution efforts, to open and keep the target channels, as its correlation levels with the the peculiar forms of practiced outlets, the price is closely linked with the investment policy.

The price is the only variable of the marketing mix that produces incomes, other components requiring expenses, should be added that the price is a very flexible and can be changed very quickly, unlike to a product features and distribution activities. In an enterprise of competitive organization, the flexibility price is a crucial mechanism that stimulates the creation of required goods and removes blockages caused by overproduction.

The manager shall be constantly facing decisions on price, although in some cases, not only need to maximize the sales and or profits. It is obvious that pricing should be done in the context of specific market restrictions, which have to do make the organization, respecting at the same time, its strategic objectives.

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PSYCHOSOCIAL AND ECONOMIC EFFECTS OF UNEMPLOYMENT. CONCRETE RESEARCH ON THE POPULATION OF UNEMPLOYED IN BIHOR COUNTY

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Abstract: The present paper is structured in two parts: the first part comprises a theoretical analysis of unemployment, focusing on its negative effects, and the second part presents the results of a sociological survey based on a questionnaire applied by the survey operators on a sample of unemployed, determined by means of share sampling technique.
The objective of this research is to detect the effects of unemployment on the individual's personality, his family and the social networks which the individual is part of. By observing the groups of expenditure within the family budgets affected by unemployment, we find that the most affected ones are the expenses for the purchase of objects for leisure and the purchase of clothing, closely correlated with the high age of the sample members who are supposed to have such items and the least affected are the expenses for children's education, for household and food.
Key words: Unemployment, psychosocial effects, social and economic cost.

1. INTRODUCTION

Unemployment defines an excess situation of the labor market, where the offer exceeds the demand in workforce. This means that some people cannot find a job, although they would like to work. This is an imbalanced unemployment and it is considered a negative phenomenon, since it is equivalent to the loss of resources due to their non-use. There is also a balanced unemployment or a natural one, considered normal for the balanced functioning of the economy. Its level is around 3% and there are labor market analysts who try to identify the positive facets of this type of unemployment, arguing that its existence motivates those who have a job to work better in order to maintain their jobs, thus leading to increased productivity [5, p.787].

Unemployment is a common phenomenon often encountered in the societies in the transition process from command, centralized economy, to the economy of free market. Thus, it was present in Romania and in Bihor county throughout the transition.

The highest unemployment rate was recorded, both in Romania and in Bihor county, in 1993 and 1994, after which there has been a downward trend. Since 1997, the unemployment rate has increased, as a consequence of the policy of privatization through liquidation and of the restructuring measures to enhance the economy. Since 1999 (at Bihor county level) and 2000 (nationwide) a decrease in the unemployment rate has been recorded, along with economic revival. Thus, in 2000, the national unemployment rate recorded the lowest value, of only 4% of inhabitants, compared with the highest value, 11.4% registered in the peak year, 1991 and 11% in 1994 [2, p. 153].

Also, unemployment has been encountered during the economic crisis begun in October 2008, as its consequence. In 2009, year of economic crisis, both nationwide and in Bihor county, unemployment was rising, reaching 7.8 and 5.9 respectively. The largest cuts took place nationwide in 2009 - 450,000 people were laid off, of whom 72,000 after collective redundancies. At the end of March 2012, the unemployment rate was 5.05% nationwide and 4.02% in Bihor county.

Unemployment is considered a negative factor because it imposes costs on society. The

national cost of unemployment can be classified into three categories: social cost, financial cost, economic cost [4, p.600].

The social cost of involuntary unemployment is incalculable. For the individual, the demoralizing effect depends on unemployment type, whether it is on long or short term. Short-term unemployment does not have serious consequences on the individual; the long-term one is devastating. Many long-term unemployed become bored, indifferent, apathetic, they lose their friends and suffer from depression.

The financial cost of unemployment has three components: aids that are provided to the unemployed, loss of revenue from taxes, that would otherwise be collected and loss of social contributions.

The economic cost translates into loss of resources, due to the fact that the economy has a low production, compared to the one which might have been achieved, if the labor force had been fully used.

In psychosocial terms, unemployment is, in market economies, a major risk, with multiple and sustainable effects; it is therefore [3, p.41]: expansion and deepening factor of poverty for the unemployed and their families, it can affect business, economic sectors, geographical areas, trades or professions; "stimulation" and maintenance factor of criminal state; factor of impaired health; deterrent, marginalization and exclusion factor of people with low qualifications or poor level of education; factor of deepening labor market segmentation; factor of political instability, economic and social destructive conflict.

There are also *positive consequences* of unemployment, such as: it is a labor reserve that can cover additional labor demand in certain periods; it creates premises for the drawback of salaries and on this basis of costs and prices; it is a factor of pressure on the occupied workforce, contributing to its discipline, to boost work towards improving quality and productivity, in the direction of increasing professional competence; it creates stronger relationships among employees, with favorable effects on the results of their work. [1, p. 89].

2. THE EFFECTS OF UNEMPLOYMENT

Before the effect of redundancy is felt by other family members, the newly unemployed are facing a new situation and a series of experiences, affecting their personality.

Unemployment affects self-esteem, self-realization, physical and mental health, their whole behavior. Some will internalize their feelings, others will display all the states they are going through.

The most common attitude is anger, manifested through a nervous state, accompanied by loss of security; others can be overcome by despair, hatred, may show signs of illness or even the feeling of near death, suicidal thoughts. Few are those who can detach and look at things as if nothing had happened.

In terms of self-esteem, this is affected by the individual's uncertainty about his role; the unemployed, even if they do not recognize or allow it to be observed, feel offended, don't know their value anymore, considering themselves victims of society; others, with a more balanced personality, can easily overcome this period, without their personality being deeply affected.

The crisis experienced by some unemployed layoffs is sometimes so deep, that it affects their health; therefore, stomach aches may occur, nervousness, insomnia, tension or fear etc.

It is found that mortality is more common in males and in the active population, as a result of cardiovascular disease, suicide and psychosocial stress caused by divorce, family breakdown, poverty, job insecurity or unemployment, all these being consequences of redundancy.

The main field, where the unemployed are mostly affected is the financial one; if until then the budget was planned, now some of the chapters on costs are disregarded or eliminated. Effects include interruption or reduction of income, redistribution of funds based on priorities. "In many Romanian families, unemployment means stepping into poverty" [6, p. 79].

The indirect results of redundancy are not a very visible consequence of unemployment, but their actions extend over a long period of time and affect the life of individual and family, by: affecting the plans of expansion of habitat; limiting the access to education for children and adults; limiting the access to culture (theatre, cinema, shows, etc.); the effects on choosing transportation means; limiting access to medicine and health maintenance; affecting moments of leisure (giving up vacations and holidays).

3. THE ANALYSIS OF RESEARCH DATA

The objective of this analysis is to detect the effects of unemployment on the individual's personality, his family and the social networks which the individual is part of.

The used research method was the sociological investigation and the chosen research instrument is the questionnaire. The population on which the investigation was conducted consisted of all registered unemployed in Bihor county.

The used sampling technique in selecting the subjects included in the sample was that of the sampling rate and the used sampling criteria were *age* and *gender*.

The sample included 451 subjects in Bihor county with the structure indicated in table 1.

Table 1: The structure of the sample according to gender and age

%	Total	Male	Female
<25 years	14,41	8,87	5,54
25-29 years	12,63	7,53	5,10
30-39 years	31,04	17,51	13,53
40 – 49 years	27,50	15,74	11,77
50-55 years	10,42	6,65	3,77
>55 years	3,99	2,88	1,11

The questionnaire was administered by the operators of inquiry, at the agency to which the unemployed have to go, at least monthly, to get their unemployment card signed or to search for information on employment opportunities or retraining.

4. THE EFFECTS OF UNEMPLOYMENT ON THE PERSONALITY AND SOCIAL RELATIONSHIPS OF THE UNEMPLOYED

As it is a situation of under-usage and exclusion from the labor market, it is assumed that unemployment affects negatively the main areas of life, the lower budget being considered in this case an intermediary variable.

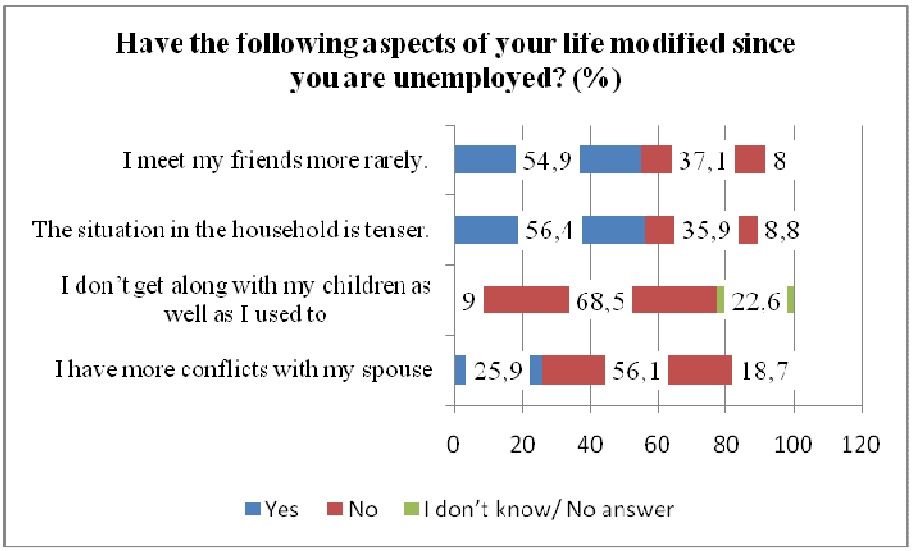

Figure 1. The effects of unemployment on some dimensions of personal and social life.

Analyzing the effects on the dimension *relationships with friends*, we find that a little over

half percent of subjects, exactly 54.9% of them feel the effect of damaged relationships with friends. Unemployment affects the relationship with friends as the unemployed, on one hand, has a lower budget for leisure activities (see below budget reduction for these activities), and on the other hand, of course depending on his personality, it generates a state of discomfort in the organization of his program, because in addition to a stable financial source, holding a job involves other benefits: time organization (the individual follows a structure of well-defined time), activity (brings to the individual, besides professional development, sources of fulfillment, self-confidence, it energizes the intellectual and psychical), cooperation (to meet the growing phenomenon of social tasks), social recognition, harmonious development of personal identity [3, p. 79]. This variable is associated with reduced spending on leisure; the test of significance value is 0.03.

34.9% say that the tense situation in the household has not increased, 56.35% say they have felt an increased tension in the household lately and 8.75% do not know or do not respond to this item. Even though most of them say that they rely on family support, the family life of a significant number of people has been affected by an increasing tension, dissatisfaction and feelings of insecurity, which radiate, damaging even the subconscious level, the atmosphere.

The relationship of unemployed parents with their children has not changed in 68.48% of cases, 8.95% answered affirmatively and 22.56% of the respondents do not know or do not respond (the high number of non-responses can be explained by the desirability of the item, as well as the corresponding number of those who have no children). It is expected that, as they have more time, they would spend it with their children, thus compensating for previous periods.

A quarter of respondents said that their relationship with their spouse worsened (25.2%), 56.09% responded negatively to this item and 18.71% do not know or did not answer. It seems that the relationship with their spouse and children remains the most stable one as only 25.2% felt a change in their relationships.

Unemployment affects the person's mood to a high extent, 42.38% stating that they feel depressed, 38.43% responded negatively and 19.18% do not know or did not answer.

However, 46.75% are optimistic about resolving their current situation, 40.48% are not optimistic in what concerns the change of their situation and 12.77% do not know or do not respond; the relationship is somewhat balanced between optimism and its lack. (see figure 1)

5. EFFECTS OF UNEMPLOYMENT ON THE SIZE AND STRUCTURE OF REVENUE AND EXPENDITURE BUDGET OF FAMILIES

In order to capture what types of expenses in the family budget were affected as a consequence of the unemployed situation we formulated a question with multiple choices, on the dimensions of a family budget.

First, analyzing the budget, we requested answers regarding how to fill budgetary sources, when the existing ones are insufficient. The responses of the subjects revealed that about 10% of the subjects constantly repeated that it was not the case to use other resources to cover the regular budget; approximately 2.5% did not answer.

From those who needed additional resources, the majority, 63.3% respectively appealed to their own savings, 37.6% resorted to loans, probably from a bank, and 44.6% said they had sought assistance from relatives and friends. As expressed percentages exceed 100%, we appreciate that some subjects had accessed two or more of the methods tested by us.

The conclusion that can be formulated from the analysis of data suggests that most of the unemployed respondents (90%) faced financial problems, which underlies the idea that the size of the revenue is deeply affected by the situation of unemployment, especially in the case of the long term one.

Reduced revenues resulted in a reduction of the budget allocated to the various expenses such as: expenses for the child's education, food expenses, expenses on clothing, housing, transport, purchase of objects; below we will see how the answers in relation to these expenses are structured:

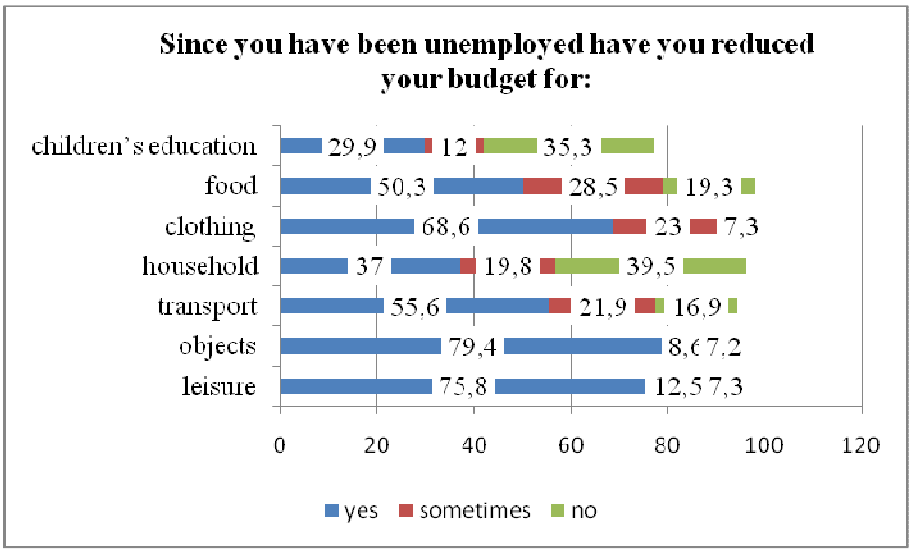

Figure 2. The way unemployed status influenced the structure of expenditures in the family budget

The data presented in figure 2 show that the most affected group of expenditure is the one concerning the purchase of objects (79.4%), perhaps of furniture, household items, cars etc., maybe because most subjects were placed in age groups of over 30 years and they already own such items, so the purchase of new or more modern ones is not an urgent necessity. Such expenses have seldom been renounced, only a percentage of 15.8%.

On the second place in the structure of renounced expenditures there were expenditures for leisure (75.8%) that is the cost of holidays, weekends, general leisure expenses, which can be easily renounced in cases of financial restrictions. A less significant category (19.8%), probably youngsters or those who have support from their family or who have other sources of income have not renounced or have rarely renounced such expenses.

Clothing expenses were reduced in the case of 68.6% of subjects, probably the older ones.

Almost half of respondents mentioned difficulties in providing the necessary food and housing costs (37% to whom we can add 19.8% who have occasionally encountered such difficulties.) Nearly 40% of the subjects who had housing related problems were those who owned their houses.

We observed that the least severe problems were reported in relation to expenditures for children's education. Most families with children have one or two children, and in our society education expenses are considered an investment rather than consumption expenditures, as the child becomes the highest value for the family.

6. CONCLUSIONS:

- Unemployment is considered a negative factor because it imposes costs on society. The national cost of unemployment can be classified into three categories: social cost, financial cost, economic cost.
- In psychosocial terms, unemployment is, in market economies, a major risk, with multiple and sustainable effects.
- The research was conducted on a sample, determined by quota sampling technique, on the population of registered unemployed in Bihor county.
- The sample comprised 451 unemployed. It should be noted that the sample is not representative for the entire population, but we think that it presents a number of relevant characteristics for understanding the problems currently faced by the unemployed, the data being able to suggest some measures that could boost employability and the social reinsertion phenomenon of the unemployed in the studied area.
- Regarding the subjects' perception of the effects of unemployment on social life we found that *the relationship with the spouse and children remains the most stable, as only 25.2% felt a*

change in their couple relationship. And on this occasion the role of family is reconfirmed in providing material and emotional support to its members, especially in crisis situations.

- In what concerns *the groups of expenditure within the budget of families affected by unemployment*, we find that the most affected ones are the expenditures for objects, for leisure and the purchase of clothing, closely correlated with the high age of the sample members, who presumably own such objects, and the least affected ones are the expenses with children's education, with housing and food.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

A PERFORMANCE MEASUREMENT SYSTEM FOR THE TEXTILE AND CLOTHING INDUSTRY: THE PERFORMANCE BOX

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Abstract: The exacerbation of competitiveness that is characterising the textile and clothing industry calls companies for a continuous rethinking of their operations activities. In such a context, the Performance Measurement Systems (PMSs), through which companies control and monitor their divisions and functions, need to be flexible, dynamic and able to change as circumstances change.
The actual implementations of existing PMSs is often difficult and expensive, since theoretical frameworks appear static and complex to be operationalized.
In order to overcome this limitation this paper introduces a PMS called Performance Box. It is based on a hierarchical, multilevel and multidimensional structure. It is built around interchangeable performance dimensions that make it flexible and adaptable to any specific company requirements.
The description of an industrial case study provides a pragmatic insight on the opportunities deriving from the application of this PMS.
Keywords: Performance Measurement System (PMS); textile and clothing industry, performance measures attributes.

1. INTRODUCTION

In the last century, Western companies operating in the textile and clothing industry have radically changed their management approaches, shifting their operations strategic focus from the efficiency of their production systems to the improvement of productivity, flexibility, innovation and quality at the same time [16].

Up to the '70s the competition among this industry was essentially based on the product price. From the '80s to the '90s the increasing market saturation and the entrance of new and well organised competitors pushed companies to re-think their operations, moving towards more complex organisations focused on product quality and process innovation.

In the next phase, still on-going, market instability and unpredictability have dramatically increased. This new condition has caused an exacerbation of competitiveness and consequently the need of tackling new forms of differentiation. Therefore, to satisfy both tangible and intangible, expressed and non-expressed customer requirements, companies have been requested to implement new operations systems being at the same time efficient, effective and flexible and supporting the provision of high quality solutions.

In such a context, the Performance Measurement Systems (PMSs), through which companies control and monitor their divisions and functions, have to be designed and built to capture all the dimensions that a company has to face in managing its business. A multi-level and multi- perspective approach is thus required. It means that a performance evaluation cannot be based only on a complete set of financial Key Performance Indicators (KPIs), but it must be built around many other facets such as quality, effectiveness, timeliness, efficiency and flexibility. Moreover, it must be conceived to be open to all the different levels of an organisation, in order to enable data sharing among functions and divisions as well as improvement in operations processes.

Current literature on PMS provides many theoretical frameworks, models and tools. However,

their actual operationalization is often difficult and costly. In order to fill this gap, this paper introduces an a new PMS called Performance Box and its application competing in the textile sector.
In the remainder of this paper, an overview of literature relate to PMS is provided (Section 2). Within this theoretical background, Section 3 describes the development of the proposed PMS, while Section 4 introduces its first empirical validation. A discussion of the results with research and managerial implications precedes the final conclusions (Section 5).

2. LITERATURE REVIEW

As reported by Franco-Santos et al. [5], a Performance Measurement System (PMS) can be classified along with three different dimensions:

1. features, which are the properties or elements that constitute a PMS (performance measures, objectives, supporting infrastructure, targets, causal models, hierarchy/cascade, performance contract and rewards);
2. roles, which are the purposes or functions that are performed by a PMS (strategy formulation, implementation and execution, focus attention and alignment, internal and external communication, measure, evaluation and improvement of performance, monitor progress, planning, rewards, managing relationships, feedback, double-loop learning, benchmarking, compliance with regulations, control, influence behaviour);
3. processes, which are the series of actions to build and manage a PMS (information provision, measure design / selection, data capture and analysis, target setting, rewards, identify stakeholder needs and wants, strategic objectives specifications, decision making, performance evaluation, interpretation, review procedures, planning).

Referring to the features dimension and in particular to the "performance measures" attributes, literature is wide and various. Many and heterogeneous measures perspectives have been considered by scholars in building frameworks for PMS development and implementation, that are briefly described in the follows:

1. The Performance Measurement Matrix [8] seeks to consider different classes of business performance (financial and non-financial, internal and external), without making explicit the links between the different dimensions;
2. The Results and determinants framework [4] is based on the idea that there are two basic types of performance measure in any organisation, those related to results, and those focused on the determinants of the results;
3. The SMART Pyramid [11] is organised around four levels of performance (corporate, strategic business area, process, and organisational unit). As far as strategic business area is concerned, its performance can be articulated in financial and competitive results; at the process level, performance can be measured with regard to customer satisfaction, flexibility and productivity; the organisational unit performance can be evaluated on quality, time to market, lead time and costs;
4. the Balanced Scorecard [7] provides an evaluation around four different dimensions (strategy, processes, economics, training and improvement). It is based on a limited set of financial and non-financial, short- and long terms KPIs, linked each other through a cause-effect logic structure, that allow a comprehensive evaluation of the company;
5. the framework developed by Brown [2] is built around five stages in a business process and highlights the differences between input, process, output and outcome measures;
6. The Performance Prism [12] is built around five dimensions, logically linked each other: stakeholders involvement and satisfaction, strategy, processes and capabilities. It is able to achieve different organisation levels.

Table 1 summarises the main performance measures attributes [1][7][10][11][14][15] characterising each framework previously described.

Table 1: Main performance measures attributes – A comparison

	Dimensions	**Efficiency / effectiveness**	**View**	**Integration**	**Level**
Performance Measurement Matrix [8]	Cost / Non-cost	Efficiency Effectiveness	Internal External	Low	Business
Results and determinants framework [4]	Financial / Competitiveness / Quality / Flexibility / Resource utilisation / Innovation	Efficiency Effectiveness	Mostly internal	Causal relation between determinants and results	Business Process
SMART Pyramid [11]	Vision / Market / Financial / Customer satisfaction / Flexibility / Productivity / Quality / Delivery / Cycle Time / Waste	Efficiency Effectiveness	Internal External	Vertical	Business Process Organisational unit
Balanced Scorecard [7]	Finance / Customers / Internal processes / Innovation	Efficiency Effectiveness	Internal External	Horizontal Vertical	Business
Brown's framework [2]	Inputs / Processing System / Outputs / Outcomes / Goals	Efficiency Effectiveness	Internal External	Horizontal	Process
Performance Prism [12]	Stakeholder satisfaction / Strategy / Process / Capability / Stakeholder involvement	Efficiency Effectiveness	Internal External	Logical connection between the dimensions	Business Process Organisational unit

Unlike the context in which firms operate, these PMS frameworks, often implemented at considerable expenses, appear to be static [9] and difficult to operationalize [13]. On the contrary, PMSs need to be flexible, dynamic and able to be changed as circumstances change [3][6], so that performance measures remain relevant and continue to reflect the issues of importance to the business [11]. It is particularly true for highly competitive and dynamic global markets, where companies are obliged to continuously rethink their product and service offering and to redefine the organisational principles that support its provision, including their PMSs.

3. TOWARDS A NEW PMS – THE PERFORMANCE BOX

In order to overcome the limitations of existing PMS frameworks, and with a particular attention to dynamism requirements, a new PMS, named Performance Box, has been developed. In particular, its flexible structure is based on a set of performance dimensions, that mutually influence each other. For every dimension a set of KPIs is proposed. The KPIs can be easily calculated but are not linked each other by a rigid cause-effect logic. Moreover, each KPI can refer to a specific process, a set of processes or to the overall organisation, following a hierarchical structure. Dimensions and KPIs are not fixed, but they can be selected from an existing database, in accordance with the specific management necessity. The general scheme of the Performance Box is shown in Figure 1.

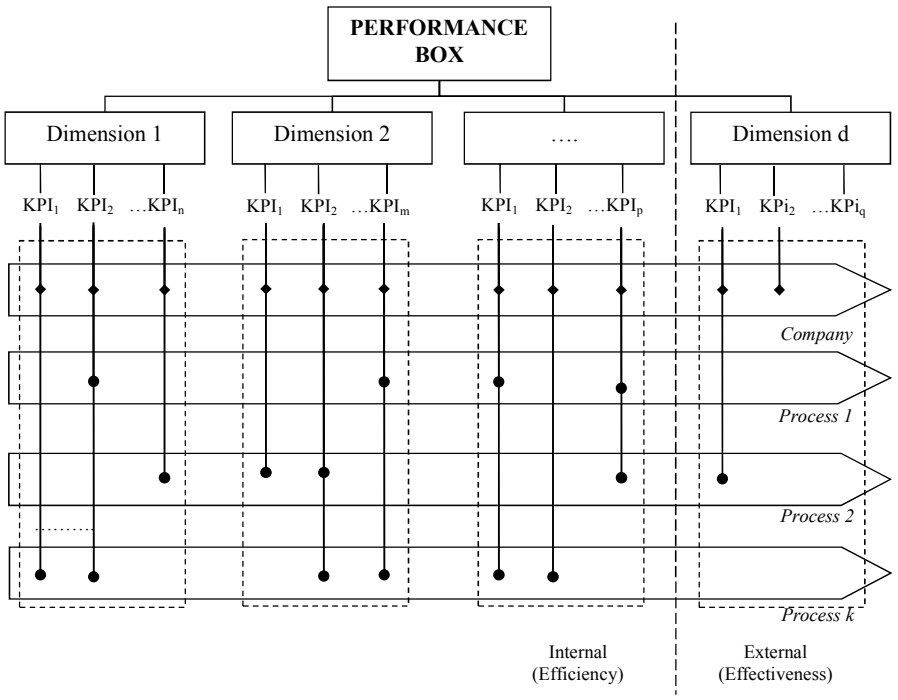

Figure 1: The Performance Box: general scheme

The Performance Box main features are reported in Table 2.

Table 2: The Performance Box main features

	Dimensions	**Efficiency / effectiveness**	**View**	**Integration**	**Level**
Performance Box	Not defined *a priori* (Reflect the strategic priorities)	Efficiency Effectiveness	Internal External	Vertical Horizontal	Business Process

Then, for each KPI, three different classes of information can be identified (Table 3):

1. the weight. This value, that can range from 0 to 1, is defined by the company management directly in the budgeting phase. Its value can change overtime or in accordance with specific activity or process;
2. the target and the required improvement (calculated as a percentage of the target). Both these KPI's information are selected by the management during the budgeting phase;
3. the actual value, the achieved result (calculated as a percentage of the required improvement), and the final score. The latter is calculated multiplying the achieved result by the KPI weight.

These different types of information enable: i) the measurement and the evaluation of a single process; ii) the analysis of a specific KPI or iii) the performance dimension.

Table 3: Performance attributes evaluated for each KPI of Performance Box

General information		**Budget**		**Balance**		
KPI	Weight	Target	Required improvement	Actual Value	Achieved result (as % of the target)	Score

4.AN EMPIRICAL APPLICATION

The Performance Box previously described has been empirically validated through an application in a real case study. The participating company (hereafter referred to as TexCo) is an Italian producer of yarns and fabric for household textile. One of the best suppliers in Made In Italy linen, TexCo has founded its success on the capability to match designing creativity, high competences and skills on product and production processes.

The high speed of change that characterises the sector where TexCo operates entails a continuous re-thought and re-design of the production processes, and, consequently, the need of a flexible PMS. In such a context, a new PMS has been proposed. Based on the Performance Box framework features, it has been built around four performance dimensions, selected by the management accordingly to the company strategy: cost, quality, time and productivity. Then for each production process (e.g. wool and candlewick spinning, sizing, warping, weaving) a set of KPIs has been identified and selected by an existing database. An extract of KPIs identified for each process is reported in Table 4.

Table 4: Cost Analysis –process level

	Cost	**Quality**	**Time**	**Productivity**
Spinning	Operating costs in a given period R&D expenditure as a percentage of operating costs	Numer of neps Number of abnormalities	Average length of piece of equipment implementation project Average elapsed time between stock outs	Productivity increase Technology rating
Sizing	Preventative maintenance spend as a % of total maintenance spend Cost of absenteeism	% of shrink resistance % of harness of threads	% of standard production lead time Setup time	% of standard products Stock turnover
Warping	Water consumption Cost of non-conformance to quality requirements (CONC) in a given period	% of shrink resistance % humidity of threads	Idle time Repair and maintenance time	Forward order book as % of available capacity
Weaving	Energy consumption Labour cost Set-up cost	Deviation in thread quality % of customer complaints / previously occurred defects	Average lead time to produce and circulate reports Time for training and staff development per employee in a given period	Technology rating Number of product variants offered

For each performance dimension, information about KPIs have been used to provide an in-depth analysis on the achieved performances. The analysis has been carried out considering both a single process (for example, Table 5 reports the cost analysis of the weaving process), and the whole company (as shown in Table 6).

Table 5: Cost Analysis –Process level

Dimension : Level:	Cost Weaving	Weight	Target	Required improvement	Actual value	Achieved result (as % of the target)	Score
Labour cost		0.65	1.06	3%	1.11	0.95	0.61
Energy consumption		0.13	0.25	1%	0.23	1.08	0.14
Set-up cost		0.03	0.05	7%	0.05	1.00	0.03
Maintenance (machines and equipments)		0.05	0.10	5%	0.09	1.10	0.06
Amortization (machines and equipments)		0.14	0.21	3%	0.24	0.86	0.12
Weaving process Total score							**0,96**

Table 6: Cost Analysis – Company level

Dimension : Cost Level: Company	Weight	Target	Required improvement	Actual value	Achieved result (as % of the target)	Score
Delay in delivery	0.20	0.5%	8%	0.6%	0.83	0.17
Quality (scrap and reworks)	0.15	1.0%	5%	0.9%	1.11	0.17
Set-up cost	0.15	0.5%	6%	0.5%	1.00	0.15
Training	0.25	10.000 €	8%	10.000 €	1.00	0.25
Research and Development	0.25	8.0%	2%	8.0%	1.00	0.25
Total score						**0,99**

Then, the total scores have been graphically represented through a radar diagram. The analysis is reported in Figure 3, where the blue and red lines indicate, respectively, low/medium and medium/high performance borders while the achieved performance is indicated by the green line.

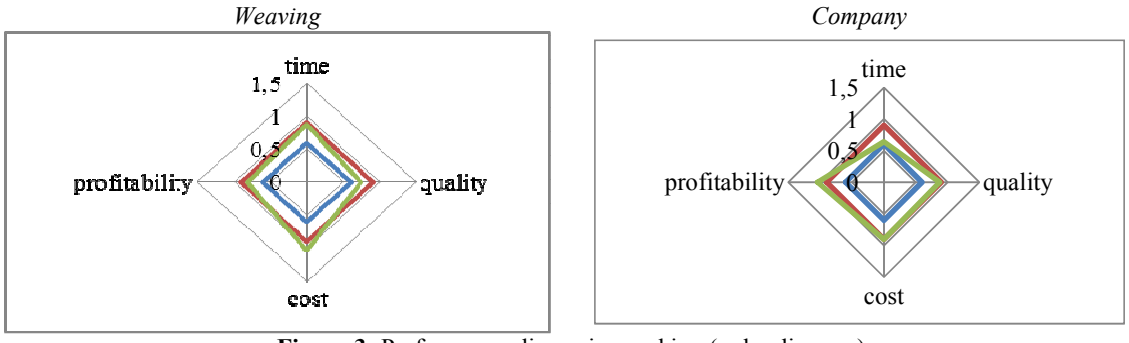

Figure 3: Performance dimension ranking (radar diagram)

Thanks to its main features, the Performance Box has been also adopted as a qualitative support tool during the analysis of investments. For instance, Table 6 reports an example of its utilisation in comparing three different types of machines in order to select the weaving characterised by the highest level of performance.

Table 6: Cost Analysis – Utilisation of Performance Box for analysis of alternatives

	Air loom	Positive pliers loom	Negative pliers loom
Total score: Cost	**0.96**	**1.01**	**0,99**
Labour	0.61	0.49	0.55
Energy	0.14	0.19	0.16
Set-up	0.03	0.05	0.05
Maintenance (machines and equipments)	0.06	0.06	0.06
Amortization (machines and equipments)	0.12	0.22	0.17
Total score: Quality	**0.97**	**1,03**	**1,01**
Total score: Time	**1.02**	**0.97**	**1,02**
Total score: Profitability	**1.00**	**1.02**	**1.04**

5. CONCLUSIONS, LIMITATIONS AND FURTHER DEVELOPMENTS7

In last decade, the external pressures and the international competitiveness have pushed textile and clothing companies to a continuous change of their strategies. The new paradigm of competition is

founded on product quality, innovation, customisation, process flexibility, efficiency and effectiveness.

In such a context, it emerges the clear necessity of having suitable methods and tools supporting operations planning, measurement and control with a multi-level, hierarchical and multi-perspective approach. Moreover the PMS has to be user friendly, quick, flexible as well as open to the different levels of the organisation. The Performance Box is conceived to satisfy these necessities. Built upon the main features of the PMSs mostly adopted in industry, it has been thought for those organisations that operate in a complex and quick industry, as the textile and clothing sector.

Thanks to a modular configuration, a small set of financial and operative KPIs, dynamically adaptable (in terms of types and numbers) to the necessity of the single company, the Performance Box makes easy performance retrievals and reports. Moreover the capability to change target in real time and to support a qualitative evaluation of different alternatives, makes this PMS a very easy, instantaneous and powerful tool to comprehensively evaluate a company and manage its operations in complex and dynamics markets.

The results presented in this paper cannot be considered exhaustive. Further development must be carried out in order to: (i) enlarge the sample of companies where the model can be applied, (ii) extend the model to the whole supply chain considering the relationships between the different tiers, such as suppliers, manufacturers and customers, (iii) develop the integration with the company reporting system and (iv), integrate the PMS with a benchmarking tool.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

SOCIO-ECONOMIC ASPECT OF INNOVATIVE MANAGEMENT APPROACH IN TEXTILE AND APPAREL INDUSTRY

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Abstract: This article deals with transformation of classical production line into cellular manufacturing enables to produce a wide variety of products with reduced demands for storage and production areas, removal of operational workers (masters) with a high degree of awareness, commitment, and responsibility of every employee, etc. Nowadays, existence of software and hardware support for activities in the apparel industry enables to reduce time and financial costs in mode designing, construction and modelling of the cut, designing cut positions and cutting of the materials, logistics, transfer of information, management activities, etc. The 3D scan of the human figures introduces entirely new opportunities for taking and controlling measures, suitability of used material, overall visualization and creation of virtual twins. The recession in apparel and textile industry, which has been caused by more factors, forces change of look on present way of orientation of the branch. Quantitative and price competition is not sufficient to gain market prevalence. Increasing the quality of all the parameters of produced clothing is the way to succeed. Via transformation of the apparel industry in Slovakia from the realization of the work in salary to the own development, design, manufacturing and sale, it is possible to create a basis for innovative business in this sector with high added value and market share in home and foreign markets.
Key words: Textile and apparel industry, innovations, 3D scan of the human figures, CAD support, cellular manufacturing, socio-economic aspect.

1. INTRODUCTION

Recession in the apparel and textile industry in the last decade has been notable. Employment in this branch has decreased from 2,810,000 persons in 2005 to 2,037,000 persons in 2009. The establishment of the EU-27 (EuropeanUnion), number of businesses in the branch has decreased by more than 100,000 from 234,605 to 128,330 [1]. Under globalization processes in the world economy, the markets have been liberalized and interconnected. New business opportunities have been created, and textile and apparel industry in Europe has experienced a massive import of Asian products, mainly due to inability to compete with low wages in Asia. Because of ecological, social and legal standards in the EU, employers must choose another way than price competition due to increasing prices of energy and monetary politics of China (which is gaining export prevalence through long-term undervaluation of Yuan). Preferring the so called work in the salary, which consists of import of complete material, hand-made finalization, and repurchasing for low prices wherein wages are the only value added, is not sustainable in long-term because of wage increase [2,3]. Future success of the businesses in the T/A (textile and apparel) industry depends on the modernization rate in manufacturing in order to maintain their competitiveness on a demanding international market, as well. Therefore, it is necessary to improve technical equipment and production quality and change

structure of the industry, (i.e. moving it into the area of specialized products and to a level that Asian production cannot achieve).

2. MANAGEMENT CONCEPT FOR MASS CUSTOM-MADE CLOTHING

The first part of the manufacturing process is a division of the material into the parts. Currently fully automated cutting rooms are via CAD (Computer Aided Design)and CAM (Computer Aided Manufacturing) support able to perform most of the activities in a short time with a little man assistance. In such a way maximization of material saving, accuracy of the cut and sequence of the material pattern is ensured. Assortment of the industrial mass production is divided according to the products in standard sizes. Products are manufactured a season in advance and their composition, and volume reflect predicted demand on the market. They are manufactured into storage and consequently distributed to the shops. Even with the most detailed analysis of the market it is not possible to predict real demand with 100% accuracy. Therefore, there are seasonal surpluses, which represent financial burden for storage, additional distribution, and sale. Usually these products are sold without profit. A huge advantage of custom-made production is the uniqueness of every product which has already its customer in the time of designing. After finishing off the product, it is sent directly to the customer and that reduces storage and sale costs.

Mass custom-made production differs from industrial production mainly in its assortment. In industrial production, it is represented by a higher volume of same types, production line is the best for this type of manufacturing. It is characterized by division of the manufacturing process into individual operations mainly based on the machine. They are arranged in order according to technology process with an impact on minimization of manipulation activities with semi-products. The most efficient way is to perform elementary operations on one machine. This division seems to be inefficient and sometimes impossible at custom-made production. Every product is manufactured in another way, technology process, and at different machinery. Basic feature of this requirement is flexibility of the workers, machinery, equipment, and technology process. These requirements are met by cellular organization of the production. Its main idea is to divide manufacturing process into individual modules (cells) which independently perform defined production tasks and are interconnected by information and material flow.

2.1. Advantages of the cellular production [4]

Cells are arranged according to the need for machinery for the production. Products are typed into one cell in terms of this specification. This division is possible in the clothing industry due to the fact that it is not required to have many machines used for textile production. It is essential to take into account the production material and we should look for similarities mainly in its thickness, character (textile, knitted fabric, non-woven fabric) and color grade (e.g. if dark materials are produced in one cell, consequent production of white material would be damaged by residues of threads in the machines). Advantages of the cellular production are given below.

1. Reduction of stocks and semi-finished products.
2. Ability to react more quickly and reliability of the deliveries.
3. Reduction of the manipulation activities.
4. Simpler management.
5. Simpler and more efficient price setting and cost control.
6. Easier analysis and work measurement.
7. Better utilization of the machinery, human resources, and production premises.
8. More efficient planning and management of the production.
9. Improvement of the quality.
10. Faster and simpler start for a new production.
11. More flexible and simpler dislocation of the machinery.

Machinery is mobile because of the wheels and it enables quick rearrangement according to technical requirements for product manufacturing. Complete material with petty preparation and packaging are shipped at the beginning of the shift. Perfect technical preparation is required in advance. The cell knows what, how and in what time should be produced. Production should be managed by the slogan: “What I start producing today, will be finished today.” In this situation work-

in-process is minimal and products are prepared for export at the end of the day and storage is not needed. Manipulation activities are reduced to materials delivery, transportation of the finished goods for export and in within the cell between closely standing workplaces. Production process is transparent and enables faster identification of faultiness, slowdown of the performance, low productivity and quality and it enables their fast removal as well.

2.2 An Example

Composition of one cell for manufacturing a group of clothing: outer female garments and textile garments with lining (e.g. jackets, jackets for transitional season, coats, vests, skirts, dresses with lining etc.). Machinery: single needle machine, double needle machine, overlock machines, button machine, punching machine, ironing machinery for inter-operational and final ironing (Fig.1).

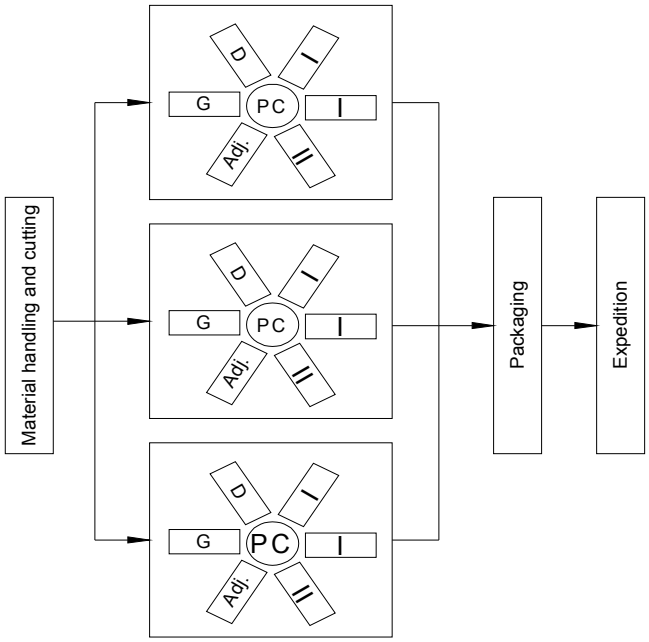

Figure 1. Proposal of cell production for mass custom-made clothing

Personal computer is a part of the cell and it provides all information about the product, e.g.:

- Specifications and requirements of the customer.
  - Cutting and modeling preparation.
  - Materials and cutting data (about every part of the product).
- Petty preparation data.
- Technology processes (database of standardized operations).
- Date of order and delivery.
- Way of packaging.
- Furthermore, it provides information about production cell.
- Actual performance of the cell and target performance.
- Quality of the cell production.
  - Workers assessment.
- Maintenance of the machinery.

Software support of the production:

- **Production and technology solutions**: database of the technology processes of production.
- **Service production**: recordings of machinery and equipment maintenance, breakdowns, and repairs.

- **Management solutions**: production management within individual cells, complex management of the company, management of the supplier-purchaser relationships, price and quality policy.

3. PROPOSALS FOR INNOVATIONS IN MODELS CREATION

Quality of products is an area which enables competition with Asian textile products and services. Products imported to Slovakia are known for their poor quality of used materials (basic, lining, infilling as well as accessory materials). Due to unqualified work operators, unfavorable work conditions and very often child labor, the technology and manufacturing of the products is on a lower level. Use of dangerous chemicals during manufacturing represents a significant threat to customers. Even though it is difficult to state the originality of the products, falsification of trademarks is a common practice in Asian countries [3]. Quality of the product also means its size and proportions and an overall fit and shape of the clothing. Mass production utilizes size standards reflecting standard sizes of the human figures. Although these standards are set by international regulations, every company uses its own different size standards. Therefore, it is necessary to try the clothing personally and just few customers will find a suitable and comfortable clothing [5,6]. This issue provides an opportunity to utilize CAD systems to determine the size by digitalization of the human body topography via 3D scanners. 3D is a high-technology which fulfills all the requirements and represents qualitative leap in product design with connection to CAD systems implementation of technological planning.

Scanner is used for exact mapping of the human body. Because every human body is unique in shape, comfortable clothing should meet the requirements of the customer (Fig.2). After making a picture of, it is possible to process and work with gained data [7,8,9]. It is possible to prevent long measuring with IT technology. This activity is processed by powerful hardware and sophisticated software. This is followed by rendering, i.e. mapping and texturisation of final virtual twin. Virtual shows with these models are planned for the future [10,11].

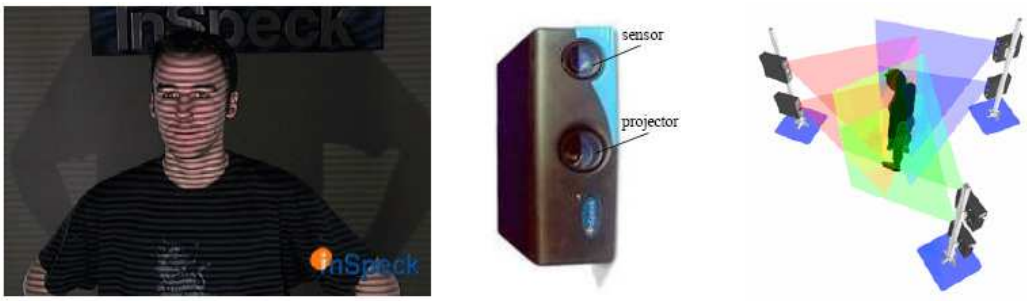

Figure 2. Example of optical projection of the light of the figurant and a device [15].

Mass production of custom-made clothing reduces the time and increases production efficiency and thus creates individualized product or service. Furthermore, these technologies reduce time between placing an order and delivery of the goods. Term **"**mass custom-made clothing**"** characterizes adaptation of the mass production processes, information technologies, and new strategies of management in order to increase personalized offers with the customer's help. Role of the mass custom-made clothing is to find out exactly what products customers require, when they require them and what is a reasonable price for these products. This new approach to apparel production management enables flexible production and rapid response to customer's demands. In practice, it could be realized via customer centre where a customer would provide his measures making use of the 3D scanner, to choose the model of the product and the materials. This way we could create a unique design according to customer's measures and needs. Obtained measures and chosen model represent input data for creating cut documentation and material consumption applying software (Fig.3).

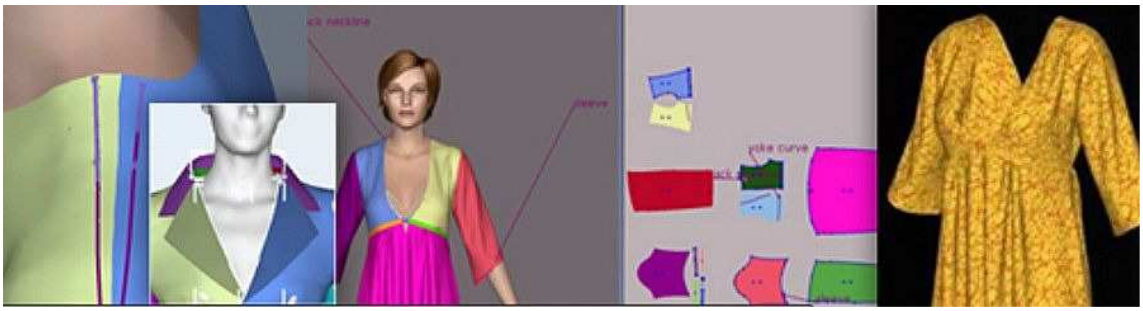

Figure 3. Possibility of application digitalized measures of the human body in textile production [12].

In classical clothing production, the right size of the clothing is obtained by a repeated control and trying on semi-finished clothing with consequent fitting on the body. Creation of virtual twin enables to check modeling of the cut, suitability of used materials and accessories and an overall fit of the product on an individual figure (Fig.4). Nowadays, existing systems offer static simulation of dressed models [13]. Moreover, there is an effort to implement dynamics of the movement into trying on clothes. In present, there is a trend to build a platform for virtual models fitting with the use of so called virtual fashion shows which are on-line animation of dressed virtual twins or generic models dressed in designed clothing. This enables visualization of dynamic interaction of simulated model on a moving human body.

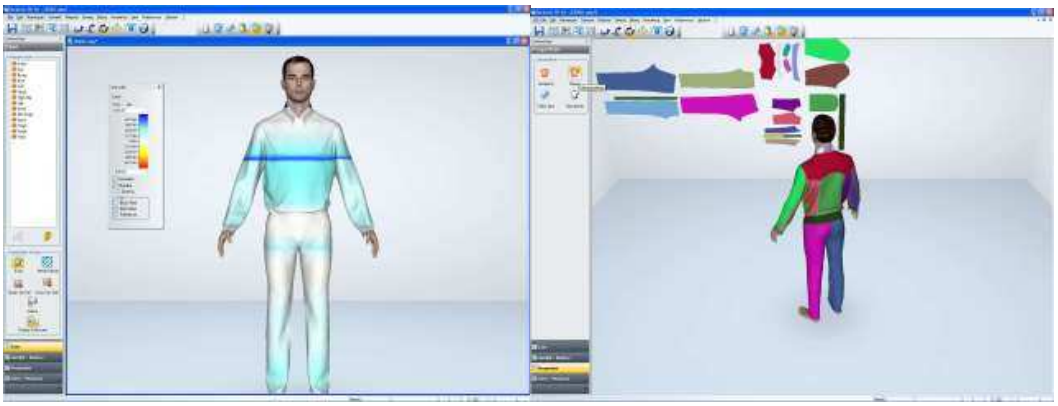

Figure 4. Virtual twin, design of the model and specification of individual parts of the clothing [14].

Main requirements for quality clothing are not only in its shape and fitting on the figure, but as well a quality of used material. Upper material should be pleasant for touching, colorfast and lasting. Lining and cushioning material should have similar properties as upper material (i.e. they should be shrinkable, resistant to abrasion, colorfast). Supplementary material such as buttons, buckles, zips and joining material (mostly threads and glues) must meet requirements for toughness, security, and adequacy to other materials used on the clothing. The most critical parameter is aesthetic value and color of the model. Possibility to choose the materials increases uniqueness of the model and software support of selection of the materials helps to professionalize this process. Database of the materials includes not only their visualization, material composition but also suitability of usage for certain clothing. Manufacturer is provided with information about price of the materials which is crucial for setting final price of the product. It is possible to avoid non-profit manufacturing while making a design.

4. SOCIO-ECONOMIC ASPECT OF THE CELLULAR PRODUCTION

The number of people employed in the clothing industry has been decreasing since 2002. The biggest decline occurred in the time of global financial crisis between 2008 and 2009, but even a consequent recovery of the economy in 2010 has not caused an increase of employment in this area of industry (Fig.5).

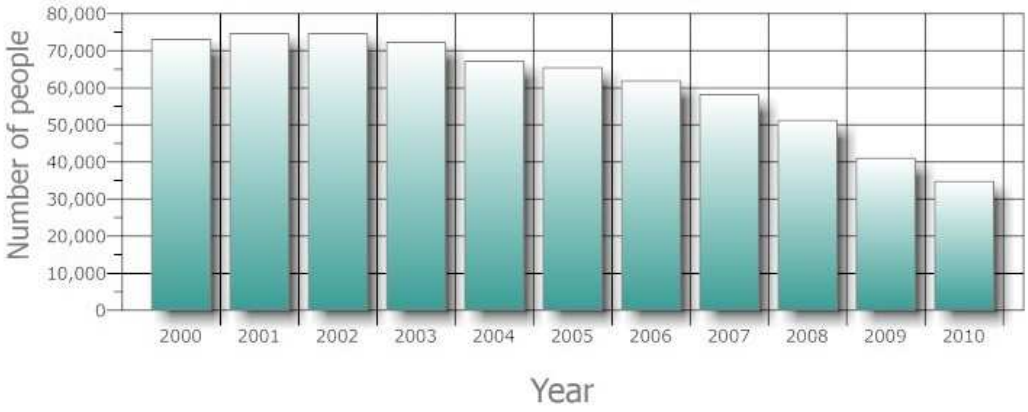

Figure 5. Average number of people employed in manufacturing industry CB i.e. textile, clothing, leather, and leather products [16]

Specific feature of this industry is that women represent 85% of the people employed. This is a reason for higher drawings entitlement provided by law, for example, maternity leave, parental leave, sick leave, etc. Bigger part of the production is located in less developed parts of Slovakia. These attributes represent even bigger pressure on social status of the people working in the industry. Advantage of manufacturing in Slovakia is the high proficiency and skillfulness of the employees which enables to achieve high quality of the products. On the other side, employees have very low motivation due to low salaries. These salaries are one of the lowest within the industrial areas. Average nominal salary in the industry manufacturing textile, clothing, leather and leather products in 2010 was 518 Euros compared to the average salary 795 Euros in the whole industry [2]. Another crucial factor is work at production line. The work consisting of routine operations on the same place will become monotonous after some time and may cause apathy. When an employee starts to work in some operation, he will adopt it very quickly, improve his skills and becomes professional in it. The problem is that he stays at the same position for months even years, and his perception of the manufacturing process is limited to this operation and he cannot perform other operations and is not interested in them. His work task becomes automatic, routine, and boring. Such an employee has problems to understand changes and innovations as something beneficial or advantageous.

Work in the production is managed by operational worker, i.e. foreman. He has all the competences for manufacturing process on the operational level. He sorts the employees, machinery, operations; very often he arranges technological process, decides about manufacturing performance and demonstrates it. He is responsible for daily plans fulfillment. Shift of the main competence for production line to the foreman in combination with routine work moves the employee to the positions where he just follows and fulfills the instructions without having any self-realisation competences. Aesthetics, quality, and originality are the most valued attributes. However, their transformation into the production process is only on the level of draftsman, designer, and technologist. Cellular organization of the production takes into account certain demands for every employee. The most significant factor is being informed about the product directly from the customer. Every employee is responsible for correct technology, quality, and timely fulfillment of the manufacturing. Organization of the work in the cell (with from 4 to 8 employees) is similar to custom workshop in which distribution of the work and cooperation is on a very high level. Every employee produces the product alone or during some operations in cooperation with other employees from the workshop.

This way he creates quality and look of the product which contains his personal mark on the label in case of a claim. During his work time, he changes different job positions and machinery and this way he is not limited to one stable work position. His remuneration depends on his work and its quality which is visible on the cell's computer. Precondition for this is that every employee can work with a computer. On one side, this competence is a necessity; in the other side, it increases computer literacy of the population. Minimization of storage causes enormous savings of financial and space capacities. A high number of products of the same type are produced in production line. In order to make it possible for summer clothing, items are produced in winter and vice versa. Therefore, products are stored for 6 months in warehouses until they are shipped to the shops. Ordering of an exact product

will remove these requirements. Products are shipped to the customer immediately after their finalization. Correctness of business and production strategy is reflected in production, turnover, and profit. Other hidden attributes of success are the customer's satisfaction, prestige of the company, (branding etc.) which are very difficult to measure but are as important as financial indicators. A well-known brand is a guarantee for quality. This is what customer repeatedly buys. It is not easy to establish such a brand. It requires hard and, creative work with continuous improvement and innovation. Nowadays, the era of information technologies offers challenges and progress in the clothing industry. Therefore, it is necessary to use and implement them, and this way transform production companies into modern firms with own fashion brands and creative employees at every level (management, design, construction, and production).

5. CONCLUSION

Decline in textile and apparel industry in Slovakia and the whole EuropeanUnion (EU) calls for change in this field. Present time is characterized by a rapid development in information and telecommunication technologies and offers possibilities for their implementation in this stagnating industrial branch. It would be senseless not to take advantage of these trends. The use of 3D scanners for digitization of the human body topography and CAD systems in constructing, modeling, designing, and creating cut positions, etc., makes the work more accurate, faster and introduces new possibilities for clothing design and production. Customer's direct entrance into the process of product design makes it original and reflects his own creativity. Visualization of the design on a virtual twin intensifies viewability, efficiency, and adequacy of the model for certain customer. Production management in which designs can be produced in a remarkably short time, with high economic efficiency, and quality must be adjusted to this way of production. Cellular production organization has potential to fulfill these requirements. Its operation involves higher demands for production employees in IT area, their independence, responsibility, cooperation, and high quality of the work. EU countries are trying to transform the society into a knowledge society by using different methods. A good tool in the production area is to increase awareness of the employees, support them in creativity and innovations in order to achieve continuous improvement of their own work performance.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY ON S.W.O.T ANALYSIS ON ONE FIRM IN THE TEXTILE INDUSTRY TO IMPLEMENT NEW CONCEPTS AND STRATEGIES

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Abstract: Some commercial companies in the textile industry are concerned with the implementation of new strategies that lead to the development of high quality products, which are offered to the clients as quickly as possible. Achieving this objective leads directly to the success of the company and getting the profit [3, 17, 19].
Continuous improvement strategy "KAIZEN" represents a strategy whereby it designates the gradual and continuous improvement of the company' management and company's activities, of the parameters of quality, productivity and competitiveness, with the direct involvement of the entire staff. [1, 5, 8,9,15,19,20].
SWOT analysis allows formulation of reviews about past and present condition of the company. It can be defined as a complex research of economic, technical, sociological, legal and managerial aspects that characterizes a company activity to identify the strengths, weaknesses, opportunities, threats and the causes that generate or will generate them, put forward recommendations to eliminate or decrease the negative aspects and valorisation of positive aspects. [2,4,6,7,10,11,12,13,14,16,18]
Key words: quality, textile, management, Kaizen, production, SWOT analysis

1. INTRODUCTION

The view of generalization of advanced production systems that use modern managerial methods for fabrication process requires the fulfilment of certain requirements in the field continue improvement of the quality of production and products [14].

SWOT is the acronym for English words: *„Strengths"*, *„Weaknesses", „Opportunities"* and *„Threats"*. The first two relate to the company and reflect its status, and the next two concern the environment and mirrored its impact on company activity. [2,4,10,11,16].

SWOT analysis may be conducted both at the level of company as a whole as well as in the functional areas of business: distribution, research and development, production, financial and personal - work relationship [2,4,10,11].

2. CASE STUDY

2.1 Company Presentation

One of world leaders on European textile companies which started a few years ago developing KAIZEN concept is Italian group "X". "X" Company was set up in 1987 in Verona, with the aim to create a new line in the production of stockings, bathing suits, blouses, T-shirt, pyjamas, a.s.o. for women, men and children, and their sale through a network of franchising type. In these years Company "X" has developed a network of more than 1200 shops scattered in the whole world: Italy, Austria, Cyprus, Croatia, the Czech Republic, Greece, Hungary, Lebanon, Mexico, Poland, Portugal, Serbia, Slovenia, Spain, Turkey, France, Macedonia, Montenegro, Great Britain, a.s.o.

Company "X" has several factories in SriLanka, Romania ("X" Textiles Ltd), Bulgaria and Serbia. "X" Textiles Ltd has as activity field the manufacture of underwear items. This company has implemented since 2004 the concept KAIZEN and the results started to appear gradually. On the basis of the financial information of the company, presented in table no.1, and on the basis of other information received from the company, it may make a SWOT analysis of the firm.

Table 1: Financial information about "X" Textiles Ltd. Balance sheets

Year	Turnover (RON)	Revenue (RON)	Costs (RON)	Debts â(RON)	Gross profit (RON)	Clear profit (RON)	Gross loss (RON)	Clear loss (RON)	Average number of employees
1999	44.477	48.991	86.569	175.010	-	-	37.578	37.578	68
2000	747.849	820.140	484.487	352.953	335.652	314.176	-	-	99
2001	1.931.002	2.015.559	960.762	484.100	1.054.796	1.007.250	-	-	118
2002	4.999.888	5.289.536	4.531.670	7.786.070	757.866	730.080	-	-	222
2003	10.159.595	11.817.982	13.266.598	14.879.237	-	-	1.448.616	1.457.175	209
2004	19.868.951	21.661.310	17.271.638	13.647.491	4.389.671	3.662.913	-	-	214
2005	26.225.235	28.785.887	22.617.632	16.332.134	6.168.255	5.180.285	-	-	287
2006	30.392.919	32.451.110	27.165.904	12.525.459	5.285.206	4.436.650	-	-	316
2007	31.409.923	32.332.486	28.320.032	7.230.709	4.012.454	3.368.050	-	-	354
2008	24.055.375	25.238.230	21.841.809	4.034.011	3.396.421	2.849.044	-	-	332
2009	32.697.953	34.087.970	26.399.045	2.288.375	7.688.925	6.453.087	-	-	412

Other information in the balance sheet of the year 2009:
Fixed assets total: 16.728.212,00 RON
Current assets total: 11.424.737,00 RON
Stocks: 1.546.281,00 RON
Cash and banks accounts: 829.351,00 RON
Capital total: 25.898.782,00 RON
Registered capital: 55.000,00 RON

2.1.1.Commercial activity

"X" Textiles Ltd has as activity field the manufacture of underwear items.
Cod CAEN 2009 - 1414 - Manufacture of underwear
Cod CAEN 2008 - 1823 - Manufacture of underwear

Turnover

"X" Textiles Ltd had a turnover on rise since 1999 till 2009 with the exception of 2008.
Of 1999 until the 2009 turnover has increased with 32.653.476,00 RON.
The highest turnover was achieved in 2009- 32.697.953,00 RON.
The lowest turnover was achieved in 1999 - 44.477,00 RON.
In the balance sheet in 2009, the turnover of "X" Textile Ltd., increase with 8.642.578, RON, that means 35,93% to the previous year.

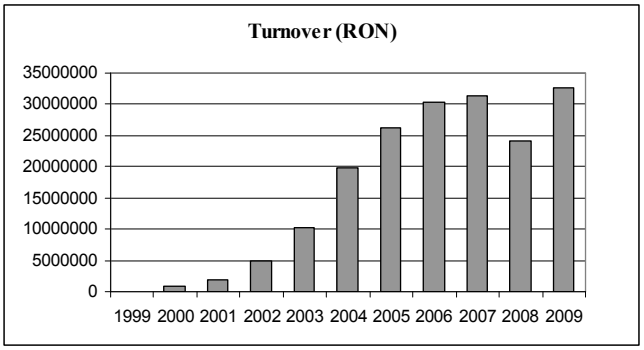

Figure 1. Turnover evolution (RON)

Revenue

Revenues obtained by "X" Textiles Ltd have an ascending evolution with decreasing in 2007 and 2008, when revenues achieves 32.332.486,00 RON, respectively 25.238.230,00 RON
Since 1999 up to the year 2009 revenues have increased with 34.038.979,00 RON.
The higher revenue have been obtained in 2009:34.087.970,00 RON.

The lower revenue has been obtained in 1999: 48.991,00 RON.

In the balance sheet of the year 2009, revenues made by "X" Textiles Ltd, have increased with 8.849.740,00 RON, that means 35,06 % compared to the previous year.

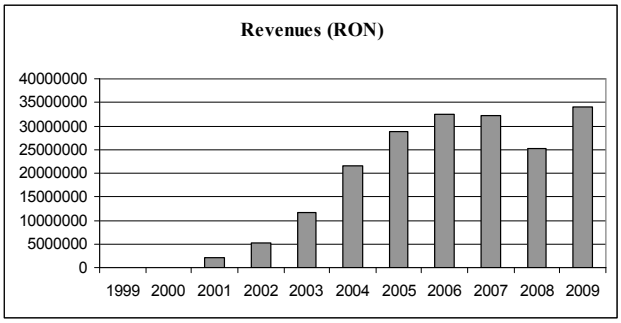

Figure 2 Revenues evolution (RON)

Costs

"X" Textiles Ltd has had increasing costs from 1999 until 2009 except for the year 2008, when they had a value of 21.841.809,00 RON. From 1999 to 2009 the costs increased with 26.312.476 RON.

Most of the charges were made in 2007 - 28.320.032,00 RON.

The fewest charges were made in 1999 - 86.569,00 RON.

In the balance sheet of the year 2009 the "X" Textiles Ltd. have increased with 4.557.236,00 RON, that means 20,86 %, compared to the previous year.

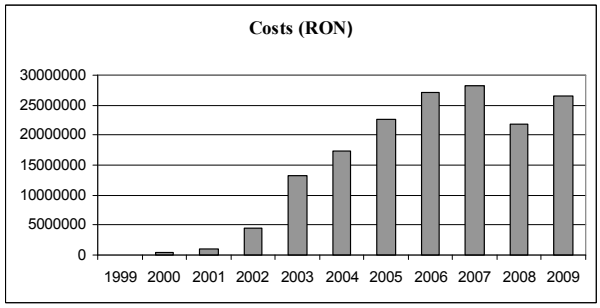

Figure 3. Costs evolution (RON)

Profit/loss

"X" Textiles Ltd obtained profit in 2000, 2001, 2002, 2004, 2005, 2006, 2007, 2008 and 2009 and losses in 1999 and 2003

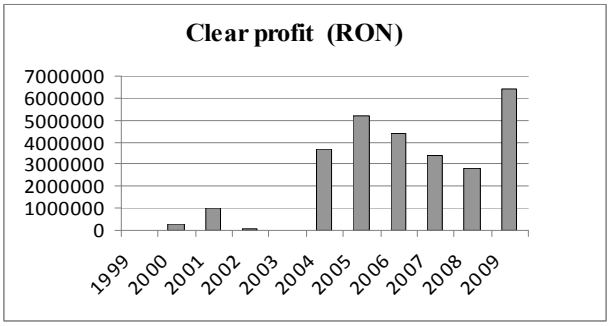

Figure 4. Revenue/costs (profit/loss) evolution (RON)

Debts

"X" Textiles Ltd debts have been oscillating between 1999 and 2009. The
The level of debt has increased with 2.113.365,00 RON.
The higher due has been in 2005 - 16.332.134,00 RON
The lower due has been in 1999 - 175.010,00 RON.

According to the balance sheet of 2009, the debts have fallen with 1.745.636,00 RON, that means 76,28 %, compared to the previous year.

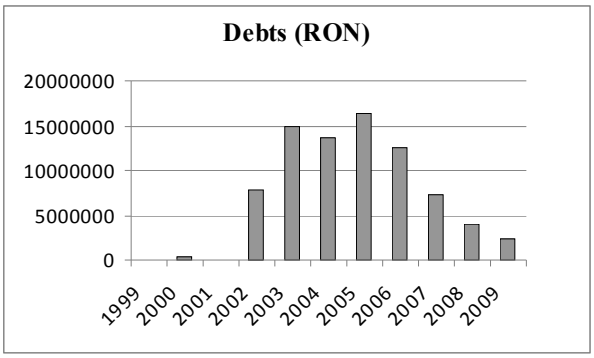

Figure 5 Debts evolution (RON)

Employees

The number of employees of the "X" Textiles Ltd has an ascending evolution, with sharp falls in 2003 and 2008, when average number of employees was 209, respectively 332. Since 1999 up to 2009 the number of employees has increased with 344. Most employees have been in 2009: 412. Less employees have been in 1999: 68

According to the balance sheet of 2009, the number on the employees rise with 80 persons, that means 24,10%, compared to the previous year.

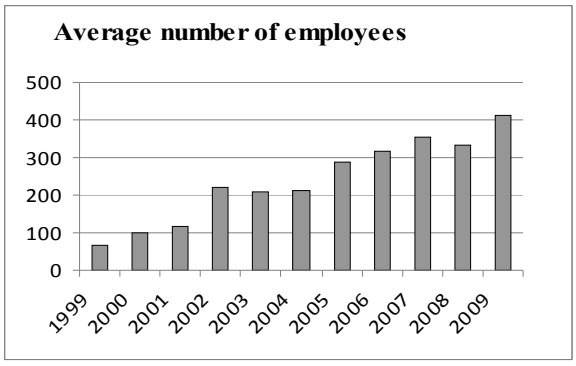

Figure.6. Employees evolution

From the analysis diagnosis we have summarised the main strong points and weak points, on domains.

The remuneration policy practiced at 'X' Textiles Ltd

The company gives incentives on the basis of performance, attendance and retirement.

Financial field

Strengths:

- it has improved the efficiency and profitability of the company;
- operating revenues have increased
- the company's solvency in long term is to be ensured
- the turnover grows

- immediate cash indicator is permanent over 1 (that means that the company can cover the current debts)

Weaknesses:

- Long duration to recover the claims
- High level of the tax on profit and wages
- Low level of funds as compared to the duties payable in the short term by the company
- Decrease of rotational speed of the movable property means

Commercial field

Strengths:

- the staff has technical and economic qualification
- supply is done with predominance by external providers
- transport of the raw materials and materials for production, as well as the goods intended for sale is carried out mainly by own means
- there is competitiveness on the market
- all production is for export
- average prices for the product

Weaknesses:

- the system of warehouses and depots has been used under design capacity
- poor communication between the commercial department and the customer

Production field

Strengths:

- use of high quality raw materials and materials
- small stocks of finished products

Weaknesses:

- in part control system of the quality of knitted and woven fabrics, certain defects are not detected at this stage
- reduce of time between the receipt of raw materials and export of finished products requires a reorientation of the informational structure at organizational level. This aspect is trying now
- execution at an average level of the activities in the departments of production

Human resources field

Strengths:

- increasing number of employees
- staff attachment to the company and its objectives
- positive trend is due to the fact that the young generation (under 25 years) exceeds 6 percent older generation (over 55 years). It create such premises for a properly exchange of generations

Weaknesses:

- no professional training courses in the analysed period
- wages have had a higher rate of growth then productivity but lower that inflation

Research and development field

Strengths:

- the company has qualified personnel to implement new techniques
- the company has qualified personnel for study and development of new technologies, devices and machines that grows the efficiency of the textile division
- modernization and upgrading of equipment
- allocation of funds for technological development

Weaknesses:

- the company is not well informed about patents and new findings in textiles
- technical staff participate in few national and international fairs of textile

Management field

Strengths:

- using a participative management system
- horizontal and vertical integration decisions on organizational structure

- use of extrinsic and intrinsic motivation system of the personnel
- management flexibility to new and changing

Weaknesses:

- no informational system defined
- complex forecasting techniques are used but insufficient
- no specialized personnel in human resources management

Opportunities:

- existence of real competitive environment due to the large number of economic agents from profile
- great potential in the internal and international market;
- elimination of certain restrictions will lead to the increase of the market share

Threats:

- strong competition from illegal imports of textile products and clothes
- no strong individual companies, road opener and leaders of technology changes and modernization processes in the industry
- in the process of drafting of the Government's policy is missing the consulting with private sector, policies fail to reflect concerns of private sector and it reduced the competitiveness
- no coordination/collaboration in the textile industry on line of strategies implementation for the development of this branch

Recommendations:

- To maintain and accentuating "X" Textiles Ltd company development, it may act by:
- further modernization of technical-material base
- development of the information system internal and external
- preparation and training of specialists for the departments in which there is a minus in personal or qualification
- -know - how import by participation in fairs and training courses

3. CONCLUSIONS

Implementation of some new concepts and strategies with regard to quality assurance lead to:

- ❖ productivity increase
- ❖ immediate and rapid improvement of technological processes
- ❖ lower production costs
- ❖ Ranking of the development objectives;
- ❖ elaboration of development measures and establishing indicators to be carried out

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

SHIFTS IN GLOBAL TEXTILE AND APPAREL INDUSTRY, WHAT IS NEXT?

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Abstract: The textile and clothing production always changed its geographic location usually occurring from developed to developing countries in medium term ranges. Analyzing and understanding the shifts in textile and clothing industry is very important to see the new challenges and opportunities for many countries in order to determine the future activities and make strategic decisions. In this study, the textile and clothing trade around the globe is analyzed. The emerging and descending countries in terms of textile and clothing production and trade are carried out within 30 year period beginning with 1980. Future expectations and discussion are made based on the analysis and the countries that are supposed to receive shift are given with a classification.
Key words: *Global shift, Textile and Apparel Industry, Production, Trade*.

1. INTRODUCTION

Producing the primary needs for people, textile and apparel industry has always been one of the most important industry fields in the world. According to the data taken from the census bureau, the world population increased from 3 billion in 1959 to 6 billion by 1999, a doubling that occurred over 40 years [13]. Moreover, the future forecast says that the world population is projected to grow from 6 billion in 1999 to 9 billion by 2040[13]. That means, there will be continual increase in demand of those products at least in terms of amount. Moreover, textile and apparel industry has a significant contribution on world trade. According to the WTO reports, textile and apparel trade got the share of 1.6 and 2.3 in world total merchandise trade in 2008 [12]. Textile and apparel industry is mostly the first industry in industrialization period of newly developing industries as it requires low investment and provides fields of employment. For this reason, it is quite popular in the areas where the unemployment rate is high and huge amount of labor are available. The global shifts occurred in different time periods are the evidences for this.

There are many studies in both periodical and academic publications that analyses the movements and shifts in textile and apparel trade. Even many books related with the textile and apparel production give place to the historical changes in textile and apparel industry or commercial or statistical web pages in the field of textile trade publish annual or yearly books. Nonetheless, the shifts of production and trade of the apparel industry must be analyzed in much more detail and must be updated often in order to make in depth analysis and foresee the changes before they occur. One of the researchers, Gereffi has performed many detailed type of studies [4,5,6] about the global apparel value chain in which he analyzed the shifts in apparel industry with a systematical approach. According to the author, four migration phases occurred during that period first of which is from North American and Western Europe to Asian big three in 1950s and early 1960; second shift occurred from Japan to Asian Big Three; third migration happened to China and other Southeast Asian countries; finally fourth migration occurred in 90s to south Asia, Latin America, Eastern Europe and Mediterranean region. After 2000, the accession of China to WTO and abolishment of quotas were expected to have an enormous impact on the world textile and apparel trade whose effects are began to be felt gradually since the end of 90s. Nonetheless, this can cause a fifth shift of the production pattern in textile and apparel trade while the region is not specified at that time.

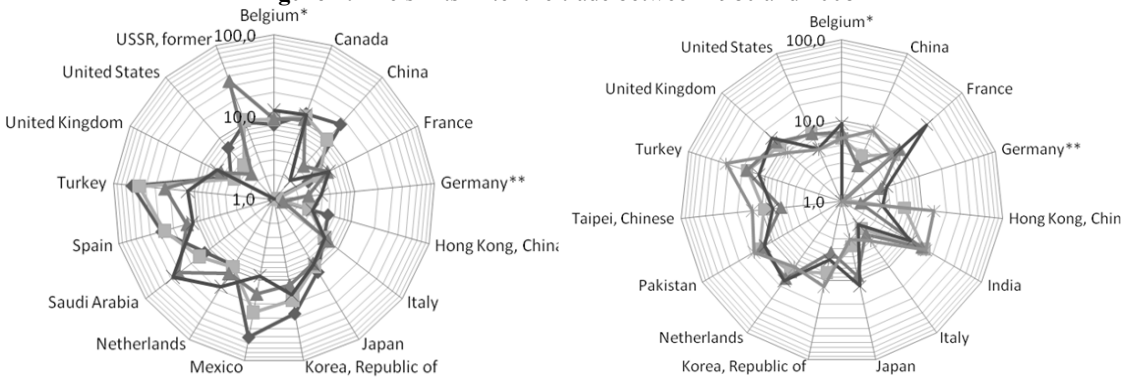
This aim of this study is to provide a foreseeing about the fifth shift of textile and apparel production in the world. To this aim, the global textile and apparel trade was analysed using statistical databases [12,7]. The countries were analyzed both in terms of import and export values regarding the textile and apparel trade in case that the consumption of the country is also one of the determinants of the capability of the country to receive a shift.

2. METHOD

Two analyses were established in this study. In the first part, past data was analyzed between the years 1980 and 2008 in 10 year intervals beginning with 1980. The textile and clothing import and export values were gathered for each year and top ten countries were listed. For these countries, all the import and export data was determined for all years and the averages were taken for ten year intervals. Then the radar graphics were drawn in order to describe the shifts. In the second part, a closer look was made within the time period between 2000 and 2010. All the textile and clothing import and export values were listed for the years, 2000, 2005 and 2010. Among the 182 countries, 48 countries missing data and 28 countries having less than 0,01 share in world's textile and clothing exports in the years analyzed were eliminated. The trends for the countries were determined according to their performance in year 2000 and 2010. They were given ranks within these years and the rank in 2010 was subtracted from the rank in 2000. The countries that got that value between 5 and -5 was identified as the stable countries, the countries getting higher values than that were considered as the countries that are showing increasing trend and finally the ones lower than -5 as the countries showing decreasing trend. Then, the countries were classified according to the recent data and the countries that were regarded to receive a shift were pointed with a discussion in the end.

3. RESULTS

Figure 1: The shifts in textile trade between 1980 and 2008



(a)Textile imports (b) Textile exports

(Data compiled from WTO statistics)

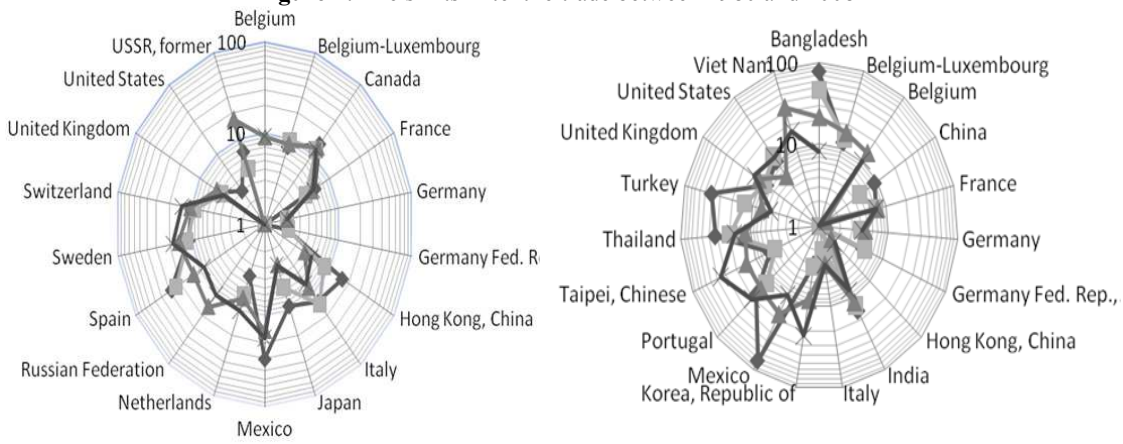
*The data for Belgium was found under Belgium-Luxembourg until 1989

**The data for Germany was compiled from the data for Germany Fed. Republic and Germany

Increase in textile imports may refer that there is a demanding production field in the country that uses textile material as an input for the subsequent production processes. Decreasing in textile imports may be caused from two different situations because of either beginning of textile production or a decline in subsequent processes. Regarding the textile imports, China, South Korea, Mexico, Spain and Turkey became the rising countries while United Kingdom, Saudi Arabia, Netherlands, France and Belgium have lost their ground at the top levels as seen Figure1. Japan, Italy and Canada showed a stable behavior, whereas Hong Kong and Germany showed a fluctuating manner.Germany seems to be more effective until 2000 and Hong Kong can be stated to be active especially between 1990 and 2000. Increase in textile exports reveals that, there is an excess capacity for producing textile materials that are exported. Specifically, it may show that the subsequent production stages are not in use in the country, the country may produce textile material but not apparel. Decrease in textile

exports may refer that either the country ends its textile production or the capacity in the following production stages increased. According to Figure 1, China, India, Pakistan and Turkey are the rising countries in terms of textile exports. Belgium, France, Germany, Japan, Netherlands and United Kingdom are the descending countries. Japan is still efficient partly in textile production and export. Italy, Belgium, Pakistan and France may be regarded as preserving their rank throughout the period whereas Hong Kong, Italy, Korea, US showed rather fluctuations.

Figure 2: The shifts in textile trade between 1980 and 2008



(a)Clothing imports (b) Clothing exports

(Data compiled from WTO statistics)

*The data for Belgium was found under Belgium-Luxembourg until 1989

**The data for Germany was compiled from the data for Germany Fed. Republic and Germany

Clothing manufacturing covers all the products which are produced using the textile materials. When the amount of the clothing imports decrease the country may start to produce for itself. Moreover, it may refer that the imports are selected from the low price products. In the case of clothing imports as in Figure 2, Italy, Japan, Russian, Spain and US can be regarded as the rising countries in 28 year period. Russia is an importer of both textile and apparel goods. Netherlands and Sweden are the descending countries. On the other hand, Belgium, Germany, France and United Kingdom showed a stable behavior unlike France, Hong Kong and Mexico. Both textile and apparel industry is in decline in US for years. But US is still effective in both textile and apparel exports because of the production of well known brands and value added textile products. Germany and France are still among the most important textile and clothing importers and exporters although their clothing industry lost its ground. Italy and Spain are known with their fashionable apparel exporters and Italy is also effective in textile exports while they both import many products also from the other countries. Increase in clothing exports is caused because of the excess production or the production of value added quality and fashionable products. Decrease in clothing exports refers the insufficiency or the withdrawal of the country from the production.From Figure 2, Bangladesh, China, India, Mexico, Turkey and Vietnam are the rising countries whereas China is certainly the country that showed the biggest success during that period. Bangladesh has also developed substantial apparel industry. Vietnam took the advantage of low capital investment requirement and availability of low labor cost to establish a significant garment industry. Maquiladora operations, manufacturing plants that assemble components and re-export garment to US are important components of Mexican apparel industry. Hong Kong, Italy, South Korea and United Kingdom are the descending countries. Belgium, France and Germany showed a stable behavior and Portugal, Thailand are showing the fluctuating behavior.

3.1. Analysis between time period 2000 and 2010

Table 1 shows a part of analysis based the data gathered for the years 2000, 2005 and 2010. Whereas the shares were evaluated from the average values of import and export values in textile or clothing. The trends were evaluated from the ranks in years 2000 and 2010. According to the findings in this step and previous step, the countries were divided into 6 categories which are stable textile

exporter, potential textile exporter and newly emerging textile exporter, stable clothing exporter, potential clothing exporter, newly emerging clothing exporter.

Table 1: The share and trends in the countries in terms of textile and clothing import and export values

No	Country	S in TI	Trend	S in TE	Trend	S inTI	Trend	S in CE	Trend
1	Albania	0,05	8,00	0,00	22,00	0,04	-7	0,07	21,00
2	Argentina	0,38	-1,00	0,13	-4,00	0,11	-11	0,03	6,00
3	Armenia	0,01	13,00	0,00	2,00	0,01	35	0,01	-5,00
4	Australia	0,88	-8,00	0,16	-18,00	1,12	4	0,08	0,00
5	Austria	0,94	-5,00	1,04	1,00	1,51	1	0,73	9,00
6	Azerbaijan	0,02	27,00	0,01	25,00	0,01	-1	0,00	27,00
7	Bahrain	0,08	-22,00	0,04	-2,00	0,03	-8	0,06	-21,00
8	Bangladesh	1,13	15,00	0,37	8,00	0,07	-28	3,17	5,00
9	Belarus	0,17	3,00	0,25	-5,00	0,03	-5	0,13	3,00
10	Belgium	1,88	-6,00	3,46	-2,00	2,43	-2	2,23	4,00

S in TI: Share in Textile imports, S in TE: Share in Textile export, S in CI: Share in Clothing import, S in CE: Share in Clothing Export, T: Trend Source: WTO statistic databa

Stable textile exporter: China, Germany, Hong Kong, Italy, Japan, Korea, became the stable textile exporters whose export values are more than the textile imports. Czech Republic, Malaysia, Thailand, Austria were also found to be stable textile exporters but the difference between their share in textile imports and textile exports was very small. Belgium, Netherlands and Taipei Chinese were among the textile exports whose shares in textile import were decreasing. France, United Kingdom, United States, Canada, Mexico and Spain took place among the countries that made textile exports too. But their import values were higher than their exports especially for Canada, Mexico and Spain.

Potential textile exporter: Indonesia, Pakistan and Turkey became the countries which had stable textile exports whereas their textile imports increased. Among these three, Indonesia showed poorest performance. India became the interesting country which increased both textile imports and exports. Its exports increased more than Pakistan and Turkey but its imports also increased more than Turkey. Portugal seemed to have potential in terms of textile exports. Although its share in world's textile imports and exports were equal to each other, its imports were decreasing at much higher pace than exports. Bangladesh, Egypt and Tunisia that had high textile import values increased their share in terms of textile exports. Nonetheless, except Tunisia, the increase in textile imports was more than the increase in textile exports. Poland, Romania, Bulgaria, Lithuania, New Zealand, Moldova, Lebanon became the countries that had stable textile imports and increasing textile exports. Although their export values fell below their imports their jumps in terms of textile exports put them under potential countries.

Newly emerging textile exporter: Although the share of textile exports in the world reaches only 0,24 Syrian increased its rank 28 up within 10 years interval of 2000 and 2010. Morocco became the rising country in terms of textile exports although its share was around 0,09. Another country that decreased its textile imports but increased its textile exports was Malta.

Stable clothing exporter: China, Hong Kong, Italy became the stable clothing exporters. United States decreased the clothing exports whereas it got the highest share in textile imports. Like US, Germany, France, Belgium, United Kingdom, became stable clothing exporters but they became also stable clothing importers with higher shares. Netherlands and Spain increased their clothing exports even Spain left 17 countries behind, whereas they both had high shares in clothing exports also. Korea, Portugal, Hungary and Mauritius decreased their clothing exports. Mexico, Morocco, Philippines and Taipei Chinese kept exporting clothing but at a decreasing pace.

Potential clothing exporters: Turkey, India, Indonesia, Romania and Thailand became the clothing exporters with increasing clothing imports. Among them, Turkey, India and Indonesia's increases in clothing imports caused them to leave more than 20 countries behind. Pakistan became the country that showed higher increase in clothing exports than Turkey, India and Indonesia countries but its rank in clothing imports showed more desperate increase then them. Malaysia, Cambodia, Bulgaria and Egypt increased their clothing exports and their clothing imports fell behind clothing exports. All

these countries imported textile to some extent but Cambodia and Egypt were among the ones that increased the textile imports much. On the other hand, Bulgaria and Egypt became also textile exporters. Bangladesh, Vietnam, Tunisia, Honduras became the rising countries with a decrease in their clothing exports in parallel. Austria, Denmark, Sweden and Switzerland seemed to have potential although their imports were high as well.

Newly emerging clothing exporter: Albania increased its rank in terms of clothing export although its share among the world's clothing exports was around 0,07. Guatemala, Jordan, Kenya, Peru, Poland might be the clothing exporters but their imports were increasing in parallel. Tanzania having a share of lower than 0,01 in clothing exports, increased its ranking 18 level.

The results showed that, mostly the developed countries dominated the textile and clothing trade in the world. Besides, China had the largest share in both world's textile and apparel trade. Nevertheless, there were winners and potential countries located in different regions of the world that have the potential to receive the fifth shift such as Bulgaria, Czech Republic, Romania, Poland, Portugal, Romania and Turkey in the continent of Europe; Honduras, Guatemala, Mexico and Peru in the continent of America; Bangladesh, Cambodia, India, Indonesia, Malaysia, Pakistan, Phillipiness, Thailand, Vietnam in the continent of Asia and Egypt, Kenya, Morocco and Tunisia in the continent of Africa. This showed that, there was much fragmented structure of the textile and clothing production which prevented to create global winners but developed local winners instead. Moreover, all the countries were found to be influenced from the competition and the pressure of increasing imports which were eventually caused upon the changing dynamics of the global trade because of liberalization, as can be understood from their increase in value of the imports. Although, Turkey, India and Pakistan became the ones that highlighted among the other countries regarding their situation of following up the path of Korea, Taiwan, Hong Kong and Singapore, these countries and the rest need to achieve higher differentiation and overcome many political and technological issues.

4. DISCUSSION

According to Abernathy [1], wage rate is the major factor in receiving a shift for production but, it is not the only concern. The qualification of the workers is also important. According to Clammet [3], East Asian dominance in the global apparel industry is due to the perception that workers in countries such as Hong Kong, Taiwan, China, Vietnam, Cambodia and Indonesia are highly skilled. Similarly, managers from Hong Kong, Taiwan and neighboring countries have a reputation of boosting factory productivity and easily adapting to new technological systems. The production type and producing value added garment is also very important in order to gain shifts and upgrade, as these kind of products create their own niches which can not be beaten as in the case of the East and Central European market countries [2]. The main factors that damage the textile and clothing industry in underdeveloped nations were identified as trade barriers, inadequate industrial and trade policies, a lack of infrastructure, low buying power, a shortage of financial capital, and a dearth of managerial skills [8]. Because, the decision makers consider the political stability, currency volatility and potential treats posed by transnational diseases [1]. On the other hand, geographical proximity and regional trade agreements can be the driving factors in making sourcing decision. While geographical proximity to end markets reduces the transportation time and drive shorter lead time, prefential trade agreements decreases the tariff rates creating a competitive advantage. For instance, U.S. expanded sourcing from Mexico, Canada and Caribbean Basin Initiative countries compared to Asian countries because of preferential trade agreements and closer geographical position [10] as shipping time from Sri Lanka, Bangladesh and India to the US averages 28 days compared to 2 days from Mexico or Canada [11]. Morocco, Jordan, Mauritus benefited from the preferential trade agreements with US whereas Egypt gained popularity in fashion conscious European market that required quick replenishment [9]. Moreover, the sourcing of clothing was claimed to be allocated to the lower wage countries in different regions in order to decrease the risk. Magder claims that the competition will increase as more and more countries try to replicate the success of East Asian newly industrialized countries [9]. Infrastructure is the other point that the developing countries aiming to make a jump should improve. According to Clammet [3], global manufacturing forces the developing countries to construct or promote regionalised production sites aiming to capitalise local institutional assets pointing out the fact, the clusters are important components of the larger commodity chains. The combination of full package production and low wages are claimed to make China unbeatable [9].

Moreover, design, production planning and distribution activities that remain in house can be offered to the international buyers by the countries desiring to receive a shift. The governmental supports should not be ignored for improving infrastructure. For instance in Philippeness, a transformation plan is being prepared which included providing financial support for the companies seeking to import machinery.

5.CONCLUSION

In this report, the global shifts were analyzed in both textile and apparel industry. It was seen that the shift of textile and clothing production continues toward the newly developing and underdeveloped countries as in the past, creating dispersed regions of production. On the other hand, the current analysis based on the textile and clothing imports and export values didn't point a specific country or countries. Although there are some potential countries that can follow a path in terms of upgrading such as Asian Tigers, and specifically Turkey, Pakistan and India, that were stated to have highest advantage, these countries should be analyzed if the could overcome some issues regarding their infrastructure. Moreover, these analyzes should be expanded in order to include the parameters regarding the geopraphical proximity, political strength and free trade agreements as influential factors.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CRITICAL EVALUATION OF BUSINESS PERFORMANCE IN TEXTILES AND LEATHER INDUSTRY

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Abstract: Performance results obtained in terms of entrepreneurial skills, professional skills and structured cross various specializations in the field of management, in textiles and leather industry, demonstrates the ability of permanent self-control skills on motivation for learning, in relation to their professional and personal development objectives. Article identifies and evaluates the performance of critical business managers working in textiles and leather industry, analyzing their competitiveness in enterprises in terms of transverse and professional. Entrepreneurial job performance conferred by program engineering and management studies in the field are presented in the following steps: design, evaluation and management of production systems, design and management organizations management system, use the organization's information system management roles in the performance of textiles and leather industry, design implementation and monitoring of operational strategies and ultimately business counseling industry.
Key words: critical evaluation, performance, entrepreneurship, textiles and leather industry

1. INTRODUCTION

In a socio-economic environment been in constant change, as that in Romania, opened a fierce foreign competition, referral opportunities and entrepreneurship of the population are not high enough for an idea to materialize in an activity successful.

It requires the existence of attaractive business environment, the local administrative behavior, which supports free enterprise. Otherwise, we have to deal with ordinary business initiatives that will have important synergistic effects in the textiles and leather industry.

The phenomen on of entrepreneurial development occupies an important place and role of entrepreneurial skills in the professional and conferred cross – study programs in engineering and management field, in textiles and leather industry, which we will present a critical analysis, evaluationand conclusions as we interpret the data obtained. [4]

Knowledge of business practices, today becomes increasingly important for many types of businesses contributing significantly to the growth of a company (at micro and macro).

The main goal in developing professional skills and business performance due to cross-study programs conferred by the field of engineering and management of textile and leather industry is stimulating the Romanian companies by developing their own collections, for both domestic and for export production to reduce dependence on the system “lohn”.

Skills is the ability to select proven entrepreneur, combine and use the appropriate knowledge, skills and other acquisitions of learning (personals values and attitudes) in order to solve successfully the various types of work situations and problems and/or learning and for professional and personal development in terms of effectiveness and efficiency. The competence means “how to” or “how to meet their professional and personal development in terms of effectiveness and efficiency”.

The competence means "how to" or "how to meet their professional roles" a graduate of a training program. [1]

Entrepreneurs from textiles and leather industry should demonstrate:

a) acquisition and use of effective learning methods and techniques of business from textiles and leather industry

b) development of skills and constantly self conscious about the motivations for learning, in relation to their professional and personal development objectives

c) ability to make distinctions between data, information and knowledge and apply techniques to manage them in textiles and leather industry.

d) awarness of extrinsic and intrinsic motivations of learning to gain a good ability in business from textiles and leather industry [5]

2. GENERAL INFORMATION ABOUT SKILLS IN THE FIELD OF ENGINEERING AND MANAGEMENT FROM TEXTILES AND LEATHER INDUSTRY

For a better market competitive strategy is necessary to employ more vigorous policy in the field of employment and wages by increasing labor productivity.

For an independent view on business activity and to have a chance to assimilate new policies and business activities not jeopardize the textile company managers are advised to engage internal and external financial audits, foreign specialists to improve the manufacturing process for assimilation new products, to consult engineers to guide the foreign investment tu purchase specific equipment requirements main selling markets to promote business, to hire specialists to provide early changes in fashion trends and new product range. Any enterprise is developing more strategic options in response to physiognomy and market requirements, depending on each of its features, followed each time to decide which options is best. [3]

2.1 Types of skills used in textiles and leather industry

Knowledge used in textiles and leather industry is expressed by the following level descriptors:

- Knowledge, understanding concepts, basic theories and methods of the field and area of specialization from textiles and leather industry, their proper use in professional communication
- Use of basic knowledge for explanation and interpretation of various types of concepts, situations, processes, projects associated
- Knowledge, understanding and use of specific language from textiles and leather industry
- Explaining and interpreting

Ability used in textiles and leather industry is expressed by the following descriptors:

- Applying the principles and methods to solve problems / situations defined, typical field conditions support from textiles and leather industry
- Appropriate use of standard evaluation criteria and methods to assess the quality, merits and limitations of processes, programs, projects, concepts, methods and theories field from textiles and leather industry
- Development of professional projects using principles and methods established in the field of textiles and leather industry
- Application, transfer and problem solving;
- Critical reflection and constructive;
- Creativity and innovation.

According CNCSIS, that the National Framework of Qualifications in Higher Education skills falls into three categories, as they apply in textiles and leather industry:

a) general skills – are skills that apply in the field of study that follows exercise professional roles in an environment with various activities, these skills allow actual use of all integrated, easy, dynamic and well structured knowledge, skills (eg. cognitive, actional, relational, ethical) and other acquisitions (eg. values and attitudes) in an industry closely in this case, textiles and leather industry

b) professional competences (specific job skills) – are those skills that enable the development of a specific training program for employee or student to face the requirements of specific professions, allowing use of the overall integrated, easy and dynamic knowledge, skills and other acquisitions (eg. values and attitudes) in the exercise of certain professions in the field, in this case, textiles and leather industry

c) transversal competences – are the skills that have the greatest degree of generally and therefore. Are necessary and useful in several fields, include those purchases that transcendent the field, that program of study with a cross – disciplinary nature and is using all knowledge, skills and other acquisitions fundamental to any human subject needs for employment, integration, implementation and development personal and professional in this case, textiles and leather industry.

2.2 Presentation skills for study programs in the field of engineering and management from textiles and leather industry

For all programs of study in engineering and management field, used in textiles and leather industry, professional and cross are as follows:

Professional skills:

- Ability to develop innovative textiles and leather industry enterprises;
- Ability to manage textiles and leather industry competitive;
- Ability to communicate, promote textiles and leather industry business;
- Formulation, implementation and control of business strategy;
- Formulation of project proposals and monitoring their implementation;
- Advice to develop competitive market textiles and leather industry companies.

Transversal competences:

- Ability to make decisions under conditions of high risk management, creative solutions to mitigate conflicts that occur in internal and external organizational environment in textiles and leather industry
- Formulation of techniques and procedures for evaluating human resources fostering communication and teamwork in textiles and leather industry enterprise;
- Further develop entrepreneurial skills in textiles and leather industry [2]

3. TRANSVERSAL COMPETENCES CONFERRED ON THE PROGRAM OF STUDIES IN THE FIELD OF ENGINEERING AND MANAGEMENT FROM TEXTILES AND LEATHER INDUSTRY

Analysis of transversal competences conferred by the curriculum of engineering and management from textiles and leather industry is summarized by the following characteristics:

1. Entrepreneurship highlighting the elements of creativity and initiative in work situations data
2. Application data effectively in interpersonal communication techniques and teamwork in the textiles and leather industry enterprise
3. Use of English in learning situations and work data, with emphasis on terminology in textiles and leather industry.

Transversal skills applied in textiles and leather industry activity refers to:

a) Powers of role:

- Autonomy and responsibility for professional tasks in terms of teamwork, self – limited, distribution of tasks and responsibilities and qualified support to the goals.
- Social interaction, which requires familiarity with the roles and responsibilities assumed under the labor organization and textiles and leather industry institutions

b) personal and professional skills development from textiles and leather industry:

- Awareness of the need for continuous training and scientific
- Awareness of the need for efficient use of resources and techniques for continuous professional and personal development in textiles and leather industry. [5]

4. PROFESSIONAL COMPETENCES CONFERRED ON THE PROGRAM OF STUDIES IN THE FIELD OF ENGINEERING AND MANAGEMENT FROM TEXTILES AND LEATHER INDUSTRY

Professional competences conferred on the program in the field of engineering and management studies and applied in textiles and leather industry to reach performance are presented the following steps:

1. Design, evaluation and management of production systems in textiles and leather industry
- Knowledge of design concepts and theory used in production systems.
- Ability to explain and interpret the solutions of optimization models for production systems in textiles and leather industry
- The formulation of specific models for designing a production system in textiles and leather industry
- Analysis and critical evaluation of alternatives considered in textiles and leather industry
- Develop innovative solutions to improve performance of production systems in textiles and leather industry.

2. Management system design and management in textiles and leather industry organizations
- To know and understand:

- business management requirements in the market economy and the implications of globalization on the functioning of textiles and leather industry companies.
- process management elements in modern textiles and leather industry enterprise and manager roles
- operation used in textiles and leather industry company and the drivers for its success on the market.

- Use basic in textiles and leather industry knowledge:

- analysis of the company on different production functions
- identifying factors causing problems in the textiles and leather industry activities of an enterprise

- Apply the principles and methods for identification of actions that can be taken to improve customer service and business efficiency textiles and leather industry
- Use of control mechanisms in business to textiles and leather industry enterprise.
- Creative use of human resources for successful textiles and leather industry company.

3. Using information in the performance of textiles and leather industry organization management roles
- Knowledge and understanding of the role of enterprise information system.
- Knowledge of a life cycle stages of an information system performance in textiles and leather industry
- The ability to conceptually design a computer application.
- Analysis and critical evaluation of alternatives considered.
- Use of innovative methods in defining systems design specifications in textiles and leather industry.

4. Design, implementation and monitoring of operational strategies in textiles and leather industry
- Knowledge of planning and decision-making methods
- Ability to analyze the decision context states and identify the proper method to solve
- The ability to generate alternative decision in textiles and leather industry
- Comparison and evaluation of decision alternatives, choosing feasible
- Formulating programs performance textiles and leather industry action and allocation of resources to implement decisions.

5. Advising textiles and leather industry business
- Knowledge of terminology, concepts and specific models of textiles and leather industry business.
- Understand how systemic representation of the business
- Ability to calculate performance indicators for a business representative and to interpret in textiles and leather industry
- Ability to use established methods of analysis and evaluation of textiles and leather industry business
- Ability to prepare a business plan performance [7]

5. CASE STUDY: REVIEW AND CRITICAL ANALYSIS ON BUSINESS PERFORMANCE OF TEXTILES AND LEATHER INDUSTRY

The analysis is based on information gathered by interviewing a representative sample of people in textiles and leather industry enterprises in Romania, on their intentions or entrepreneurial

activity, as appropriate. Initial data set consists of responses to the questionnaire interview of 800 subjects. To ensure rigorous research methodology, where subjected to statistical analysis only subjects who provided complete answers to every question. Thus, the number of available data was reduced to 600 subjects of which 360 (60%) were males and 240 (40%) are women.

Recent years have seen a considerable increase worldwide in the number of women who begin and run a business with its own textiles and leather industry. This has increased interest in this group of entrepreneurs in the field of engineering and management resulted in creating and implementing public policies to encourage women in textiles and leather industry business.

Table 1: Profile entrepreneurs

Skills	Potențial entrepreneurs	New entrepreneurs	SME owners
Age (years)	35	34	37
Experience in management (years)	66%	54%	59%
Experience in work (years)	10	10	14

In Romania, as in other industries, in textiles and leather industry, male entrepreneurship prevails, the number of men involved in entrepreneurial activity exceeds thet of women in all geographic regions of the country: [6]

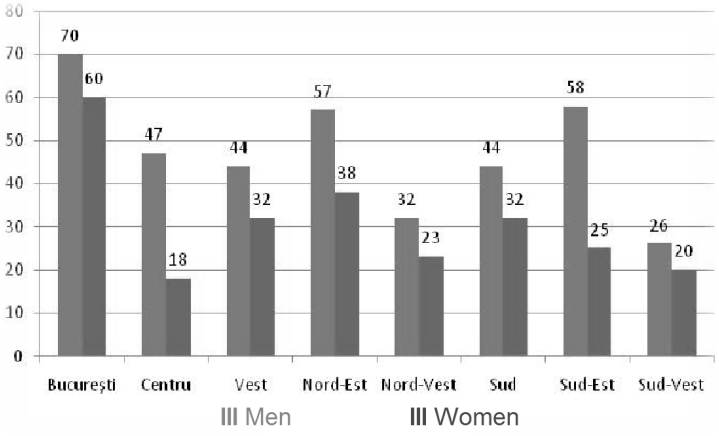

Figure 1: Geographical distribution of the sample of activity in Romania

By analyzing the geographical distribution of the sample studied engineering and management can see that both men and women, most entrepreneurs come from the capital (21% of men and 26% of women). Capital is followed by North-East areas (19% for men and 18% for women) and South- East (where 18% of men and 10% of women are involved in entrepreneurial activities). The opposite is found South-West and North-West, which has the lowest levels of involvement in entrepreneurial activities. [6]

In terms of potential entrepreneurs - those who have not yet own a business but who are involved in activities in order to start a business in the engineering and management from textiles and leather industry - we can see that they predominate in the North-East, South East and West of the country (have considered the employment of women working, in all departments of management) [6]

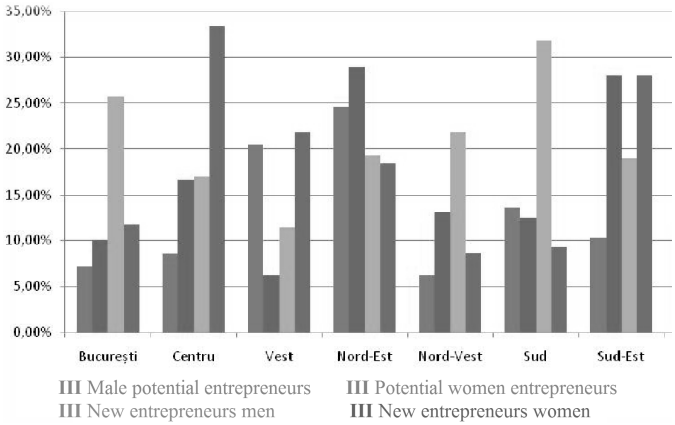

Figure. 2: Geographical distribution of entrepreneurs

Geographical distribution for new entrepreneurs -people who started a business in the engineering and management from textiles and leather industry as in other industry, in the last two years - shows a different situation from that of potential entrepreneurs. If these categories South, South-East, Centre and Bucharest country is on the first four places.[6]

Key skills needed to develop personal and professional journey of textiles and leather industry are: language communication skills, communication skills in foreign language mathematical competence in science and technology, digital literacy, the use of multi-media technology, skills "learning to learn" civic and social networking skills, entrepreneurial skills and artistic skills and cultural expression from textiles and leather industry. [8]

6. CONCLUSIONS

In the year 2011, in Romania entrepreneurship male dominated, the number of men involved in entrepreneurial activity from textiles and leather industry exceed that of women in all geographic regions of the country.

The regions showing the highest levels of entrepreneurial activity in the textiles and leather industry are:

- Capital (Bucharest and Ilfov country) with 7% of men and 10% of women (women were identified and leading various departments in textiles and leather industry)
- North East Zone by 25% both for men and 29% for women (women were identified and leading various departments in textiles and leather industry)
- South East area with 12% of men and 26% of women (women were identified and leading various departments in textiles and leather industry)

The prospect of developing entrepreneurial skills in the professional and conferred cross-study programs in the field of engineering and management from textiles and leather industry and support tools for funding have been severely restricted with increased financial and economic crisis event.

International market down turn and domestic demand due to increased demand for goods and services deferred or restricted consumption of goods and services due to the reduction current incomes and rising unemployment have led to reorientation of many entrepreneurs, the drastic reduction of business size, shift work or liquidation.

The Romanian market is on a downward trend for about two years, domestic producers of textile industry asking for government support of the crisis, including proposals for counting when the development of recovery projects in the Romanian textile export brands, promoting policies fiscal support for the development of specialized companies in rural areas, and encouraging small entrepreneurs or young Romanian designers.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY ON THE INFLUENCE THE PARTICIPATION RATE OF POLYESTER FIBERS ON THE CHARACTERISTICS OF THE YARN FROM A BINARY BLEND

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Abstract In this study is analyzed the influence of the participation rate of polyester fibers on the breaking length of the yarn made from a binary blend consisting of cotton and polyester and are established the regression equations which show the dependence between the participation rate of polyester, breaking of cotton fibers and breaking length of the yarn.
In this study we watched the establishment of correlations between breaking strength of the fibers of cotton, the rate of polyester and the breaking length of the yarn made of binary blend.
Key words: binary blends, experimental programs, mathematical modeling, regressions, polyester, participation rate

1. INTRODUCTION

For binary blends, designer should keep in mind a number of specific elements of the two types of fiber that will make the mixture, thus [6], [8]:

- resistance of polyester fibers is much greater than resistance of the cotton fibers
- because different elongations, the average strength of the blend is lower, so for the same fineness of the yarn made of each component should be more fibers in the structure of the yarn.
- chemical fibers have a greater uniformity both at length and at fineness.

We made yarns in two ranges of fineness: Nm34 and Nm 40, warp destination with different rate of polyester.

For the experimental work used a central rotational programme compound with two independent variables. Mathematics patterning has been realised in Mathcad 8 Professional and it contains 13 experiments from which five parallel experiments has been made at independent parameters central values [7], [9].

2. EXPERIMENTAL PART

To analyse the influence of polyester ratio we chose as independent variable x - breaking strength of the cotton fibers, y - the rate of polyester and as depending variable we chose the breaking length of the yarn made of binary blend

The coded values of the independent variables are presented in table no.1. [7]

Table 1: Coded values

Independent variables	Coded values				
	- 1.414	- 1	0	1	1.414
x	2.8	3	3.5	4	4.2
y	0	16.6	50	83.4	100

The matrix for the experiment used for the mathematical modelling of the process is present in table no. 2.

Table 2: Experimental matrix

Experiment number	Independent variables				Answers			
	Coded values		Real values		Real reale		predicted Soloviev	
	x	y	x	y	Nm34	Nm40	Nm34	Nm40
1	-1	-1	3	16.6	11,8	11,73	10	10,1
2	1	-1	4	16.6	13,18	13,42	11,17	11,23
3	-1	1	3	83.4	17,71	17,3	15,14	15,27
4	1	1	4	83.4	19,33	19,1	16,67	16,8
5	-1.414	0	2.8	50	12,46	12,32	10,84	10,9
6	1.414	0	4.2	50	12,87	12,58	11,29	11,4
7	0	-1.414	3.5	0	12,4	12,3	10,79	10,7
8	0	1.414	3.5	100	26	25,4	23,66	23,6
9	0	0	3.5	50	13,6	13,85	12,15	12,1
10	0	0	3.5	50	12,45	12,51	12,15	12,1
11	0	0	3.5	50	13,28	13,33	12,15	12,1
12	0	0	3.5	50	13,18	13,25	12,15	12,1
13	0	0	3.5	50	13,27	13,42	12,15	12,1

The utilisation of Mathcad 8 program allowed the obtaining of the regression equations:

$$Nm\ 34 : L_{RF} = 13,156 + 0,447x + 3,912y - 0,352x^2 + 2,915y^2 + 0,06xy \quad \textbf{(1)}$$

$$Nm\ 40 : L_{RF} = 13,272 + 0,428x + 3,776y - 0,45x^2 + 2,75y^2 - 0,08xy \quad \textbf{(2)}$$

The significance of the regression equation' coefficients was verified with Student test. After the verification, we conclude that one coefficient is insignificant. The coefficients are shown in table no. 3.

Table 3: Coefficients' significance

	Experimental variant			
	Nm 34		Nm 40	
	Value	significance	Value	significance
t b_0	69,14	yes	61,22	yes
t b_1	2,97	yes	2,81	yes
t b_2	25,99	yes	21,7	yes
t b_{11}	-2,2	yes	-2,6	yes
t b_{22}	18,04	yes	14,79	yes
t b_{12}	0,28	no	0.113	no

For the coefficients significance analysis have been compared the values for each coefficient with the critical value of t test, for a 5% degree of significance - 2,132

The adequacy of the model was verified with Fisher- Snedecor test and with the percentage deviation.[7] The calculated value with Fisher- Snedecor test in less the critical value, and the percentage deviation ale less then 8,3% for Nm 34 yarn and less than 9,3 % for Nm 40yarn, that shows the veracity of the model.

We eliminate the insignificant coefficients, end we obtained the regression equations:

$$Nm\ 34 : L_{RF} = 13,156 + 0,447x + 3,912y - 0,352x^2 + 2,915y^2 \quad \textbf{(3)}$$

$$Nm\ 40 : L_{RF} = 13,272 + 0,428x + 3,776y - 0,45x^2 + 2,75y^2 \quad \textbf{(4)}$$

The existence of second degree terms shows that the answer surface will be well defined.

Nm 34

The canonical form of the regression equation was calculated, the new axis centre has the coordinated: x = 0,634, y = -0,671

The value of the dependent variable in the centre of the response surface is $y_c = 11,98$.

Nm 40

. The canonical form of the regression equation was calculated, the new axis centre has the coordinated: x = 0,475, y = -0,686

The value of the dependent variable in the centre of the response surface is $y_c = 12,078$.

In figures no.1 and 2 are presented the level curves obtained by the intersection of the answer surface with parallel plains in the limits of the experimental region.

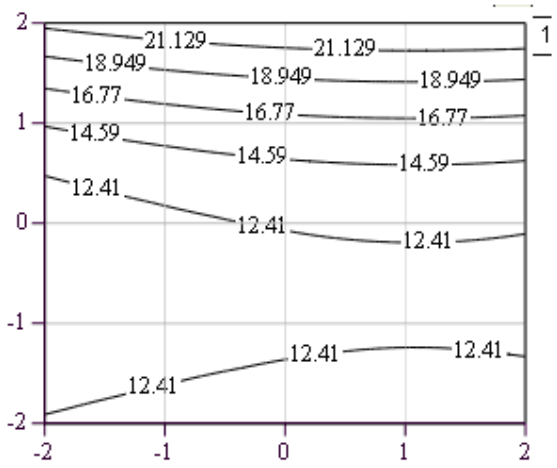

Figure 1: Level curves for equation (3)

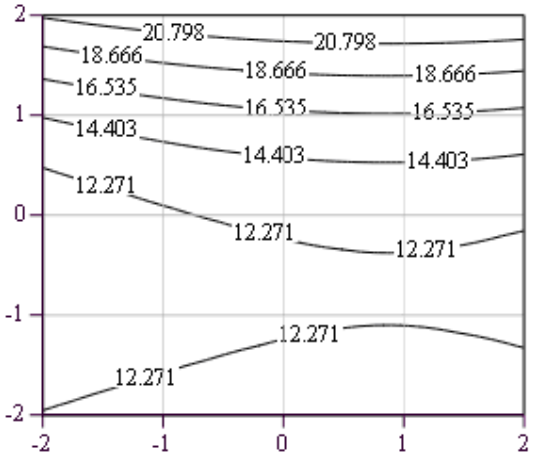

Figure 2: Level curves for equation (4)

In figures no. 3.and 4 is presented the variation z = f (x) for y = constant. for both equations

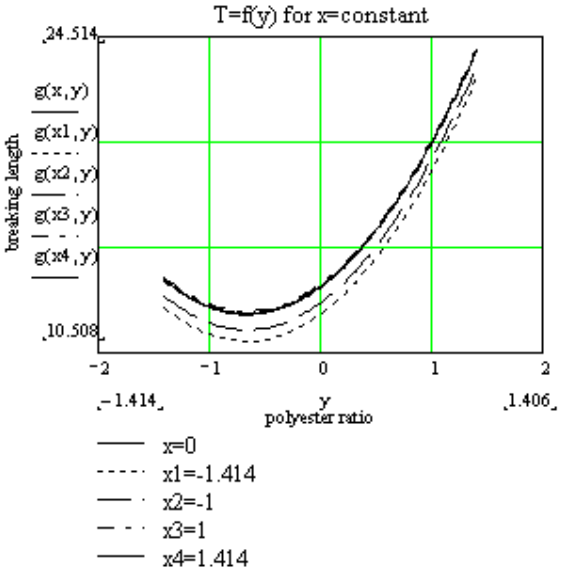

Figure 3. The influence of the polyester ratio about the breaking length of Nm 34 yarn

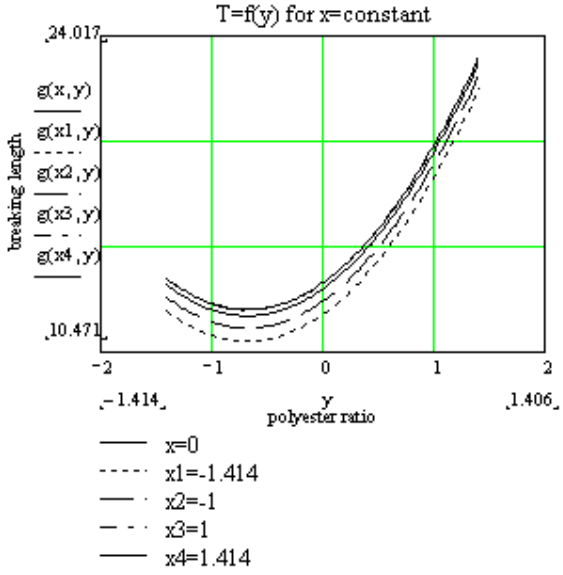

Figure 4. The influence of the polyester ratio about the breaking length of Nm 40 yarn

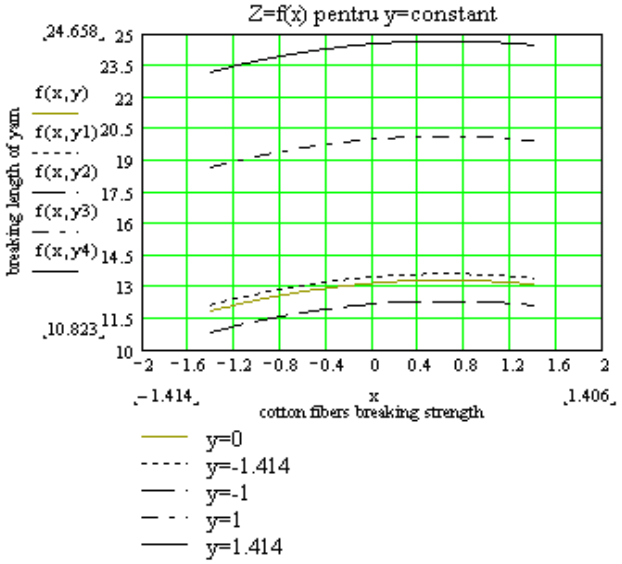

Figure 5. The influence of the cotton braking strength about the breaking length of Nm 34 yarn

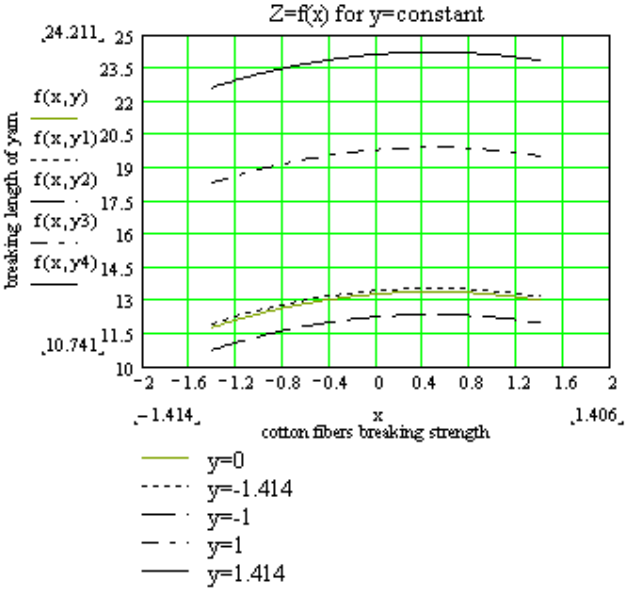

Figure 6. The influence of the cotton braking strength about the breaking length of Nm 40 yarn

3. CONCLUSION

After studying the coefficients of regression equation we notice that the influence of both variables is in the same way on the dependent variable, the breaking length, the most important is the polyester ratio. The breaking strength of cotton fibers influence the breaking length of the yarn with 3,39% while the polyester ratio influence the breaking length of the yarn with 29,73% at Nm 34. The influence of the polyester ratio is about 10-12 % bigger than the influence of the breaking strength of cotton fibers at Nm40 yarn, too.

When analyzing the level curves for the two variants, their similarity is apparent and that by increasing the breaking strength of cotton fiber grows the breaking length of the yarn. This increase is not so significant as that produced by raising the quota of polyester in blend review. However, this occurs after the value of quota over 35-40%. Up to this value, by increasing the quota of participation there is a decrease in the breaking length of the yarn.

On the one side of "saddle" point (with code value -0,672) between 0 and 50% polyester, we can make a yarn with a certain breaking length using both variants on blending recipe. So, according to the destination of yarns and the possibilities of supply it may choose one of the variants that satisfy more than others. If it has a small quantity of polyester will prefer a small polyester ratio and the yarns will have the same breaking length than with a bigger ratio. On the other hand this aspect will influence the comfort features of the products.[1], [4], [2], [3], [5]

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

EFFECT OF COTTON FABRIC WEIGHT PER SQUARE METRE ON DURABLE PRESS FINISHING WITH BTCA

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Abstract: Presently polycarboxylic acids are being used for cellulose crosslinking. Among these, 1,2,3,4-buthanetetracarboxylic acid (BTCA) is the most effective in combination with a corresponding catalyst. In this research, a comparison of crosslinking effects on fabric cotton of different weight per square metre is studied. We used Fourier transform infrared (FTIR) spectroscopy to evaluate the effectiveness of the BTCA in each fabric. Also, we evaluated the modification the wrinkle recovery angle of the treated cotton fabrics and it was measured according to UNE EN 22313. Focused on getting some conclusions, the results of each sample have been compared with the results of the untreated fabric and it could be observed differences in behaviour depending on the weight per square metre from the used fabric.
Key words: *BTCA, cotton, FTIR, crosslinking, WRA.*

1. INTRODUCTION

Polycarboxylic acids, especially 1,2,3,4 butanetetracarboxylic acid (BTCA) in combination with phosphorus containing catalysts, such as sodium hypophosphite, have proven to be the most effective substitutes for the crosslinking agents which release formaldehide, like N-methylol compound dimethyloldihydroxyethylene urea (DMDHEU). [1-3]

During the cure process, normally conducted at 160 to 180ºC for 2 minutes, the carboxy groups of the BTCA form ester linkages with the hydroxymethyl groups of the cellulose to give cotton fabric durable press properties. [4-6]

In our previous research, we studied the ester crosslinking of cotton cellulose by polycarboxylic acids using Fourier Transform Infrared (FTIR) spectroscopy. We evaluated the effectiveness of the polycarboxylic acids as crosslinking agents by measuring the ester carbonyl band intensity. We obtained a relation between the degree of esterification and BTCA concentration. Thus, this technique allows us to obtain the efficiency of crosslinking by a non-destructive analysis.

In this work, we used two kinds of cotton fabrics with different weight per square metre, 110 and 210 g/m^2. Those samples were treated with an aquous solution containing BTCA and hypophophite as catalyst and cured at high temperatures. We investigated the influence of weight per square metre of cotton fabric on the effectiveness crosslinking.

2. EXPERIMENTAL

2.1 Materials

We used two kinds of cotton fabrics with different weight per square metre, 110 and 210 g/m^2. The fabric of 110 g/m^2 was bleached, the other fabric (210 g/m^2) wasn't. These fabrics samples were impregnated with solutions containing the polycarboxylic acid, using 80 g/L of 1,2,3,4-butane-tetracarboxilyc acid (BTCA) and 40 g/L sodium hypophosphite monohydrate ($NaH_2PO_2 \cdot H_2O$) (SHP), which was used as catalyst for the reaction of cellulose with BTCA. The samples were immersed in the aqueous solution and then were passed through squeeze rolls to give a specified pick-up, we obtained 70% and 83% in fabric samples of 110 and 210 g/m^2, respectively.

2.2 Crosslinking Procedure

Samples were crosslinked following the procedure of dry crosslinking. This included impregnation with BTCA and SHP, drying at 85ºC, and crosslinking at 180ºC during 2 min. After, we washed some samples with and without neutralization using ammonia (NH_3) to remove the unreacted acid on the fabric.

2.3 Instrumental techniques

A BRUKER IFS 66/S FTIR espectrometer was used to analyze the spectrum and to obtain the effectiveness of the crosslinking. The resolution for the infrared spectra was 4 cm^{-1}, and there were 64 scans form each spectrum. The degree of crosslinking was determinated by the intensity proportion of the band's ester (1725 cm^{-1})/hidroxyl group (3336 cm^{-1}).

We evaluated the modification in the wrinkle recovery angle (WRA) of the treated cotton fabrics. It was measured according to UNE EN 22313. The results obtained for the conditioned WRA was the average of ten measureaments taken along the warp and weft directions.

3. RESULTS AND DISSCUS

The table 1 shows the results of the modification on the wrinkle recovery angle of the treated cotton fabrics. The results of each sample have been compared with the results of the untreated fabric where we can see the percentage increase in warp (Ru) and weft (Rt).

Table 1: Results of wrinkle recovery angle

	Fabric 110 g/m^2					
	Untreated fabric		**Treated fabric**		**Treated and cured fabric**	
	Rt	Ru	Rt	Ru	Rt	Ru
mg/cm	57,39	80,78	65,50	85,55	77,70	124,26
% Increase			**14,13**	**5,90**	**35,40**	**53,82**

	Fabric 210 g/m^2					
	Untreated fabric		**Treated fabric**		**Treated and cured fabric**	
	Rt	Ru	Rt	Ru	Rt	Ru
mg/cm	86,02	311,20	96,49	320,80	112,55	340,58
% Increase			**12,18**	**3,08**	**30,84**	**9,44**

It could be observed differences in behaviour depending on the weight per square metre fabric used. The samples of less weight per square metre (110 g/m^2) obtain more increase of the wrinkle recovery angle in warp and weft. Although the sample of 210 g/m^2 obtain a good result in weft, but the increase in warp is lower. In both fabrics the results are better when the samples were cured at elevated temperatures.

Generally speaking, during the curing process, the BTCA reacted with the cellulose molecules of the cotton fabric through the formation of cyclic anhidrides as reactive intermediates, which esterified the cotton cellulose. In the presence of SHP, the BTCA molecules were able to crosslinking the htdroxyl groups of the cellulosic macromolecules effectively, by accelerating the formation of anhydrides from BTCA, contributing to greater WRA [3].

When the cellulose is treated with BTCA, and sodium dihydrogen pfosphate monohydrate as the catalyst, an ester bond is formed between the cellulose and BTCA under certain conditions. The band at the wavelength at 1725 cm-1 represents the ester carbonyl group, which confirm the covalent bond between the cellulose and BTCA after the treated fabric is whased with alkaline solution [7].

In this study, we use the peak ratio method (ester carbonyl peak at 1725 cm^{-1} versus –OH bending peak in cellulose at 3336 cm^{-1}), to determinate the degree of crosslinking in each sample. We compared the results of the treated and untreated samples, in both fabrics with different weight per square metre.

Table 2: Results of the FTIR analyzed peak ratio of 1725 cm^{-1}/3336 cm^{-1}

	Cotton Fabric 110 g/m2			Cotton Fabric 210 g/m2		
Banda (cm^{-1})	**Untreated Fabric**	**Treated Fabric**	**Treated and Cured Fabric**	**Untreated Fabric**	**Treated Fabric**	**Treated and Cured Fabric**
1725/3336	0,299	0,345	0,419	0,092	0,210	0,213
% Increase		15,38	40,13		128,26	131,52

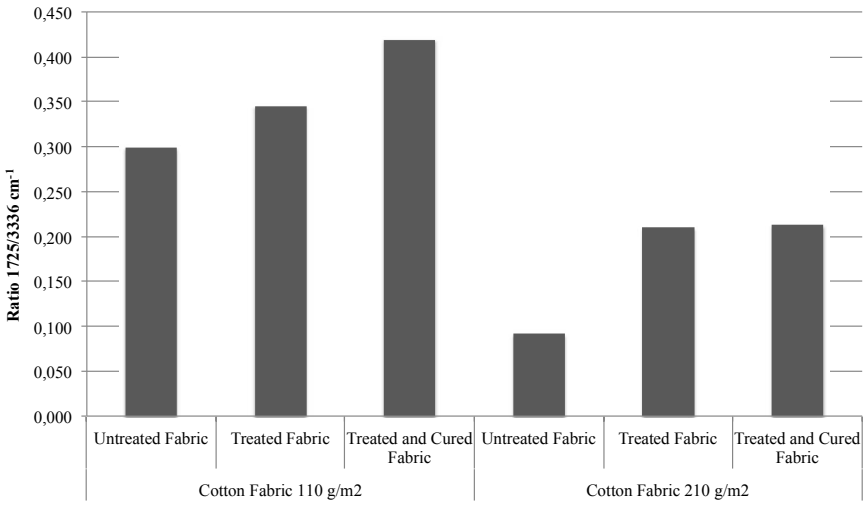

Figure 1: The FTIR analyzed peak ratio of 1725/3336.

In table 2 and figure 1, it can be seen from the results that, the untreated fabric of less weight per square metre (110 g/m^2) has a high degree of crosslinking, because this fabric was bleached. In this case, this ratio show the grede of oxidation due to this treated. Futhermore, with these dates we demonstrated that the curing improves crosslinking effect if the number of ester bonds is used as a critera for crosslinking effiency.

If we compare the results of treated and untreated samples, in both fabrics increase the ratio. Nevertheless, there are differences between the weight per square metre of the sample. The sample of higher weight per square metre (210 g/m^2) obtain more increase than the fabric of 110 g/m^2, but the degree of crosslinking is more effective because the ratio is higher in all cases.

6. CONCLUSIONS

In this study the influence of weight per square metre on crosslinking efficiency of cotton cellulose crosslinked with 1,2,3,4 buthanetetracarboxylic acid (BTCA) was evaluated. In order to get those evidences, we used Fourier transform infrared (FTIR) spectroscopy and studied the modification the wrinkle recovery angle. The results of each sample have been compared with the results of the untreated fabric and it could be observed differences in behaviour depending on the weight per square metre fabric used. In both instrumental techniques, the fabric of 110 g/m^2 obtains better effectiveness of the treatment than the fabric with more weight per square metre. The best results shown were when the samples were cured at elevated temperaturas.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

PRACTICAL ASPECTS OF QUALITY ASSURANCE AND IMPROVEMENT IN TROUSERS MANUFACTURING PROCESS

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Abstract: The paper presents a case-study for trousers manufacturing and more specific, an analysis of quality control system and action plan for improving the quality level. Using data collected in specific check points, the statistical tools as control chart, Pareto diagram, flow chart, histograms, and Fishbone diagram are applied in order to adjust the manufacturing process and improve the quality.
Key words: quality assurance, control system, trousers, quality improvement

1. INTRODUCTION

In the clothing industry, quality assurance requires the existence of a control system to provide timely information about the manufacturing process and in order to promptly and effectively intervene for removing the causes of potential disturbance. In the same time, using specific quality management tools and statistical techniques, we can establish solutions to improve product quality in a fundamental way [5]. The paper presents an application of quality assurance principles in the case of a pants manufacturer in order to improve product and process quality.

2. PRODUCT AND PROCESS ANALYSIS

In the first stage, style quality specifications are considered in the case of a five-pocket trouser, two jeans type front sidepockets, 0.2 and 0.6 cm stitched and two backpockets stitched around. A coin pocket and a basque on the backside completes the style. Hem is stitched and waistband is lined. Based on style characteristics, technological specifications are designed (Table 1).

Table 1. Style specifications

Season: zzz Tr. zzz Order: zzz Art. zzz	Style no. zzz	
Element:	Processing:	Observations:
Front sidepockets	2 jeans pockets	Sewn with the pocket bags, right sides together
Front sidepockets - stitching	2 needles	
Front coin pocket	On the right frontside, 80 mm width	
Frontside, fly – topstitch	No. 15	
Frontside, fly – closing	Zipper – metal	
Backside - inset	Hidden seamless	Basque material backed with pocket lining Inset with 2 needle stitch seam on the back trousers
Front pockets	2 stitched pockets	
Front pockets – form and position	See the model sketch	
Seams - front and back crutch seams	Topstitch with 2 needles	
Seams – inseam	Without topstitch	
Seams – outseam	Completed	1 x slim edge
Waistband – type	Doubled waistbands	
Waistband – width	40 mm	

Waistband – closing	Button + buttonhole	
Waistband – topstitch	Upside 1 x with slim seam allowance; Down 2 needles topstitch	
Insurance - rivets	8 rivets at the frontpockets and rearpockets	
Belt loops - No.	6	
Belt loops - length	60 mm	
Belt loops – opening	55 mm	
Belt loops - width	13 mm	
Belt loops - bartack	Up and down	
Belt loops - stitch	2 needles	
Bottom – type	stitched hem	
Hem – width	15 mm	Topstitch 1 x
Labeling	"Tag" with nits to pocket coin	
Processing the two rear pockets	2 decorative seams on both back pockets	Without a stitch on the back pockets and plaid stripes given
Logo	Label (“Back – Tag”)	
Pocket facing	Sewn to the pants front	
Place the hanger	Place the hanger as five-pocket (folded)	

Technical documents and control procedures were created. All nonconformities related to the trousers were established and classified using 5 classes: fabric nonconformities, manufacturing, finishing, shade and contamination [4]. Final dimensions and control limits for final control were also established, as presented in table 2.

Table 2. Admitted tolerances to final dimensional inspection

Part	Tolerances
Waist	±1 cm
Waist to unwashed trousers	±0,5 cm
Inseam	±1 cm
Inseam to unwashed trousers	±0,5 cm
Hip	±1 cm
Hip to unwashed trousers	±1 cm
Bottoms	±1 cm
Bottoms to unwashed trousers	±0,5 cm
Pulp	±1 cm
Pulp to unwashed trousers	±0,5 cm
Waistband width	±0,2 cm
Bottom width	±0,2 cm (left and right symmetry)
Belt loops width	±0,2 cm
Belt loops length	±0,2 cm
Inset width near the outseam	±0,2 cm (left and right symmetry)
Inset width on the middle of the backside	±0,2 cm (left and right symmetry)
Front sidepocket	±0,2 cm
Distance from the waistband to the opening	(left and right symmetry)
Coin pocket - width / height	±0,2 cm
Back pocket - width / height	±0,5 cm (left and right symmetry)
Back pocket - distances to the outseam and the middle of the back	±0,3 cm (left and right symmetry)
Double top stitching	Differences are not allowed (automatic)
Crosseams matching	Differences are not allowed

Thickness stitching on seams	Differences are not allowed, Provided: 120: 4.0 stitches / cm, 80: 3.5 stitch / cm 50: 3.0 stitches / cm, 30: 2.75 stitch / cm
Pocket bag finish	Differences are not allowed, 4.0 stitches / cm
Lock stitch	Differences are not allowed, 4.0 stitches / cm
Bartacks thickness	16 stitches / cm
Bartacks length	±0,1 cm
Bartacks tolerance	±3 stitches / cm
Bartacks width	0,2 cm; ±0,5 cm
Inner label position	±0,5 cm
Outer label position	±0,5 cm
Distance from logo to the waistband	±0,3 cm
Visible width of the logo	0,7 cm
Fly topstitching, distance from zipper to the end	±0,2 cm
Twisted leg	2 cm

3. IN-PROCESS INSPECTION SYSTEM AND IMPROVEMENT PLAN

After analysing the manufacturing process, an in-process inspection system was designed, including three process control points, based on the client requests, quality costs and complexity of the critical operations [3]. These checkpoints were located after waistbands corners stitching and pressing (intermediate checkpoint 1), before washing (intermediate checkpoint 2) and after final pressing for final checkpoint 3. Control points 2 and 3 were coupled, and controllers worked together and shared their work. In this case, final and intermediate inspections were physically grouped together for centralised exam. A process flow chart was conceived based on manufacturing process and control system design. In this graph, technological operations and controls were highlighted, including self-control and in-chain control, fixed-term and final inspection (Figure 1).

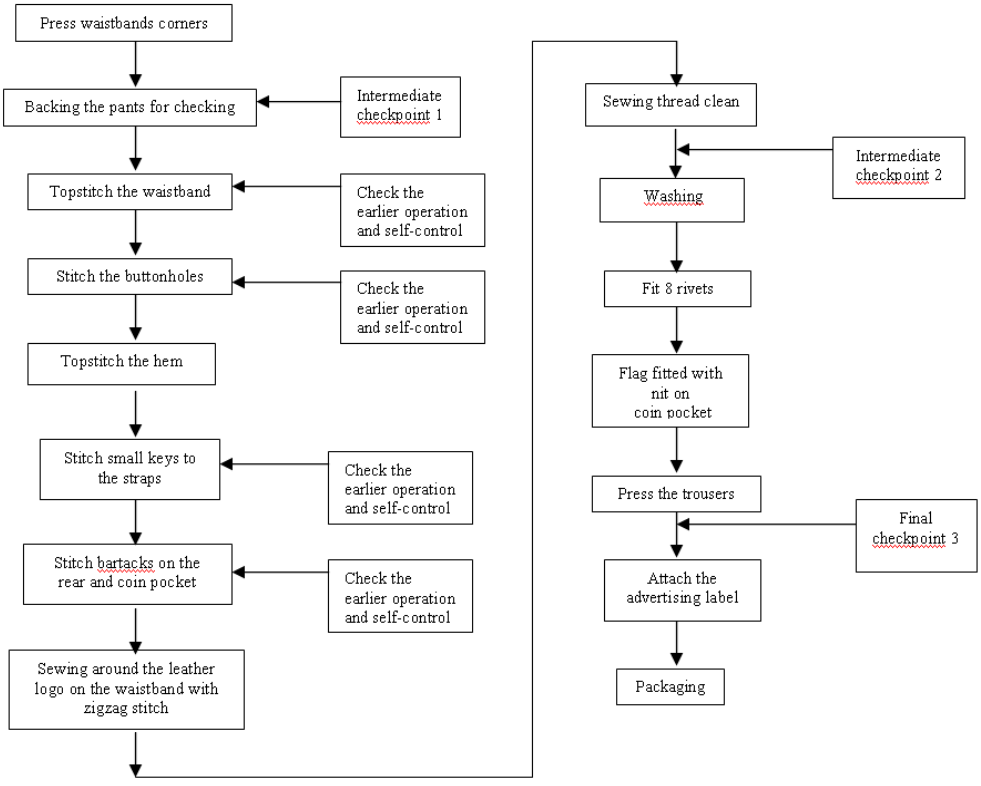


Figure 1. Flow chart for manufacturing process

Control procedures and inspections instruction for each point were established [2]. Detected nonconformities were grouped and recorded using specific check sheets:

- For the first inspection point:
  Fiber content label – conformity with model card, Outseam – seaming, topstitching, Inseam – seaming, topstitching, Frontside pockets – seaming, topstitching, smallkeys, Back pockets – seaming, topstitching, small keys, Slit – seaming, topstitching, smallkeys, Waistband + berltloops – waistband pressing, loops manufacturing, waistband corners, pressed waistband seaming, Inside the pants – overlocking, bording, seam wideness, Back cross seam – processing, pressing, Dimensions – length, waist, hip, Fabric defects, Contaminations, Shading.
- For the second inspection point:
  Belt loops – pozition, processing, smallkeys, length, Buttonholes – pozition, processing, Buttons - pozition, processing, Nits + rivets, Waistband topstitching, Brand label, Smallkeys on slit and backpockets, Hem – topstitch, Seam wideness, Seam threads, Dimensions – length, waist, hip, Fabric defects, Contaminations, Shading, Undetected defects at the first inspection point.
- For the third inspection point:
  Hem finishing, Sideseam finishing, Inseam finishing, Hip finishing, Slit finishing, Back crossseam finishing, Waistband and belt loops finishing, Inside pants finishing, Main dimensions, Fabric defects, Twist, Contaminations, Shading, Undetected defects at the first and the second inspection point.

Based on data collected in each check point on manufacturing process in a month, histograms and proportions of defects in each checking were achieved for five defects types, as seen in Figures 2 and 3.

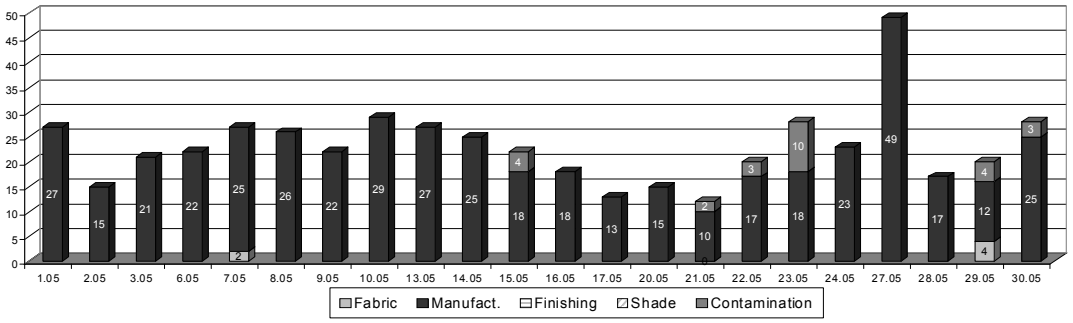
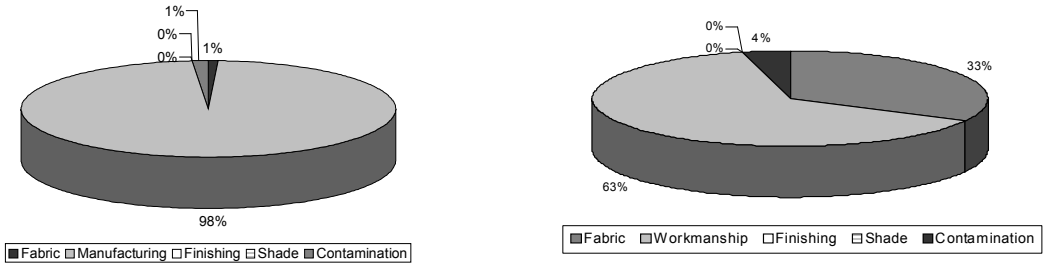


Figure 2. Histogram for the first checkpoint



a) b)

Figure 3. Proportion of defects in a) checkpoint 1 and b) checkpoint 3

At the first stage, the majority of nonconformities, about 98%, are workmanship defects, followed by contaminations and fabrics defects. The identifying of contamination in first checkpoint is mainly due to loss of fabrics inspection process from spreading, where the operator has to check them. All the nonconformities recorded in the second stage of checking refer to manufacturing, including undetected defects in the first control point. The control section 3, due to the washing process of pants in which the used aspect is done, many fabrics and workmanship defects were prevailed. The causes of defects in this stage have two reasons: first inefficiency of the flow control system that allowed unobserved defects and the pre-washing process that causes destruction, stain and seams damaging.

Finally Pareto charts had applied in case of trousers process manufacturing, as seen in Figure 4. The first grade defects that give 80% of defects detected in CP 1 were: waistband + belt loops – pressed waistband seaming, side front pockets – processing, side seam - topstitch, slit – processing, back pockets - topstitch, side seam – seaming, waistband + belt loops – belt loops processing, and contaminations. The recommended measures that prevent these types of nonconformities were to automate the fitted waistband operations, slits processed and back pockets processing, but also creating a new checkpoint after slits preparation and pockets processing. Also, statistical control techniques might be applied in this supplementary control point for faster detection and remedying defects, with minimal costs.

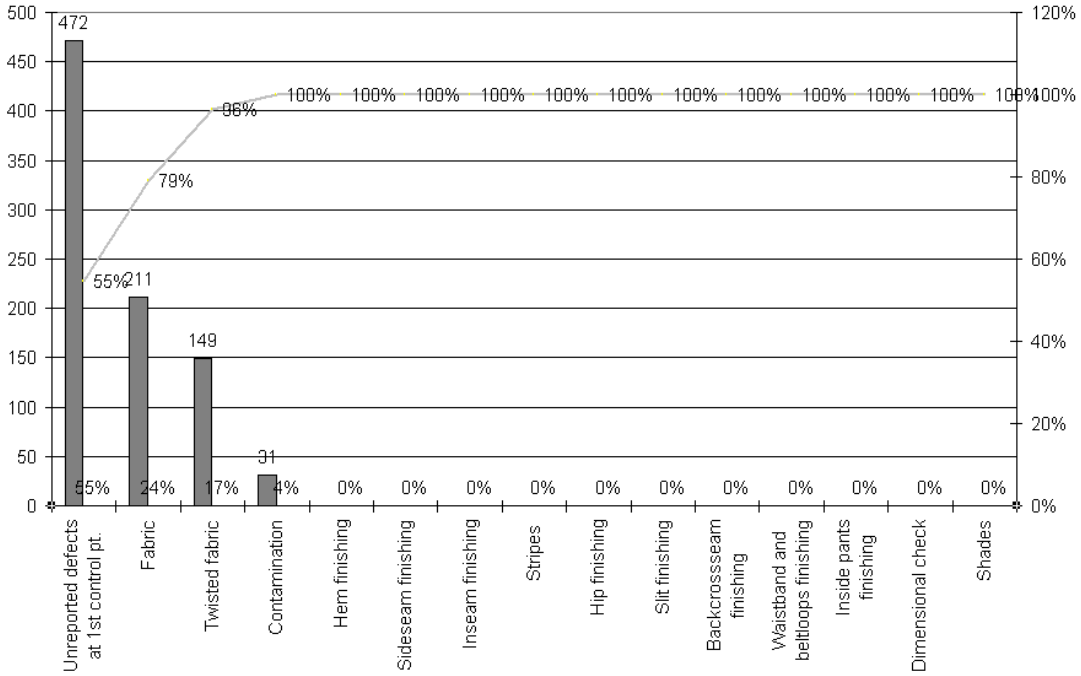


Figure 4. Pareto chart for the third checkpoint

From Pareto chart applied in Control Point 2, the main defects were bartacking, leather logo sewing and waistband topstitching. The main cause that manages to bartacks defects was physical and moral usage of bartacking sewing machines, required new acquisitions. Leather logo stitch operators had to be trained or replaced. Using automatic waistband equipment, the number of faults in this operation could decrease. In the main defects class, a Fishbone diagram was created, emphasizing the potential causes which can be managed to nonconformity. The most important quality problem detected in CP2, bartacking errors (slit and backpockets), was analysed and solved using Fishbone chart in Figure 5 [1].

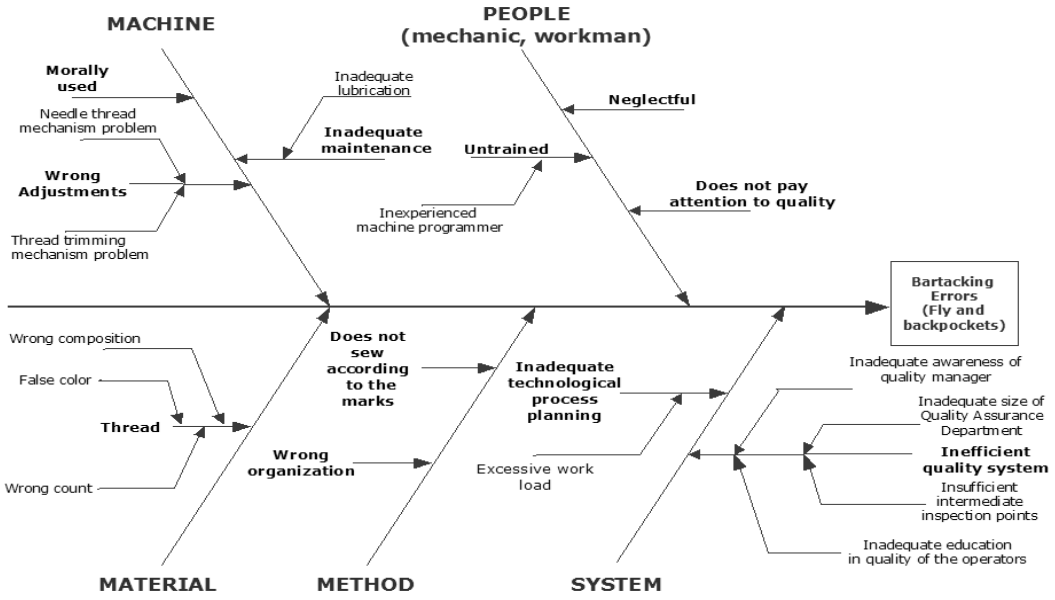


Figure 5. Cause-and-effect chart for the second checking point

A new interim checkpoint between intermediate checkpoints 1 and 2 was sustained by Pareto chart performed for control point 3, made after finishing stage. In this point, 55% of defects were unreported defects on the first control point, indicating an ineffective inspection. In stage 3, a large defects proportion was occupied by fabric defects. For product quality improving, an automatic defect detection system could be recommended. Also, the next nonconformity was twisted leg, with main cause as lack of spreading and inspection after cutting stage.

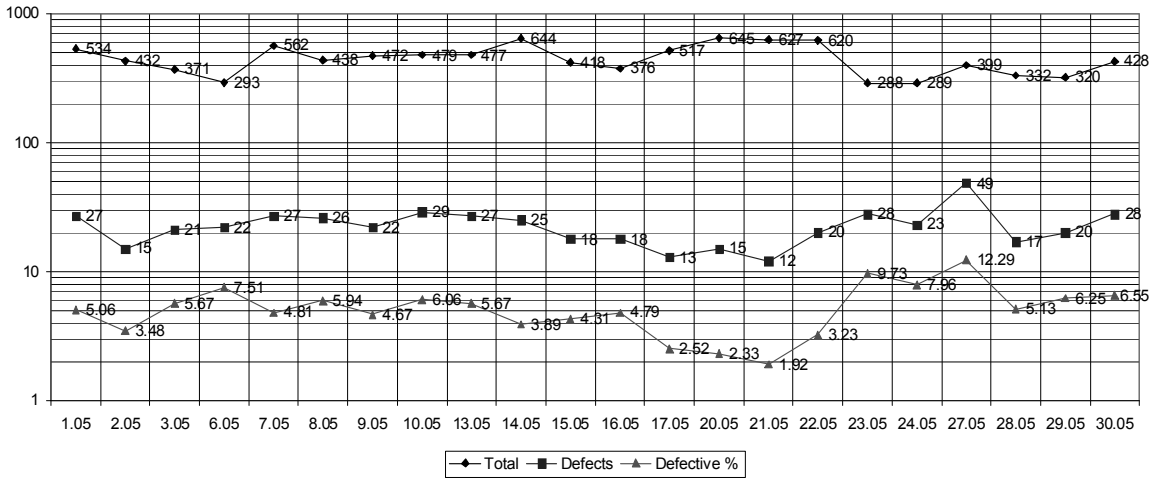


Figure 6. Production, defects and percent defective in CP 1

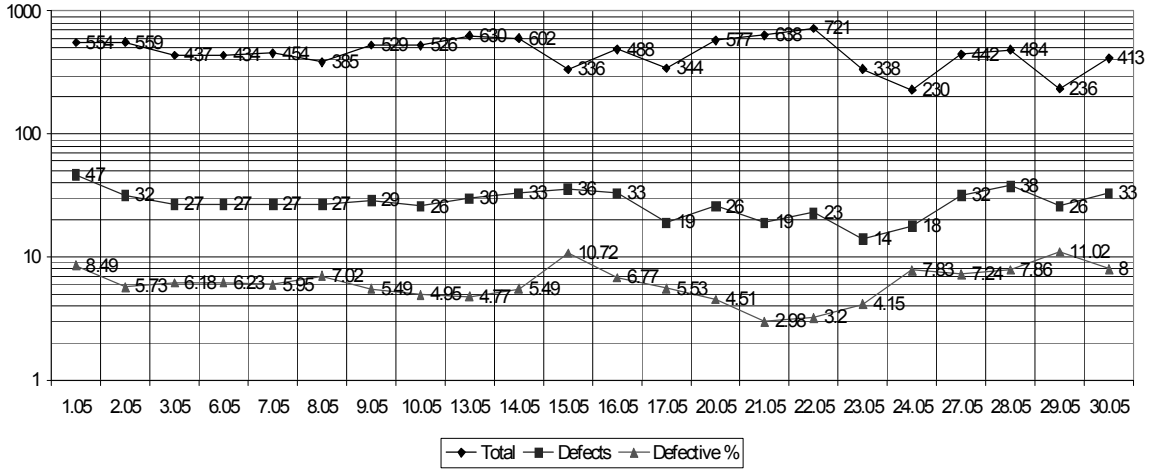


Figure 7. Production, defects and percent defective in CP 2

3. CONCLUSIONS

In order to have an overview of the control system and quality level, graphs with production level, defects and percent defective for trousers in each check point were drawn, during a month (Figures 6 and 7). Comparing these diagrams, a large proportion of defects that have passed undetected by the control points 1 and 2 were noted in the final inspection only, that which imposes definitely a quality improvement plan.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

WASHING BEHAVIOUR OF PLAIN AND KNITTING FABRICS

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Abstract: This research studies microcapsules useful life on plain and knitting fabrics applied by impregnation. Washing treatments allow us to study the behaviour of the commercial product in each fabric. Fabrics structure characteristics have an important influence in the number of microcapsules that remaining on the fabric.
Two instrumental techniques, scanning electron microscopy (SEM) and particle size analyzer, have been used in order to determinate the quantity of commercial product that remains on the fabrics and the wastewaters after washing treatments. We concluded that the total quantity of microcapsules washed out of the fabrics in the washing treatments decreases when used plain fabrics. To sum up, we can indicate that fabric structure characteristics have a considerable influence on the retention of microcapsules on washing procedure.
Key words: fragrance microcapsules, impregnation, plain fabric, knitting fabric, washing, SEM

1. INTRODUCTION

Textile industry is one of the industry sectors that have increased their consumption of microcapsules. Microcapsules applied on textiles has become a way of modify textile properties. [1,2]

Microcapsules commercial products can be applied on fabrics by impregnation, bath exhaustion, foam, spraying and coating. The most extended industrial application is by padding. Fabric structure is an important parameter to consider in the microcapsules application on fabrics [3]. Furtherrmore application procedure, bath composition, fibres nature (hydrophobic vs hydrophilic character), cross section, fabric weight and fabric wave, are variables to consider in the application of microencapsulated products into textile substrates [4] in order to ensuring the stability and durability of microencapsulated.

Textiles in their useful life are submitted to washing, drying, ironing, abrasion, etc. These processes affect the stability of microencapsulated products. In previous works [4,5], plain fabrics have undergone several washing cycles in order to determinate the durability of microencapsulated. The aim of this work is to studie and compare the stability and durability of microcapsules on the plain and knitting fabrics surfaces after washing treatments.

Fabrics have been characterized by scanning electron microscopy (SEM) and water from washing cycles have been studied by a Coulter® Counter apparatus which allowed counting the number of particles and their size in the wastewaters.

2. EXPERIMENTAL

2.1 Materials

Lavender fragrance microcapsules were supplied by COLOR CENTER (Tarrasa, Spain). The wall material was melamine formaldehyde. An acrylic resin was applied in order to bond the microcapsules to the fabric, also supplied by COLOR CENTER.

Fabrics used in the research were 100% cotton and had different characteristics, these are shown in table 1.

Table 1: Fabrics characteristics

Sample	Structure	Weight (g/m^2)
Cotton 1	Plain	120
Cotton 2	Plain	210
Cotton 3	Weft Knitting	172

Fabrics 1 and 2 had been chemically bleached with peroxide in an industrial process. Also Fabric 1 has received a finishing treatment.

Fabric 3, weft knitting fabric, was prepared in a flat knitting machine (Matsuya Corporation, Japan) gauge 12.

2.2 Fabric Treatment

Fragances microcapsules were applied to the surface of the fabrics by impregnation. An acrylic resin was used as a binder. As a result, thermal treatment in the form of hot air was applied to cure the resin and to induce microcapsules adhesion on the fibre surface. For the process, a horizontal foulard was used. Bath treatment was composed of 10g/L of resin and 60g/L of commercial microcapsules, it had been studied previously [5].

2.3 Washing Treatment

Washing process was carried out in a Heraus Linitest applying the standard ISO STANDARD 105 C10. When a cycle was finished, samples were dried on a horizonat surface and the wastewaters from washing cycles were collected in order to analyze them.

2.4 Instrumental Techniques

For fabric surface observation a scanning electron microscopy Phenom microscope (FEI Company) was used. Each sample was fixed on a standard sample holder and sputtered with gold and palladium.

The particle size distribution and the quantity of microcapsules contained in wastewater from washing were measured by BECKMAN COULTER® (Multisizer Z1, Coulter electronics). Three replicates were performed for each bath from washing cycles in order to reduce error and an average result was used.

3. RESULTS AND DISCUSSION

Figure 1 shows SEM microphotographs of cotton fabrics with microcapsules applied by impregnation. Certain differences can be observed. There is a difference in the number of microcapsules that remaining on the fabrics depending on the fabric weight. A previous work [3] has shown that fabric weight has an important influence in the number of microcapsules that remaining on the fabric for the same padding treatment. It should be noted that fabric 1 has received a finishing treatment, we can observe the product presence between fibers.

The number of microcapsules that remain on the fabric after five washing cycles depends on the fabric structure characteristics. Figure 2 shows these differences. Wastewater analysis allow us to determinate the total number of particles deteached after washing cycles and their distribution size. We can observe in Table 2 that depends on the fabric (plain or knitting) and their weight, the number of particles contained in wastewaters increase or decrease.

In the first washing cycle the number of microcapsules that goes out of the fabrics is higher than in the other washing cycles. Larger microcapsules are washed out the fabrics more quickly than the smaller microcapsules that remain on the fabrics for more washing cycles. Moreover, we can observe in Figure 2 that larger microcapsules deflate rather than smaller microcapsules.

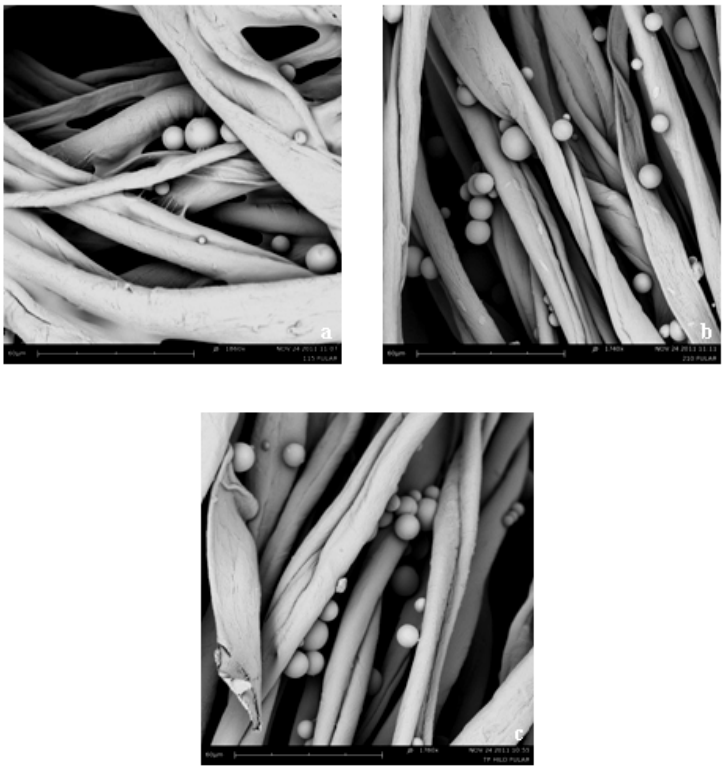

Figure 1: SEM micrographs of cotton fabrics with microcapsules
(a) Cotton 1. (b) Cotton 2. (c) Cotton 3

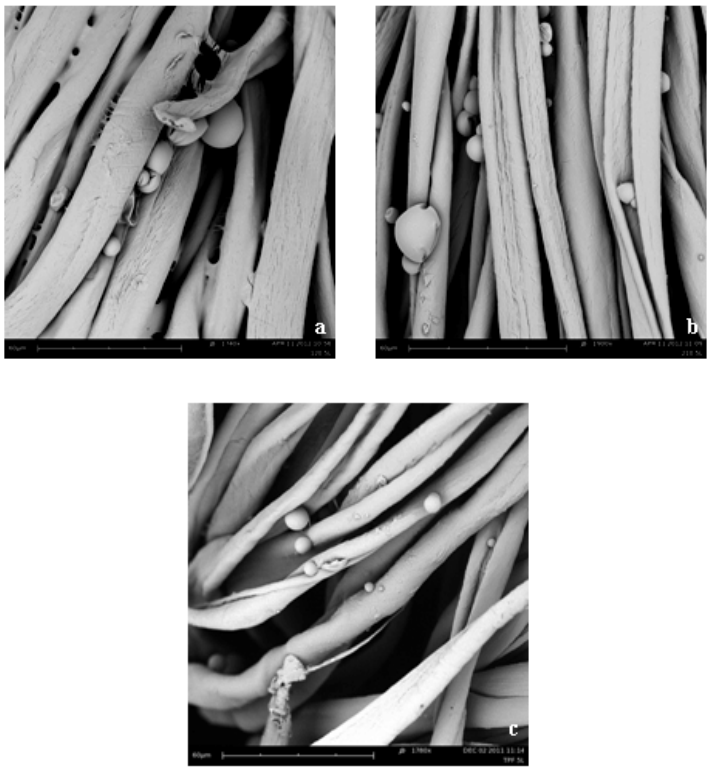

Figure 2: SEM micrographs of cotton fabrics after five washing cycles
(b) Cotton 1. (b) Cotton 2. (c) Cotton 3

Table 2 shows the quantity of particles per millilitre of liquor padding that washed out the fabrics after five washing cycles. It was observed a significant difference in the quantity of particles.

Table 2: Particles per milliliter of liquor padding

Sample	Particles number (10^3)/mL
Cotton 1	34.182
Cotton 2	16.416
Cotton 3	25.277

It should be noted that fabric 1, Figure 1(a), has received a finishing treatment. The finished product between fibers may increase the number of particles in the wastewater when the fabrics are washed.

4. CONCLUSIONS

Fabric structure characteristics have a considerable influence on the retention of microcapsules on washing procedure. The present study compares the stability and durability of microcapsules on the plain and knitting fabrics surfaces after washing treatments. Certain differences can be observed. The number of microcapsules that remain on the fabrics after washing cycles is higher in fabrics with higher weight (g/m^2).

5. AKNOWLEDGEMENTS

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ANNALS OF THE UNIVERSITY OF ORADEA
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COMPARISON OF TWO METHODS FOR DETERMINING UPF

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Abstract: Solar radiation that we perceive has increased in recent times and especially during the last years. This is due largely to changing lifestyles and the decrease of the ozone layer. For this reason has increased social awareness about the need for protection against ultraviolet radiation.
The method for determining the UPF value most used is the spectrophotometric technique as it is recognized worldwide and gives good results.
In this paper an alternative technique is exposed which employs an ultraviolet radiation lamp and a radiation detector. This new method provides greater flexibility and fewer errors in the measurements. In addition there is a statistical correlation between the two methods.
Key words: UPF, spectrophotometry, ultraviolet, UV lamp.

1. INTRODUCTION

The beneficial effects of human exposure to ultraviolet radiation (UVR) are well known. The main benefit is promoting the synthesis of vitamin D from precursors in the skin. However, prolonged and repeated sun exposure of the population causes some harmful effects. The most obvious short-term effect of over-exposure to UVR is sunburn, also known as erythema. Chronic sun damage causes to skin some diseases like cancer or skin aging. In the latest years the amount of radiation that reaches the earth's surface has increased dramatically [1-4].

The proportion of the UV region (100–400 nm) is about 5–6% of the total incident radiation and can be classified wavelength into three regions. Light radiation of wavelength 315–400 nm represents UVA region. UVB radiation is in the range of 280–315 nm [5] and is very damaging radiation. The region below 280 nm is UVC radiation, which is the most dangerous. Fortunately, UVC and about 95% of UVB radiation do not reach the earth's surface due to absorption by the stratospheric ozone in the atmosphere. Therefore, the UVR protection provided by clothes becomes a subject of considerable interest.

There are several possible pathways for UV light distribution when UVR reaches textile fabric. UVR can be reflected, absorbed and transmitted by fabric. Part of the radiation is absorbed by the fibers, another part of the radiation passes directly through the fabric by gaps between the fibers and yarns and this part is referred to as the 'transmission'[6]. Some radiation is reflected or scattered by the fibers, which may contribute to transmitted radiation if it is not absorbed by other fibers. It is clear that all clothing provides some degree of UV protection. Several factors determine the effectiveness of clothing at reducing UVR. These factors include cover factor, the weight and thickness, the construction of the fabric, the color of the fabric, the type of fiber used (composition) and other finishing processes that could suffer the fabric.

The main method for quantitative assessment of UV protection by clothing is the spectrophotometric method and it is internationally accepted. That method is described in the UNE-EN 13758-1 norm.

2. OBJECTIVE

The main method for quantitative assessment of UV protection by clothing is the in vitro test and it is based on determination of the UPF, defined as the ratio of the average effective UVR irradiance calculated for unprotected skin to the average effective UVR irradiance calculated for skin protected by the test fabric.

An alternative method to calculate the UPF value is studied in this paper and the main objective is to compare both methods. An ultraviolet lamp and a detector are used in the alternative method. The main objective is to achieve a fully reproducible method and extrapolated. Special emphasis will be undertaken to find a mathematical correlation between spectrophotometrically measuring the UPF and the measurement is evaluated in this study. It aims to minimize the measurement error committed in the spectrophotometric measurements as the detection area is very small and the fabrics are very porous and interstices generating irregularities.

3. EXPERIMENTAL

Spectrophotometric method

Inter-comparison measurements of different testing laboratories have shown that spectrophotometric assessment of the UV transmission through fabrics is an accurate and reproducible test method for determining UPF [7]. This method has become a widely accepted laboratory-based test method.

By using a spectrophotometer, the percentage transmission, both direct and diffuse, are measured at wavelength intervals of 5 nm in the 290–400 nm spectral range. Taking into account transmission data, the erythema-producing function of human skin and the intensity distribution of solar radiation over the earth's surface, the UPF can be calculated by equation:

$$UPF = \frac{\sum_{\lambda=290}^{400} E(\lambda)\cdot\varepsilon(\lambda)\cdot\Delta(\lambda)}{\sum_{\lambda=290}^{400} E(\lambda)\cdot T(\lambda)\cdot\varepsilon(\lambda)\cdot\Delta(\lambda)} \quad (1)$$

where $E(\lambda)$ is the solar spectral irradiance ($Wm^{-2}nm^{-1}$), $\varepsilon(\lambda)$ is the relative erythema effectiveness, $\Delta\lambda$ is the wavelength interval of measurements (nm) and $T(\lambda)$ is the spectral transmittance at wavelength λ. [7]

Alternative method

Recently, another method is under study and it is explained on this paper. That method consists on an UV-lamp which irradiates at 312 and 365nm, which belongs to UVB and UVA radiation severally. The detector of ultraviolet rays is found perpendicular to the UV-lamp and the fabric is above it. The experimental setup is shown on the figure 1. The system is within an opaque box.

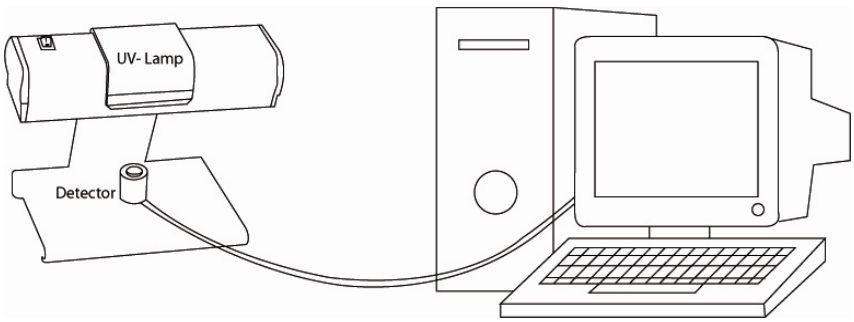

Figure 1: Diagram of UV measurement system.

Different fabric parameters have been varied to obtain a series of samples for comparison with values obtained by the spectrophotometric method. That is why the weft materials inserted are cellulosic materials such as cotton and viscose and synthetic materials like nylon and polyester. The weft density was varied from the maximum density that allows the loom to the minimum density

generating a heavy fabric and a very light fabric. The ligament employee is plain and the satin weave. The last parameter that has changed is the color and has been chosen a yellow and brown color.
The specimens were adjusted to the specifications considered. Thus, the test pieces have a size of 10x10 cm since it is perfectly covers the area detector.

The part of radiation transmitted through the fabric is detected by the detector. The main differences between the spectrophotometric method and the alternative method under study are firstly the detection area which is about 100 times bigger than spectrophotometry method, and secondly the interval of wavelength. Thus the UPF can be calculated by equation:

$$UPF = \frac{E(312)\cdot S(312)\cdot \Delta(\lambda)+E(365)\cdot S(365)\cdot \Delta(\lambda)}{E(312)\cdot S(312)\cdot T(312)\cdot \Delta(\lambda)+E(365)\cdot S(365)\cdot T(365)\cdot \Delta(\lambda)} \quad (2)$$

The equation for determining the UPF by the two methods have some differences. These differences are determined by the way of work with the alternative method. In the spectrophotometric method is performed a sweep from 290 nm to 400nm, but the alternative method only works on two specific wavelengths such as 312nm (UVB) and 365nm (UVA). It works only at these two wavelengths because it is considered to represent optimally ultraviolet radiation.

4. RESULTS AND DISCUSSION

The alternative method has given excellent results. UPF values obtained by the alternative method are related to those obtained by spectrophotometry. Mathematically it is studying the correlation between the values obtained by the two methods that have been discussed in this paper.

This work provides an alternative method for determining the UPF. The measurement error of the new method is minor because the measurement area is about 100 times bigger and also the new method is a reproducible test method for determining the ultraviolet protection factor. The main advantages of new method are the versatility and the decrease of measurement error.

A total of 72 samples have been studied using the new method. 15 samples were evaluated by spectrophotometric method in order to obtain the UPF value. As can be seen in Figure 2, the UPF values determined spectrophotometrically fit line whose coefficient of determination is 0,9367 ant its equation is:

$$y = 457{,}42x^{-0{,}557} \quad (3)$$

The values determined using the new method has exponential equation as followsand the coefficient of determination is 0,9735:

$$y - 98{,}574e^{-0{,}051x} \quad (4)$$

There is a correlation between the trend lines of both methods. UPF low values have a significant statistical correlation, but the behavior is slightly different at highest values.

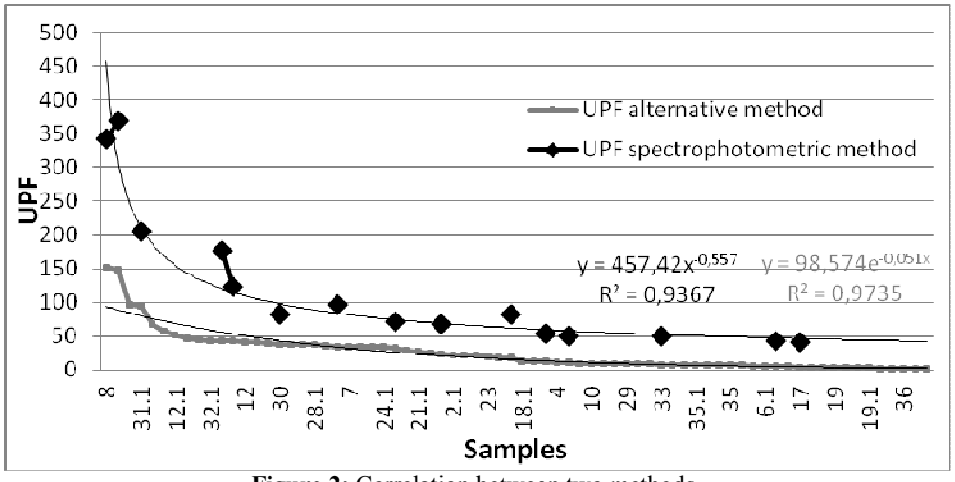

Figure 2: Correlation between two methods.

5. CONCLUSIONS

- The measurement error of the new method is minor because the measurement area is about 100 times bigger.
- The new method is a reproducible test method for determining the ultraviolet protection factor.
- The main advantages of new method are the versatility and the decrease of measurement error.
- The alternative method can be used with natural sunlight. Its use is not limited to the laboratory.
- The new method allows the evaluation of all types of fabrics.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

RESEARCH ON ECODYEING TEXTILE MATERIALS WITH NATURAL EXTRACTS

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Abstract: Naturally colored flax fabrics are considered potential eco-friendly materials for textile industries because they avoid the use of synthetic dyes and pigments which in general, contain toxic chemicals.
In this context, a comparative study about the posibility to use these natural extract has been made. The selected natural extracts of bilberry fruits and red-onion skin were applied to the dyeing of flax fibres under various conditions. The textile composites made of a flax fibrous support previously grafted with inclusion compound, namely β-cyclodextrin and dyed with the natural dye extracts have been morphologically and chemically characterized by scanning electron microscopy, X rays diffraction, FT-IR spectroscopy; the colorfastness measurements have completed this study. The measurements revealed the fact that the treatment with β-CD has relatively enhanced the washing and dry rubbing properties of the pretreated and control samples, as well. Our work paper pointed out the importance of this novel route of dyeing, regarding the safety in textiles and reducing the negative impact due to dye processes in the textile companies.
Key words: *flax textiles, natural dye, colorfastness, safety, environmental impact*

1. INTRODUCTION

Textile manufacturers are demonstrating increasing interest in the application of durable fragrances to textile as well as skin softeners.The advantage of natural dyes is eco-friendly, they do not create any environmental problems at the stage of production or use and maintains ecological balance. Depending on the climate, various plants served as sources for natural dyes, e.g., indigo plant, madder, barberry, etc. In general, numerous papers have described the selection of plant raw materials, dyeing procedures, fastness properties and they described encouraging results with regard the coloration [1-6] Anthocyanins are naturally occurring compounds that impart color to fruits, vegetables, and other plants. They are probably the most important group of visible plant pigments besides chlorophyll. Apart from imparting color to plants, anthocyanins also have an array of health-promoting benefits, as they can offer safety textile production. However, anthocyanins have received less attention than other flavonoids, despite this.

Natural dyes such anthocyanins of the main red fruits (bilberry, blackcurrant, strawberry, blackberry, black cherry, morello, raspberyy and elderberry) were analysed comparative with dyes isolated from dry skin of red-onions.

Plants and fruits are traditionally sources of natural dyes used to color textiles, some of them being presented in Table 1 [2].

Table 1: Typical examples of natural dyestuffs of plant origin.

Name of plants	Dyes/chemical classes	Colors
Barberry	Alkaloids	yellow-brown
Goldenrod, aple, pear, apricot, peach, plum, cherry, currants, grapes	Flavonols, Flavones, Isoflavones	yellow-olive
Paprika, carrot, spinach, beans, tomatoes, pepper	Carotenoids	orange-red
Red-beet	Betalains	pink-red
Spinach	Chlorophyll	green
cherries, raspberries, blackberries, blueberries, oranges, tomatoes, grapes, red wine, red corn, red onion, red cabbage, red-skinned potatoes, eggplant, fennel	Anthocyanins/anthocyanidins	red, blue, violet, brown-beige
madder *Rubia tinctorum* (glycoside). White Bedstraw (*Galium mollugo*), Soapberry, walnut	Chinone and Antrachinone	red brown
Walnut	Naphthochinone	brown and purple-grey
Indigofera tinctoria	Indole	blue
Bloodroot *Sanguinaria canadensis*	Isoquinoline	red
Orchil, archil, orseille (French) and cudbear;	Phenoxazine	red/purple/violet

Different factors affect the color and stability of these compounds including pH, temperature, light, presence of copigments, self-association, metallic ions, enzymes, oxygen, ascorbic acid, sugar, among others. For this reason many studies have been conducted with the aim to increase the stability of these substances. Therefore, the present paper highlights studies on the stabilization of natural dyes and demonstrates the potentiality of the main technique used: pretreatment with β-cyclodextrin as inclusion complex [3-5].

Our researches succeeded in emphasize the effectiveness of β-cyclodextrin in colour stabilization on textile because it has an ability to form complex with a variety of molecules including natural dyes.

The study presents results from flax fabrics grafted with β-cyclodextrin polymer and dyed with natural extracts such bilberry and red-onion anthocyanin extracts, which is one of the environmentally friendly ways to make fabrics safety.

2. EXPERIMENTAL SECTION

2.1 Plant material and natural dye extraction

Dye extracts of bilberry *Vaccinium myrtillus* and dry skin red-onion *Allium cepa* grown in Romanian region were used in the present experiment. Extraction of natural dyes from selected samples of red-onion and bilberry plants was conducted in 70% ethanol in water.

Solution to be used in dyeing experiments was of 148.58% for bilberry and onion extract concentration is 25% product.

2.2. Materials and methods

As material for the dyeing experiments, washed and bleached 100% flax fabrics were used

All chemical reagents used in the present investigation were of purity grade.

2.3. Grafting of flax support

Grafting is performed by padding *(impregnation-squeezing)-drying- curing*:

- curing in an exicator for 24 hours, initial weighting of samples, preparation of ß- CD and alcalin catalysts (NaOH şi Na_2CO_3) solutions, preparation of impregnation bath having a 100 g/l concentration of ß-CD of and 50 g/l for Na_2CO_3;

- the flax fabric were immersed in a solution containing 10-50 g/l of β-cyclodextrin which adjusted to pH 4 using acetic acid at room temperature for 30 minutes, then padded to pickup 100 %; a drying at room temperature for 12 hours; curing at 90÷170°C for different periods of time (1÷15 minutes), , for grafting performing; finally the fabric is washed thoroughly with tap hot and cold distilled water, up to pH=6,5-7;

-air drying.

2.4. Dyeing experiments

The dyeings were performed by the exhaustation method using a liquor ratio of 1:30. Ten grams of bleached flax fabric were used as textile material for all the experiments. 7.43 mg bilberry natural dye and 3.8 mg red-onion extract is considered for a solution of 1% in the same time for a solution with the concentration of 2%, the amount of bilberry natural dye is 14.86 mg and 7.6 mg onion dye. The flax fabrics were dyed with bilberry and red-onion natural extract, keeping the fabric in dye bath for about 30 minutes at 80°C. The dyed material was washed with a soap solution, cold water and dried at room temperature.

The description of obtained specimens is presented in the table below (Table 2).

Table 2: Specifications and descriptions of the samples

Samples name	Description
Flax fibers supports	
F	Non-functionalized flax fibres support (without ß-cyclodextrin)
F-ß-cyclodextrin	Functionalized flax fibers support with ß-cyclodextrin
F-ß-cyclodextrin-EXH 1% NANT	Functionalized flax fibers support with ß-cyclodextrin dyed with 1% solution of natural extract (1- from onion, 5- from bilberry)
F-EXH 1% NANT	Non-functionalized flax fibers support dyed with 1% solution of natural extract (2-from onion, 6-from bilberry)
F-ß-cyclodextrin-EXH 2% NANT	Functionalized flax fibers support with ß-cyclodextrin dyed with 2% solution of natural extract (3- from onion, 7- from bilberry)
F-EXH 2% NANT	Non-functionalized flax fibers support dyed with 2% solution of natural extract (4-from onion, 8-from bilberry)

2.5. Microscopy and analysis of textile supports

The surface morphology of the samples was investigated by scanning electron microscope (SEM) Quanta 200 3D Dual Beam type microscope, from FEI Holland, coupled at a EDS analysis system manufactured by EDAXAMETEK Holland equipped with a SDD type detector (silicon drift detector) with magnification of 3009, 12009, respectively.

X-ray diffractometry

X-ray Diffraction (XRD) data for structural characterization of the various prepared samples were collected on an X-ray diffractometer (PW1710), and the XRD patterns were recorded at 2θ angles between 20° and 80°, with a scan rate of 1.5°/min.

FTIR spectroscopy

FTIR was used to examine changes in the molecular structures of the samples. Analysis has been recorded on a FTIR JASCO 660+ spectrometer.

Fastness testing

The washing fastness was determined at 40^0 according to SR EN ISO 20105-C01:1996 Colour fastness to dry and wet consentaneous rubbing , according to SR EN ISO 105- X12:2003, has been

tested using a 760 Crockmaster equipment.The shifts have been quantified with respect to standard grey scale.

3. RESULTS AND DISCUSSIONS

SEM microscopy

Figure 1 shows the SEM images of modified and dyed flax fabrics. The surface of the original flax fabrics was smooth. After cyclodextrin activation, a few particulates showed up. This observation was consistent with that reported in the literature about morphology [1]. Flax fabrics grafted with cyclodextrin polymer appeared to be covered by a layer substance.

Without cyclodextrin, the surface morphology belonging to flax fabric naturally dyed reveals tiny deposits superficially fixed, without any visible physical bound. On the contrary, the aspect of grafted and dyed sample with natural extract proved the occurence of an inclusion compound embedded within the fibre bulk. This fact is more evident in case of dyeing with onion extract.

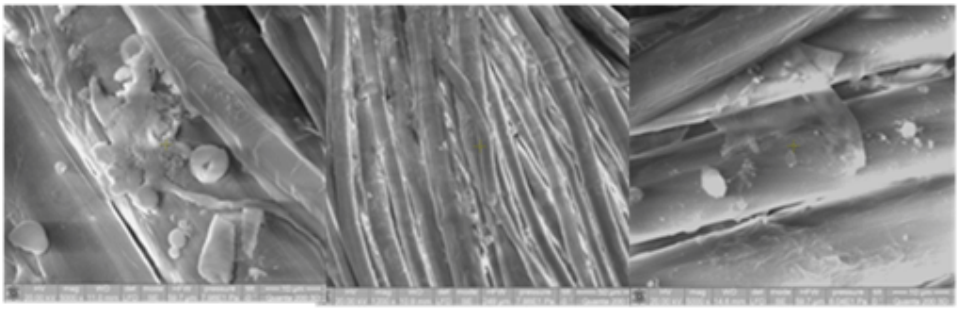

Figure 1: The SEM images for reference flax textiles (without cyclodextrin) dyed with onion and bilberry extracts inspected at the different magnifications: (×1200 and ×5000)

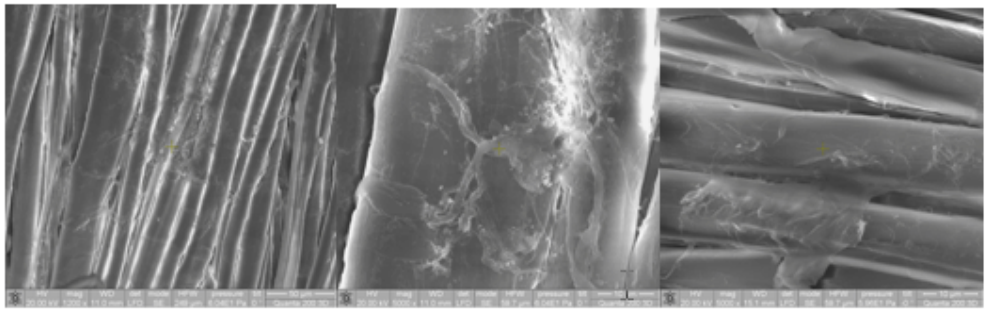

Figure 2: The SEM images for grafted (with cyclodextrin as inclusion complex) flax textiles dyed with red-onion and bilberry extracts inspected at different magnifications:(×1200 and ×5000)

FT-IR spectroscopy

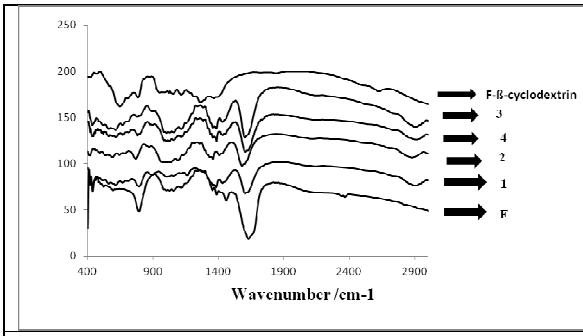

Figure 1: FT-IR spectra for flax fibers supports dyed with red-onion extract dye

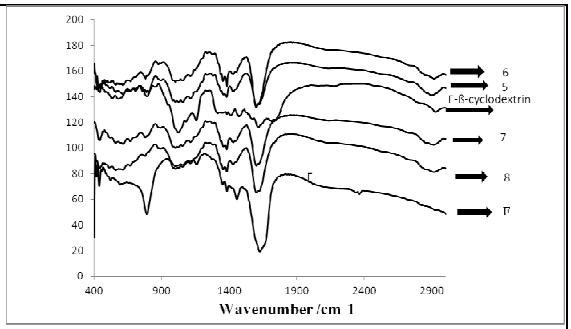

Figure 2: FT-IR spectra for flax fibers supports dyed with bilberry extract dye

The use of FTIR technique reveals the involvement of the different functional groups of both guest and host molecules in the inclusion process by analyzing the significant changes in the shape and position of the absorbance bands of natural dyes, β-CD, physical mixture and inclusion complexes. For both dyeings with bilberry and red-onion extracts, the most significant aspect is the shifting of 530 cm^{-1} band to 890 cm^{-1}, due to the inclusion process. The FTIR spectra of anthocyanin dyes depict that both natural extracts show intense peaks at 3400 (hydroxyl group) and at 1710 cm^{-1} (carbonyl group)

X- rays diffraction

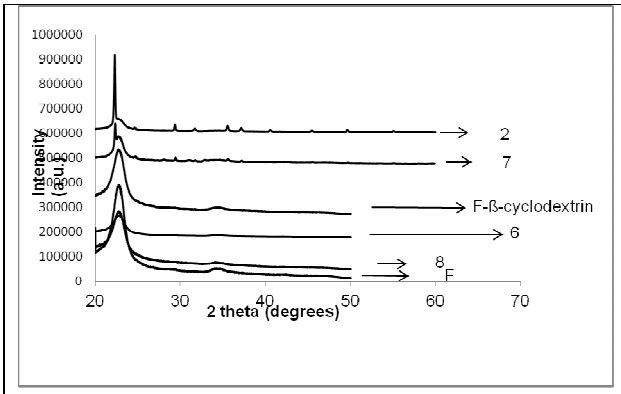

Figure 3: XRD patterns for flax fibers supports dyed with bilberry extract

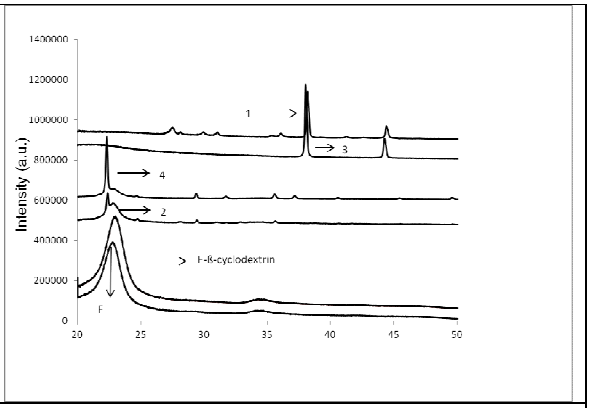

Figure 4: XRD patterns for flax fibers supports dyed with red-onion extract

The XRD patterns show relevant differences between dyeings with the natural extracts. Thus, in case of onion dye extract, relevant diffraction plans are noticed at 2θ = 39.7 and 45 degrees, meaning a very proeminent crystallization process, due to the inclusion complex formation. In case of dyeing with bilberry, these above mentioned peaks are hardly visible.

Fastness properties

The rating of washing and rubbing fastness of pretreated flax fabrics dyed with natural extracts is shown in Table 2. Generrally, it is well known that the poor wash fastness was a problem for natural dyes. From these results, it was concluded that pretreatment with β-cyclodextrin were one of the best solution to improve the colour fastness of fabrics.

Table 2: The fastness values of flax fabrics dyed with bilberry and red-onion extracts

Sample	Dry rubbing fastness		Wet rubbing fastness		Washing fastness	
	Bilberry extract	Red-onion extract	Bilberry extract	Red-onion extract	Bilberry extract	Red-onion extract
F	2	3	1-2	2	2-3	3
F /ß-cyclodextrin	3-4	3-4	2	2-3	4-5	3-4
F-ß-cyclodextrin-EXH 2% NANT	4-5	5	3-4	3	4-5	5
F-EXH 2% NANT	3-4	4-5	3	3-4	2-3	3-4
F-ß-cyclodextrin-EXH 1% NANT	4	3-4	3-4	3	4	4-5
F-EXH 1% NANT	3	3-4	3	3	2	3-4

The results clearly show that dyeings are at a certain extent more resistant in case of using onion extract as dyeing agent, especially at higher concentrations; another meaningful aspect is that

dyeing with onion extract is also more resistant if it is applied onto grafted specimens; it is the case of dyeing with bilberry natural extract, where dry rubbing resistance measurement recorded better results.

6. CONCLUSIONS

The current investigation discussed about various natural dye treatments with and without the presence of β-cyclodextrin grafting pretreatment. Following grafting with β-cyclodextrin, further treatment with natural extract, not only improve the crystallinity of flax fabrics, but olso enhanced the fastness properties of modified flax supports.

The possibility of using as inclusion complex the β-cyclodextrin in conjunction with natural dye and varying the composition of natural extract enables the dyer to achieve various shades in a dyeing process, by comparing bilberry and red-onion extracts.

This research work also aims at awarness of the detrimental environmental impact of synthetic dye production, together with a need of sustainable sources of dyes like natural products. In this context, our study demonstrates a convenient way to modify flax fabrics with β-cyclodextrin polymer, which is easily accesible for ecodyeing with bilberry and red-onion extracts.

This dyeing process provides effective utilization of natural resources as eco-friendly method and safety materials in current situation of global environmental concern.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

THE FLEXIBILITY-AUTOMATION CORRESPONDENCE TO A VIRTUAL COMMERCIAL SOCIETY

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Abstract: Design and operation of FMS is based on system requirement can be as productive and flexible as necessary, i.e. obtaining controlled correspondence between the degree of flexibility and automation of system.
The flexibility of a FMS (Flexible Manufacturing Systems) is determined by two important criteria: Flexible hardware structure of the system; Flexible software structure.
Flexible hardware structure of the CS system (calculation system) is determined to its turn according to three components: Flexibility of technological subsystem; Flexibility subsystem of storage, transport and handling; Flexibility of informational subsystem.
Key words: material goods, clothes, automation, High Tech.

1. INTRODUCTION

Man-machine chart activity.

Table 1: Execution of pockets with refill to the automatic machine

Company
Performer
Date
Operation

TWO HANDS GRAPH

LEFT HAND					**RIGHT HAND**					**Amelioration**
Description of movement	**Stages**				**Stages**				**Description of movement**	
	○	□	➡	▽	▽	➡	□	○		
Supplying workplace with landmarks			*			*			Supplying workplace with landmarks	
Disposal of landmarks package	*							*	Disposal of landmarks package	
Grab package with pockets	*				*				Waiting	
Open and verify									Open and verify	
Refill grabbing	*							*	Refill grabbing	
Fixing car refill	*							*	Fixing car refill	
Grab the pocket	*							*	Grab the pocket	

Fixing pocket at car	*							*	Fixing pocket at car	
Hold the material	*				*				Waiting	

Table 2: Execution of pockets with refill to simple sewing machine

LEFT HAND		RIGHT HAND		Amelioration
Description of movement	Stages symbol	Stages symbol	Description of movement	
Moving toward package			Waiting	
Grab the material			Waiting	
Transporting material on the table			Waiting	
Place the material			Place the material	
			Moving toward scissor	
			Grab the scissor	
			Carry the scissor toward the material	
Holding the material when cuts			Corrects refill with the scissor	
Rotate the material			Rotate the material	
Fixing refill			Corrects refill with the scissor	
Waiting			Carry scissor on the table	
Rotate the material			Grab the crook	
Waiting			Bring the crook toward material	
Fixing refill			Fixing refill	
Holding the material when cuts			Cuts corner pocket	
Rotate the material			Rotate the material	
Holding the			Cuts corner pocket	

material when cuts				
Check the pocket corners			Check the pocket corners	
Waiting			Carry crook on the table	
			Return toward left hand	
Turn corners to the outside			Turn corners to the outside	
Move the material toward sewing machine			Move the material toward sewing machine	
Place the material on the bed of machine			Place the material on the bed of machine	
Conducts the material			Acting machine	
Get material out			Get material out	
Rotate the pocket			Rotate the pocket	
Place the material			Place the material	
Strengthens the end of pocket			Strengthens the end of pocket	
Perform stitch on the product			Perform stitch on the product	
Move product toward the box			Move product toward the box	

Table 3: Execution of buttonholes

Company
Performer
Date
Operation

TWO HANDS GRAPH

LEFT HAND					**RIGHT HAND**					**Amelioration**
Description of movement	**Stages**				**Stages**				**Description of movement**	
	○	□	⇨	▽	▽	⇨	□	○		
Place the material to machine	*					*			Place the material to machine	
Acting the machine	*				*				Waiting	
Guides the material	*							*	Guides the material	
Returns the material	*							*	Cuts string with crook	

Returns the material	*							*	Returns the material	A basket for processed landmarks
Place the material	*							*	Place the material	
Acting the machine	*							*	Hold the material	
Put mark on the storage table	*				*				Waiting	

Table 4: Man-machine chart activity

MAN-MACHINE CHART FOR BANZIC Existing / improved situation					
MAN			**MACHINE**		
T(s)	Activity	Stage	Stage	Activity	T(s)
	Receives landmark			Stay	
640	Cut			Works	140
320	(Stay) Waiting for landmark			Works	40
640	Cut			Works	60

High productivity is achieved through the increasing the number of automated functions. The automation degree of FMS can be expressed by the number and type of automated functions in the system, the number expressing the level of flexible automation system. The first step in automation of flexible production is the use of MT (machine tools) with NC (numerical control), to which only the function of the actual processing is automated, the other remaining non-automated manufacturing functions.

By automating some new functions to obtain higher levels of automation of FMS (flexible manufacturing systems), as shown below.

2. REQUIREMENTS OF RI / M

Next will be presented several requirements that must be met by the RI / M machine tools serving to SC.

- Possibility of controlling at least six degrees of freedom, it is generally considered that three degrees of freedom (plus one / those for the grip) would be sufficient to place the task. Often, however, the kinematics it is more complex , particularly on the architecture of the underserved machine . Also, in many cases one gripping mechanism is not sufficient, requiring two of these devices by type and handle load variation.

- Possibility of rapid programming, refers to the possibility of introducing into the program of any point which the robot can reach on the desktop given of its mechanical structure. The program must be easy to achieve and stored for use when is needed.

- The possibility of intervention into the program, this intervention capability into the program is necessary in the case of breaks or changes "on line". Corrective actions are very common for flexible cells, especially if there is a checkpoint. The system is generally dependent upon received orders from this post.

- Compatibility with NC (numerical control) systems are constantly upgrading necessary so that the robot is capable of interfacing with them.

- Repeatability, accuracy in repeatability is directly proportional to the positioning accuracy achieved by the RI / M. It requires that the ordinary robots does not exceed 0.3 mm. Positioning accuracy is required, for example, to achieve centering the workpiece in the machine tool fixtures.

When handling parts with primary the processing (casting, the processing pr: deformation, etc..) themselves gripping devices may have a special construction to take any differences in their geometry.

- The speed, at least equivalent to the human operator. It is considered that if the robot is too slow tool machine shall not be used to optimum capacity, resulting in lost productivity. This may decrease the benefit of replacing the human operator with the robot.

- Possibility of pallets and de palletizing, in many applications is not beneficial for parts to arrive one by one in the power supply station itself. Possibility palletizing and depalletinzing of the pieces ensures the creation of buffer storage system so that food can remain in flux in terms of disruption upstream.

- Creation of program files, to adapt the processing flexible robot systems must be developed to manipulate landmarks families, in this case for each type of marker belonging to the family is required a separate program.

- The reliability, high reliability is required, as if a robot serving a group of machine tools fails, the effect is similar to the "domino" stopping all processing flow. It requires reliable answer minimum 400 hours mean time between failures. It also requires a "mean" lower the troubleshooting that may occur in operation.

- Adaptability and the ability to diagnose, refer to the robot's ability to respond to changes in the system also of human operator. For this the robot must be equipped with special sensors, operating specific to environment and the tasks they are to perform.

- The structural variety and mobility, these requirements are generally met by the RI / M modular architecture or when the change in mobility is achieved relatively easily. If we refer only to the case of supply / discharge machine tools can, for example, involve a manipulator with two branches equipped with gripping devices, one used to supply semi-finished parts, another for evacuation, instead of single-arm, which performed both functions. This provides a decrease in transfer time and also can create the robot can move over a path so that the volume increase workspace. An example of this is considered the robot mounted on rails that can serve more than one fixed machine, as well as cars arranged around it. Just as this movement to be made on a linear trajectory.

3. CONCLUSIONS

Today we assist to a wide variety of material goods. The received requests, industries realize most often produced in medium, small and unique series. So, now - more than other times, the question of production, of small and unique series in terms of high quality, efficiency and productivity, these objectives can be achieved by introducing new work systems, new technologies, based on automation, microelectronics and computer called High Tech - High Technology. Manufacturing systems have evolved much over time, depending on the specific conditions existing organization and tech at a time.

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ANNALS OF THE UNIVERSITY OF ORADEA
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THE DEMERITE METHOD APPLIED IN WOVEN MATERIALS CONTROL

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Abstract: The demerite method is to analyze the frequency of industrial products defects while providing statistical, analytical indicators and diagrams appropriate correct technology interpretation of the results for quality control. By these indicators, the beneficiary is warned about non-quality level and the provider is made aware of the defects dynamics and directed to take efficient measures of prevent, remedial and removal of generating causes of non-conformity with the highest.
Key words: demerite method, Pareto diagram, control sheet, woven materials defects

1. INTRODUCTION

The industrial method used to analyze the frequency of products defects is called the method of „demerite" (from the word in french Démérite = lack of merits). The method is recommended in following cases: complex and finished products; mass production; in final stage of manufacturing process; to production batches unfractionated.

The woven materials defects are classified and the main types are prescribed in SR ISO 8498/1996 (SR = Romanian Standard) [2]. For woven materials, defects in the longitudinal direction are determined primarily by the imperfections of warp system, and those on transversal direction by the weft system imperfections.

The method principle is a general defects classification according to their gravity, detected at control table, described in Table 1 and adoptating share system for to each type of defect [3].

The defects gravity can be assessed by the size of the losses caused it causes lack of quality, both in manufacturing process and during use of product. The classification of defects according to the gravity, depends largely on the the imposed beneficiary requirements. The evaluation of gravity should take into account the possible evolution of defect during the manufacturinf process or during use of product. Some defects are considered critical in a certain technological stage, can be attenuated or removed in subsequent stages. There are cases where some defects with reduced gravity may be increased during the technological process or behavior.

Smooth relations provider-beneficiary require also the defects differentation in order of their gravity, especially establishing the penalties their finding [5].

Table 1

Classification of defects	Symbol	Defect definition
Critically	c	Defect that contravenes serving product, so do not appear in woven material.
Main	p	The defect which may cause a deficiency or a reduction of product using possibility, causing some inconvenience to the beneficiary. Generally produce complaints.
Secondary	s	It reduce the possibilities of using too much product, is distinguishable by the beneficiary and remediable before delivery. It doue not generate complaints.
Minor	m	Not reduce the usability and no drawbacks. Beneficiary does not notify them.

The defects are classified to the possible effects in use. A product can have one or more defects of different kinds. By arbitrarily, it is adopted a particular system of share, indicated in table 2.

Table 2

Shares system	Shares scale			
	m	s	p	c
I	1	3	5	10
II	1	5	25	125
III	1	10	50	100
IV	1	10	100	1000

Compliance defects in shared gravity categories (penalized) as gravity allows synthetic expression, the resulting demerite [4]. In calculus of demerite are used the following symbols indicated in Table 3.

Table 3

Category	Number of defects	Shares
Critically	Nc	Pc
Principal	Np	Pp
Secondary	Ns	Ps
Minor	Nm	Pm
Sums	**N**	

The demerite is determined by relation (1)

$$D = \frac{Nc.Pc + Np.Pp + Ns.Ps + Nm.Pm}{N} \quad \textbf{(1)}$$

The method is applied continuosly, systematically, in the factory frame. The output N can vary from an interval to another.

2. EXPERIMENTAL PART

When a product fails to meet all or part of one or more of the functions, induce to the beneficiary a state of dissatisfaction. In this case through an analysis on product , can be input into evidence a series of defects and/or non-conformities which are considered non-quality characteristics. For each type of defect is established a number which represents the defect share / penalty coefficient.

The frequency analysis of industrial defects are used several share scales, the most used for woven materials, in increasing of defects gravity, is 1-10-5-100 scale (the first number refers to the minor defect and the last number, the critical defect) [4].

The database was obtained from control table of a S.C. IASITEX, Jassy, for 13 days and a single shift, registering all types of defects of 100% cotton raw woven materials.

At the control table is practical the detection, classification of defects simultaneously technological categories and their recording in the observation/control sheet which is the quality journal (see figure 1).

In Table 4 are indicated the categories and sharing defects at the reception/delivery of woven materials.

Quality Journal Completion

The quality journal must contains the following headings:

1. The worker name control/complete the product sheet at the reception;
2. Order number of sheet;
3. The checking period of product/month, week;
4. The product and the its code;
5. Detected defects in control, classified groups according to gravity;
6. The check day of product;

Table 4

Categories of defects	Penalty points	Classification of defects
1. Critic defects	100 points	A. Holes/ foreign body
		B. Nests
		C. Mixed weft/Foreign fibers
		D. Printing spots/folds nonprinted
		E. Tendrils in the middle of material
		F. Color ratio/Wrong pass
2. Principal defects	50 points	G. Thin zones/Thick zones
		H. Yarn flotations
		I. Stripes of different shades
		J. Nonwashble spots
		K.Corrugations on warp direction
3. Secondary defects	10 points	L. Displacements of print pattern
		M. Absence of yarns
		N. Defective selvage / Broken edges
		O. Thick yarns
		P. Oil spots
		R. Tendrils at edge
4. Minor defects	1 point	S. Lack of edges
		T. Uneven pilling
		U. Birdseye
		V. Marks from temple

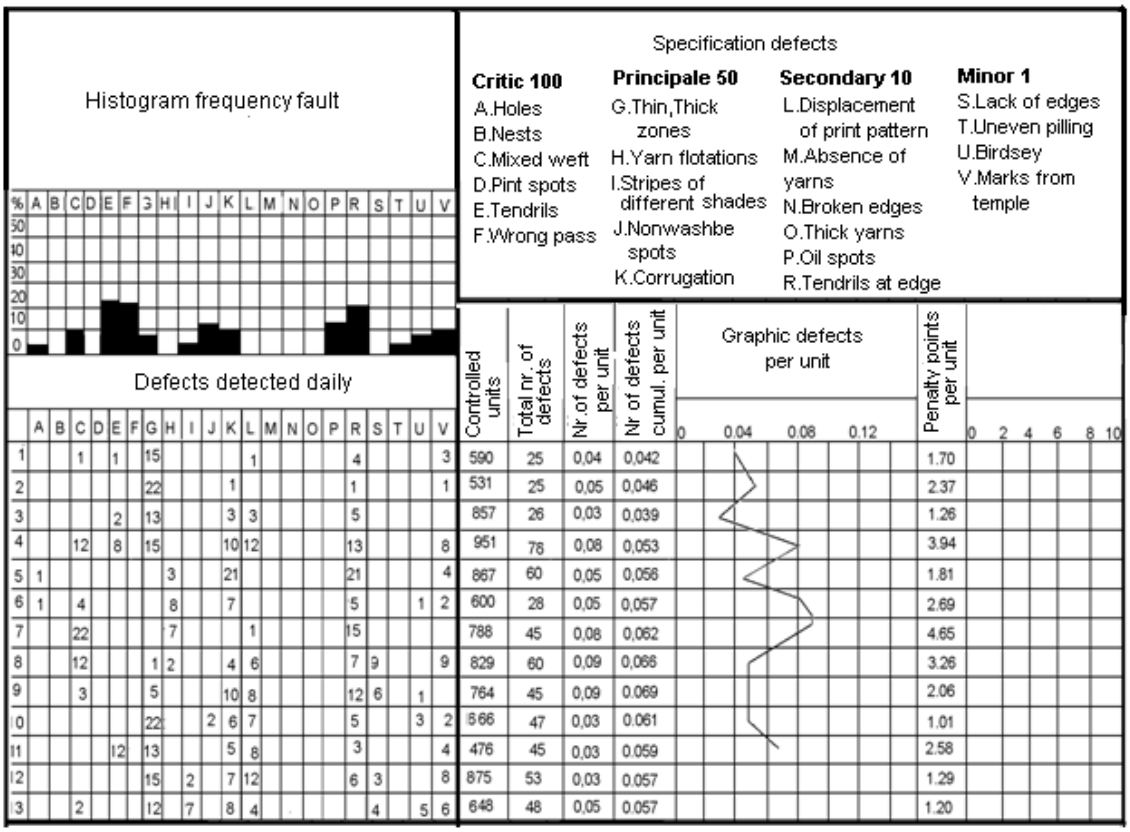

Figure 1. Control Sheet "Quality Journal"

7. Number of defects number found in controlled woven materials/ during one working day/ one, two or three shifts/ respected the code letter of each defect (the same as in heading 5);
8. The defects frequency histogram,completed daily by cumulation of arising defects is the first indicator quality constanly giving each type of defect image and also allows the staff orientation in

charge of what type of defect have directedatention to the causes it determined the measures proposed to reduce or eliminate.

The experimental data table contains the following information:

1. The daily controlled length/ reported in units of length or conventional length pieces, of 100 m/for instance: N = 590 m;
2. Total number of defects found in group N of woven materials, controlled in that day/ for instance: n=25;
3. Relative frequency of defects or defect number on unit from that day/ for instance: n/N= 25/290 = 0,042;
4. Relative frequency of defects or cumulative number of defects per unit at the beginning of recording period till x day / for instance: till the last day

$$\frac{n1+n2+n3+.....+nx}{N1+N2+N3+.....Nx}=0{,}046$$

5. The diagram of relative frequency of defects number as the second quality indicator- which show the defects number of woven material and its evolution from day to day, and the third indicator allows the drawing the conclusion on woven materil defects evolution over time;
6. The penalty points controlled conventional unit of 100 m/ **for instance**: for the first day, according to the detected defects number and their classification, it is obtained the D demerite/ synthetic indicator of defects:

$$D=\frac{1.100+1.100+15.50+1.10+4.10+3.1}{590}=1{,}7$$

7. The diagram of synthetic indicator of defects is the fourth quality indicator which indicates the defects number per unit and their gravity.
8. Actions taken to reduce defects.

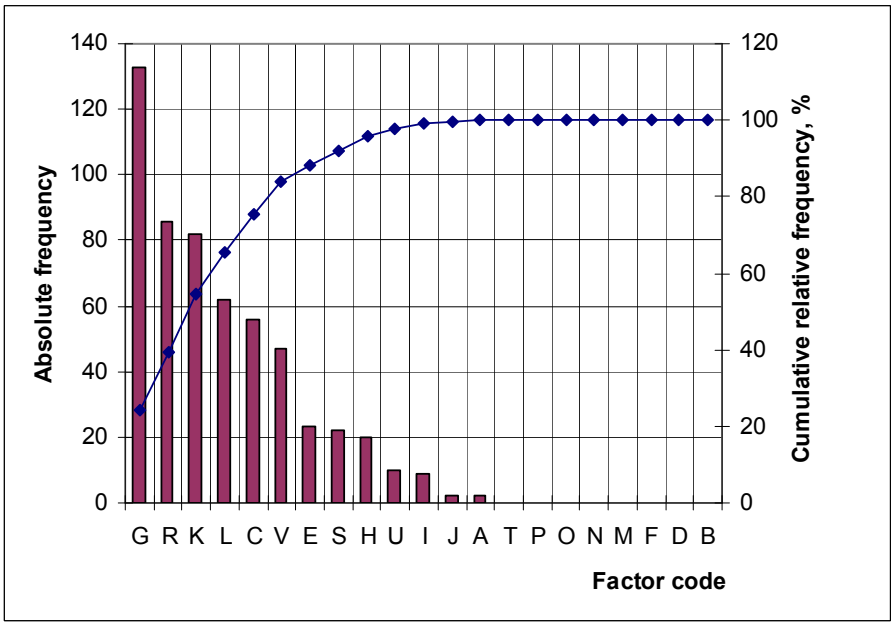

Figure 2. Pareto Diagram

The demerite method allows continuos monitoring of production quality. It starts with ordering defects in frequency of occurance (Pareto analysis) , see figure 2.

The Pareto diagram differentiates the defects in order of importance for control actions and improvement of quality as support for a preventive control development.

From the Pareto diagram shows that it is sufficient to solve the first 3-4 types of defects that the defects percentage to decrease over 70%..

The Pareto diagram is based on 80/20law – 80% from total variation (or quality problems) is duet o only 20%from total number of possible causes [1].

Ordering of defects frequency (Pareto analysis) leads to the establishemnt of technical measures succesion, knowing that the removing the first 2-3 types of defects can minimize the number of rejects [2].

3. CONCLUSIONS

1. The demerite method is the only known method of mass products quality comparing, manufactured in the company at different time.

2. The defects found in production control the manufacturer source of information is very useful for for setting targets to improve the production.

3. The continuous improvement of products quality and establishment of appropiate technical measures means to reduce of defects number.

5. By demerite method of dynamic analysis is performed the product quality, which allows the application of preventive actions to improve quality.

6. The principle of this method is to determine the standards of products according to their defects, not their qualities. This method is used a lot, because it has some advanges over direct and indirect comparative methods.

7. The demerite method is fast, easy to use, allows obtaining information on quality product developmentfrom the manufacturing and it can take some immediate steps to remedy the defects.

8. "The demerite journal" allows for three quality indicators: relative frequency of daily defects, demerite index, defects histogram.

9. In case of continuos series of product, the quality made for a certain time period (daily, weekly, monthly or annually) can be estimated using a global indicator, „the demerite index", in terms of „nonconformity" or defects found at final inspection.

10. The Pareto diagram shows the imbalance of the studied categories and offers a starting point for finding directions to improve or main factors determining non-quality.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

ALGORITHM FOR THE UNIDIMENSIONAL STATISTICAL PROCESSING OF THE MAIN ANTHROPOMETRIC PARAMETERS THAT CHARACTERISE THE OUTER BODY SHAPE FOR MEN

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Abstract: The present paper shows the results of unidimensional statistic analyses of anthropometrical basic parameters such as: height (body length) – I_c, bust perimeter – P_B and waist perimeter – P_T, obtained by taking measurments on young men between 20-29 years of age, and the determination of initial data necessary for bidimensional statistical distributions. It should be noted that for the studied age group, in order to completely assess the variation of the main anthropometric measurements for characterizing the human body, their distribution shape was checked by different mathematical statistical methods (graphical displays, applying the "chi-square" test, calculating the asymmetry coefficients and excess vaulting and excess error calculation), using the prepared database, for a representative sample of 150 subjects.
Key words: anthropometry, anthropometric characteristics, statistical processing

1. INTRODUCTION

The industrial design of clothing is being realised for products made in large series, that use as calculus base the dimensions from anthropometrical standards specific for type bodies. Thus, a certain dimensional typology is set up, determined by the exact knowledge of the morphological differentiation of the types within the population as well as of their frequency.

Studying the entire population is practically impossible, so usually the selection method is used for characterising the collectivity. This method consists in the anthropometrical survey of a determined number of subjects extracted from the general collectivity, chosen in a predetermined manner and studied in order to characterise the whole collectivity or population.

Taking into account the fact that the existing anthropometrical standards are already outdated, currently there exists a need to carry out a new anthropometrical survey of the population at the request and for satisfying the needs of the clothing industry.

The data obtained after anthropometrical measurements require a statistical unidimensional or bidimensional processing. This is necessary because for characterising the size and variability of anthropometrical indicators for the selection within the population, there are used the methods of mathematical statistics.

For analysing the shape of the distribution and for determining the statistical parameters that characterise each anthropometrical parameter, there is applied a unidimensional statistical processing. The anthropometrical data employed in the present research correspond to a sample of 150 subjects, representing men with ages comprised between 20 and 29 years.

2. GENERAL INFORMATION

This paper presents some applications of the unidimensional statistical repartition for the main anthropometrical parameters with longitudinal orientation (body height – I_c), with transversal orientation (bust perimeter – P_B) and conformation-specific (waist perimeter – P_T), for the above-mentioned sample.

The calculations and interpretations comprised in the paper are based on the notions listed below, notions that are widely applied in the processing of anthropometrical data:

- composition of the variation string, determining of the extreme values (x_{min}, x_{max});
- determining of the number of classes (k), and of the interval between two successive classes (c):

$$c = \frac{A}{k} = \frac{x_{max} - x_{min}}{1 + 3{,}322 \lg n} \quad \textbf{(1)}$$

- encountering frequency within the variation string (f_i):

$$f_i = \frac{n_i}{n} \times 100 \quad (\%) \quad \textbf{(2)}$$

- arithmetical selection mean ($\bar{x}$):

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \quad (cm) \quad \textbf{(3)}$$

- selection dispersion (s_x^2) and mean square selection deviation (s_x):

$$s_x^2 = \frac{1}{n} \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2 \quad ; \quad s_x = \sqrt{\frac{1}{n} \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2} \quad \textbf{(4)}$$

- variation coefficient (C_v):

$$C_v = \frac{s_x}{\bar{x}} \times 100 \quad (\%) \quad \textbf{(5)}$$

- significance test applied to the selection mean ($t_{\bar{x}}$):

$$t_{\bar{x}} = \frac{\bar{x}}{s_x} \quad \textbf{(6)}$$

- limit error of the selection mean ($\Delta\bar{x}$):

$$\Delta\bar{x} = t_{student} \times s_{\bar{x}} \quad \textbf{(7)}$$

- limits of the confidence range within which the collectivity's mean is located (x_{inf} ; x_{sup}):

$$\bar{x} - \Delta\bar{x} < \bar{x} < \bar{x} + \Delta\bar{x} \quad \textbf{(8)}$$

According to the speciality literature, it is known that, for the extreme values of a string, the absolute frequencies are smaller, decreasing in comparison with the frequency of the mean value. This phenomenon can be described using fundamental theoretical distributions in probabilities theory, by means of a resemblance to the theoretical Gauss-Laplace distribution, also known as normal distribution law.

2.1 Verifying the shape of the distribution of the main anthropometric sizes that characterise the outer body shape for men

A string of experimental values is verified if it respects such a distribution, through following methods:

- representation of the polygons of absolute frequencies of the values of the analysed parameters and comparison of the obtained graphs with the theoretical representations of the normal Gauss-Laplace distribution curve;
- application of the „chi-square" test (χ^2) and comparison of the calculated value with the value presented in the speciality literature, for the same confidence level (1-α);
- determining the values of the assymetry coefficients (β_1), vaulting coefficients (β_2) and excess coefficients (E) and of the distribution error (E_d) and comparison of the obtained data with those characteristic for the Gauss-Laplace distribution.

2.1.1. Verifying the shape of the distribution by means of graphical representations

For the presented anthropometrical sizes, following algorithm was chosen:

1. grouping of the data on classes and presenting these in tables:

Table 1 – Variation strings for $\hat{I}_c$

Classes	x_j	m	f_m (n_i)	f_{mc}	$f_r = \frac{f_m}{n}$	f_{rc}	mf_m	m^2f_m
165,0-168,9	167,0	-3	7	7	0,05	0,05	-21	63
169,0-172,9	171,0	-2	13	20	0,09	0,14	-26	52
173,0-176,9	175,0	-1	36	56	0,24	0,38	-36	36
177,0-180,9	179,0	0	40	96	0,27	0,65	0	0
181,0-184,9	183,0	1	34	130	0,23	0,88	34	34
185,0-188,9	187,0	2	14	144	0,09	0,97	28	56
189,0-192,9	191,0	3	4	148	0,02	0,99	9	27
193,0-196,9	195,0	4	2	150	0,01	1,00	8	32
c=4	$\bar{x}_a$ =179		150				-83/+79 =-4	300

Table 2 – Variation strings for P_B

Classes	x_j	m	f_m (n_i)	f_{mc}	$f_r = \frac{f_m}{n}$	f_{rc}	mf_m	m^2f_m
80,0-83,9	82,0	-4	2	2	0,01	0,01	-8	32
84,0-87,9	86,0	-3	5	7	0,03	0,04	-15	45
88,0-91,9	90,0	-2	20	27	0,14	0,18	-40	80
92,0-95,9	94,0	-1	30	57	0,20	0,38	-30	30
96,0-99,9	98,0	0	40	97	0,27	0,65	0	0
100,0-103,9	102,0	1	32	129	0,21	0,86	32	32
104,0-107,9	106,0	2	18	147	0,12	0,98	36	72
108,0-111,9	110,0	3	3	150	0,02	1,00	9	27
c=4	$\bar{x}_a$ = 98		150				-93/+77 =-16	318

Table 3 – Variation strings for P_T

Classes	x_j	m	f_m (n_i)	f_{mc}	$f_r = \frac{f_m}{n}$	f_{rc}	mf_m	m^2f_m
77,6-80,5	79,0	-3	3	3	0,02	0,02	-9	27
80,6-83,5	82,0	-2	18	18	0,10	0,12	-30	60
83,6-86,5	85,0	-1	33	46	0,19	0,31	-28	28
86,6-89,5	88,0	0	44	90	0,29	0,60	0	0
89,6-92,5	91,0	1	30	123	0,22	0,82	33	33
92,6-95,5	94,0	2	13	139	0,11	0,93	32	64
95,6-98,5	97,0	3	7	146	0,05	0,98	21	63
98,6-101,5	100,0	4	2	150	0,02	1,00	16	64
c=3	$\bar{x}_a$ = 88		150				-67/+102 =+35	339

2. graphical display of the variational strings grouped by classes, by obtaining the histograms and polygons of the absolute and relative frequencies and of the cumulated absolute and relative frequencies, respectively (fig.1÷3), for the main anthropometrical parameters presented in tables (1÷3):

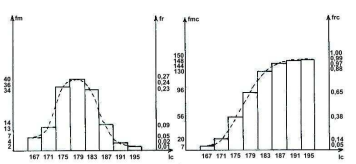

Figure 1: Histogram and polygon for $\hat{I}_c$

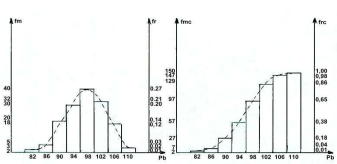

Figure 2: Histogram and polygon for P_B

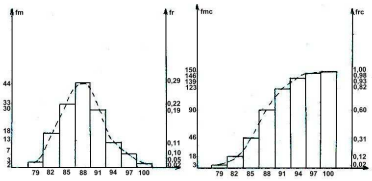

Figure 3: Histogram and polygon for P_T

3. verifying the normality of the distribution of these values according to the law given by the analytical Gauss-Laplace relationship:

$$f(x_i) = \frac{1}{s\sqrt{2\pi}} \times e^{-\frac{1}{2}\bullet\frac{(x_i-\bar{x})^2}{s^2}} \quad \textbf{(9)}$$

In order to display the function given by relationship (9), there are made the necessary calculations for representing the normal distribution curve specific for the three main parameters tested, the results of these calculations being summarised in tables 4÷6.

The theoretical number of subjects is calculated according to the following relationship:

$$n_t = f(x_j)\frac{n_r c}{s} \quad \textbf{(10)}$$

Table 4 – Calculation of the normal distribution curve for $\hat{I}_c$

Classes	Class mean x_j (cm)	Real number of subjects n_r	$x_j - \bar{x}$	Normed deviation $t=\frac{x_j-\bar{x}}{s}$	Ordinates of the normal curve $f(x_j)$	Theoretical number of subjects n_t
165,0-168,9	167,0	7	-12	-2,15	0,0392	4
169,0-172,9	171,0	13	-8	-1,44	0,1422	16
173,0-176,9	175,0	36	-4	-0,72	0,3083	33
177,0-180,9	179,0	40	0	0	0,3989	43
181,0-184,9	183,0	34	4	0,72	0,3083	33
185,0-188,9	187,0	14	8	1,44	0,1422	16
189,0-192,9	191,0	4	12	2,15	0,0392	4
193,0-196,0	195,0	2	16	2,87	0,0064	1
	-	n_r=150	-	-	-	n_t=150

Table 5 – Calculation of the normal distribution curve for P_B

Classes	Class mean x_j (cm)	Real number of subjects n_r	$x_j - \bar{x}$	Normed deviation $t=\frac{x_j-\bar{x}}{s}$	Ordinates of the normal curve $f(x_j)$	Theoretical number of subjects n_t
80,0-83,9	82,0	2	-16	-2,85	0,0069	1
84,0-87,9	86,0	5	-12	-2,14	0,0408	4
88,0-91,9	90,0	20	-8	-1,42	0,1448	16
92,0-95,9	94,0	30	-4	-0,71	0,3097	33
96,0-99,9	98,0	40	0	0	0,3989	43
100,0-103,9	102,0	32	4	0,71	0,3097	33
104,0-107,9	106,0	18	8	1,42	0,1448	16
108,0-111,9	110,0	3	12	2,14	0,0408	4
-	-	n_r=150	-	-	-	n_t=150

Table 6 – Calculation of the normal distribution curve for P_T

Classes	Class mean x_j (cm)	Real number of subjects n_r	$x_j - \bar{x}$	Normed deviation $t=\frac{x_j-\bar{x}}{s}$	Ordinates of the normal curve $f(x_j)$	Theoretical number of subjects n_t
77,5-80,4	79,0	3	-9	-2,1327	0,0410	4
80,5-83,4	82,0	15	-6	-1,4218	0,1452	16
83,5-86,4	85,0	28	-3	-0,7109	0,3098	33
86,5-89,4	88,0	44	0	0	0,3989	43
89,5-92,4	91,0	33	3	0,7109	0,3098	33
92,5-95,4	94,0	16	6	1,4218	0,1452	16
95,5-98,4	97,0	7	9	2,1327	0,0410	4
98,5-101,4	100,0	4	12	2,8436	0,0070	1
-	-	n_r=150	-	-	-	n_t=150

Based on the obtained data, there are plotted the normal distribution curves for the three main anthropometrical parameters (fig. 4÷6), presented as a curve with symmetrical branches, fact that can be analysed also according to the results indicated in the above-presented tables (table 4÷6):

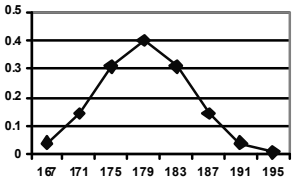

Figure 4 – Normal distribution curve for $\hat{I}_c$

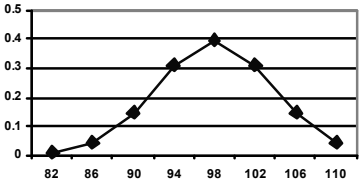

Figure 5 – Normal distribution curve for P_B

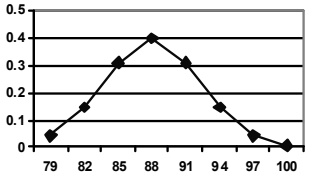

Figure 6 – Normal distribution curve for P_T

4. comparing the shape of the empirical distribution with theoretical distributions that were scientifically fundamented in the theory of probabilities.

2.1.2. Verifying the shape of the distribution by means of the „chi-square" (χ^2) test

The normality of the distribution curves of the values of the analysed parameters can be verified also by determining the value χ^2 using the relationship (11), values that will then be compared, for the same confidence level (1-α), with the value presented in the speciality literature.

$$\chi^2 = \sum_{i=1}^{k} \frac{(n_i - n \times p_i)^2}{n \times p_i} \quad \textbf{(11)}$$

The obtained results are summarised in table 7:

Table 7 Values for χ^2

"χ^2" value / Anthrop. parameter	$\chi^2_{calculated}$	χ^2_{table}
$\hat{I}_c$	3,0904	11,1
P_b	8,1448	
P_t	23,6369	

2.1.3. Verifying the shape of the distribution by calculating the asymmetry, vaulting and excess coefficients and of the distribution error

The values of the asymmetry (β_1), vaulting (β_2) and excess (E) coefficients can be determined using the relationships presented below, after which they are compared with the data characteristic for the Gauss-Laplace distribution. The distribution is normal if $\beta_1 = 0$, $\beta_2 < 3$ and $E = 0$.

$$\beta_1 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^3}{n \times s_x^3} \quad \textbf{(12)}$$

$$\beta_2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^4}{n \times s_x^4} \quad \textbf{(13)}$$

$$E = \beta_2 - 3 \quad \textbf{(14)}$$

The size of the distribution error (E_d) that characterises the deviation of the empirical distribution curve from the normal distribution curve can be obtained with the relationship (15), being noteworthy that, if $E_d < 5\%$, the deviation of the empirical distribution of the studied parameter from the normal distribution is not significant.

$$E_d = (|0{,}125\ \beta_1| + |0{,}058\ \beta_2|) \times 100\ (\%) \quad \textbf{(15)}$$

The obtained results are summarised in table 8:

Table 8

Statistical parameter	Anthropometrical parameters		
	$\hat{I}_c$	P_B	P_T
β_1	0,1471	-0,2094	0,3770
β_2	3,0867	2,5731	3,1591
E	0,0867	-0,4269	0,1591
E_d	2,3416	5,0935	5,6353

6. CONCLUSIONS

From the analysis of the results obtained from the unfolded researches, following conclusions can be drawn:

- the distributions called empirical or experimental, presented in fig.1÷3 have a great resemblance to the theoretical Gauss-Laplace distribution, the law of normal distribution;
- from the analysis of the shape of the distributions of the main parameters considered, presented as tables 4÷6 and figures 4÷6, there can be noticed a resemblance with the shape of the Gauss-Laplace distribution;
- the observing, by the anthropometrical parameters, of the Gauss-Laplace theoretical distribution law, allows the realising of some stages from the technological process for designing and manufacturing clothing products: defining the size and waist groups, defining the types of statures and the conformation groups, the percentual distribution of the number of products by sizes, waist sizes and conformation groups;
- when comparing $\chi^2_{calculated}$ with χ^2_{table} it can be noticed that for the first two parameters $\chi^2_{calculated} < \chi^2_{table}$, so it can be considered that the data distribution is normal, while for the last parameter the distribution is not a normal distribution, because $\chi^2_{calculated} > \chi^2_{table}$;
- it can be noticed that in the case of the bust and waist perimeters E_d>5%, which means that fthe empirical distribution deviates from the theoretical one, although not by much over the admitted limit, the explanation being that these dimensions are the main dimensional indicators for characterising the body conformation for men, with a high variability among the population;
- according to the values obtained for the asymmetry, vaulting and excess coefficients summarised in table 8, it can be said that for $\hat{I}_c$ and P_T, the curve's asymmetry is positive, while the curve's shape is more vaulted compared to the normal distribution, the particular values being more grouped around the mean value while for P_B the curve's asymmetry is negative, the curve being more flattened and the particular values being in this case farther away from the mean values;
- under these conditions, based on the data obtained following the various verifications carried out, it can be said that the analysed dimensions follow a normal distribution law.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

NEW METHOD FOR APPLYING MICROCAPSULES IN THE SPINNING PROCESS

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Abstract: A new method has ben developed for applying the microcapsules in the spinning process, in all those yarns made in ring spinning machines, wether short fibre or long fibre. The microcapsules were placed in the interstices of the yarn, before being communicated twist. This allows solving the problem of permanence of the effect provided by the active ingredients contained in the microcapsule, for functionality and use of textile garments, against repeated washing.
The method is technical and industrial feasible. This has been demonstrated by the interest shown by an important manufacturer of textile machinery for spinning. The proposed method is valid for all types of fibres that are processed by the systems of carded cotton, worsted, semi-worsted and woollen, when obtained in ring spinning machines. The new method of application is suitable for all types of microcapsules, wich are currently developed for use on textiles.
Key words: Ring spinning, microcapsules, washing.

1. INTRODUCTION

In a previous work, we have consulted a very high number of documents published in the scientific and patents databases, about the state of the art for the application of the microcapsules in textiles.[1,2,3,4,5]. It shows a variety of application methods, being the most used the padding and the application by exhaustion, with different endurance results of the effect of textile product in front of the use; but there is no documented method about the application of the microcapsules in the spinning process.

The general outline of a spinning process is a group of operations for opening, cleaning and mixing, followed by a separation of the fibres and formation a sliver with the fibres parallel to its axis. Subsequently its regulates the mass of the card sliver obtained by successive doublings and drafts in the draw frames or gills, depending it is short fibre or long fibre.

In this sequence of operations described is not possible to apply the microcapsules; occurs an uncontrolled movement of fibres due to an important variation in the coefficient of friction and the adherence fibre-fibre and fibre-metal. This does not permit the normal spinning operations.

2. EXPERIMENTAL

2.1 Preliminary trials

In our point of view, the first machine that is suitable to apply the microcapsules is the roving frame, which are obtained the thin roving, that becomes the yarn during the drawing. At this level of processing of the fibres, could give a positive result the inclusion of the microcapsules in the internal structure of the roving.

The first tests were carried out in a Electro-Jet Rovematic ADR roving frame, located in the spinning workshop at the Technological Innovation Centre CTF, in the Technical University of Catalonia. To house the roving, was prepared a plastic holder to allow the passage of the bath with the microcapsules. They wanted to imitate the movement of the liquor, common in operations of yarn dyeing, with corresponding reversals in the flow direction of the liquor get a good color matching in

all layers of the roving folded. The roving bobbins has been treated in a machine designed for the dyeing of special yarns. These equipments can works under pressure, until temperatures of 140ºC.

We used an aromatic microcapsule type Center Finish 164/02, with lavender scent, from the Spanish company Color Center. The resin used, BC type, also from Color Center, is an aqueous solution of an acrylic polymer, with anionic character.

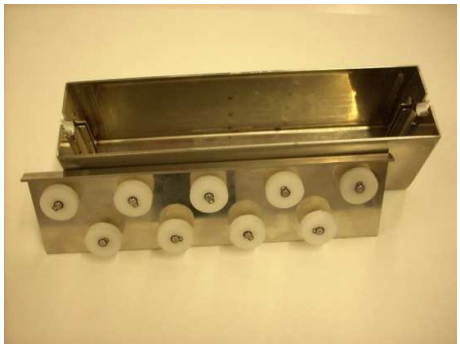

Figure 1: Device for the application of microcapsules on a core yarn

The pH of the solution varies between 7 and 8, with a density near to 1 g/cm^3. The bath application consisted of a 10% microcapsules and 3% of resin. The duration of treatment has been to 30 minutes at 70ºC, followed by a radiofrequency drying.

The appearance of the roving treated with the microcapsules shows a structural disorder, which will cause problems in the spinning machine. Another problem that hamper the application of the microcapsules in the roving is the high bath ratio required for dosing in the dyeing equipments, currently available in the industry. This represents an excessive consumption of microcapsules and a cost that does not make the method feasible from an industrial perspective.

The spinning tests carried out in a ring spinning machine, don't have industrial interest because the amount of breaks by 1000 spindles/hour and, consequently, the waste rate obtained increases from 0,3%, in normal conditions, up to 12%. For its negative industrial processability and for the bad quality of the yarns obtained, this method of application has disallowed.

2.2 Trials in the ring spinning machine

Excluding the option of applying the microcapsules in the roving, we have investigated the possibilities presented by the ring spinning machine. Different specific devices have been developed, for to dispense, regularly, the microcapsules in the preliminary draft, in the main draft, on the outlet cot of the drawing system and in the spinning triangle.

In all cases the results were negative, by the high rate of waste and for the chemical degradation of the parts of the drawing system, and consequently, about the lower quality of the yarn.

The option, which as proved to be the definitive, is to distribute the microcapsules upon a very thin yarn of the same composition of the yarn to manufacture and which is your nucleus. Then coated with fibres of the same typology, resulting a core spun yarn.

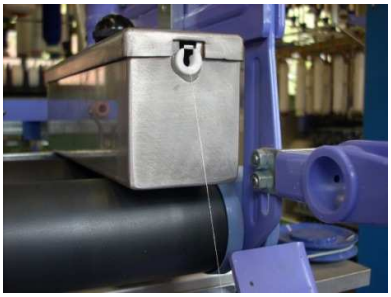

Figure 2: Application of microcapsules in the spinning machine

The designed device, for impregnating the core yarn, consists of a stainless steel cuvette, tightly coupled to the space available for each spindle of the ring spinning machine. We experimented, in our work, with a single spindle but have been careful all the technological requirements of an industrial level. Technical disadvantages do not appear to place the device in long ring spinning machines, which have up to 1600 spindles. Figure 1 shows the detail of the device projected and manufactured.

At the entry and outlet of the cuvette is placed a micro-ceramics thread guide to minimize friction with the yarn and the microcapsules, wich might be come off to generate a high friction. The guide bearings, in Teflon, are very low inertia for reduce the treated yarn friction and to prevent the loss of microcapsules. The mechanism can be easily disassembled for maintenance. It is also planned to give this mechanism a pneumatic device to facilitate the automatic threading of yarns and a heating system with thermostatic regulation.

The core yarn is fed into the impregnation cuvette, placed at the front of the ring spinning machine, over the drawing system. Each yarn must be perfectly aligned with the drafting mechanism. Figure 2 shows the passage of the impregnated yarn with the microcapsules by the mechanisms of the ring spinning machine, to made coated yarns.

In the experimental phase, we worked with a ring spinning machine Pinter 1803 Merlin Spa, located in the spinning workshop at the Technological Innovation Centre CTF, in the Technical University of Catalonia.

3. RESULTS

The Figure 3 shows a photomicrography, obtained by Scanning Electron Microscopy (SEM) at 1660 magnification, corresponding to the yarns made from the highest possible production rate in the spinning machine, according to the twist imparted at the yarn and the maximum number of revolutions at which the spindle can be rotated at industrial production situation.

In the next step of our research we evaluated the influence of the fixing resin in the retention of microcapsules on the yarn, after several consecutive washes.

With impregnated yarns, at different test conditions, we have produced knitted fabrics with a circular knitting machine laboratory, for monitoring and evaluation of retention of microcapsules over the fibres after the successive washings.

Figure 3: Fibres from the yarns made from the highest possible production rate

The amount of particles in the washing baths has been evaluated by counting with a specific equipment. During the washing cycles is produced, also, a separation of other types of particles, such as remains of fibres and small particles of trash.

We have performed a blank test, as a reference, without microcapsules, without resin and not curing. Subsequent trials have been programmed to variable curing temperatures between 60ºC to 120ºC.

The resin concentrations studied have been the 1,2, and 3% according to the data supplied by the manufacturer of the microcapsules and the resin.

From detailed study of the experimental results obtained in the different boundary conditions and analysis of trends clearly marked, we conclude that, from a viewpoint of industrial application of the microcapsules, the best conditions for resin curing are 100ºC with a percentage of 2% resin.
It's no suitable to work at high temperatures because the active substance contained in the microcapsules can be altered, affecting your stability.

The microscopic observations show that the number of washes increased the bursting of microcapsules because, in our opinion, by the mechanical effect of the washing machine. In all cases studied, is after the first wash when a greater number of particles are separated.

Table 1: Multi-factor experimental design

	-1,414	-1	0	1	1,414
V_1	8,6	9	10	11	11,4
V_2	13	15	20	25	27
V_1 : % Microcapsules			V_2 : Application temperature		

Is found that after 15 washes remains preferably, in the fabric, the smaller microcapsules; but in sufficient quantity to give at the yarn the aromatic effects. It should be noted that currently, when applying fixative resins, do not overcome the 5 washes, in most cases.

For finer adjustment of the conditions for application of the microcapsules and resin, we have planned a Box-Hunter multi-factor experimental design for two variables and five levels of inspection, according to as shown in Table 1. We seek the optimum conditions, taking into consideration that the first variable is the concentration of the microcapsules and the second variable is the temperature of application. We obtain the next equation of response:

$$Y= 2355,2+23,175\cdot V_1+1,625\cdot V_2-7,1625\cdot (V_1)^2-24,6625\cdot (V_2)^2-7,5\cdot (V_1V_2) \quad \textbf{(1)}$$

Your three dimensional graphic representation and contour lines are plotted in Figures 4 and 5. The analysis of variance and regression shows that there is no interaction between the two variables and

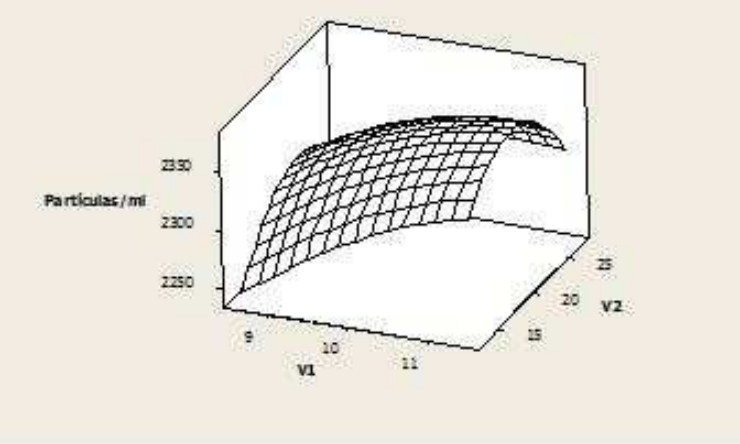

Figure 4: Tridimensional graphic representation. (Response surface)

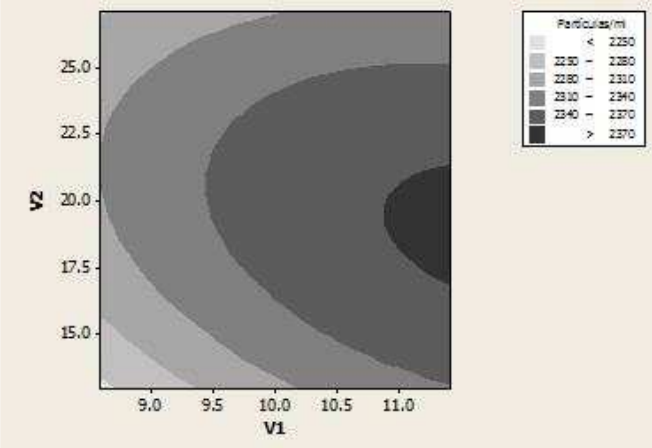

Figure 5: Contour lines

the concentration of the microcapsules is the most significant variable. Solving the mathematical model, we obtain an optimal conditions for microcapsules concentration of 11,7% and the application temperature of 19ºC.

4. CONCLUSIONS

- A new method as proposed for applying microcapsules, in the textiles, during the spinning process, in the interstices of the yarn fibres, linked by the effect of the twist.
- The method is technical and industrial feasible; this has been demonstrated by the interest shown by an important manufacturer of textile machinery for spinning.
- The proposed method is valid for all types of fibres that are processed by the systems of carded cotton, worsted, semi-worsted and woollen, when obtained in ring spinning machines.
- The new method of application is suitable for all types of microcapsules, which are currently developed for use in textiles.

5. ACKNOWLEDGEMENTS

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- Our gratitude to all companies that have collaborated in developing the necessary devices to carry out the research.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDIES REGARDING THE COMFORT ENSURED BY THE SEA SURVIVAL SUITS

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ABSTRACT: This paper presents studies regarding the comfort ensured by the swimming or sea rescue suits and the offshore or marine transportes working suits. The overall comfort index is determined based on the analisys of: air flow resistance values, vapour passage resistance and thermal resistance for these clothing ensembles used in different environmental conditions. Taking into consideration: the values of this index, the limits of the comfort parameters and on the basis of the graphics made, there can be chosen the best solution for both types of products to survive at sea, and also it could be indicated from the beginning the materials these products will be made of.

Key words: protective clothing, clothing ensembles, clothing comfort, textile materials, environmental factors.

1. INTRODUCTION

For safely carrying out sailers' work, different clothing products are used, such as swimming or sea rescue suits and offshore or marine transportes working suits. These are worn over the normal clothing which is used in function of the season, with or without shoes.

The analyzed swimming or sea rescue costumes are made of multilayer fabric, with rubberized exterior, and relon knitted interior, wool for clothing, polyurethane foam and metallized polyester. These materials provide excellent fatigue properties and the ability to withstand compression and decompression [3]. The survival in case of a prolonged immersion in water, however, is based on other factors (time spent in water, the sea water temperature, amount of body fat and individual behavior), which influence directly the cooling rate and chance of survival [4]. When the skin and blood are cooled, metabolic and physiological processes slow down, breathing and heart rate are very slow, blood pressure is low, resulting in loss of consciousness and hypothermia [5].

The offshore platforms or marine transporters working suits are also multi-layered, being made at the exterior from coated fabric and at the interior from cotton fabric, polyester or knitted relon (one or two layers), polyurethane foam, and metallized polyester. These products are worn over the clothing worn by season.

To enable designers to evaluate the protective function of clothing, it is necessary to develop evaluation techniques to minimize loss of mobility when it is worn in unfavorable conditions [1].

2. WAY OF WORKING

There were analyzed 14 types of swimming or sea rescue suits and 74 types of offshore platforms or marine transporters working suits [2]. The implications of adopting textile materials with different characteristics for ensuring the thermophysiological comfort were studied using mathematical modeling elements. Table 1 shows the limits of variation of climatic factors influencing the the thermophysiological comfort, in function of the season.

Table 1: The values adopted for the climatic factors

	Parameter	Symbol	Unit	Value			
				Summer	Autumn	Spring	Winter
1	Specific density of air	γ	Kg/m^3	1,15	1,218	1,24	1,475
2	Relative humidity of air	φ	%	80	90	60	90
3	Air temperature	t	°C	30	15	12	-25
4	Wind speed	v	m/s	5	8	15	40

There were made changes in the structure of the clothing products, to determine the influence on the thermophysiological comfort parameters. There were established: the thermal resistance values, the resistance to air flow, the resistance to vapour passage, under standard atmospheric conditions as well as imposed environmental conditions (table 1).

The values of the three determined characteristics were included in an index, which is conventionally called "global index of comfort". By determining the global index of comfort, on the basis of laboratory tests done on textile materials, are being replaced the clothing products for wearing. The method has the advantage that the samples of clothing products to be tested in unfavourable conditions is lengthy, costly and with risks for the subjects who wear them.

The global index of comfort was determined starting from the variants of the characteristics summarized in the three comfort parameters. The "benchmark" clothing products were established based on the following considerations:

- In laboratory and imposed environmental conditions, as the "benchmark" were considered the products and clothing structures presenting the highest values for the three characteristics, granting them a maximum score of 100.
- In imposed environmental conditions the score was multiplied with the value of the characteristic at the higher value of the new variant.
- The scores of the studied variants were summed.

The limits of the comfort parameters, which can be the basis of the complete design norms, are highlighted. By inserting in the products' structure other materials with different functional characteristics, we can test the compliance with the established limits for the global index of comfort.

Because the tests were made for a large number of variants of swimming or sea rescue costumes, in table 2 are given the values of the comfort parameters and of the global index of comfort for environmental conditions, when used in the worst season (winter).

Table 2: The values of the comfort parameters and of the global index of comfort

Composition of clothing structure		Comfort parameters and score						P_{total}
Variety	Clothing layer	R_{sum}		R_v		R_p		
		$m^2h°C/Kcal$	P	mmhm2/g	P	m^2h mm/Kg	P	
1	2	3	4	5	6	7	8	9
Swimming and sea rescue costumes								
Undershirt	Knitted cotton	0.48	100	1.902	97.84	13.71	21.04	218.8
Shirt	Woven cotton/polyester							
Sweater	Knitted polyacrylonitrile							
Winter jacket	Jacket doubling							
	Lining							
	Jacket fabric							
Training suit	Lining							
	Costume fabric							
Costume lining	Knitted cotton							
	Wadding 2.15							
	Metallized polyester (g=0.04 mm)							
Suit	Rubberized fabric							

	0.31							
Watertight costumes for the work on offshore platforms or marine transporters								
Undershirt	Knitted cotton	0.825	99.5	1.652	97.28	6.1	95.36	292.1
Shirt	Woven cotton/polyester							
Sweater	Knitted polyacrylonitrile							
Winter jacket	Jacket doubling							
	Lining							
	Jacket fabric							
Training suit	Lining							
	Costume fabric							
Costume lining	Knitted cotton							
	Metallized polyester 0.04							
	Knitted relon							
Suit	Coated fabric 0.04							

Observation: The layers of clothing presenting variable characteristics are accompanied by numbers which represent their thickness in mm.

On the basis of the obtained values, graphics are presented in figures 1 and 2, according to the data in table 2; the graphics show the interdependence between the scores of the comfort characteristics.

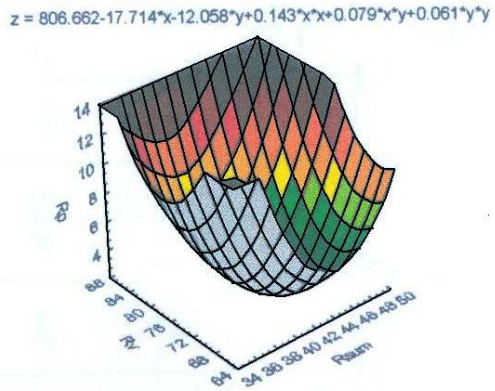

Figure 1. The interdependence between the scores of the comfort characteristics at swimming or sea rescue suits, used in winter conditions

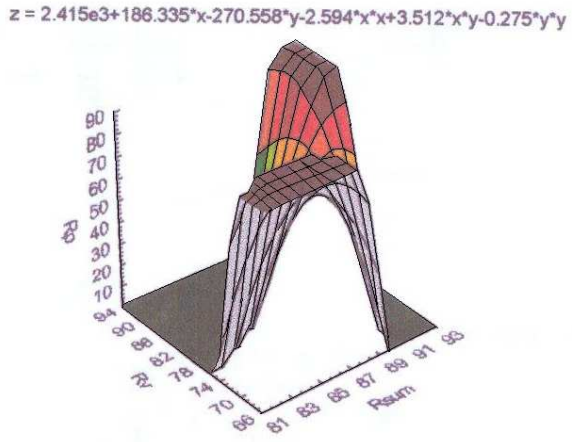

Figure 2. The interdependence between the scores of the comfort characteristics at watertight working suits for offshore platforms or marine transporters, used in winter conditions

3. CONCLUSIONS

In the case of swimming or sea rescue suits the scores for the three parameters increase with the increase in thickness for the layers of metallized polyester, wadding or clothing cotton and polyurethane foam or PVC. In imposed environmental conditions the scores for the three comfort parameters have the same trend for all climate conditions, the decrease from environmental conditions being greater than in laboratory conditions. The largest decrease, of approx. 46%, ocurs in the resistance to air permeability parameter.

In the case of watertight working suits for offshore platforms or marine transporters, the score for the three parameters increases if layers of metallized polyester, coated fabric or a thicker insulation layer is used. In imposed environmental conditions the scores for these parameters are lower than in laboratory conditions, the largest decrease being in the resistance to air permeability, approx. 50%.

Regardless of the type of sea survival suit, proportionally with the increase of the global index comfort, the scores for the resistance to the air flow and resistance to the vapour flow are also increasing.

Taking into account the values of the global index of comfort, the limits of the comfort parameters, as well as from the resulted graphics, we can choose the best solution for these protection suits and specify from the beginning out of what materials to be made and especially what characteristics these materials should have.

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ANNALS OF THE UNIVERSITY OF ORADEA
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METHOD AND ALGORITHM FOR MASS CALCULUS OF THE FINISHED FABRIC WITH CHECK PATTERN FROM WEAVE. YARN SETT METHOD

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Abstract The check pattern fabrics produced through the association of groups of yarns with different weaves, setting and/or lengthwise density have equal dimensions of the weave repeat along the two directions, longitudinal and cross making checks. The analysis of the existing correlations between the components of the fabric internal structure, and of the possibilities offered by the mathematical modeling applied to the description of the fabric structure, led to the conclusion that the only method through which one can obtain a check pattern fabric through the association of groups of yarns with weaves with significantly different mean float is that of sizing the composing elements such that to provide an equal degree of compactness on all the fabric, no matter the zone and character of the associating weave. The algorithm for mass calculus of the fabrics with check pattern from weave by means of the yarn setting method is described within a flow chart which also serves as basis of a logical diagram for the development of a computer assisted design software
Key words: lengthwise density, yarn setting, fabric mass, compactness degree, weave .

1. INTRODUCTION

The check pattern fabrics produced through the association of groups of yarns with different weaves, sets and/or lengthwise density have the dimensions of the weave repeat equal in the two directions, longitudinal and cross, making up a check pattern.
In order to obtain longitudinal and cross stripes with marked contrast, the associating weaves must assure a different degree of appearance of one of the yarn systems on the fabric face. This is obtained through a different mean float. In most of the cases, one of weaves is of hessian type, with mean float F= 1 [1], [2].

Due to the association of weaves with significantly different mean float, this will implicitly result in a non-uniform character of the fabric internal structure, negatively influencing the positional stability of yarns into the fabric. It is necessary to find a method to produce the internal structure uniformity, such that the positional yarn stability becomes identical within all the stripes, irrespective of weave or mean float.

The analysis of the correlations between the components of the fabric internal structure, and the possibilities offered by the mathematical modeling applied to the description of fabric structure, the conclusion was drawn that the only method by which one can obtain a check pattern fabric through the association of groups of yarns with significantly different weaves and mean floats is to set the dimensions of the component elements such that to provide an equal compactness on the entire fabric, no matter the zone and character of the associated weaves.

When designing a check pattern fabric from weave, solutions must be found for the efficient utilization of the characteristics of yarns and other component elements, such that every component should participate with a maximum contribution in taking over the tension produced by concrete exploitation conditions. This can be accomplished by using scientifically substantiated methods based on the geometry of the fabric structure and the component intercorrelation, such that each of them brings a maximum contribution to meet the quality requirements imposed by the user.

2.THEORETICAL CONSIDERATIONS

The fabric mass is one of the basic characteristics by whose means the quantity of yarns in mass unit (g or kg) contained on a unit length (1 m) or surface (1 m^2) of the fabric is established

The algorithm proposed for mass calculation is conceived to include all the factors which determine the level of fabric mass, and are classified as:

- direct factor: yarns characterized by lengthwise density and yarn set
- indirect factors: yarn deformation through crimping, measured through the wave height and crimp angles materialized in yarns shrinkage during the weaving and finish processes, the nature of the component fibers, mass loss or gain during finish.

In the case of these fabrics, the mass calculation is performed considering that there is a check pattern weave repeat only in the ground zone on the width l'_f. The calculation algorithm described in this work is related to the specific case of the fabric produced on non-conventional Sulzer-Rütti weaving machines, at which shadow welt is executed by introducing the weft yarns ends with a length of lm/2 in the next lease.

The basic relation for mass calculation are as follows:

$$Mt = Mu + Mb \quad g/m \tag{1}$$

where:

$$Mu = M'u_f + Mm \quad g/m \tag{2}$$

where: - Mt - is the total mass of the finished fabric, in g/m;
- Mu, Mb - the mass of warp and weft yarns respectively, in g/m
- $M'u_f$ – the mass of weft yarns on the width l''_f, in g/m;

$$l'_f = l_f - l_m \tag{3}$$

- where: - l_f is the width of the finite fabric, in m,
- l_m total width of selvages, in m.
- Mm- mass of weft yarns from selvages, in g/m. $\mathbf{g/m.}$

There are two possibilities for mass calculation, frequently used in fabric design: the method of yarn sett and the method of yarn count.

In order to develop a calculus relation which includes the components found in the finished fabric, the following specification need to be made:

The finish process in which the fabric is subjected to operations of humid- thermal processing or of other nature: bleaching, back filling finish, mercerization, exerts an influence on the two yarn systems (warp and weft), modifying their mass and therefore their lengthwise density.

In reality, the yarns from the finish fabric have a lengthwise density different from that which they had in the grey fabric, which has a direct influence on the mass. Practically, one cannot measure the modified lengthwise density of the yarns from the finished fabric, that determine the real fabric mass.

Modification of the lengthwise density of the yarns from the finished fabric is introduced in the mass calculation relations by means of the „coefficient of mass modification”

$$c_{fm} = \frac{100 \pm p_f}{100} \tag{4}$$

where: - p_f is the mass loss (- p_f) or gain (+p_f) in the finish process, in %.

Thus, the correlation between the two conditions of the fabric: grey and finished, is

$$Mt = Mt_c \cdot \frac{100 \pm p_f}{100} \tag{5}$$

Taking into account these specifications concerning the influence of the finish processes on the fabric mass, the lengthwise density is considered at its rated value in the design calculus.

The algorithm for mass calculation of the finished check pattern fabric from weave is synthetically presented in the flow chart 1.

Flow chart 1: Mass calculation for the finished check pattern fabric from weave. Method of yarn set (number of picks).

Input data	Symbol	MU
Width of stripes with weave i per width (l'$_f$) of: (l'_f)	L_i	cm
- warp	Lu_i	
- weft	Lb_i	
- selvages	Lm	
Yarn sett (number of **picks)** in:	P_i	Fire/10cm
- warp	Pu_i	
- weft	Pb_i	
- selvages	Pu_m	
Lengthwise density (yarn count) of yarns from:	Tt_i	tex
- warp	Tt_{ui}	
- weft	Tt_{bi}	
- selvages	Tt_m	
Yarn shrinkage during weaving		
- warp	C_{uti}	
- weft	C_{bti}	
- selvages	C_{um}	%
Yarn shrinkage during finish		
- warp	C_{ufi}	
- weft	C_{bfi}	
Mass loss (or gain) at finish	$\pm p_f$	%

↓

1. Calculus of total yarn shrinkage at weaving and finish

$$a_{ui} = 100 - \frac{(100 - C_{uti}) \cdot (100 \pm C_{uf})}{100} \quad \%$$

$$a_{bi} = 100 - \frac{(100 - C_{bti}) \cdot (100 - C_{bi})}{100} \quad \%$$

↓

2. Calculus of mean shrinkage of yarns from stripe with weave 1 (plain)

$$a_{u1med} = \frac{\sum_{i=1}^{m} Lb_i \cdot a_{ui}}{\sum Lb_i} \quad \% \qquad a_{bimed} = \frac{\sum_{i=1}^{m} Lu_i \cdot a_{bi}}{\sum Lu_i} \quad \%$$

↓

3. Mass calculus for warp yarns with weave repeat within the width l'$_f$ l'_i

$$M'u_f = \left[\sum_{i=1}^{m} \frac{Lu_i \cdot Pu_i \cdot Tt_{ui}}{100(100 - a_{ui})}\right] \cdot \frac{100 \pm p_f}{100} \quad g/m$$

↓

4. Calculus of selvage yarns mass

$$Mu_m = \frac{l_m \cdot Pu_m \cdot Tt_{um}}{100(100 - a_{um})} \cdot \frac{100 \pm p_f}{100} \quad g/m$$

↓
①
①
↓

5. Calculus of total mass of warp yarns

$$Mu = \left[\sum_{i=1}^{m} \frac{Lu_i \cdot Pu_i \cdot Tt_{ui}}{100(100 - a_{ui})} + \frac{l_m \cdot Pu_m \cdot Tt_{um}}{100(100 - a_{um})}\right] \cdot \frac{100 \pm p_f}{100} \quad g/m$$

↓

6. Calculus of weft yarn mass

$$Mb = \left[\sum_{i=1}^{m} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi}}{100(100 - a_{bi})}\right] \cdot l_f \cdot \frac{100 \pm p_f}{100} \quad g/m$$

↓

7. Calculus of total fabric mass

$$Mt = \left[\sum_{i=1}^{m} \frac{Lu_i \cdot Pu_i \cdot Tt_{ui}}{100(100 - a_{ui})} + \sum_{i=1}^{m} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi} l_f}{100(100 - a_{bi})} + \frac{l_m \cdot Pu_m \cdot Tt_{um}}{100(100 - a_{um})}\right] \cdot \frac{100 \pm p_f}{100} \quad g/m$$

3.EXPERIMENTAL

The algorithm for mass calculation of a finished check pattern fabric from weave was applied to the structure of a fabric from cotton-type yarns having the basic and auxiliary characteristics given in Table 1.

Table 1: Fabric characteristics

Input data	Symbol	Values	MU
Width of stripes with weave (within the width l'$_f$) - warp	L_i Lu_1 Lu_2	92 85	Cm cm
- weft	Lb_1 Lb_2	53 47	Cm Cm
- ground with weave repeat - selvages	l_f' l_m	157 3	Cm cm
Yarn set (number of picks) - warp: - from ground	Pu_1 Pu_2	352 440	Fire/10cm Fire/10cm
- from selvages	Pu_m	352	Fire/10cm
- weft	Pb_1 Pb_2	264 330	Fire/10cm Fire/10cm
Lengthwise density of yarns (yarn count) from: - warp: - from ground	Tt_{u1} Tt_{u2}	16.66(Nm60) 8,33x2(Nm120/2)	Tex tex
- from selvages	Tt_{um}	16.66(Nm60)	tex
- weft	Tt_{b1} Tt_{b2}	16.66(Nm60) 8,33x2(Nm120/2)	Tex tex
Shrinking of yarns at weaving: - warp : - from ground	C_{ut1} C_{ut2}	10 5	% %
- from selvages	C_{um}	10	%
- weft	C_{bt1} C_{bt2}	12 6	% %
Fabric shrinking at finish - warp - weft	C_{uf} C_{bf}	+4 -8	% %
Mass loss at finish	$\pm p_f$	-4	%

4. RESULTS

The application of the algorithm from flow chart 1 on a fabric with the values of the technical and structural characteristics from Table 1 gave the values of finite fabric mass, presented in Table 2.

Table 2: Experimental results

Name of the calculated parameter	Symbol	Value	MU
1. Total shrink of yarns during weaving and finish			
- in warp	a_{u1}	6,4	%
	a_{u2}	1,2	%
	a_{um}	6,4	%
- in weft	a_{b1}	19,0	%
	a_{b2}	13,5	%
2. Mean shrink of the yarns from stripes with weave 1 (plain)			
- in warp	a_{umed}	4,0	%
- in weft	a_{b1med}	16,3	%
3. Mass of warp yarns			
- across the width l'_f			
○ warp			
▪ ground	M'_{uf}	114,5	g/m
▪ selvages (across width l_m)	M_{um}	1,8	g/m
- total mass of warp yarns	M_u	116,3	g/m
4. Mass of weft yarns	M_b	99,9	g/m
5. Total mass of the finished fabric	M_t	216,2	g/m

5.CONCLUSIONS

The fabrics with check pattern effect obtained from the association of yarn groups with different weave, lengthwise density and/or yarn sett (number of picks and/or yarn count) on the both yarn systems detain an important place in the assortment of fabrics for both garments and other destinations, among which one must mention the sized fabrics: handkerchiefs, table cloths, napkins etc.

The method and the calculus algorithm for designing the check pattern fabrics from weave have been conceived such that the resulting fabric as a whole demonstrates yarn positional stability and the most uniform aspect possible.

The method proposed in this work is based on sizing the basic parameters of the check pattern fabric from weave yarn sett and lengthwise density (number of picks /yarn count) in terms of compactness.

In order to produce a fabric with the internal structure as uniform as possible, no matter the weave from the associated stripes which make zones with distinctive structure, it must be designed such that its compactness is equal or slightly different on the entire surface.

The algorithm proposed for mass calculation is conceived such that it contains all the factors that determine the level of the fabric mass and are classified as follows:

- Direct factors: yarns characterized by lengthwise density and yarn sett (number of picks/yarn count);
- Indirect factors: yarn deformation through crimp, measured be means of the wave height and crimp angle materialized in yarns shrinking in the weaving and finish processes, the nature of component fibres, mass loss or gain through finish.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

APPLICATION OF RISK METHODS TO SEW KNITTED PRODUCTS

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Abstract: Successful development of some solutions depends on their translation into manufacturing is based on staff involvement, like involvement of band heads implemented on line of control results. Currently in many companies the management of the company is based for the control of the flow almost exclusively on self-performed by each employee at his workplace and made the control of the controller in charge and monitoring finished products. They also must ensure that no defects arise in manufacturing the quality of execution systematic data. Workers should be trained and taught in the right way to execute various operations. In this respect, the band head should ensure that every worker is trained in performing the assigned operation. Personnel training lead to the improvement of the quality by increasing the quality of execution and cost reductions.
Key words: *Main defects, solutions, control, self control*

1. INTRODUCTION

The main defects that may arise in the process of making knitted manufactured products are divided into:

- defects resulting from improper execution;
- defects caused by improper adjustment of equipment.

The effects of this defect relates to loss of time and productivity, employee stress, loss of orders. [1]

To determine the general causes can generate the output of each defect can be used Ishikawa diagrams presented in Figures 1 and 2. From the two figures are detached general causes that may cause defects of the two groups. [15]

Table 1. Analysis of the real causes for examined the affecting groups

Type of defect	Possible cause	The probable cause	Explaining the cause
Defects generated due to improperly adjusted machinery	Environment	No	Environmental conditions are generally normal
	Worker	Yes	These defects may be caused by the worker because of inexperience, ignorance of the technological process
	Raw material	No	The raw material used to make the product does not cause these types of defects
	Machinery		The machines correspond to the technological process but are not adjusted properly
Defects due to incorrect execution	Worker	Yes	Worker knows that assignment because it was not properly informed
	Environment	No	Environmental conditions are generally normal

It is noted that the group of sub factors involved in Ishikawa analysis is the same for some factors, differing only the main factor that has a direct influence on the defect analysis.

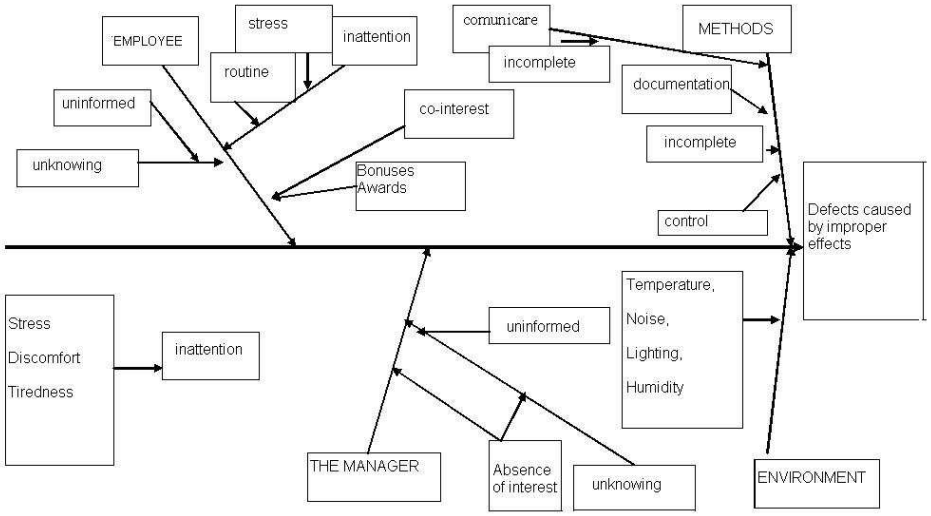

Figure 1. The general studying causes of defects due to technological indiscipline

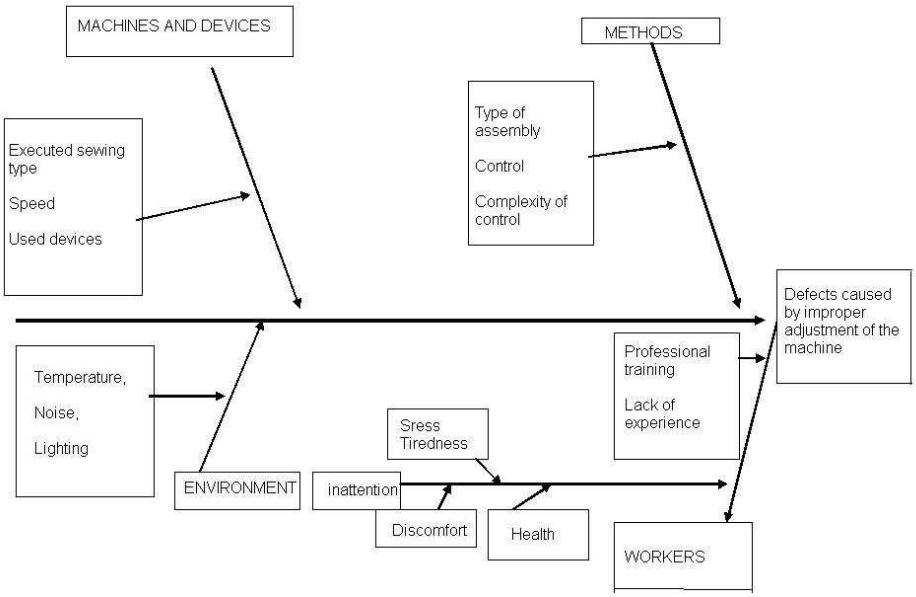

Figure 2. Analysis of the general causes due to the machine

If in terms of factors that depend on human or environmental resources to solve is how simply requires solving technical factors determining the causes of their depth. In order to analyze the causes of technical factors in Table 2 is presented each defective part and technical reasons for it. Finding solutions for remediation requires being removed real causes reducing harmful effects solutions or eliminating the causes being also presented in Table 2.

Table 2. The analysis of cause - failure - remediation

Failure	Cause	Remediation
Over-sizing or under-sizing of finite element	Incorrect dimensional marking	Dimensional marking contours Reconstruction of stitching
Visible perforation	Mismatch characteristics of materials with the diameter of the needle	Correlation of raw material characteristics with the needle softness

Spots on material	Excessive lubrication of the machine, Preliminary messing of the machine before starting work	Cleaning the machine, Replacing the spotted part
Uncut strings	Negligence of worker	Cutting of threads

2. CONCLUSIONS

Successful development of these solutions depends on their translation into manufacturing is based on staff involvement, as follows[3]:

- Involvement of band heads implemented on line of control results. Currently in many companies the management of the company is based for the control of the flow almost exclusively on self-performed by each employee at his workplace and made the control of the controller in charge and monitoring finished products. They also must ensure that no defects arise in manufacturing the quality of execution systematic data. These types of control, although they are strictly necessary are not sufficient. To overcome problems in the control line that control should be more rigorous. In this regard and leaders of groups should handle the translation of results into practice control. Thus, among the duties of department chefs should enter also the communication of workers, features of the model and their quality requirements and check understanding by them of specific work tasks. Thus decline internal failure costs and increase product quality. Such as reduced consumption of time, would increase production capacity, would be solved a number of delivery problems, loss of orders etc.
- Training of workers.

Workers should be trained and taught in the right way to execute various operations. In this respect, the band head should ensure that every worker is trained in performing the assigned operation. Personnel training lead to the improvement of the quality by increasing the quality of execution and cost reductions[9].

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

PROGRAM FOR THE DESIGN OF WOOL-LIKE FIBRE RECEIPT

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Abstract The informational program which is presented in this work has the advantage of choosing the raw materials that compound the blend, function of the compounds' cost, but it is taking also into account the basic laws of the blending (the relation between the diameters and the average lengths of the compounds). All these will have as a result the reducing of the raw materials consume and also it drops the waste percentage from the technological processes.

In order to verify the program's functioning, the quality characteristics of the raw materials and their cost had been taken from the analyse bulletins and from bills and introduced in the tables which are the program's database.

Key words: quality, textile, wool, fibre, program, Excel, blends, average characteristics

1. INTRODUCTION

The program presented in this paper aims the optimisation of the blending receipts, in order to obtain wool-like combed yarns[5,6], taking into account in the same time the imposed conditions in the case of blending two components (the relation between the diameters, the relation between the average lengths and the number of the fibres in the transversal section of yarn).

This program aims the obtaining the optimal receipt of fibres blend starting from the processing dates, the important quality characteristics of fibres and their cost.

The program has been elaborated in Excel version 7.0 and occupies a sheet from a work agenda[7,8,11], using the table calculation facilities provided by version chosen.

2. THE PROGRAM'S WORKING ALGORITHM

The program enables to establish optimum blend for combed type wool yarns taking into account both the quality fibers used and their cost, on the basis of a data base acquired to the suppliers of raw materials[3,4,10]. The program was developed on the basis of cyclical flowchart, presented in figure 1.

In accordance with the flowchart, shall be entered in the program as input data the characteristics of the fibres. For wool the input data are: fibres' diameter, standard deviation of the wool fibres' diameter, Hauter length, standard deviation of the length and the cost and for polyester: the length density, standard deviation at the length density, Hauter length, standard deviation of the length and the cost[1,9]. In the program there is the possibility of the introduction of the 10 types of wool fibres and 10 types of polyester.

The elaborated program realizes the next steps:

a. in two tables (for wool and for polyester) the values of the fibres' quality characteristics and of their cost are introduced. These values are taken from the analyze bulletin of the raw materials' purveyors and from the facture emitted of them. It has to be mentioned that the program is elaborated for the fibres blend, taking into account that in the moment of calculation ten wool an ten polyester lots are available.

b. the conversion calculation from the direct system in the indirect system of fibres' fineness using relation 1 and 2.

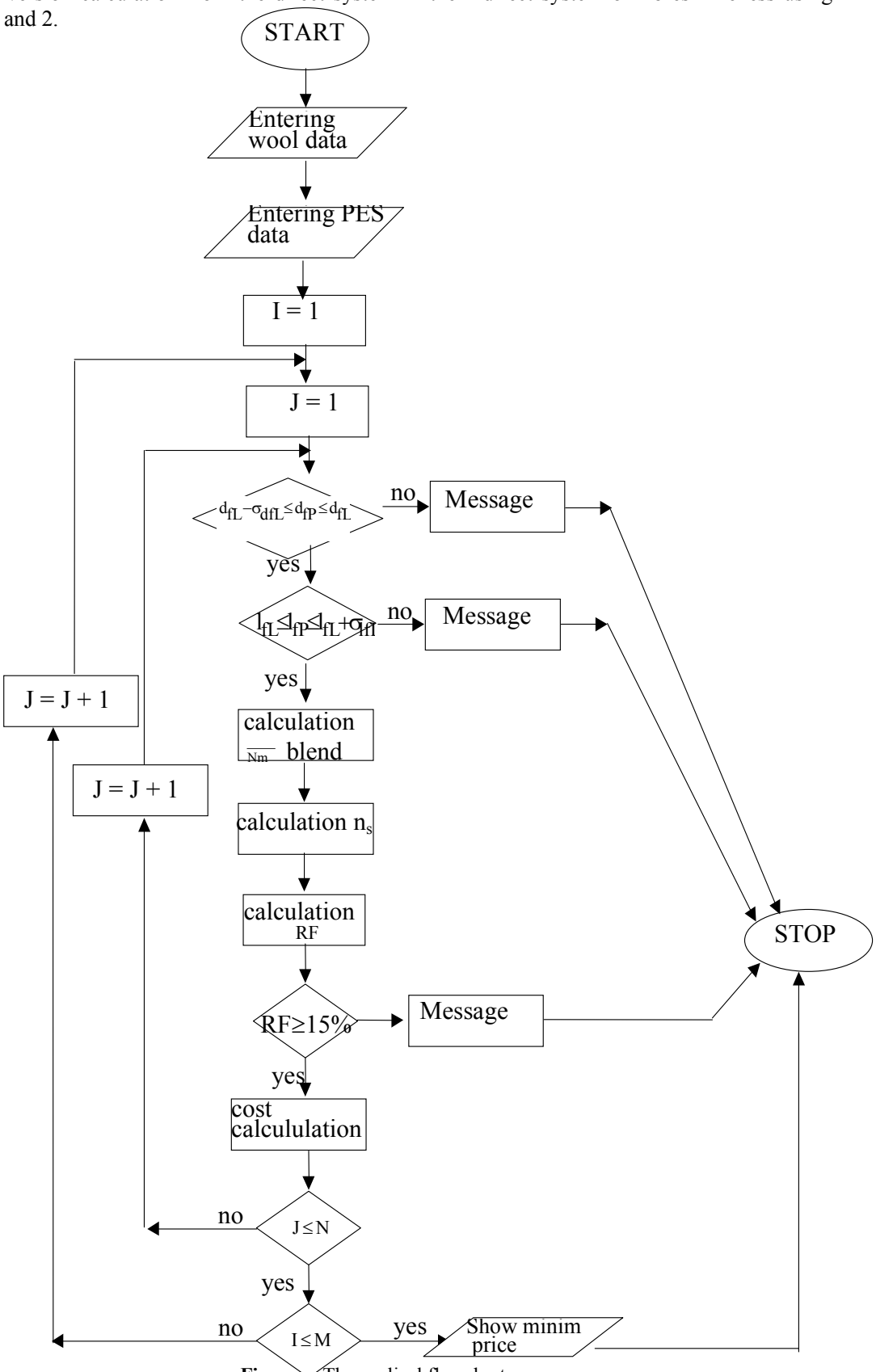

Figure 1. The cyclical flowchart

- for wool:

$$Nm = \frac{4 \cdot 10^6}{\pi \cdot 1{,}31 \cdot d_f^2} \quad \textbf{(1)}$$

- for polyester:

$$Nm = \frac{9000}{T_{den}} \quad \textbf{(2)}$$

c. the user is asked for the necessary dates for the next calculations, such as: the yarn's fineness, the minimum number of fibres from the yarn's section and the participation ratio in blend (concerning mass) of the first compound (regularly, the wool)

d. the blends' fibres average fineness is calculated with relation (3) and, if the following conditions are accomplished (4) and (5), the result is showed.[1,5,6]

$$Nm_{med\ am} = a_1 \cdot Nm_L + a_2 \cdot Nm_{PES} \quad \textbf{(3)}$$

$$d_{fL} - \sigma_{dfL} \le d_{fPES} \le d_{fL} \quad \textbf{(4)}$$

$$l_{fL} \le l_{fPES} \le l_{fL} + \sigma_{lfL} \quad \textbf{(5)}$$

If these two conditions are accomplished, they have as a result obtaining some qualitative yarns in the technologic process, the reducing of the raw material consume and of the waste in the combed wool spinning.

e. the number of fibres in the transversal section of the desired yarn is calculated with the relation (6)

$$n_S = \frac{Nm_{med\ am}}{Nm_F} \quad \textbf{(6)}$$

f. the spinning reserve for all variants is calculated with relation (7), and only those values belonging the fibre blends that accomplish the relation (8) will be showed.

$$R_F = \frac{n_s - n_{s\,min}}{n_{s\,min}} \cdot 100 \quad \textbf{(7)}$$

$$R_F > 15\% \quad \textbf{(8)}$$

g. the blend cost is calculated and only the values belonging to those fibre blends that accomplish the conditions from above will be showed

$$p = a_1 \cdot p_L + a_2 \cdot p_{PES} \quad \textbf{(9)}$$

h. in a separate cell the minimum cost for the blending receipt , which accomplish all the imposed condition, is showed

3. EXPERIMENTS AND CONCLUSIONS

In the industrial practice, during the researches made in order to elaborate the present work, it has been found that the supplying with raw material is made by following criteria than those concerning the quality of the raw material and of the minimum cost of it, such as: function of the delivering term and of the imposed conditions at the raw material's payment (longer falling due terms, delivering in counter- mach). It should be underlined that, in most of cases, the yarns obtained from these raw materials cannot be totally integrated in the standards or in the internal norms, and the raw material consume was bigger that predicted and more waste obtained.

In order to verify the program's the program's functioning, the quality characteristics of the raw materials and their cost has been taken from the analyse bulletins and from bills and are introduced in the tables which are the program's database (figure 2).

The quality characteristics which have been taken into account are:

- the diameter of the wool fibres
- the standard deviation of the wool fibres' diameter
- the average length of the wool fibres, respectively of the polyester fibres
- the length density of the polyester fibres
- the standard deviation of the polyester fibres' length density

Lana	f11	f12	f13	f14	f15	f16	f17	f18
dfL	20,26	18,2	17,9	23,7	23,5	24,6	25,3	17,6
NmL	2367,88	2934,24	3033,42	1730,38	1759,96	1606,1	1518,44	3137,71
sigma dfL	18,2	17	15	24	22	18,7	25	17,2
lfL	93,7043	90,1925	87,1211	84,4121	82,0049	79,852	77,9144	76,1621
sigma lfL	35,3738	33,9003	32,245	30,455	28,5563	26,56	24,4641	22,2553
p L	7	6,8	6,6	6,4	6,2	6	5,8	5,6
dfL-sigma dfL	2,06	1,2	2,9	-0,3	1,5	5,9	0,3	0,4
lfL+sigma lfL	129,078	124,093	119,366	114,867	110,561	106,41	102,378	98,4174
Poliester	f21	f22	f23	f24	f25	f26	f27	f28
TdenP	1,5	1,4	2,89	3	2,3	4,3	3,9	4,4
NmP	6000	6428,57	3114,19	3000	3913,04	2093	2307,69	2045,45
dfP	12,4005	11,98	17,2125	17,537	15,3553	20,996	19,9952	21,2383
sigma dfP	2	2,2	2,33	1,89	1	2	1,5	1,7
lfP	92,452	89,264	85,254	83,236	80,475	77,698	71,368	65,664

Figure 2: Table for imput initial data

The program has been carried out the necessary calculations and displayed the performance. For the variants that didn't fulfil the impose conditions about the compatibility of the raw material the program display: "STOP". For the variants that fulfil the conditions, the price is display (figure 3)

	f21	**f22**	**f23**	**f24**	**f25**	**f26**	**f27**	**f2**
f11	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOI
f12	5,81	STOP	STOP	STOP	STOP	STOP	STOP	STOI
f13	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOI
f14	5,63	5,7455	5,9875	STOP	STOP	STOP	STOP	STOI
f15	5,54	5,6555	5,8975	6,0845	STOP	STOP	STOP	STOI
f16	5,45	5,5655	5,8075	STOP	6,1265	STOP	STOP	STOI
f17	5,36	5,4755	5,7175	STOP	6,0365	STOP	STOP	STOI
f18	5,27	5,3855	5,6275	5,8145	5,9465	STOP	STOP	STOI
f19	5,18	5,2955	5,5375	5,7245	5,8565	STOP	STOP	STOI
f110	STOP	5,2055	5,4475	5,6345	5,7665	STOP	STOP	STOI
pret minim =	**5,18**							

Figure 3: The final results

The program is designed to search the lowest value in for in the prices matrix, and then it displays the minimum value of the price in a separate cell, showing which are the fibres that may be blended for the yarn with minimum cost. Also, with the help of this program it may find the technological possibilities for blending in order to obtain a specific yarn or other thinner.

The working of the program is relational so through introduction of new values in figure 2 and another fineness of the yarn, the result is automatically changed. Modifying the fineness of the yarn we will have less blending variants at the same costs of the raw materials.(table 3)

	f21	f22	f23	f24	f25	f26	f27	f28	f29	
f11	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f12	5,81	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f13	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f14	5,63	5,7455	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f15	5,54	5,6555	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f16	5,45	5,5655	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f17	5,36	5,4755	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f18	5,27	5,3855	STOP	STOP	5,9465	STOP	STOP	STOP	STOP	
f19	5,18	5,2955	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
f110	STOP	5,2055	STOP	STOP	STOP	STOP	STOP	STOP	STOP	
ɔret minim =	5,18									

Figure 4: Results for one yarn

The practical experiences shows that the yarns realised from compatible raw materials placed between some quality parameters, imposed by standards, and in the other cases there have been processing problems in the technological flux.

In conclusion the program is a useful instrument for the users from industry, which take their supplies from the nowadays market and assure a global view over all blending possibilities of the compounds.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

TENCEL / LENZING FIBER, A NEW FIBER

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Abstract: Tencel is a *new* fiber made in a process that is similar to the creation of rayon. As with rayon, cellulose, primarily from wood pulp, is used to make the fiber. Whether this creates a *natural* product is open to discussion. The process involves dissolving wood pulp with a solvent which unlike the process for rayon or cupra, is a relatively non-toxic amine. The dissolved pulp is then forced through tiny holes called spinnerettes creating long, smooth, lusterous fibers much like silk in appearance and drape. It can be dyed to deep color. When spuning tencel fiber it is quite luscious. It has that wonderful silken sheen. One knows that no silk worms died to produce it. It can be very slippery to spin so it is not a beginner's fiber, but anyone ready for silk can handle it with ease. Many spinners have a great enthusiasim for this new fiber. You get the benefits of silk at half the price. However, to dye you will have to use a procion type dye for cellulose rather than the acid dyes one can use on a protein fiber like natural silk.
Key words: Tencel fibre, Tencel fabric, eco- fibers, Lenzing fibers, production process.

1. THE NEW AGE FIBER

TENCEL® heralds the beginning of a new age in fiber technology. Completely natural, **TENCEL® is Lenzing Fibers' brand name for lyocell.** A major break-through was made with the development of the unique nanofibril structure of this fiber. TENCEL®, made from wood pulp cellulose, offers a unique combination of the most desirable properties of man made and natural fibers: soft as silk, strong as polyester, cool as linen, warm as wool and as absorbent as cotton. Quite simply a "break-through"fiber.[4]

Tencel is a natural, man-made fiber and is the trade name for the generic fiber **Lyocell.** Tencel is soft, fluid, and has a spledid "natural" feel to it. In the fabric world, tencel is known for its "drape" because of how it compliments the human form. Tencel is made from the natural cellulose found in wood pulp and produced in a non-chemical manner. The fiber is economical in its use of energy and natural resources, and is fully biodegradable.

Figure 1. Tencel–fibers and blends

Figure 2. Tencel fiber

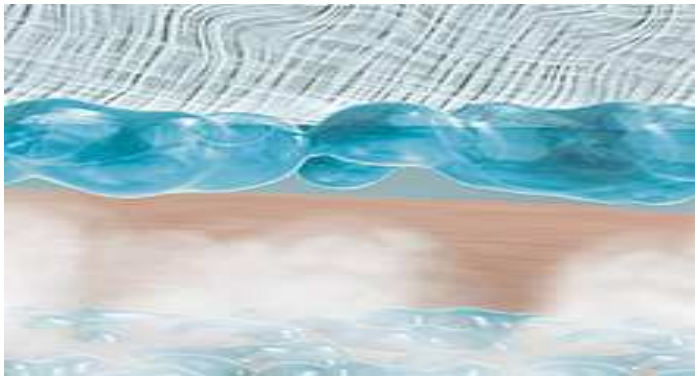

Figure 3. Polyester fiber

2. THE MANUFACTURING PROCESS

Hardwood logs are chipped into squares about the size of postage stamps. The chips are digested chemically, to remove the lignin and to soften them enough to be mechanically milled to a wet pulp. This pulp may be bleached. Then it is dried into a continuous sheet and rolled onto spools. At this stage, it has the consistency of thick posterboard paper. The roll of cellulose weighs some 500 lb (227 kg). The waste liquor may be reworked to produce tall oil, used to make alkyd resins. At the *Lyocell* mill, rolls of pulp are broken into one-inch squares and dissolved in N-methylmorpholine N-oxide, giving a solution called "dope." The filtered cellulose solution is then pumped through spinnerets, devices used with a variety of man made fibers. The spinneret is pierced with small holes rather like a showerhead; when the solution is forced through it, long strands of fiber come out. The fibers are then immersed in another solution of amine oxide, diluted this time, which sets the fiber strands. Then they are washed with de-mineralized water. The Lyocell fiber next passes to a drying area, where the water is evaporated from it. The strands then pass to a finishing area, where a lubricant, which may be a soap or silicone or other agent depending on the future use of the fiber, is applied. This step is basically a detangler, prior to carding and spinning into yarn.

The dried, finished fibers are at this stage in a form called tow, a large untwisted bundle of continuous lengths of filament. The bundles of tow are taken to a crimper, a machine that compresses the fiber, giving it texture and bulk. The crimped fiber is carded by mechanical carders, which perform an action like combing, to separate and order the strands. The carded strands are cut and baled for shipment to a fabric mill. The entire manufacturing process, from unrolling the raw cellulose to baling the fiber, takes about two hours. After this, the Lyocell may be processed in many ways. It may be spun with another fiber, such as cotton or wool. The resulting yarn can be woven or knitted like any other fabric, and given a variety of finishes, from soft and suede-like to silky. The amine oxide used to dissolve the cellulose and set the fiber after spinning is recycled. 98% of the amine oxide is typically recovered. Since there is little waste product, this process is relatively eco-friendly. However, it uses a substantial amount of energy, and uses an organic solvent.

It is produced by a process of advanced spin in a solvent, with minimal impact on the environment and with economic use of water and energy. The solvent used is toxic but is recovered in proportion of 99%. Toxic emissions of producing fabrics is low compared to other fiber producing factories. Production process is in closed circuit and does not require bleach which is commonly used to produce other fiber. Tencel fibers, do not contain free chlorine.

It is hard to ad here colors and pigments to the fiber and because of this some manufacturers may use a variety of chemical painting, enzyme bath, or treatments of the layers, organic or not, which could remove Tencel fiber from the notion of organic fiber.

3. MAJOR PROPERTIES

Tencel first went on public sale as a type of rayon in 1991. It shares many properties with other cellulosic fibers such as cotton, linen, ramie and rayon. Some main characteristics of lyocell fibers are that they are soft, absorbent, very strong when wet or dry, and resistant to wrinkles; lyocell fabric can be machine- or hand-washed or dry cleaned, it drapes well, and it can be dyed many colors, and can simulate a variety of textures such as suede, leather, and silk.[1]

Tencel fiber characteristic is to improve the drape of various materials blended with it, due to special qualities of strength, purity and absorption, qualities that have increased the percentage of use in the textile industry.

Tencel fibers are 100% cellulose fibers produced from a renewable source, namely eucalyptus, bamboo or beech pulp produced in unpolluted forests, planted by man on land which could not grow edible plants. All are 100% degradable. [8]

These fibers are composed of nano-fibril molecules, arranged in a crystalline microfiber structure focused on several directions, hence resulting in high strength, purity and excellent chemical storage properties when the fiber is wet.

It is hard to ad here colors and pigments to the fiber and because of this some manufacturers may use a variety of chemical painting, enzyme bath, or treatments of the layers, organic or not, which could remove Tencel fiber from the notion of organic fiber.

Besides the listed properties of fiber, it has the potential to fibrillate.

Water, most vital for life, is managed uniquely by TENCEL®'s properties. TENCEL® absorbs excess liquid and quickly releases it again into the atmosphere. The true nature of TENCEL® can be found in this perfect interaction. If that does not constitute the dawning of a new age, then what does? Fibrils are the key to the performance and possibilities of TENCEL®.Fibrils are tiny components (little "hairs") which make up the fiber. The unique structure of the fibrils allows the production of textiles which, until now, could only be dreamed of. This is the first cellulose fiber whose functionality is based on this innovative structure. The controlled and regular arrangement of these tiny fibrils leads to new functional properties. The fibrils are hydrophilic and optimize the absorption of moisture with excellent cooling properties.

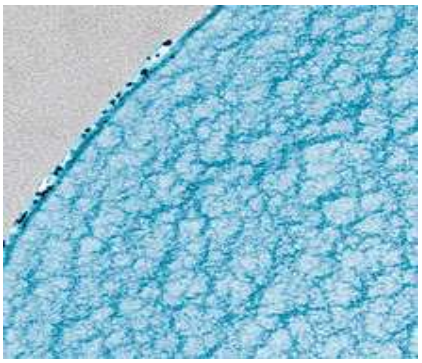

Figure 4. Natural cooling. Fibrils

Fibrillation is the process in which the wet fiber, through abrasive action produces microfiber at its surface. By controlling fibrillation a multitude of finishes can be obtained. Surface fibers of standard fibers are fibrillated to obtain a material with a quality touch and a velvety surface.

Figure 5. Fibre Tencel – fibril and non-fibril appearance

Nanofibrils are the key to the performance possibilities of TENCEL®. The unique technology of nanofibrils allows the production of textiles, which, until now, could only be dreamed of. This is the first cellulose fiber to use this nano technology. Controlled and regular arrangement of nanofibrils in the TENCEL® fiber leads to new functional properties. The nanofibrils are hydrophilic and optimize absorption of moisture with excellent cooling properties.

TENCEL® / Polyester

Figure 6. * Natural cooling
* Nanofibrils
* Outstanding moisture management
* Inhibits bacteria growth

Moisture transport as a result of nano technology. In contrast to synthetic fibers, with reduced wicking properties, TENCEL® offers unique moisture transport. The completely new nano technology of TENCEL® supports this natural fiber property, guaranteeing optimum conditions for the skin. Synthetic fibers cannot absorb moisture into the inside of the fiber. The illustration shows that in contrast to cotton and polyester fibers, TENCEL® controls and regularly absorbs moisture. Also TENCEL® absorbs 50 % more moisture than cotton. By contrast polyester does not absorb moisture.

Cotton

TENCEL®

Polyester

Figure 7.

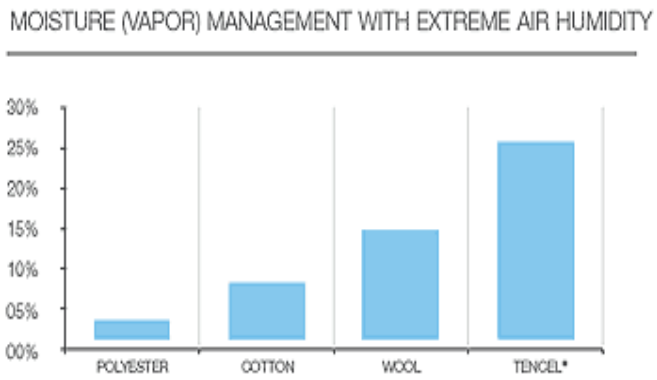

Figure 8. Moisture Management with extreme air humidity

Moisture transport is determined by climate. Depending upon climate conditions, TENCEL® either absorbs or releases moisture. Compared to other fibers, TENCEL® features the highest moisture absorption-rate: with air humidity at 65 %, TENCEL® still has unused capacity to absorb moisture from the skin.The graph shows the increase of moisture in a textile when the textile is moved from a relative humidity of 65% to a relative humidity of 100%. The moisture refers to the weight of the dry textile.

4. TENCEL® - THE SKIN SENSOR

The skin is the largest human respiratory organ. Human skin acts as a protective shell, regulates body temperature and maintains water balance. TENCEL® supports these body functions acting like a second skin.

A subjective feeling of well-being depends considerably on moisture absorption and on surface structure of the fibers. Rougher fibers can lead to skin irritation. The extremely smooth surface of TENCEL® feels soft and pleasant to the skin. The reason for the fine surface of the fiber is low fiber stiffness

TENCEL® / Cotton

Figure 9.
* Smooth fiber structure
* Temperature control
* Irritation free
* Suitable for sensitive skin

5. TENCEL® FOR SENSUAL SMOOTHNESS

Smoothness across the board. A comparison of the fiber surfaces makes the difference patently obvious. TENCEL® fiber has a smoother and more supple surface than wool or cotton. Wool tends to have a scaly surface, while cotton is irregular and rough.


Cotton


Wool


TENCEL®

Figure 10.

TENCEL® is a godsend for anyone with sensitive skin. The combination of a smooth fiber surface and excellent moisture absorption creates a positive environment for healthy skin, making TENCEL® ideal for anyone with sensitive skin.

Tencel fiber A. 100, subsequently developed, has a non-fibril finishing, fine and is used in particular to obtain knitted fabrics for underwear having contact with the skin over a large area. Tencel standard fiber A. 100 has a strong glaze, can be easily painted and has a good resistance to snapping and bursting forces. At the same time, wash performance is improved, improving retention of the original shape of the material and increasing the cloth covering capacity when used in mixtures with other fibers, improving the quality and composition of the material or when the material is thermo-fused. [6]

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY OF THE INFLUENTIAL FACTORS OF THE BREAKING FORCE OF THE FABRIC MADE OF WOOL AND WOOL-TYPE YARNS

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Abstract: The value of the cloth breaking force is the resultant of the correlation between structural characteristics, of which the yarns are significant, with the two characteristics: longitudinal density and yarn count, as well as the nature and proportion of the composing yarns.
In the field of the woolen cloths, no study has been carried out concerning the structural elements which define and influence the breaking force for the two yarn systems.
At the same time, no methods have been proposed through which the cloth basic characteristics represent a mathematical model based on interdependence connections whose manifestation follows the real logic, and the existing correlations between the composing cloth elements.
The work is meant to establish the correlations between the level of the breaking force of the yarns and their structure, as well as the level of the breaking force of the cloth and of its composing yarns.
Key words: breaking force of yarns and cloth, longitudinal density, stiffness, coefficient of utilization of yarn breaking force, index of utilization of yarn breaking force, safety coefficient.

1. INTRODUCTION

The breaking force is one of the quality characteristics specified in all internal norms, or in company or Romanian standards for fabrics [1]. The measurement of this characteristic is recognized as necessary by both fabric manufacturers and users. For the fabrics with technical destination which are subjected to tensile stresses during their utilization, it represents a basic characteristic.
The value of the fabric breaking force is the resultant of the correlation of the structure characteristics, out of which significant are the yarns with their two characteristics: lengthwise density and yarn set, as well as the nature and proportion of the component fibers.

No studies have been made in the field of the wool-type fabrics in regard to the structural elements that define and influence the breaking force for the two yarn systems.

Taking into account the absence of a method and algorithm for breaking force calculus, we have considered as necessary to perform studies in this field, meant to lead to calculus methods and algorithms that can be practically used for both the design of the fabrics tensile stress properties, and for checking them.

In the present work, we meant to establish some correlations between the level of the yarn breaking force and their structure, as well as between the levels of breaking forces of the fabric and component fibers respectively. With this aim in view, the following studies have been carried out:
- Study of the influence of the participation quota of the component fibers on the yarn breaking force;
- Study of the correlation between the breaking force of the single and plied yarn respectively;
- Study on the correlation between the breaking force of the yarn in its two conditions: individual and integrated into the fabric respectively.

2. STUDY OF THE INFLUENCE OF THE PARTICIPATION QUOTA OF THE COMPONENT FIBERS ON THE YARN BREAKING FORCE

It is well-known that the yarns made of wool- synthetic blend have a wide utilization in the industry that produces wool-type fabrics. The biggest weight belongs to the yarn of a 45% wool- 55% PES blend, mainly destined to garment industry: lady's and man's tailor-made suits, sack suits, skirts, trousers, light raglans, etc.

The utilization of the synthetic fibers blended with wool fibers has some disadvantages too, such as the diminution of the physiological comfort when their proportion in the blend is high. It was found that the blends in which the synthetic fibers do not exceed 60% provide a physiological comfort within normal limits [2,3].

2.1. The Experimental

In order to mark out the influence of the wool and synthetic fibers participation quota on the yarns breaking force, five variants of wool- PES blends- most frequently used in the wool industry- were experimented, one of the variant containing all-wool yarns.

For the experiments, we chose wool-type yarns of the 45%wool- 55%PES blend, because they hold the first rank in terms of weight in the yarn consumption for the fabrics assortment which represents the object of this study. The obtained results, expressed in mean values, are presented in Table 1.

Table 1: Mean value of the breaking force of Nm 52 yarns (19.23 tex)

Blend variants	Participation quota (%)		Breaking force, r (cN)	Tenacity, r_S (cN/tex)	Breaking force increase (%)	Breaking length, L_r (Km)
	Wool	PES				
1	100	-	110	5.72	100	5.7
2	70	30	154	8.00	139	8.0
3	60	40	173	9.00	156	9.0
4	45	55	210	10.92	189	11.0
5	30	70	247	12.84	222	12.8

The increase of the breaking force of the wool-type yarns obtained from the L+PES blend is explained by the fact that the polyester fibers tenacity is higher than that of the wool fibers [2,3,5].

In order to produce fabrics with breaking force superior to that of the all-wool fabrics, it is necessary to use spun yarns from blends of wool fibers with polyester or other synthetic fibers.

3. STUDY OF THE CORRELATION BETWEEN THE BREAKING FORCE OF THE SIMPLE AND PLIED YARN RESPECTIVELY

It is well known that, between the breaking force (r) of the single yarn and the breaking force (R) of the plied yarn obtained from (n) components with the same lengthwise density (yarn count) and fibre content, one cannot write the equality:

$$R = n \times r \quad \textbf{(1)}$$

The researches [6], [7], [8] have shown that this equality is only valid if an utilization coefficient (f) is introduced, such that the relation (1) becomes:

$$R = f \times n \times r \quad \textbf{(2)}$$

While in the field of cotton-type yarns researches have been carried out in order to establish the utilization coefficient (f), the research results representing the object of the normative act STAS 5806 of 1981, what concerns the wool-type yarns no systematic studies have been performed to produce the value of this coefficient.

In the specialized literature, reference is made to the fact that indeed the equality (1) cannot be valid, but no concrete solutions are given specifying the value of the utilization coefficient; all we can find are appreciations and recommendations without an experimental basis.

3.1. The Experimental

We have used as experimental material the wool-type yarns and L+PES blended yarns with the lengthwise density (yarn count) of 19.23 x 2 tex, Nm 52/2.

The investigations on the breaking force and the coefficient of utilization of the breaking force for the single and plied yarn respectively have been carried out taking into account two variable parameters, whose value directly influences the level of the plied yarn breaking force: the participation quota of the L-PES components, and the twist of the plied yarn (by means of the twist coefficient α_m). It was found out that in all the cases of wool and PES blended fibers, irrespective of the participation quota, the breaking force of the resulted yarns increases with increasing PES quota [3].

The twist represents the second factor considered as significant, with direct influence on the breaking force of the wool-type yarn. The results obtained related to the influence of the two parameters on the breaking force of the wool+PES blend yarns Nm 52/2 are shown in Table 2.

Table 2: The mean values of the breaking force (cN) of the Nm 52/2 yarn (19.23 x 2 tex) in terms of twist and the participation quota of the components

Participation quota (%)		Torsion, twists/m			
Wool	PES	500 a_m=69	600 a_m=83	700 a_m=97	800 a_m=110
100	-	226.6	233.2	237.6	242
70	30	315.7	323.4	329.6	335.7
60	40	352.9	359.8	366.8	370.2
45	55	426.3	432.6	438.9	445.2
30	70	498.9	503.9	514.3	516.2

3.2. Determination of the utilization coefficient of the breaking force for single yarn in the plied yarn

The utilization coefficient (f) of the yarn breaking force is calculated from:

$$f = \frac{R}{n \times r} \quad \textbf{(3)}$$

where:
- f is the utilization coefficient of the breaking force of the single yarn in the plied yarn;
- R– plied yarn breaking force, in cN;
- r – single yarn breaking force, in cN;
- n – number of single yarns from the plied yarn.

The breaking force of the single yarn Nm 52 (19.23tex) is considered as a basis. The value of utilization of the single yarns breaking force in the breaking force of the yarn obtained by twisting the two single yarns is calculated by making the ratio between the values of the plied yarn breaking force from Table 2, column 4 and the values of the single yarns breaking force from Table 1, column 4. The results are presented in Table 3.

Table 3: The values of the coefficient of utilization of the breaking force of the single yarns in the plied yarn, in terms of the twisting force and the fibres participation quota

Participation quota (%)		Torsion, twists/m			
Wool	PES	500 a_m=69	600 a_m=83	700 a_m=97	800 a_m=110
100	-	2.06	2.12	2.16	2.2
70	30	2.05	2.1	2.14	2.18
60	40	2.04	2.08	2.12	2.14
45	55	2.03	2.06	2.09	2.12
30	70	2.02	2.04	2.07	2.09

The obtained results show that there is no equality between the breaking force of the plied yarn and the sum of the breaking forces of the component single yarns. The explanation consists in the effects of the twisting operation, among which one can mention:
- increase of the number of the fibres fixed in the plied yarn, compared to that from the single yarns;
- increase of the transversal (friction) forces between the component fibres of the single yarn;
- etting an increased fibres compactness in the single yarn.

4. STUDY OF THE CORRELATION BETWEEN THE BREAKING FORCE OF THE INDIVIDUAL YARNS AND THE YARNS FROM THE FABRIC

The level of fabric breaking force is determined by the behaviour of the composing yarns with respect to the breaking force, whence the stringency to study the manner in which the yarns breaking force acts in the two conditions: individual yarns and yarns integrated in the fabric. This study is necessary for at least two reasons:
- **Measuring method**
  - Breaking force of the single yarns is determined with a dynamometer with the distance of 500 mm between clamps [10];
  - Breaking force of the fabric integrated yarns is determined per groups of yarns contained in 50 mm wide strips, on the dynamometer with the distance of 200 mm between clamps [1].
- **Yarns condition** (environment influence)
  - Breaking force of the fabric integrated yarns is influenced by internal environmental factors specific to the fabric, such as: interaction between the component yarn systems, warp and weft, perpendicular to each other, by yarns sett (number of picks) and weave;
  - Breaking force of the single yarn is influenced not only by internal factors specific to the fabric structure, but also by yarns specific factors, such as: properties of the component fibers and the manner in which they are assembled (spinning procedure, torsion).

For these reasons, one cannot put the equality sign between the breaking force of the 50 mm wide fabric strip, and the sum of the breaking forces of the component single yarns from the corresponding strip.

In order to appreciate the behavior of the yarns in the two conditions in relation with the breaking force, the tenacity of single yarns and that of fabric integrated yarns were proposed as comparison element. The practice shows that there is no straight correlation between the single yarn tenacity and the tenacity of the component fibers. Thus, while the wool fiber tenacity ranges between 1.0 and 1.7 cN/den, and the PES fibers tenacity ranges between 4.5 and 6 cN/den, the yarn capacity to take over tensile stresses does not increase to the same extent to which the participation quota of the PES fibers in the yarn structure increases.

In order to calculate the tenacity of the yarns in the two conditions, the following calculus relations were used:
- tenacity of single yarns prior to their integration into the fabric:

$$r_s = \frac{r_{med}}{T_t} \text{ (cN/tex)} \quad \textbf{(4)}$$

- tenacity of fabric integrated yarns:

$$RR_s = \frac{1000 \cdot R_{med}}{N_f \cdot T_t} \text{(cN/tex)} \quad \textbf{(5)}$$

or:

$$R_s = \frac{2000 \times R_{med}}{P \times T_t} \text{ (cN/tex)} \quad \textbf{(6)}$$

where:
- r_S is yarn tenacity before weaving, in cN/tex;
- r_{med} - mean breaking force of yarns before weaving, in cN;

- R_s - tenacity of fabric integrated yarns, in cN/tex;
- R_{med} - mean breaking force of the 50 mm sample, in daN;
- N_f - number of yarns from the 50 mm wide fabric sample;
- P - yarns set (number of picks), in yarns/10 mm;
- T_t - lengthwise density (yarn count) of yarns, in tex.

4.1. The experimental

The Nm 52/2 yarn with 600 twists/m was considered as the reference element, in five blending variants. The tenacity of the analyzed yarns, in cN/tex, was calculated on the same basis, the results being presented in Table 4.

Table 4: Tenacity of Nm 52/2 yarns (19.23 x2 tex) in terms of torsion and participation quota

Participation quota (%)		Torsion, twists/m			
Wool	PES	500 α_m=69	600 α_m=83	700 α_m=97	800 α_m=110
100	-	5.89	6.06	6.18	6.29
70	30	8.2	8.41	8.57	8.73
60	40	9.17	9.35	9.54	9.62
45	55	11.08	11.01	11.41	11.57
30	70	12.97	13.1	13.29	13.42

Based on the study of tenacity of single yarns before their integration into the fabric, and that of the fabric integrated yarns, the yield of the fabric integrated yarns was established, defined as the ratio between the tenacity of yarns into the fabric and the tenacity of yarns before their integration into the fabric, named „index of breaking force utilization for the fabric integrated yarns (noted by I_r):

$$l_r = \frac{R_{st}}{R_s} \quad \textbf{(7)}$$

Based on the experimental results concerning the breaking forces of yarns in the two conditions, before and after being integrated into the fabric, whose values are given in Table 5 for 19.23×2 tex yarns, it was established that their level is significantly influenced by two fabric parameters: yarns sett and lengthwise density (number of picks and yarn count).

Table 5: The main tensile characteristics of the weft yarn 19.23x2 tex and the fabric breaking force

Run no.	Characteristic	Symbol	M.U.	Experimental variants:			
				Pb=180	Pb=200	Pb=220	Pb=240
1	Yarn breaking force before weaving	R	cN	402.2			
2	Yarn tenacity before weaving	R_s	cN/tex	10.46			
3	Fabric breaking force	R_t	daN	37.57	42.01	46.7	51.68
4	Breaking force of yarn into the fabric	R_{ft}	cN	417.4	420.1	424.5	430.7
5	Tenacity of yarn into the fabric	R_{st}	cN/tex	10.85	10.92	11.04	11.20

The values of the utilization indices of yarns breaking force as function of the two factors for all the studied yarns are presented in Table 6. One can notice that these values are bigger than unit.

Table 6: Utilization indices of breaking force of the fabric integrated yarns in terms of yarn sett and lengthwise density (number of picks and yarn count)

Fineness, Nm	Count number, tex	Number of picks, yarns/10 cm			
		180	200	220	240
48/2	20.83 x 2	1.023	1.03	1.04	1.052
52/2	19.23 x 2	1.038	1.045	1,057	1.071
56/2	17.86 x 2	1.051	1.059	1.07	1.084
60/2	16.67 x 2	1.065	1.073	1.085	1.1

The data analysis shows that, within the considered range of weft sett (number of picks) variation (from P_b =180 yarn/10 cm to P_b=240 yarn/10 cm), the index of breaking force utilization increases by 2.8% for the 20.83x2 tex yarns, and by 3.3% for the 16.67x2 tex yarns.

At the same time, one can notice that the utilization index of the yarns breaking force decreases with lengthwise density (yarn count), a diminution of the index value ranging between 3.94% and 4.36% being found. These differences appear also due to yarn set modification.

Considering these values, it is imperative that they are taken into account when developing the algorithm for the breaking force calculation, as a correction factor which influences the yarn consumption, therefore the manufacturing cost.

5. CONCLUSIONS

1. The value of the fabric breaking force is the resultant of the other structural characteristics, among which significant are the yarns, with their two characteristics: lengthwise density and yarns sett (pick spacing and yarn count), as well as the nature and proportion of the component fibers.

2. The utilization of synthetic fibers blended with wool fibers is motivated by practical reasons, imposed by the fabric behavior during their utilization, which shows off in the increase of the performances of some physico-mechanical parameters, such as: breaking force, friction force, creasing capacity, maintainability.

3. It has been demonstrated that in all the cases of wool and PES fibers blending, irrespective of the participation quota, the breaking force of the resulting yarns increases with the increasing PES quota [6, p.208].

4. One cannot put the equality sign between the breaking force of the 50 mm wide fabric strip, and the sum of the breaking forces of the single component yarns from the corresponding strip, at least for the following reasons:

5. Breaking force of the single yarns is determined with a dynamometer with a 500 mm distance between the clamps [15];

- Breaking force of the fabric integrated yarns is determined per groups of yarns contained in 50 mm wide strips, on a dynamometer with a 200 mm distance between clamps [13];
- Breaking force of the fabric integrated yarn is also influenced by the interaction between the component yarns systems, warp and weft, perpendicular to each other, by yarn sett (number of picks) and weave.

The yield of the breaking force of the fabric integrated yarn is defined by the ratio between the tenacity of the fabric integrated yarns and the tenacity of yarns before their integration into the fabric, named „index of breaking force utilization of fabric integrated yarns" (noted by I_r)

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

THE EFFECT OF SURFACE MODIFICATION PATTERN ONTO ANTIBACTERIAL FEATURES OF TEXTILES

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Abstract: The main result/outcome and characterizing attribute of the study envisages a facile route of ionic silver (Ag(NH3)2]OH) onto some linen fibrous supports previously grafted with MCT-β-CD (MonoChloroTriazinyl–β-CycloDextrin), in different concentrations. The method is aiming at an antibacterial activity/behaviour, without affecting other comfort attributes and mechanical strength.
In terms of *methodology*, an homogenous solution of $AgNO_3$, and amonia has been stirred, in order to obtain Ag(NH3)2]OH complex. After a 10 minutes ultrasonication phase, the linen fibrouss pecimens previously grafted with MCT-β-CD (MonoChloroTriazinyl–β-CycloDextrin), have been immersed in the homogenous solution, for 24 h.The fibrous supports surface patterning by grafting process has been evaluated through a co-assisted investigation system: FT-IR and XPS Spectroscopy. The antimicrobial activity of studied specimens has been quantitatively and comparatively tested, against and *Staphylococcus aureus* and *Escherichia Colli*. A remarkable efficient biostatic efficacy has been highlighted against *Escherichia Colli* bacile.
Key words: linen fibrous supports, grafting agent, antimicrobial activity surface modification

1. INTRODUCTION

Produced through the enzymatic degradation of starch, cyclodextrins (CDs) are nonreducing cycliclinked oligosaccharides (17). They have torodial shape, with a hydrophilic outer surface and an internal hydrophobic hollow cavity that can entrap a vast number of active ingredients as shown in Fig 1.

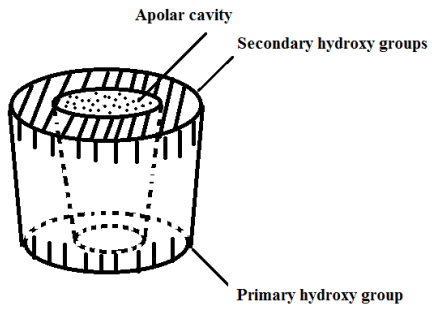


Figure 1. Scheme of cyclodextrin torus shape

Three different CDs can be obtained in various proportions: α-, β-, γ- Cyclodextrins constituted of six, seven, and eight, respectively, according to the environmental conditions. Their noticeable capacities of including hydrophobic compounds, as well as forming an inclusion complex

having antibacterial activity have been used in several areas, such as: food, pharmaceutical, and chemical industries (26). Containing citric acid and sodium hypophosphate (SHP), and acting as catalyst, they can also provide durable UV protective and anticrease features to finished fabric.
It has been proved, that in the textile field, inclusion of an antibacterial agent within the cavities of CD has a major advantage since it produces long-lasting biocidal action as compared to those fabrics that have been directly treated with an antibacterial agent for the purpose of imparting biocidal action (1, 21).

Having in mind the fact the increased resistance of bacteria against conventional antibacterial agents, textile research is now aiming at metals such as copper, zinc, cobalt, and silver because of their strong antibacterial properties (23).

Moreover, one of the most widely used metal as an antibacterial agent in medical textiles is silver (4,12, 19). It has a minimum inhibitory concentration (MIC) value of 0.050 mg/L against *Escherichia coli*. (11). There are a lot of reports regarding the investigation of antibacterial properties of silver nanoparticle loaded cotton fabric (5,18, 28). Grafting of monochlorotriazinyl- β-cyclodextrin (MCT-β-CD) with another insecticide, limonene, onto cotton fabrics is a remarkable and innovative technology (3). The novelty of this study, consists in entrapment of silver ions into the CD of chemically modified linen support by the adsorption and ion-exchange method and its antimicrobial attributes.

2. EXPERIMENTAL

2.1 Materials and methods

Linen fabric was purchased by a local textile mill. Salts of silver nitrate and ammonia were obtained from Floka, Germany. Double distilled water was used throughout the investigations. The fabrics were scoured in an aqueous bath for 30 min at 60 °C, 2% nonionic detergent liquid ratio 1:50. The scoured supports were washed with warm water followed by rinsing for 5 min in cold water and air dried.

2.2. Pretreatment (chemical modification) of the linen supports in order to obtain MCT loaded support

There are numerous chemical methods being used to modify linen support with CD, like watersoluble CD-based polymers, previously synthesized in a controlled manner by a one-pot synthesis method. The fixation between the linen support surfaces and synthesized water-soluble polymer is possible due to the covalently bond formed by polycondensation reactions (6).

The β-cyclodextrin modified with monochlorotriazine (β-CD-MCT) is fixed on the surface of linen support by the pad *(impregnation-squeezing)*-dry- cure method at a higher temperature (26).
In this case, the experimental protocol of grafting consists in the following stages:
- curing in an exicator for 24 hours, initial weighting of samples, preparation of ß- CD and alcalin catalysts (NaOH şi Na_2CO_3) solutions, preparation of impregnation bath having a 100 g/L concentration of ß-CD of and 50 g/L for Na_2CO_3;
- the linen supports were immersed in a solution containing 10-50 g/L of monochlortriazinyl β-cyclodextrin; the pH was adjusted to 4 using acetic acid, at room temperature for 30 minutes, then padded to pickup 100%;
- drying at room temperature for 12 hours; curing at 90÷170°C for different periods of time (1÷15 minutes), according to the experimental planning, for grafting performing; finally the support is washed thoroughly with tap hot and cold distilled water, up to pH=6,5-7;
- air drying.

The percent grafting (G) was calculated using the following expression:

$$\%Grafting(G0 = \frac{W_g - W_0}{W_0} \times 100 \quad \textbf{(1)}$$

where W_0 and W_g are the sample weights before and after graft copolymerization, respectively. Thus, possible host of entrapment foreign species is possible due to the the internal cavity of CD molecules, attached to the cellulosic supports (2).

2.3. Entrapment of Ag (I) ions into loaded MCT-modified linen support

Recently, novel strategies were developed to introduce silver (I) ions into grafted cotton support (10).

The present study used a dry preweighed piece of MCT grafted support which was equilibrated in distilled water for 24 h. H^+ ions come out from the swollen grafted linen support into an aqueous solution of AgNO3 (0,1M) (magnetic stirring, for 24 h, to form $Ag(NH_3)_2]OH$ complex) by the ion-exchange method; silver (I) ions were then incorporated onto the swollen cyclodextrin grafted linen support after 24 h at 27°C. An ultrasound stage of 10 minutes followed. Washing of support in distilled water for 15 min to remove unreacted salt has been subsequently made (20). When the equilibrium of CD-grafted support in the aqueous solution of $AgNO_3$ has been performed, silver ions entered into the internal hydrophobic cavity and accumulated there. An ultrasonication stage of 10 minutes has been made; subsequently, the previously MCT grafted linen specimens have been immersed in the initial solution, during 24 hours.

The description of each composite obtained is presented below:

Fibrous supports grafted with different concentrations of MCT which subsequently silver ions have been entrapped within				
P0 +$[Ag(NH_3)_2]OH$)	P2 + $[Ag(NH_3)_2]OH$	P3 + $[Ag(NH_3)_2]OH$	P4 + $[Ag(NH_3)_2]OH$	P5+ $[Ag(NH_3)_2]OH$
P0= Fibrous composite:reference	P2 = Fibrous composite:linen grafted with MCT1	P3 = Fibrous composite:linen grafted with MCT2	P4 = Fibrous composite:linen grafted with MCT3	P5= Fibrous composite:linen grafted with MCT4

2.4. Characterization of monochlortriazinyl β-cyclodextrin grafted support and entraped silver ions-loaded β-CD grafted onto linen supports.

2.4.1. Spectroscopic techniques

a. FT-IR spectroscopy

Among all specimens, the discussions have been oriented only to P5 indexed composite, which is the most relevant.

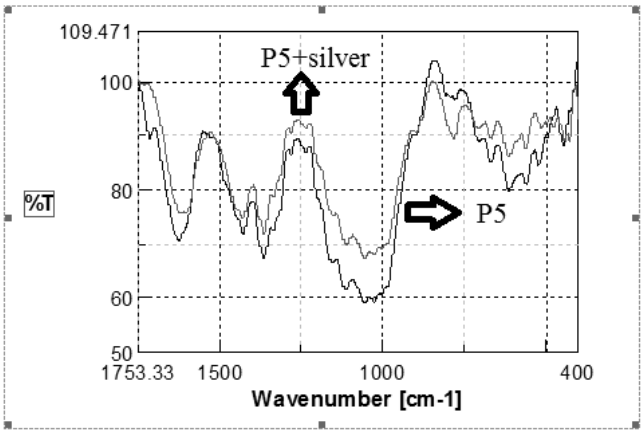


Figure 2. FT-IR spectra for MCT (monochlortriazinyl β-cyclodextrin) treated fibrous composite (P5) and P5+$[Ag(NH_3)_2]OH$

Spectra interpretation

In the FTIR spectra belonging to specimens treated with [Ag(NH3)2]OH some changes are noticeable, as follows :

1. A significantly diminishing or even the dissapearance of the band from 1717 cm^{-1} (νC=O). This fact could indicate a binding of oxygen (O) to nitrogen (N), resulting in an azometinic bound (νC=N), showing a vibration band at 1605 cm^{-1}.
2. The occurrence of some vibration bands at about 476 and 426 cm^{-1}, corresponding to Ag-N bounds (21).

b. XPS spectroscopy

In order to further elucidate the mechanism of antimicrobial finishing, the elemental composition of support surface was determined by XPS (Figs 3 and 4). It is shown that silver, carbon and nitrogen elements were detected on the treated support. A double peak of Ag on the surface of antimicrobial linen textiles was presented in the XPS spectra of silver (Fig. 3). The binding energies for these two peaks were 368.4 (3d5/2) and 374.2 eV (3d3/2), respectively, which were all higher than that of Ag2O (367.7 and 373.7 eV) (22) and AgO (367.3 and 373.2 eV) (13). But the difference of binding energies between these two peaks (5.8 eV) lied between that of Ag2O (6.2 eV) (14) and AgO (5.6 eV) (15). This suggested that there existed two different states of silver on the surface of supports. The overall high-antimicrobial ability of treated textiles should be a synergetic effect induced by both two silver states (16).

The C1s spectrum showed two peaks at 368.6 eV for C–N (azometinic bound) and 374.4 eV for O–C–O bond (Fig. 4), data which are in very good correlation with FT-IR spectroscopy.

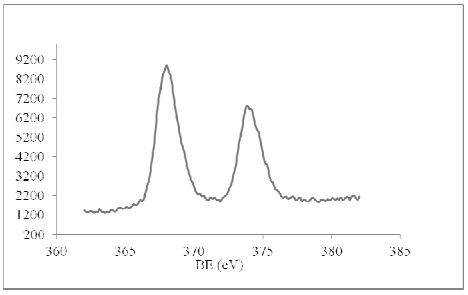


Figure 3 XPS spectrum of Ag3d in surface of P5 antimicrobial specimen

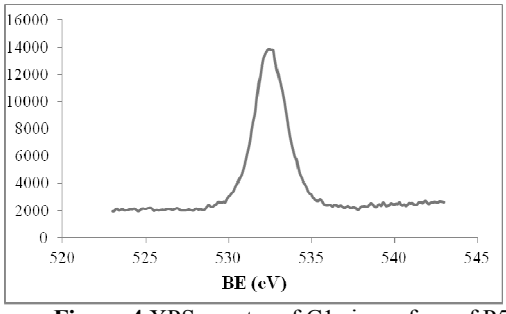


Figure 4 XPS spectra of C1s in surface of P5 antimicrobial support

ANTIBACTERIAL ACTIVITY OF CYCLODEXTRIN-GRAFTED LINEN SUPPORT

This type of investigation aimed at antimicrobial activity testing of linen fibrous composites grafted with different concentrations of monochlortriazinyl β-cyclodextrin.

Materials utilized and experimental protocol

The used materials: 1 cm^2 of fibrous linen support, treated with different concentrations with grafting agent; strains of standardized bacteria (ATCC), culture media used for bacteria (nutritive gelose and tomato juice agar), physiological serum and sterile consumables. The microbiologic investigations have been performed at Microbiology-Immunology Laboratory of University Centre of Medical and Veterinary Researches, within the Faculty of Veterinary Medicine, of Iasi. In order to evaluate the antimicrobial effect of studied fibrous composites onto human carrier skin, specimens from male individuals have been sampled. The samplings were obtained by means of sterile absorbers - exudates, from armpits zones, where favourable conditions for skin micro biota multiplying.

Experimental technique

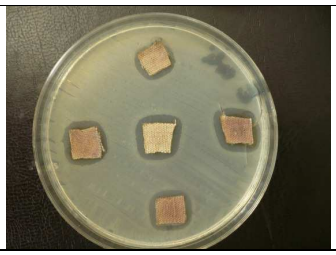
24 hours bacterial cultures have been used, grown in liquid medium. From these, decimal dilutions have been obtained, in order to monitor the antimicrobial effect, in terms of bacterial load. Thus, for Gramm positive strain (*Staphylococcus aureus,* according to ATCC 29213) the maximum dilution was of 10^3, and for Gramm negative strain (*Escherichia coli* according to ATCC 25922) the maximal dilution was 10^5. The comparison of turbidity has been realized with Mac Ferland nephelometric scale.

The embodiment method consisting in melting of nutritive gelose and cooling it at 45^0C, pouring of 9 mL of melt medium in Petri plate and its homogenizing with 1 mL from each dilution of tested bacterial strain was used. The fibrous specimens treated with different concentration of MCT were embodied in a semisolid and seeded medium. After solidification, the specimens have been incubated at thermostat for 24 hours at 37^0C.

3. RESULTS AND DISCUSSIONS

a. The inhibition area size for studied bacili

b. The size of inhibition area, for *Staphilococus Aureus*



c. The size of inhibition area, for *Escherichia Colli*

Fig. 5.The inhibition area size for studied bacili

Table 1. *In vitro* antimicrobial activity of AgO on standardized bacterial strains

Tested strains	Decimal dilutions	Inhibition areas (mm) of fibrous supports grafted with different concentrations of MCT which subsequently silver ions have been entrapped within				
		P0 Fibrous composite:reference +silver	P2 Fibrous composite:linen grafted with MCT1+silver	P3 Fibrous composite:linen grafted with MCT2+silver	P4 Fibrous composite:linen grafted with MCT3+silver	P5 Fibrous composite:linen grafted with MCT4+silver
Staphylococcus aureus ATCC 29213	10^1	0	0	0	□5	□8
	10^2	0	□2	□5	□10	□15
	10^3	□2	□13	□20	□70	□80
Escherichia coli ATCC 25922	10^1	0	0	0	0	0
	10^2	0	□2	□10	□15	□35
	10^3	□2	□5	□10	□20	□50

In order to show biocidal action against *E. coli*, silver (I) ions have been frequently applied (20, 28); however, the mechanism of the biocidal action of silver is not quite clearly delimited. Nevertheless it is believed that on contact with moisture, Ag+ ions are released from grafted linen support and they bind both to microbial DNA, preventing bacterial replication, and to the sulfur hydryl group of metabolic enzymes of the bacteria electron transport chain, thus causing their inactivation. The bactericidal action of Ag-loaded support depends upon the concentration of AgNO3 solution per 30 mL distilled water and extent of grafting of copolymer onto support, respectively. Five silver-loaded grafted supports have been prepared by immersing five different grafted samples (with different concentrations of MCT) into AgNO3 solution. The results of antibacterial tests have been well shown in Fig. 5. A clear zone of inhibition can be clearly seen in the Petri dish supplemented with Ag (I)-loaded supports, as shown in Figs. 5b, 5c. It is not very clear if the higher the concentration of grafting agent, the higher will be the loading of Ag(I) into the CD cavities; hence, the bacterial growth inhibition capacity of resultant supports are approximately the same, since the concentrations of grafting agent is not sensitively different one to each other. It was expected to highlight a correlation/dependence between the bactericidal action of Ag-loaded support and the extent of grafting of copolymer onto support. In order to prove the idea that a greater amount of grafting on the support will induce a greater power bacterial growth inhibition (25), further studies will be performed with the respect to increase the concentration of grafting agent (MCT).

6. CONCLUSIONS

In the present study, CD-grafted line supports have been used in entrapment of silver ions into cavities of obtained inclusion compounds that produces long-lasting and effective biocide action and may provide protection to the support against environmental encounters during handling and washing

of supports, thus enhancing its shelf-life. Specimens with CDs can be loaded with the necessary silver concentrations.

The antimicrobial linen supports were prepared by the sol–gel method using AgNO3 solution. Some conclusions were obtained as following:

(1) Antimicrobial linen supports were achieved with CD treated linen support using silver nitrate solution by soaking process.

(3) The antimicrobial textile showed an excellent antimicrobial effect against *E. Coli*.

(4) XPS confirmed that silver presented on the surface of the antimicrobial textile was in two different states, i.e. Ag+ and Ag2+. Both two silver states have contribution to the overall antimicrobial activity.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

EFFECT OF SELECTING HEALD FRAME POSITION ON FABRIC PROPERTIES

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Abstract: Shedding is the first primary motions of loom. It is done by raising and lowering the Heald frames. The heald frames on a loom are positioned side by side with a little distance as possible. The different positions of heald frame causes the variation in distance from cloth fell to peek of shed. In the present paper, the effect of this positional variation upon warp yarns, fabric properties and most importantly the whole weaving procedure have been concentrated. To find out the significance of this effect, two categories of fabric was produced using same weave (combination of plain and twill) but changing drafting plan. In the first category, the warp yarns having plain weave were threaded to heald frames nearest to the cloth fell and the other portion of warp yarns having twill weave were threaded farthest to the cloth fell. The drafting plan of second category was reverse the first category. All the other parameters were same in both cases. During weaving, weaving performances was observed and recorded in both cases. Later, crimp% of plain and twill portion of both fabrics were measured by Tautex Digital Crimp Tester and yarn strength of plain and twill portion of both samples were measured by Titan universal strength tester. It was observed that selecting heald frame position have substantial effect on crimp%, yarn strength and fabric performance. It is expected that this study will be help full to increase weaving performance and ensure better fabric quality in case of producing fancy weave.
Key words: Shedding, heald frame, drafting plan, plain and twill

1. INTRODUCTION

Shedding is the first of the three primary motions of loom. The art of shedding to separate the warp yarns into two sets of yarns between successive picks is one of the major concerns to produce a quality fabric. It is imperative to create sheds accordingly to create desired effect on the produced fabric. To create larger and complex designs there has been facilities to house a large number of heald frames in a loom.

The growing needs for bulk fabric production causes to run looms at a very high speed. This puts an immense but unavoidable force on yarns during weaving. It is the duty of the weaver to maintain uniformity of various factors which affect yarns throughout the production stages in order to achieve a uniform product. Even a slightest of change in force may cause a major fault which in turn leads to an undesired product. For this, every single motion involved in weaving must be studied and considered to create production plans.

Modern day dobby looms may have up to 24 heald frames [6]. The heald frames on a loom are positioned side by side with as little distance as possible. Yet the distance becomes quite a fact when compared to heald frame positioned at the front to the heald frame positioned at the far back. So it becomes an interesting subject of study on the effect of this positional variation on the yarns, the produced cloth and most importantly the whole weaving procedure.

2. EXPERIMENTAL

The experimental fabric was produced at Akij Textile Mills Limited and Paramount Textile Limited and testing was conducted at the testing laboratory of Ahsanullah University of Science and Technology (AUST).

2.1 Experimental loom

The experimental loom was fully computerized modern dobby loom which is used for sampling purposes. It is called SL 8900 Evergreen, made by CCI Tech Inc., Taiwan.It is shown on figure-1.

Figure 1: CCI Tech SL8900 Evergreen

2.2 Shed characteristics of experimental loom

The shed type of the experimental loom was clear or regular shed which mean the shed angle remains same throughout the sheds formed by all the heald frames in a loom [5]. To achieve this type of shed, the heald frames located at the back need to move up and down more than the healds located at the front [1, 6]. A clear shed is shown in figure 2. This type of shed is found in all air jet looms.

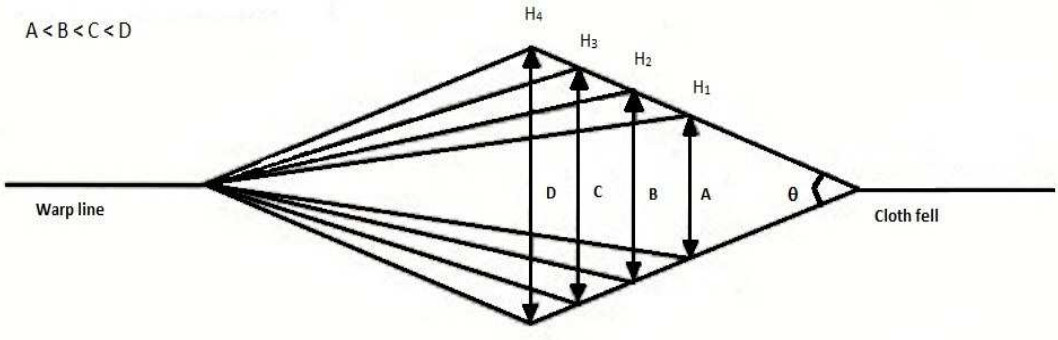

Figure 2: Clear shed

From the figure 2 it is clear that the distance needed to create the shed angle θ is more for the back heald frame H_4 than the front heald frame H_1as depth of shed D for the back heald shaft is far more than A, the depth of shed of the front heald shaft. Thus the tension put upon the warp is more for the back healds than the front healds [1]. This effect becomes quite severe when weaving fabric with large number of heald frames.

2.3 Raw Materials Used

The experimental fabric was produced using 100% cotton yarn.The produced fabric specification were $\frac{40 \text{ X } 40}{110 \text{ X } 70} \times 10$” and $\frac{40 \text{ X } 40}{140 \text{ X } 80} \times 10$” respectively.

2.4 Weave selection and sample preparation

For the experimental purpose four sample was produced using two types of weave.The weave of the 1st and 2nd sample was a combined structure of $\frac{1}{1}$ plain with $\frac{2}{2}$ twill and the weave of the 3rd and 4th sample was another combined structure of $\frac{1}{1}$ plain with $\frac{3}{1}$ twill.Both weave was slected such a way that the drafting plan is like as straight draft within 8 heald frame and weave repeate remain same in all cases.The 1st sample (Fig:3) and 3rd sample was produced keeping twill portion in front heald frame (H_1 - H_4) and plain portion in back heald frame (H_5 - H_8).The 2nd sample (Fig:4) and 4th sample was produced by changing the lifting plan so that plain portion remain in front heald frame (H_1 - H_4) and twill portion remain in back heald frame (H_5 - H_8)[3,4].In the figure, H_1 - H_8 represent the heald frame no, P_1-P_4 represent picks and E_1-E_8 represent the ends per repeat in the weave.Idea about the the weave structure is mentioned below:

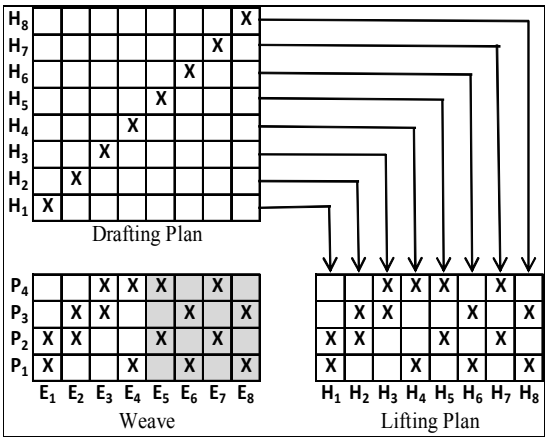

Figure 3: Weave of sample 1

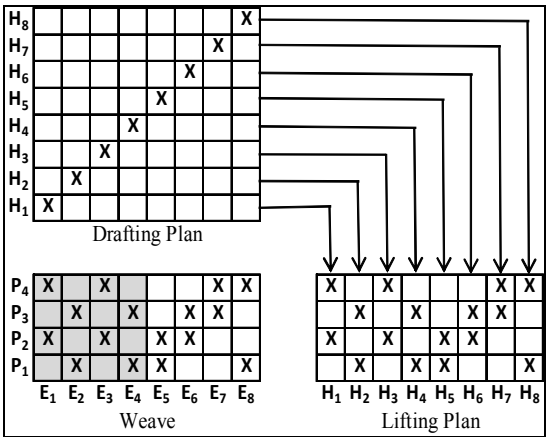

Figure 4: Weave of sample 2

2.5 Experimental results

2.5.1 Effect of heald frame positions on crimp%

Due to the interlacing of warp and weft threads a certain amount of waviness is imparted to the warp and weft threads in the fabric. This waviness is called crimp.Warp crimp was measured by using the TAUTEX Crimp Tester. Initially the instrument was calibrated by using a weight of 250 gm and the distance between the upper jaw and coupling end of the weight was 110cm. And the zero value was obtained in the monitor of the instrument.The pretension for the warp yarn and different weft yarns were calculated by using following formula [2].

Pretension (gm) = (0.2 X Yarn count in Tex) + 4

Ten different samples were taken from the plain portion as well as twill portion for every sample.The length of each specimen was 30cm. The yarn from the fabric samples was pulled carefully and two ends of these yarns were mounted at the upper and lower jaws of the instrument. And the tension on the yarns was applied to the yarns by moving the lower jaw slowly downwards until the monitor of the instrument showed the required pretension. Then the reading of the straightened length of the yarn was taken from the scale of the instrument. By using the following formula crimp of each individual yarns was calculated [2, 3].

$$\text{Crimp } \% = \frac{L-p}{p} \times 100$$

(Where, L is the straightened length of the yarn and p is the length of yarn in fabric)

Data obtained for testing the first sample, second sample, third sample and fourth sample are shown in the table 1, table 2, table 3 and table 4 respectively.

Table 1: 2/2 twill portin in the front and plain portion in the back heald frame

No. of observation	L	p	Crimp% in plain portion	Avg. Crimp % (x)	L	p	Crimp% in twill portion	Avg. Crimp % (y)	Difference of Crimp% (x-y)
1	34.6	30	15.33	16.5	34.5	30	15	15.6	0.9
2	35.2	30	17.33		34.8	30	16		
3	35.2	30	17.33		34.6	30	15.33		
4	35.1	30	17		34.7	30	15.67		
5	34.9	30	16.33		34.9	30	16.33		
6	35	30	16.67		34.8	30	16		
7	35.2	30	17.33		34.6	30	15.33		
8	35	30	16.67		34.7	30	15.67		
9	34.8	30	16		34.6	30	15.33		
10	34.5	30	15		34.4	30	15.33		

Table 2: 2/2 twill portin in the back and plain portion in the front heald frame

No. of observation	L	p	Crimp% in plain portion	Avg. Crimp % (x)	L	p	Crimp% in twill portion	Avg. Crimp % (y)	Difference of Crimp% (x-y)
1	35.3	30	17.67	15.63	34.6	30	15.33	14.8	0.83
2	34.9	30	16.33		34.6	30	15.33		
3	34.8	30	16		34.5	30	15		
4	35.4	30	18		34.3	30	14.33		
5	34.4	30	14.67		34.2	30	14		
6	34.5	30	15		34.5	30	15		
7	34.2	30	14		34.6	30	15.33		
8	34.5	30	15		34.4	30	14.67		
9	34.5	30	15		34.4	30	14.67		
10	34.4	30	14.67		34.3	30	14.33		

Table 3: 3/1 twill portin in the front and plain portion in the back heald frame

No. of observation	L	p	Crimp% in plain portion	Avg. Crimp % (x)	L	p	Crimp% in twill portion	Avg. Crimp % (y)	Difference of Crimp% (x-y)
1	35.7	30	19	19.332	35.4	30	18	18.178	1.154
2	35.8	30	19.33		35.5	30	18.33		
3	35.7	30	19		35.6	30	18.6		
4	36.1	30	20.33		35.6	30	18.6		
5	35.7	30	19		35.5	30	18.33		
6	35.7	30	19		35.1	30	17		
7	36.1	30	20.33		35.5	30	18.33		
8	35.8	30	19.33		35.5	30	18.33		
9	35.7	30	19		35.6	30	18.6		
10	35.7	30	19		35.3	30	17.66		

Table 4: 3/1 twill portin in the back and plain portion in the front heald frame

No. of observation	L	p	Crimp% in plain portion	Avg. Crimp % (x)	L	p	Crimp% in twill portion	Avg. Crimp % (y)	Difference of Crimp% (x-y)
1	35.7	30	19	18.466	35	30	16.666	17.232	1.234
2	35.7	30	19		35.4	30	18		
3	35.5	30	18.333		35.3	30	17.666		
4	35.5	30	18.333		35.3	30	17.666		
5	35.4	30	18		35	30	16.666		
6	35.5	30	18.333		35	30	16.666		
7	35.7	30	19		35.1	30	17		
8	35.3	30	17.666		35.3	30	17.666		
9	35.4	30	18		35	30	16.666		
10	35.7	30	19		35.3	30	17.666		

2.5.2 Effect of heald frame positions on tensile properties

The tenacity of the warp yarn in plain and twill portion for every sample was investigated by using Titan Universal Strength Tester.The results have shown in the Table-5 and 6.

Table 5: Tenacity of warp yarn of sample 1and 2

Specimen	Sample 1				Sample 2			
	Twill portion		Plain portion		Twill portion		Plain portion	
	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity
01	14.50	13.62	12.37	9.44	12.85	14.74	12.71	13.04
02	15.46		10.06		12.47		12.41	
03	12.54		5.73		17.12		11.85	
04	15.16		8.98		12		11.74	
05	10.44		10.6		19.24		16.48	

Table 6: Tenacity of warp yarn of sample 3 and 4

Specimen	Sample 3				Sample 4			
	Twill portion		Plain portion		Twill portion		Plain portion	
	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity	Tenacity cN/tex	Average Tenacity
01	11.56	11.80	11.82	11.31	14.85	14.09	14.26	13.46
02	11.18		11.47		14.10		12.49	
03	13.13		10.84		13.52		13.03	
04	10.73		10.55		14.75		13.52	
05	12.39		11.85		13.25		14.01	

3. DISCUSSION OF RESULTS

3.1 Effect of heald frame positions on crimp%

Table1-4 and chart1 and chart 2show that warp crimp are higher for plain portion than twill portion in all cases. This may be due to the fact that in plain portion the number of interlacement is more than that of twill portion.This excess amount of yarn can reduce the excess tension from warp yarn exerted by the farther heald shafts.Due to that reason crimp% was lowered in case of sample 2 and sample 4 i.e. when the plain portion of the weave repeat was threaded through the front or nearer heald shafts. The reduced crimp% will lead to lower yarn consumption which will give us upper hand to reduce manufacturing cost and increase profit.

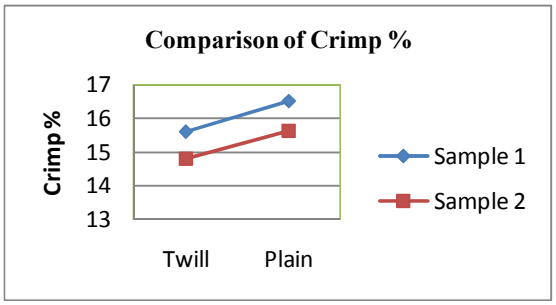

Chart-1: Effect of heald frame position on crimp%

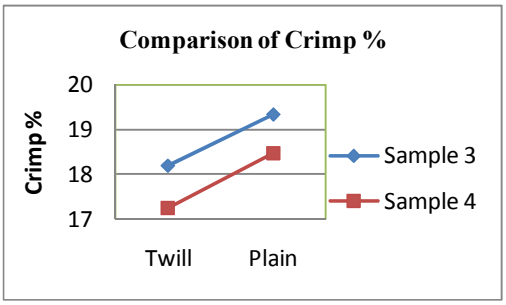

Chart-2: Effect of heald frame position on crimp%

3.2. Effect of heald frame positions on tensile strength

Lowest crimp% will increase the tensile strength [5]. Table 5 and table 6 are showing the same scenario i.e. the tenacity of warp yarn is higher in case of sample 2 and sample 4.Higher strength of warp yarn reduces the end breakage; improve fabric quality and finally increase the productivity of the loom.

4. CONCLUSIONS

This paper lead to many important observations regarding selecting heald frame at the time of drawing-in the warp yarn for weaving.It is found that if the weave repeat contain varieties of warp floats then the front or nearer heald frame should select for threading the yarn of shorter warp floats.As a result the warp crimp% and end breakage will be reduced.Finaly it can be stated that properly heald frame selection may help to increase the productivity of the loom and improve the fabric quality.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

DETERMINATION OF OPTIMUM PERFORMANCE REGIME FOR SUNSTAR BUTTONHOLE MACHINE BY VIBRATIONS MEASURING TECHNIQUE. PROCESSING THE DATA MEASURED WITH DATA EXPLORER SOFTWARE MODULE

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Abstract: In the case of buttonhole machines, it is considered that vibrations can cause thread breakage and needle wear and measures should be taken to eliminate or reduce them. For this purpose, for diagnosing the causes of SunStar machine buttonholes stoppages, vibration measurements were made. These were performed in each measuring point, by installing a vibration sensor on the three directions of Cartesian coordinate system: axial (X), horizontal (Y), vertical (Z).
Key words: vibrations, buttonhole machine, thread breakage, optimum performance regim

1. INTRODUCTION

By the late 1970s it was only sufficient the maintenance of industrial equipment so that they produce at their maximum capacity, intervention on the equipment was only done in the case of system crash due to wear in some places or degradation. Repairing meant the replacing of the damaged subassembly or even the entire machine. [3]

Therefore, a major concern for management companies and experts in machinery and equipment was the still is the development of organizational measures and technologies to reduce as much as possible crash of equipment, and duration of unavailability. [2]

Operating status of any equipment in the industry, be it, static or dynamic, is the main concern of designers and those who exploit it. One of the characteristics of this state is the vibratory motion. Global measurements of vibration provide a quick and useful indication of the approved vibration level, useful if you want to obtain information on the general condition of a dynamic machine or vibration isolation effectiveness. [1]

Vibrations represent a mechanical agent harmful to machines, making a movement whose energy is used in useful industrial processes. In practice vibrations can not be avoided, they are a result of machinery operation, the environmental action on mechanical structures of the machines. Relatively low level vibrations can propagate along the elastic structure of the equipement, trigerring other parts of the structure to resonance vibration and this becomes the significant source of noise and vibration harmful for equipment operation. [8]

Technology has greatly developed so that vibration monitoring can be performed with a variety of devices and systems, measuring equipment choice is one of the most important objectives of the implementation of predictive and proactive maintenance.

In the case of buttonhole machines, it is considered that vibrations can cause thread breakage and needle wear and measures should be taken to eliminate or reduce them. For this purpose, for diagnosing the causes of SunStar machine buttonholes stoppages, vibration measurements were made.

These were performed in each measuring point, by installing a vibration sensor on the three directions of Cartesian coordinate system: axial (X), horizontal (Y), vertical (Z). Measurements were performed in Garments laboratory, Department of Industrial and Management Engineering in Textile

and Leatherworks from the University of Oradea. Buttonholes were made on the following materials: polyester, wool and cotton.

Figure 1. SunStar buttonhole machine

Figure 2. Materials on which buttonholes were made

Vibration measurements were made with Impaq FFT spectrum analyzer, manufactured by Benstone Instruments Inc., USA. Impaq is a portable analyzer with color graphic display, keyboard and display functions for the graphics measured and analyzed. The technical characteristics of the analyzer are listed below: [5]

Analog input channels:	4 syncronized channels 1 auxiliary channel for speed and phase measurements
Input ytpe:	ICP, AC, DC
Maximum input range:	± 20 V
Frequency range:	0-40.000 Hz;
Analog-to-digital converter:	24 bit
DSP Processor:	TI TMS320C6711
Dynamic range:	> 90dB
Spectral resolution:	12 800 spectral lines;
Screen:	LCD color TFT-65536 colors
Communication intergace with the PC:	USB 1.1, mini USB type B connector
Auto-testing function:	check cable intergrity and vibration sensor
Memory:	16MB+2 GB Compact Flash PCMCIA
Input connectors:	4 pin Lemo, Aux: 6 pin Lemo
Auxliary channel:	TTL (TTL output, external speed and phase sensor, output RS-232C for printer)
Operating system:	Windows CE

Fig. 3. Impaq analyzer description [5]

Vibration analyzers include a data analysis software that is installed on the PC. Program allows downloading and analysis of data performed by software modules installed in the vibration analyzer. It also has functions for post processing data, simultaneous viewing of several types of diagrams and spectra, making mathematical relationships (+, -, *, /), integration, derivation, etc. Real-time filters. [6]

However, better programs also have data export facilities in the following file formats: UFF, BUFF, ASCII UFF, MATLAB, files ASCII (eg MS Excel) and user-defined and automatic generation of technical reports according to the application studied, defining custom templates, save as HTML, PDF, EXCEL and WORD. [7]

In conclusion, vibration analyzer is ideal for use in all industrial fields.

The following AMC were used and software modules for analysis and diagnosis of machine buttonholes errors:

a. **Vibrometer** – for global vibration measurements to establish qualification for the operation of buttonholes machine.
b. **Waveform and FFT analysis** – in order to operate waveform and frequency spectrograms on one or more channels. With the help of this software settings for the frequency range, measuring parameters, number of mediations, etc. can be performed.
c. **Data Explorer** – installed on your computer and allows analysis and interpretation of data measured with the Impaq analyzer.

2. EXPERIMENTAL PART

Before the vibration measurements were determined following technical requirements: type of vibration measurements; setting points and directions of measurement; vibration parameters and their values; setting the operating regimes.

Vibration sensor used for measurements was a general purpose piezoelectric accelerometer with sensitivity of 100 mV/g, recommended for vibration measurements machines with speed over 600 rpm. Vibration measurements were made in each measuring point, on three directions defined by the Cartesian coordinate system (X, Y, Z).

Frequency domains for global vibration measurements and FFT analysis were saved in analyzer Impaq memory, after that were transferred on the Data Explorer computer software.

Since the buttonhole machine manufacturer specifies neither acceptable levels of vibration which set qualifications for the operation of the machine and nor optimal regimes to increase the reliability, we determined that this technique can be determined by measuring vibration and faults diagnosis of needle by infrared respectively.

In this respect the following measurement parameters were determined, in accordance with the regulations:

ISO-10816-1-1995 Mechanical vibration. Evaluation of machine vibration by measurements on non-rotating parts, Part 1: General requirements. [9]

ISO-5348-1998 Vibration and mechanical shocks. Mechanical setting of accelerometers i.e. [10]:

– effective vibration speed [mm/s] rms, in the frequency range - 2-1000 Hz <600 cpm;
–effective vibration movement [μm] rms in the frequency range - 2-1000 Hz <600cpm;

2.1. Spectral analysis of vibration and fault diagnosis

2.1.1. Measurement of vibrations on the direction of axial measurement (X)

After collecting data from the sewing machine and their transfer to the computer operating system that works with Data Explorer application, it begins the analysis and fault diagnosis stage.

Frequancy ranges for these collections were chosen to cover the entire domain of expression of any faults, not just those related to causes of buttonholes machines stoppages. After choosing this working method, functioning regimes were established from 1000 cpm to 2200 cpm. [4]

Collecting data from the Sunstar buttonholes machine was monitored and then performed in the following fields of vibrations: speed, movement and acceleration.

Figure 4. SunStar buttonhole machine with measuring vibration sensor installed on the axial direction

The material selected for buttonhole was 100% polyester, 35 mm stroke length, on axial measurement direction.

Collecting data using vibration is done with the help of transducers which will take vibrations spectra and convert them into electrical information that will be transmitted to the data collection system. Depending on the vibrations parameter measured, transducers can evaluate the amplitudes of vibration, vibration velocity or acceleration of vibration.

Amplitude of vibration recorded at the measuring point is shown in the table below: [4]

Table 1. Amplitude of vibrations depending on operating mode with sensor on the axial

OPERATING MODE	AMPLITUDE OF VIBRATIONS		
No. ***cpm***	**SPEED** ***mm/s*** **[rms]**	**MOVEMENT** ***µm*** **[rms]**	**ACCELERATION** ***g*** **[rms]**
1000	1,5	13	0,04
1100	3	26	0,07
1200	8,2	64	0,1
1300	6,8	52	0,12
1400	5,5	43	0,1
1500	5,3	43	0,12
1600	5,1	33	0,13
1700	4,9	28	0,12
1800	4,5	25	0,14
1900	4,3	23	0,14
2000	3,8	18	0,14
2100	4,7	22	0,15
2200	5,6	25	0,17

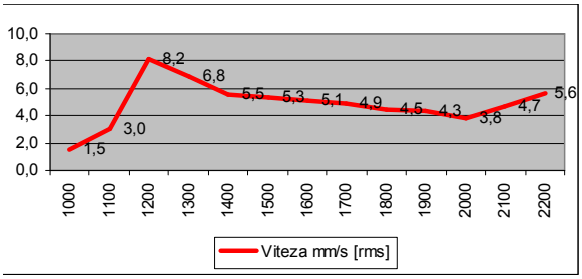


Figure 5. Speed amplitude depending on operating mode

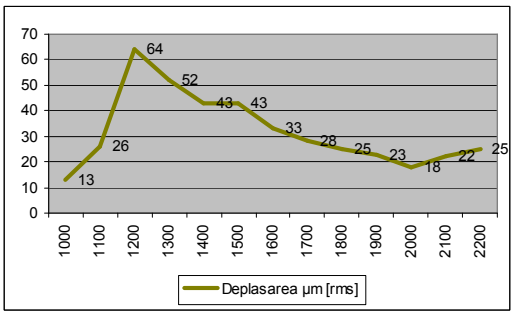


Figure 6. Movement amplitude depending on operating mode

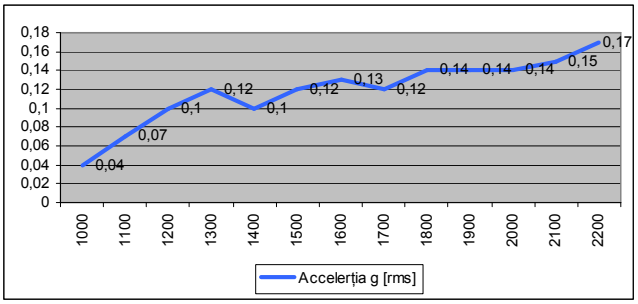


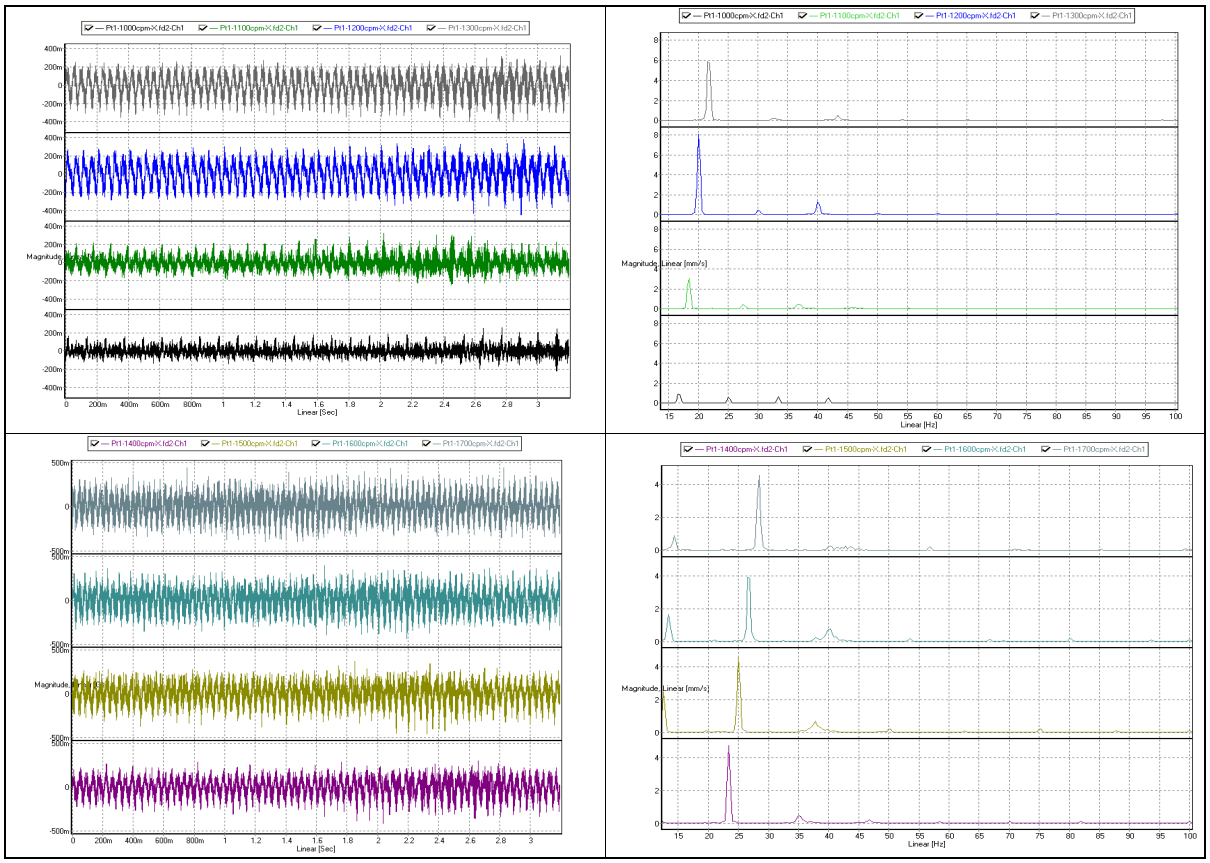
Figure 7. Acceleration amplitude depending on operating mode

Note that the lowest amplitude of the speed, which has optimal productivity and machine reliability increase, is 3.8 mm/s at 2000 cpm operating mode (Fig. 5).

In Figure 6 we can see that the amplitude of movement of the working regime of 2000 cpm up to 2200 cpm is approximately constant.

Acceleration gives impact "metal on metal" resulting an acceleration approximately linear as shown in Figure 7.

Waveforms and frequency spectograms for Sunstar buttonhole machine, measuring on the axial direction, recorded at the measuring point Pt1, are shown in the figure below:



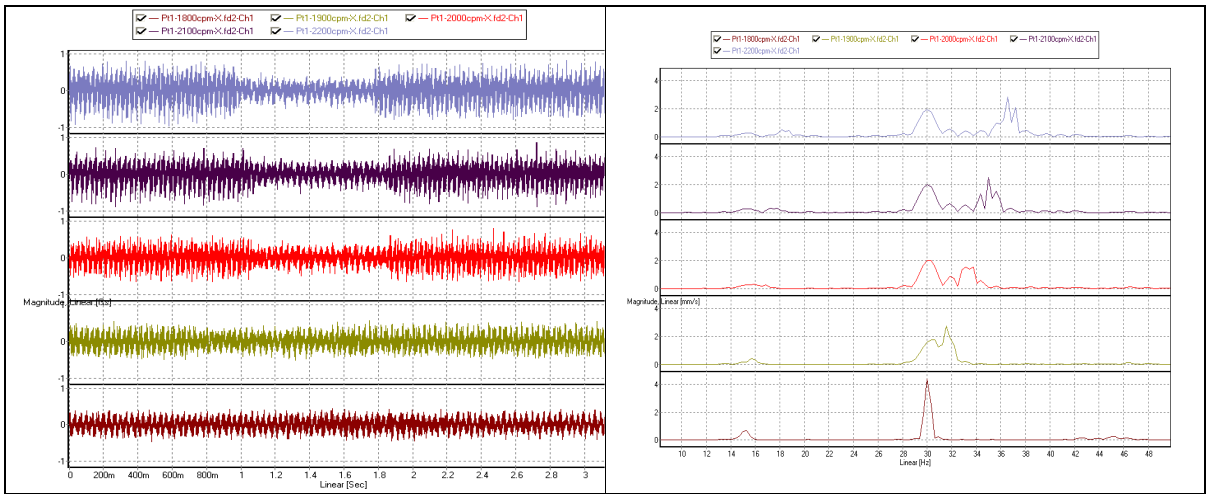


Figure 8. Waveforms and frequency spectograms recorded at the measuring point Pt1 measuring on the axial direction

The waveform shows amplitude variations only when there are changes to the operation regime of the machine buttonholes up to a working regime of 2000 cpm. The fundamental dominates the spectrum. In this regime of over 1900 cpm we observe in the spectrum an amplitude of 20 HZ which is generated by translational motion in the Z plane and by the change of buttonhole sewing direction. Optimum operating regime for this direction of measurement is 2000 cpm.

2.1.2. Vibrations measurement on the horizontal direction (Y)

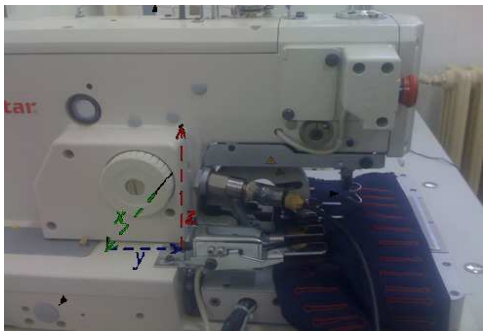


Figure 9. SunStar buttonhole machine with sensor for measuring vibrations installed on the horizontal direction

The material selected for buttonhole was 100% polyester, 35 mm stroke length, and direction of measurement - horizontal.

Amplitude of vibration recorded at the measuring point is shown in the table below: [4]

Table 1. Vibration amplitude depending on the operating mode with horizontal sensor

OPERATING MODE	**AMPLITUDE OF VIBRATIONS**		
No. ***cpm***	**SPEED** ***mm/s*** **[rms]**	**MOVEMENT** ***µm*** **[rms]**	**ACCELERATION** ***g*** **[rms]**
1000	1,4	7	0,14
1100	1,2	6	0,1
1200	2,6	18	0,1
1300	3,9	15	0,1
1400	2,6	18	0,1

1500	1,6	12	0,1
1600	2,3	12	0,13
1700	1,7	10	0,14
1800	2,4	11	0,15
1900	3,2	17	0,15
2000	4	19	0,16
2100	5,7	28	0,2
2200	6,5	29	0,25

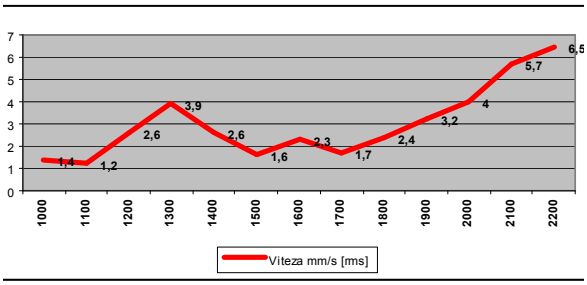


Figure 10. Speed amplitude depending on operating mode

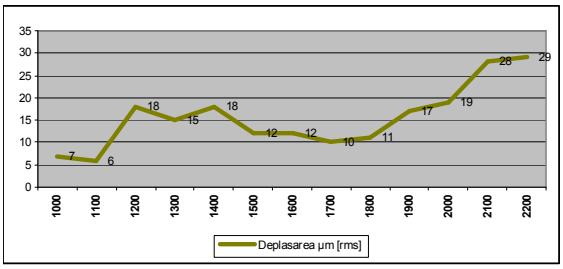


Figure 11. Movement amplitude depending on operating mode

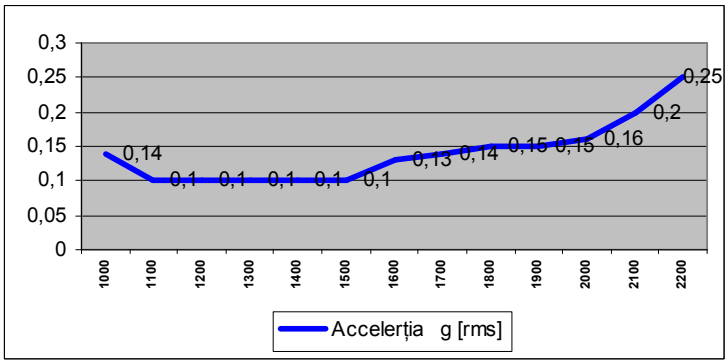


Figure 12. Acceleration amplitude depending on operating mode

Note that the lowest amplitude of the speed at which productivity is optimal and increases the machine reliability (by breaking the thread at higher intervals of time) is 1.7 mm/s at 1700 cpm operating mode (Fig. 10) .

In Figure 11 we can see that the amplitude of movement at 2000 cpm up to 2200 cpm operating mode is approximately constant.

Acceleration gives the impact "metal on metal" resulting in an approximately linear accelerator as shown in Figure 12.

Waveforms and frequency spectograms for SunStar buttonholes machine recorded at the measuring point Pt1 on the horizontal direction are shown in the figure below:

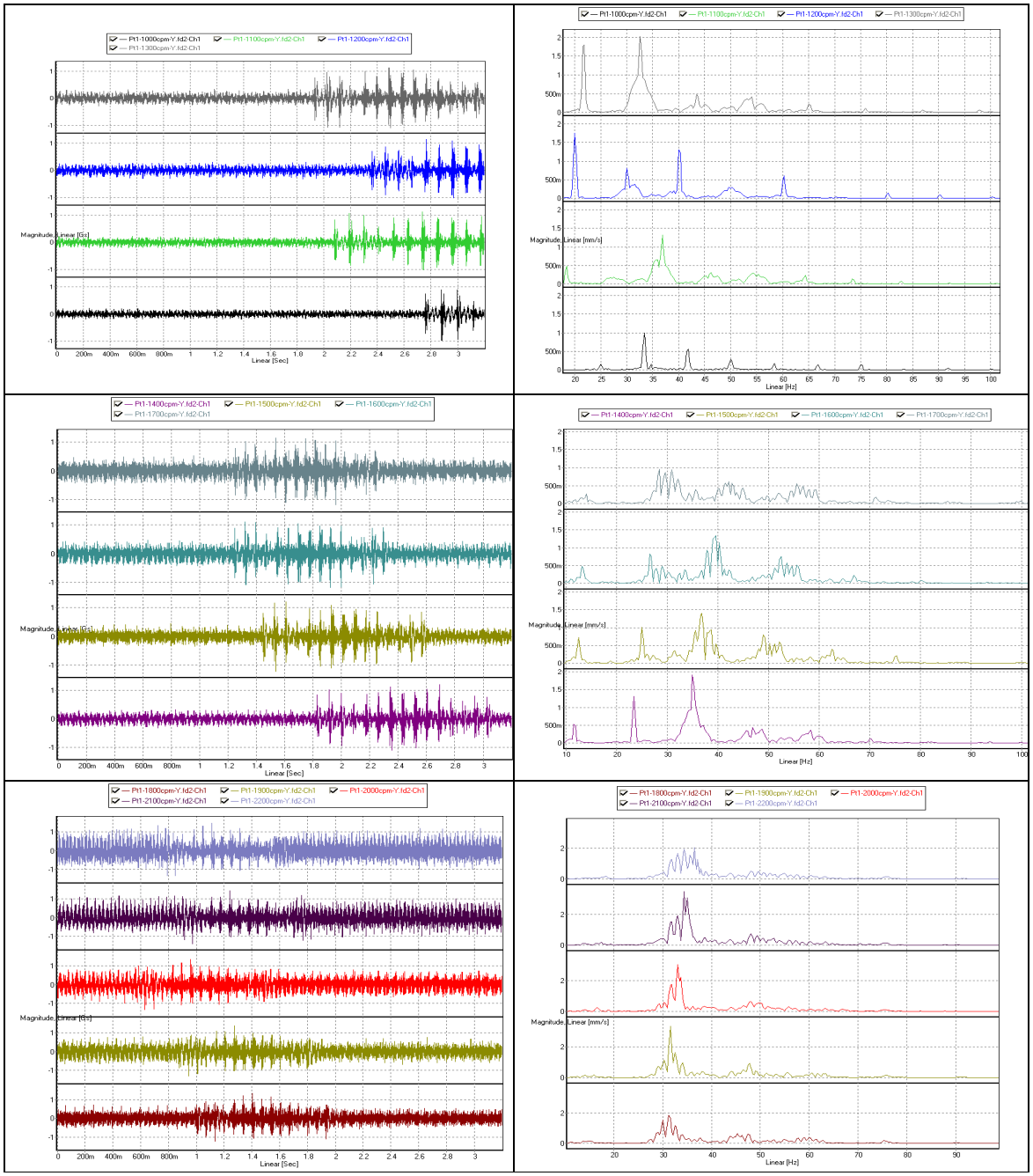


Figure 13. Waveforms and frequency spectogramele recorded at the measuring point Pt1 on the horizontal direction measurement

Fig. 13 shows that for each mode of operation up to 1800 cmp occur fluctuations in quite large waveform due to changes in the movement direction needed for the buttonhole. Up to the operating mode of 1800 cpm in frequency spectograms it can be observed besides fundamental and harmonic 2x an interharmonics which could be the result of a possible friction which appears in the translational motion of the bucket in the direction Y. To eliminate this friction is recommended to lubricate the translation mechanisms of the bucket. Over the 1800 cpm operating mode dominates in the spectrum the fundamental with sidebands which may be due to lack of lubrication of bucket translation mechanisms.

2.1.3. Vibrations measurement on the vertical direction (Z)

Figure 14. SunStar buttonhole machine with sensor for measuring vibrations installed on the vertical direction

The material selected for buttonhole was 100% polyester, 35 mm stroke length, and direction of measurement - vertical.

Amplitude of vibration recorded at the measuring point is shown in the table below: [4]

Table 3. Vibration amplitude depending on the operating mode with vertical sensor

OPERATING MODE	**AMPLITUDE OF VIBRATIONS**		
No. ***cpm***	**SPEED** ***mm/s*** **[rms]**	**MOVEMENT** ***µm*** **[rms]**	**ACCELERATION** ***g*** **[rms]**
1000	1,4	11	0,07
1100	2,2	15	0,08
1200	7	59	0,1
1300	9	100	0,14
1400	10	117	0,15
1500	11	118	0,16
1600	8	70	0,15
1700	6,5	43	0,2
1800	6	35	0,25
1900	5,4	30	0,35
2000	5,3	28	0,33
2100	6,5	37	0,4
2200	7	30	0,5

Based on this table, diagrams were made for: speed amplitude, movement amplitude and acceleration amplitude depending on the operating mode

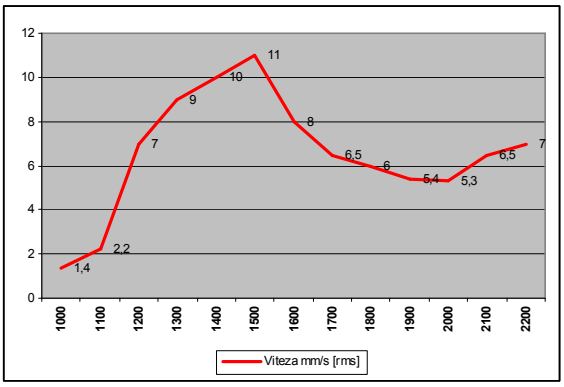


Figure 15. Speed amplitude depending on operating mode

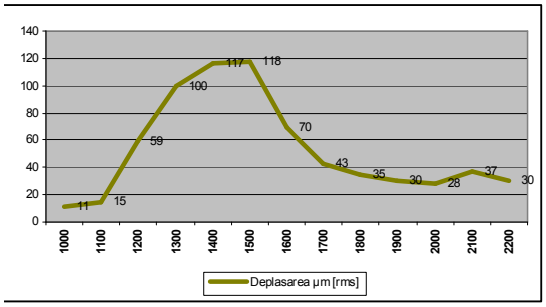


Figure 16. Movement amplitude depending on operating mode

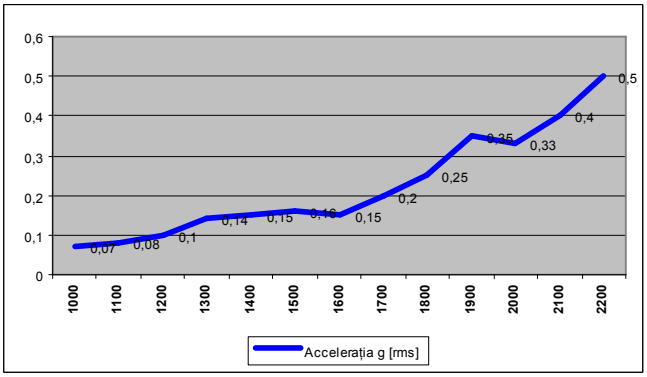


Figure 17. Acceleration amplitude depending on operating mode

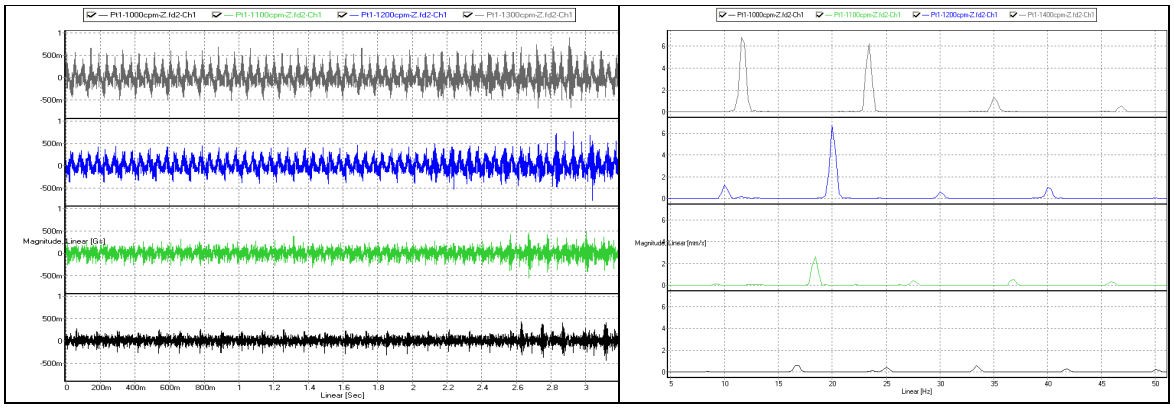
Figure 15 shows that the lowest amplitude of speed, for which productivity is optimal and increases the machine reliability is 5.3. mm/s at 2000 cpm operating mode.

It is not recommended to work with the machine at a regime of 1500 cpm, because the vibrations level is very high.

It can be seen from Figure 16 that the amplitude of movement, from 2000 cpm to 2200 cpm operating mode, is approximately constant.

Acceleration gives impact "metal on metal" resulting an acceleration approximately linear as shown in Figure 17.

Waveforms and frequency spectograms for SunStar buttonholes machine recorded at the measuring point PT1, on the vertical direction, are listed below:



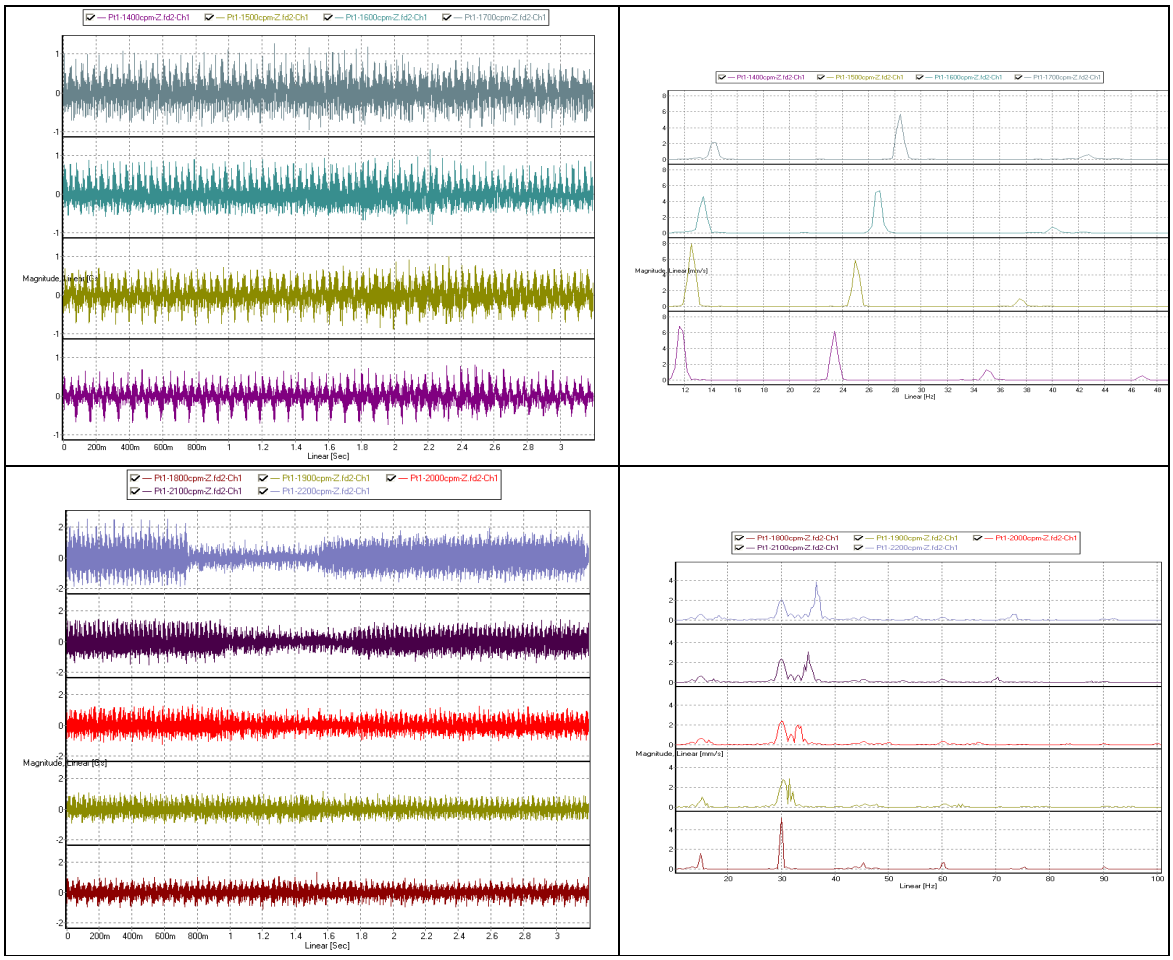


Figure 18. Waveforms and frequency spectogramele recorded at the measuring point Pt1 on the vertical direction

Waveform shows variations of amplitude only when appear changes to the operation of the buttonholes machine to an operating mode of 2000 cpm. Note that up to 1800 cpm there appears a subharmonic amplitude besides the fundamental amplitude higher or smaller in size depending on the operating mode and which is due to the games form the cinematic chain. At an operating mode of over 1900 cpm, is observed in the spectrum an amplitude of 30 Hz, which is generated by translational motion in the plane Y and by the change of direction of buttonhole making. Optimum operating regime for machine buttonholes in this direction is 2000 cpm.

3. CONCLUSIONS

Note that on the three directions of measurement, the optimum operating mode for the SunStar buttonholes machine is 2000cpm. On the horizontal direction the smallest amplitudes occur. On the vertical direction the largest amplitudes appear. Worth mentioning is that standard width for sewing buttonholes is approximately constant and is not necessary a technological variation in the number of double flights per minute during the buttonhole cycle, and this induces a stabilization time between two consecutive breaks of the thread. Identifying this issue is based on measuring the vibration amplitude in 3 directions. Another cause of breakage is needle wearing (characterized by raveled breaking of the thread), and this is an indication of the need to replace the needle.

We recommend to lubricate the machine to a certain number of operating hours for both the needle drive system and the mechanism of translation of the bucket.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

ADVANTAGES AND CRITICAL ANALYSIS OF COMPUTER ASSISTED METHODS FOR MATERIAL ESTIMATION OF LEATHER PRODUCTS

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Abstract: Computer assited methods developed to estimate needed material in leather products industry have the main advantage of reducing the process time to zero, and delivering a high probabilistic domain for the consumption norm. Their behaviour depends on using correct input data, and the main purpose is to reduce differences between estimated values and real ones. After we developed several software solutions to estimate materials consumption, we were able to compare different methods, and we state the most important conclusion, that software solutions can perform much better if used inside automatization machineries for leather cutting.
Key words: assited, material estimation, norm, leather footwear

1. INTRODUCTION

Computer assited methods, for material estimation, have the main advantage of reducing to zero the practical process duration of estimating, after setting the inputdata. Thus, a first effect of software solutions is significantly reducing the time needed for a practical estimation.

For academics, an algorithm and implementation of methods to estimate the norm of consumption is a major advantage because the computer can call in support and illustrate design concepts, making it possible to estimate the consumption norm for several sets of products, within significantly less time. However, computer assisted estimating consumption norm does not help students to assimilate the basic concepts of estimation methods, but to create the overall vision, as all method steps are done by computer. ***Thus, we recommend students access to computer assisted methods only after thorough assimilation of design concepts.***

In industry, usage of software solutions for estimating the consumption norm is justified as long as the total estimation duration is at most equal to the length estimation by using the classical methods.Thus: estimation using compact parts drawing method takes about 30 seconds, while a computer provides instantaneous results. However, computing times require auxiliary, digitization of parts required and this process can take 15 minutes. Eliminate this disadvantage can be done by estimating material requirements directly from the design stage, and not when the product reaches production. Currently, design departments use computers to estimate the time consumption and manufacturers use traditional methods to check the time of consumption. It is possible to obtain two values for time consumption, the theoretical (estimated) and real one, from manufacturing. Correlation (or significant reduction of differences) of these two values for time consumption can only be achieved through automation.

We developed a special software to estimate material consumption for leahter products, using different methods, which we explain in the following subchapters. We tested these methods on several products, to see if there are differences between estimated values, and we studied further what is the cause of this differences, and how it is linked to the method used. Later, we also studied the difference between software estimated values and real values, in order to determine which method is the most relevant; for this, we developed an deviation model, which is presented and interpreted in one of the

following subchapters. Finally, we seek to develop solutions reliable for automatization, thus we studied actual automatization machineries and how they behave.

2. COMMON METHODS FOR MATERIAL ESTIMATION OF LEATHER PRODUCTS

The most used methods for estimation are :

● methods based on parts compact drawing (figure 1) - these methods share a common part : all product parts must be drawn as closes as possible, to refflect a compact nesting on the material/leather surface. Each method uses a different approach to estimate needed material, based on this compact parts group. The *bounding rectangle method* uses, like it's name sais, the area of the bounding rectangle, multiplied by a correction coefficient ***c***. So, considering the bounding rectangle of area ***S***, the consumption norm will be ***Nc=S x c***; frequent value for ***c*** is 1.05..1.10, which is based on a 5 to 10 percentage correction, because of material defects and parts nesting while cutting. The *squares method* uses a network of squares, which is drawn over the parts compact group. Generally, a square side is 1dm, so a square surface will be $1dm^2$. The consumption norm is equal to the total area of valid squares from the network; a square is considered valid/counted if it intersects any of the parts. In this way, this method estimates needed material with a precision equal to square surface. Because this precision is a little to much for industry, the accuracy of this method can be improved by decresing square size, and by counting only the scores that have the intersected surface over a limit area, like more than 10% of the square surface.

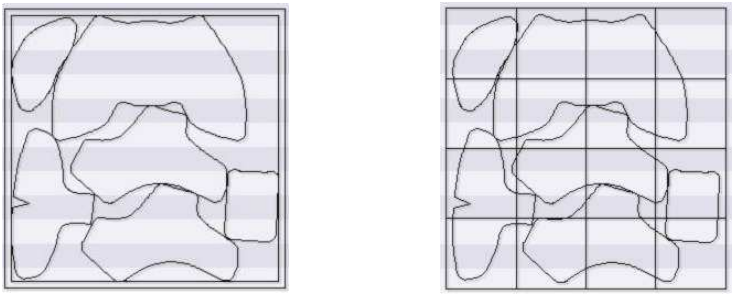


Figure 1: Estimation methods for leather products based on parts compact drawing
left - bounding rectangle method ; *right* - squares method

● methods based on parts nesting - here is the *method based on the sum of all rests*. Considered rests are defined as follows :

- normally rests ***Dn*** - rests between cutted parts of same shape and size;
- marginal rests ***Dm*** - rests because of the differences between parts shape and material shape;
- pattern rests ***Dt*** - rests between parts with different shape;
- defects rests ***Dd*** - rests because of the need to go around material imperfections;
- bridge rests ***Dp*** - rests based on the distances between cutting knives.

Normally rests ***Dn*** is eqaul to ***100-A***, where ***A*** is a nesting coefficient specific for all footwear parts. *A* reflects material usage, as shown in figure 2.

Computing the medium value for ***A*** requires considering parts surface, because parts with greatest surface influence more this value than parts with low surface. This concept is taken into consideration, computing A relative to the specific nesting paralelogram for each part.

$$\text{Thus, } A[\%] = \frac{parts\ total\ area}{parale\log rams\ total\ area} x100 = \frac{Aset[dm^2]}{parale\log rams\ total\ area[dm^2]} x100 \qquad \textbf{(1)}$$

Parts total area (***Aset***) represents the sum of all product parts surface, and ***paralelogram area*** is determined from parts nesting, as ilustrated in the next figure. This paralelogram can be considered the base cell, or the base nesting pattern, because if it is repeated, we obtain the final nesting layout.

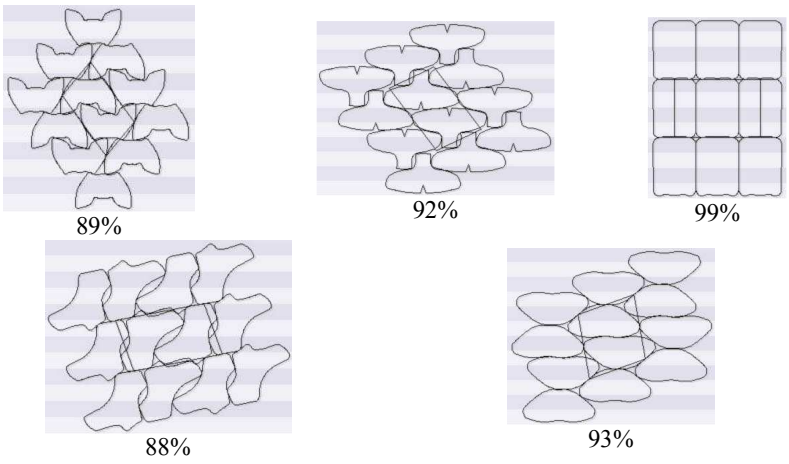


Figure 2: Nesting layouts and material usage coefficient for different footwear parts

Marginal rests ***Dm*** and pattern rests ***Dt*** are calculated toghether, using the formula $D_m + D_t = \frac{c_1}{\sqrt[4]{Fs}} + c_2$ **(2)**, where ***c1*** and ***c2*** are specific values for certain leathers (for flexibile leather, c1=39, c2=0). $F_s\,[-] = \frac{Material\ area}{Parts\ medium\ area} = \frac{M\,[dm^2]}{t_m\,[dm^2]}; t_m\,[dm^2] = \frac{Aset\,[dm^2]}{parts\ total\ number}$ **(3)**

Aset had been computed above, ***M*** is the medium surface for the leather lot (like 75... 200 dm^2), and ***parts total number*** represent how many different parts hase the final product.

Defects rests ***Dd*** are computed using a quality index; considering ***Nc*** the material needed to manufacture footwear using 1st quality leather, ***Nc**** needed for manufacturing using 2nd quality leather will be ***Nc*=Nc x Qi***, where ***Qi*** is a quality index, as follows :

Table 1: Quality indices for different quality classes

Quality class	Afferent index
1st quality	$Q_1 = 0.97$
2nd quality	$Q_2 = 1.00$
3rd quality	$Q_3 = 1.04$
4th quality	$Q_4 = 1.10$

Bridge rests

$$Dp = \frac{P_{set}\,p}{2A_{set}}x100 \quad \textbf{(4)},$$

where ***Pset*** is the perimeter for all parts [dm], and ***p*** is the distance between knives when cutting leather; generally p = 2..3 [mm].

Material usage index is

$$U = 100 - (Dn + Dm + Dt + Dd)\ [\%] \quad \textbf{(5)},$$

and material estimated area for manufacturing will be

$$Nc = \frac{A_{set}}{U}100\ [dm^2] \quad \textbf{(6)}.$$

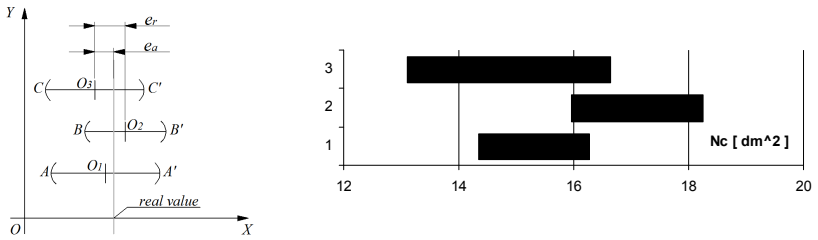
Estimation for a different leather quality ***Nc**** will use quality indices from table 1:

$$Nc^* = Nc \times Q_2 \quad \textbf{(7)}.$$

3. COMPARING MATERIAL ESTIMATIONS PERFORMED BY DIFFERENT METHODS

Theoretical materials estimation is done in order to plan material requirements for launching into production a specific order. Not always the estimated norm equals real norm from manufacturing, ***but is satisfactory if the difference between them can be tolerated****.* To quantify these differences, we elaborated a deviation model, designed for comparison of different results provided by different methods (figure 3). Generally, a method provides not a result, but a domain for the material estimation; these domains are compared:

- between each other to establish methods *stability*;
- with the real value of material norms (from manufacturing) to establish if a method is *relevant*.



a) theoretical deviation model b) deviation model for a leather article

Figure 3: *Deviation model* for computer assited material estimation

It is important to have stable estimations; if some methods trigger closed results, and a new one triggers a result which is far to different from the rest, it means that the estimation is not stable. However, even if estimation software is stable, it is important for manufacturing to have relevant solutions, like the estimated value should be as close as possible to the real value of material consumptions, like within a tolerable domain. To perform this task, we developed a deviation model, ilustrated in figure 3a. Here is our analyzing principle :

• Intervals ***AA ', BB'*** and ***CC ' -*** variation range for different estimation methods, like the *sum of all rests* and *compact drawing*, with the variants of *bounding rectangle* and *squares*; the variation range reflects the probabilistic domain for material estimation.

• Points O_1, O_2 and O_3 - centers of the above described intervals *(mean values);*these center points are at the medium of the above intervals, and they can be interpreted like the norms with the highest probability.

•ea, er - absolute exentricity *(compared to the real value of material needd)* and relative eccentricity *(compared to another method for material estimation)*; the relative excentricity value reveals how stable is the estimation softwarem while the absolute one reveals how relevant is the estimated value for manufacturing.

To analyze different products, we simple dropped data into this deviation model, and generally, the chart for a footwear product looks like the one in figure 3b.

After we compared estimated values for different products, using this model, we reveal our conclusions :

● Illustration of estimated values shows that the estimation method based on *sum of all rests* and *compact drawing method - squares variant* provides similar results, their ranges present relatively identical variation, and their average values are cuite the same.

● Estimation method based on *gabarit rectangle* shows the shortest variation range; this behaviour is because of the low number of specific control parameters *(only the correction percentage),* compared to other methods. Also, this method provides the greatest results for material consumption, and therefore over other methods, it presents pronounced exentricity.

● Amplitude range of variation is proportional to the deviation values provided by that method. Thus, method based on *sum of all rests* provides a ~ 35% deviation, the *gabarit rectangle* method ~ 15%, and *squares* variant estimation method provides a 30 .. 40% deviation.

● Theoretically, *gabarit rectangle* method shows high fidelity, but recommanding a method for practical usage among the others requires a significant amount of testing and comparison with real values of material norms obtained in practice.

From another point of view, for a software to be relevant, it is important to correlate estimated values with real values, from manufacturing; to achieve this, it is important to have a link betweem estimated values and manufacturing, and this link is automatization in leather cutting departments.

To create this link requires a larger amount of work, and we stated our concepts regardind it in the next chapter

4. REQUIREMENTS FOR AUTOMATIZATION SOLUTION IN LEATHER CUTTING DEPARTMENTS

The method based on experimental cutting is by far the one method that provides closest estimated value to the real value. Building an algorithm able to estimate the time of consumption by this method is equivalent to an algorithm to generate parts nesting on the skin.

Basically, the algorithm must provide optimal placement of several irregular polygons within a polygon mainly considered container. Unlike other methods of determining material consumption, its specific algorithm requires a significant additional workload; development of such an algorithm requires:

● a large number of tests, in order to significantly reduce processing time, practically, the algorithm will generate more alternatives, and will display the one that has best nesting coefficients. Additional testing is required in order to reduce the number of variants by establishing rules and priorities in parts nesting;

● change the level of programming; most applications are written respecting the specific syntax of the programming environment. Changing the level of the program to syntax that computes much closer to machine code. This criterion requires knowledge of calling and control hardware resources, and has the advantage of significantly reduced processing times.

Considering however that such an algorithm was implemented in programming, and there is such an application, the workload would justify if it would be possible to numerically control the cutting process, (*automation*); achieving this goal involves undergoing studying the following steps:

● implementation of an algorithm able to provide practical- economic nestings; the best provided solution should be at least equal to the best practical solution;

● reduced processing times for nesting parts over the skin;

● reduced processing times for digitizing skin contour and identifying defects using hardware able to identify the real contour of the skin and pass it on to a processing unit;

● virtually instantaneous response time of digitization equipment and delivery solution, to avoid or reduce production downtime;

● a machine able to cut parts, with a significantly superior productivity over current used technologies; such equipment must meet the following requirements:

- contour cutting for parts from the nest;
- parts surface perforations and stings;
- marking parts in order to highlight areas of overlap in the sewing-assembly;
- encoding size on parts contour;
- optional possibility to make jagged edges; except for this requirement, it is vital important the achievement of the others, to provide superior automation solution.

For a complete automated solution is necessary that the digitizing equipment would identify areas with different color from the skin.

5. CONCLUSIONS

Computer assisted process for material estimation represents a major forward step thanks to quick general software response. Thus, practical duration for the estimating process has reduced significantly, methods that rely on simple algorithms provide instant results and those based on complex algorithm, provides results in a few seconds. Overall, the times required to estimate fell, being correlated with computing power of current computers.

Assited solutions reduced the required practical space estimation, nesting skecthes, graph paper, planimeter, experimental cutting are *simulated* or *replaced* in the virtual software environment.

Thus, operator resources are significantly reduced, making it possible to focus quickly on the final result, without wasting time on the specifics, because they are handled automatically by the computer.

Material estimation for leather and syntethic products, is a recent research domain, and so there are a few relevant software solutions on the market. These software products have generally, two destinations:

● *academics* - as it illustrates and promotes learning classical methods for estimating needed materials for specific products manufacturing *(eLearning);*

● *industry:*

• *design departments* - significantly reduce the time required for material estimation;

• *manufacturing* - together with complementary technologies, these products are found in *automation.*

The initial aim of researche was reached : to develop a software able to estimate material consumption using several methods, including algortimics for the *method based on sum of all rests*, which is ***a original contribution***.

In the future, we want to focus efforts on improving the functioning of developed software solutions, and a collaboration with *design departments* and *production planning*, to provide industrial folding solutions.

Current developed solutions represent an interdisciplinary research based on *economic concepts of designing leather* and synthetic products, *mathematics* - numerical methods and, not least, *informatics-programing*. Implement functionality for industrial environment requires collaboration with *experts / technicians* in the field, and integration in the factory automation equipment involves collaboration with machinery industry. There are currently numerically controlled machines for cutting leather parts, but few folds production requirements, mostly for design departments ...

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

FITTING DIGITAL DESIGN ON VARIOUS DIGITAL LASTS CREATED WITH 3D DELCAM CRISPIN DYNAMICS CAD SUITE

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Abstract: This paper presents the basic functions for creating the shoe and product footwear design analysis last using **Delcam CRISPIN Dynamics 3D system –Last Maker** and **Shoe Design** modules. There is a brief presentation of **Delcam CRISPIN Dynamics 3D** which is a CAD/CAM system for footwear which offers new and enhanced solutions for shoemakers. **Delcam CRISPIN Dynamics3D** have developed a range of quality software products to give the shoemaker a major advantage in front of its competition. With the specific instruments of **Delcam CRISPIN Dynamics CAD Suite software, Model Tracer and Shoe Design** modules for product footwear design analysis. We presents in this paper a visual method for fitting various digital designs on digital lasts, created with **Delcam Crispin Shoe Design**.
Key words: shoe last, footwear, women, fitting design, solution for shoemaker.

1. INTRODUCTION

3D DELCAM CRISPIN Dynamics CAD Suite have developed a range of quality software products to give the shoemaker a major advantage in front of its competition. With the specific instruments of this software: **Model Tracer** and **Shoe Design** modules we presents in this paper a visual method for fitting various digital designs on digital lasts, created with **Delcam Crispin Shoe Design**. The paper are severals parts.

The first part of the paper presents general informations for shoe lasts and the system **CAD Suite Delcam Crispin Dynamics**.

In seconde parts are informations for modeling shoe last. Using the functions of the **Model Tracer**, **Shoe Last** on creating severals shoe women lasts and creating a database. This database can be used in viewing, article by article, including graphics of the last and their main geometrical parameters and in searching for a last, after one or more parameters, depending on user options. The database that was created is useful for footwear manufacturers that can always find the shoe last accordingly to their product.

In three parts are information for creating a new design for severals lasts shoe and shoe women a visual method for fitting various digital designs on digital lasts created with **Delcam Crispin Shoe Design**.

2. GENERAL INFORMATION

The last is the most complex spatial form and is indispensable in the manufacture of footwear. Even the most experienced manufacturers of footwear products mentioned the last to be the "soul "of the footwear. Without the last there would be no footwear, no footwear industry and no footwear fashion [1]. At the same time, they claim that the design and execution of the last is the most complex and elaborated process of the entire shoe manufacturing business, the launch pad of its manufacture[3], [4].

There are no straight lines on the last. The last made of a continuous flow of contours and configurations. In this respect, it is considered "a masterpiece of engineering and a work of art".

However, while taking into account fashion and the characteristics of each style, the contours must meet precise standards of measurement and sizing [1], [3], [4].

But the process of defining the geometry of the last is complex. Specialists in computerized design of spatial forms, state that computer-aided design of a last includes the most advanced design techniques: from defining the 3D geometry of the last to obtaining its numerical form. This enables manufacturers to make patterns and prototypes using Numerical-Command-Machines (NCM) such as computer-aided design techniques currently used in industries of aerospace and car manufacturing and a number of applications requiring processing of spatial coordinates in three-dimensional shapes [2], [3], [5].

With this purpose in mind, there have been developed a series of specialized CAD/CAM software products to design lasts, with interfaces for pattern production. In the following there are presented some advanced methods available for **CRISPIN Dynamics CAD Suite** for footwear, regarding the last modelling with their specific advantages and a visual method for fitting various digital designs on digital lasts, created with **Delcam Crispin Shoe Design.**.

2. 1 About for CRISPIN Dynamics CAD Suite

In this part are presented the most advanced methods offered by CRISPIN Dynamics CAD Suite system for footwear concerning the modelling process for the shoe last shape with the specific advantages. There are also facilities to re-centre front and back guide lines, change foot (no need to re-digitize) and set the correct heel height and roll. You can create guidelines to save with the last and extend the last for a boot design. The last type can also be changed to a type that allows the entire last surface to be used for a design [1],[2].

The applications in the suite are:

- **LastMaker** - a program providing the means to design and modify lasts with outputs to various 3D file formats.
- **ShoeDesign** - a program for designing uppers on 3D lasts provided by **ModelTracer** or **LastMaker**. Create realistic looking designs and flatten the styles for development in **Engineer**.
- **2D Engineering –** a program for designing on 2D lasts provided by Shoe Design, and. Digitizing., This product has been developed for shoemakers who wish to ensure that their business remains competitive by increasing the efficiency, speed and accuracy of pattern development and grading.

2.3 Complementary Products

- **ModelTracer** - a program to digitise lasts in 3D using a Microscribe™ mechanical digitizer (fig. 1).
- **DataStore** - a WEB based database system for managing pattern/design information.

Figure 1: The digitizer MicroShibeG2X

3. METHODE FOR CREATING A SHOE LAST

3.1 Recording the shape of the last, 'point cloud data', with the application Model TRacer

The way that **ModelTracer** works is by recording 'point cloud data' and some control lines with individual points on each side of the last. The process moves interactively and in discrete steps, using **Edit Panel** menu. Some of the steps are optional and need to be selected in the Configuration dialogue if they are not to be skipped. Three registration points are first recorded so that the lasts position in space is fixed. As the last is turned to digitize each side and possibly the bottom, picking these points each time will 'tell' the program where the last is [3], [4].

Figure 2: Digitizing the shape of the last

With these three points recorded, two centre lines are digitize a point at a time. The program can now differentiate the two sides of the last (fig. 2). For each side the feather line and a top line have to be recorded (fig. 3).

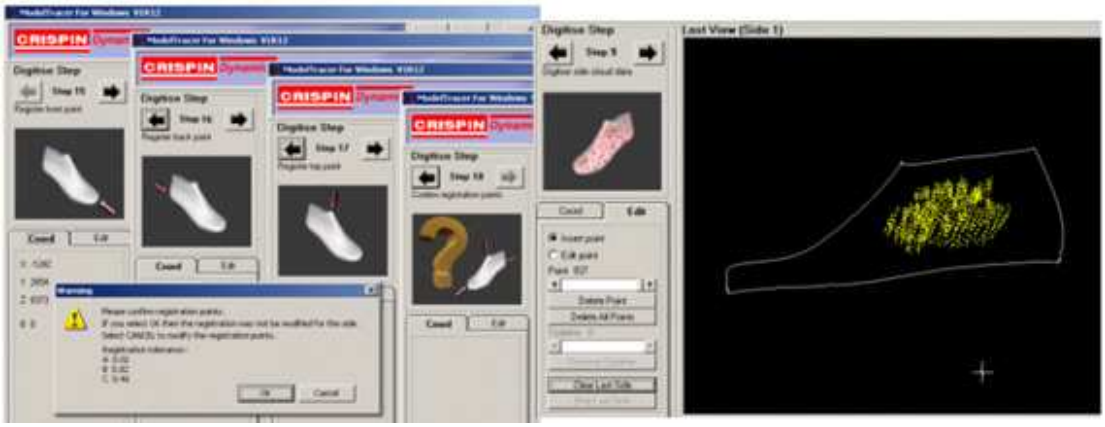


Figure 3: The steps for digitizing the base points and creating point cloud data

3.2 Cloud Data Conversion

The last part of the conversion process is the same for all the imported formats. The options are only available in the Last module. In this cases the conversion results in a **Crispin 3D** last data file with the extension ***.lst** [4],[5]. This part of the conversion process allows you to select and do additional smoothing, if necessary, to any of the vertical lines either by cursor clicking on a line near the feather line or with the help of arrows. Starting from the back centre line the two blue arrows allow you to step through or around the last from one vertical line to the next, in either direction. When you reach a line that needs extra smoothing click on the 'hammer icon'. You can only do this once for each vertical line. Having smoothed any lines that look like they needed it, click the green arrow to continue. A lot of processing is required in this next stage which creates the 3D mesh, so it can take several seconds to complete (fig. 4).

3.3 Last Information

Information about the last can be displayed in a dialog box using the menu:

Information > Last Info

function from the main menu. Once the Last Info option is selected, a dialog is displayed and the system prompts you to specify the Operator name and displays information over the current last fig. 5.

The field of the window are:

File name: file name of the current last with its destination path,

Operator: Name of the operator.

Table nr. 1

Geometric parameter	Symbol
Toe Spring	
Heel Height	
Stick Length	
Bottom Length	
Width	
Upper Girth	
Bottom Girth	

Gender: Current gender (or grading system) assigned to the last for grading purposes.
Size index: The corresponding size index number in the gender being used.
Width index: The corresponding size index number in the gender being used.
Toe Spring: System-calculated distance from the toe point to the ground when the last is in standard orientation.
Heel Height: Operator-entered value for the heel height (or pitch).

If any of the above last information is changed in the program (e.g. the toe spring is changed), the information displayed in the **Last>Adjust** option is automatically changed accordingly (fig. 5). Using the menu: **Edit>Last>Adjust** on visualized and modified the parameters for shoe last (fig. 5). Each parameters on modified using a specify window.

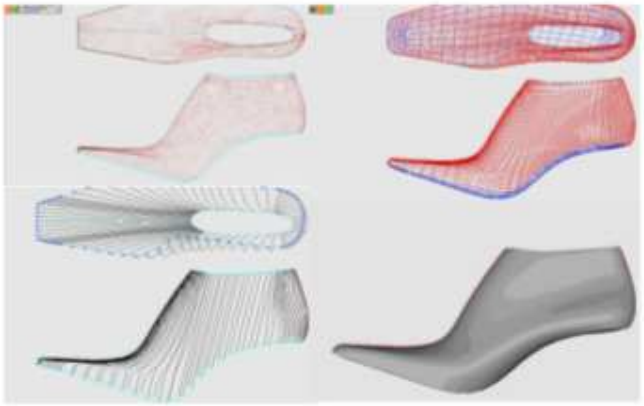


Figure 4: Cloude data conversion

Figure 5: The window Last Description

4. METHODE LINES FOR CREATING THE DESIGN

In this phase in the design of a shoe you draw the style on the last surface, create panels and apply detail like textures. There are also facilities for you to create 3D features and accessories like stitch rows, buckles and logos [4], [5]. The base function for creating 3D design is presenting in the follow table 2.
Draw the style on the last surface. The function **Style-lines** are generated on the last surface with this 'user friendly' software product allowing new designs to be achieved in minimum time whilst achieving an accurate representation of the shoe.

Table nr. 2

Icon	Function
	Surface Draw
	Projected draw - (Draw and project back to surface)
	Stream line draw - (Draw and project back to surface)
	Creating the shapes
	Edit Line
	Move or Duplicate Line(s)
	Mirror Line(s)
	Margin Line(s)
	Offset Line

5. RESULTS

The work content: a methode for creating digital women shoe lasts, a methode for creating a design “shoe low cut” and several view for finding this design [1].

5.1 Building a shoe last database

While building the data base there were required the following techniques:

- viewing the database, item by item which includes the graphic shape of the last and their main geometrical parameters.
- using the database for searching a last, by one or more parameters depending on the users options.

To this purpose were created two files: one **Excel** file and one **ASCII** file. The second one could be exploited by a specialized program to search for a last from the database, based on one or more parameters.

To create each article of the data base were followed these steps:

- the last was digitised using Tracer Model application
- the shape was obtained as an outline and a cloud of points and consequently converted into a solid, continues and smooth object
- the spatial form of the shape was analysed using Shoe Design
- the graphical form of the last was collected and its specific parameters, through computer-aided methods

5.1.1 Creating the Excel file

Each column of the file offers the following information:

- 1st column - the graphical shape of the last
- columns 2 to 6 - numerical data of the base geometrical parameters of the last

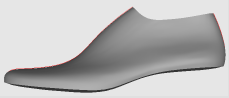
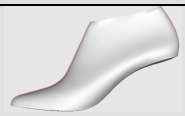
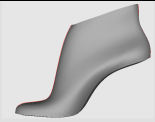
Observations

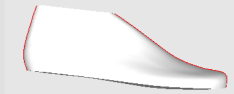
1. The file can be seen by any computer user, because it made in Excel
2. The user can select one of the lasts by directly consulting the file. Along with the numerical information, which are difficult to follow, each article contains one cell with the graphical representation of the last
3. The file may be rearranged according to user options and sorted by relevant geometrical parameters
4. A shoe last that presents interest may be analysed using Shoe Design application, Last Process menu
5. The geometrical parameters of the last may be modified in the limits presented in table 3

Below is presented a list of LAST file, available in Excel.

The creation of database required building the spatial shape of the last in computer-assisted sessions, the analysis of the last from all points of view and determining the main parameters that characterize it (table 3).

Table nr 3

Lasts	Heel Height	Stick Length	Bottom Length	Upper Girth	Bottom Girth
	**32.5**	**279**	**280**	**141**	**88**
	**73.8**	**230**	**240**	**123**	**71**
	**88.20**	**202**	**221**	**183**	**77**
	**64**	**232**	**235**	**154**	**70**

	**26.5**	**281.5**	**278**	**106.1**	**74.4**

5.2 Creating a design and several view for finding this design

Draw the style on the last surface. **Style-lines** are generated on the last surface with this 'user friendly' software product allowing new designs to be achieved in minimum time whilst achieving an accurate representation of the shoe (fig. 6).

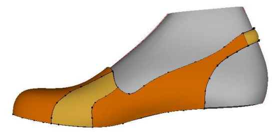
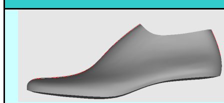
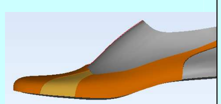
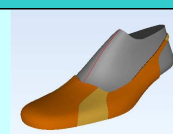
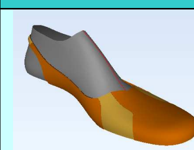
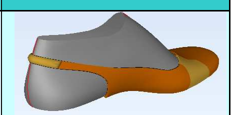
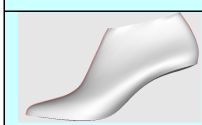
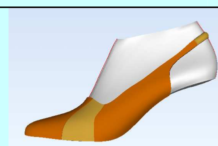
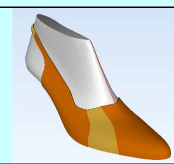
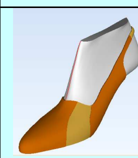
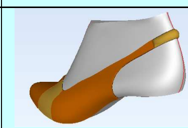
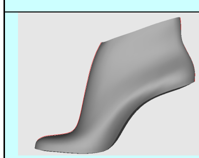
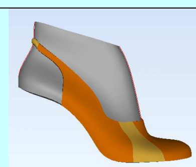
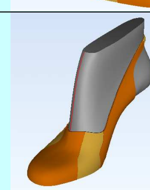
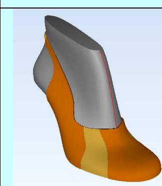
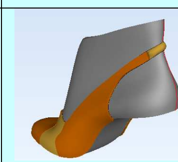
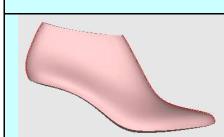
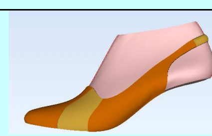
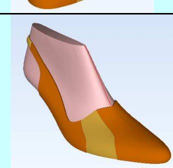
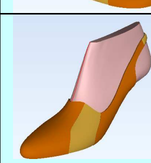
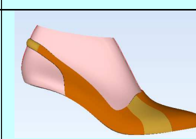
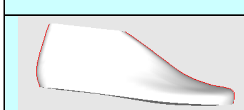
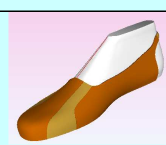
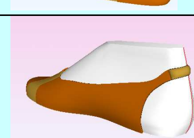
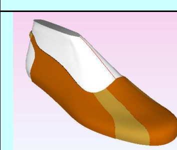
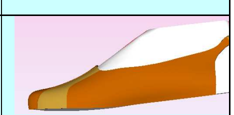


Figure 6: Creating a design of the soe last

The new design is a type file "line style" and is using for the shoe last of the data base (table 3) with the aplication **Shoe Design**. For this on selectet fiwe shoe lasts for women for, creating a new design we and presents for fitting various digital designs on digital lasts, created with **Delcam Crispin Shoe Design** in table nr 4.

Table nr 4

Shoe women last	**Several views for finding a design "shoe low-cut" using digital women shoes**			
	View 1	**View 2**	**View 3**	**View 4**
				
				
				
				
				

6.CONCLUSIONS

The work content: a methode for creating digital women shoe lasts, a methode for creating a design " shoe low cut" and several view for finding this design.

The creation of database required building the spatial shape of the last in computer-assisted sessions, the analysis of the last from all points of view and determining the main parameters that characterize it.

Building the data base required the following software using modes: viewing database, item by item to include graphics of the last and their main geometrical parameter, using the database for searching for a last by one or more parameters depending on the options of the user. This base is one instrument for elaboration the footwear product.

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[5}***, Delcam Crispin Dynamics CAD SUITE, 3D

ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

ALGORITHM APPLIED IN THE ASSEMBLING OF THE PARTS USED IN THE LEATHER ARMCHAIRS AND SOFAS UPHOLSTERING

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Abstract: The classical furniture which has leather upholstery is composed of armchairs, sofas with two or three seats, as individual pieces or sets. Each furniture piece has a basement, a rest, a rest frame, a back rest, arms and pillow arms, a seat frame, a back pillow, a seat pillow. The component details of the seat covers which upholster these pieces are made from bovines skins which are finished on a face or on the other face, from bovines split hide, from cloth and batting. For each seat cover pattern, it is needed to be elaborated assembling devices of the component details. For the seat covers manufacturing, a great part of the operations are the same for the armchairs, but also for the two or three seats sofas. The paper presents algorithms for the assembling of the parts for one set, made of furniture pieces, which is composed of an armchair, of a two seats sofa and of a three seats sofa.

Key words: upholstery, upholstering technique, upholstering methods

1. INTRODUCTION

The materials that are used for the leather upholstering of the furniture pieces are finished leathers, cloth, batting, sewing, backing band, zippers, elastic, burr etc. Considering all these materials, the finished leathers represent the most important starting material because both its value and the manufacturing specific technological conditions [1].

The leathers used in the furniture upholstering are bovines skins with large surfaces, over 400 dm^2, finished on the face as boxes with natural face, boxes with corrected face and boxes with oblate and corrected faces, finished as ooze leathers or as covered split hides. The hides with natural faces have a very good quality which, after the finishing process, keep the natural relief of the skin. The hides with corrected faces are skins which have surface damages or skins which come from havier hides with an non-uniform aspect of the skin natural drawing. In the case of this kind of hides, the natural face is removed by grinding and an artificial face is created, following to replace the natural one. After the artificial face is generated, the drawing specific for the boxes is obtained by hot pressing. In this way, the surface of the hides becomes much more uniformly in all survey areas and, in the same time, it obtaines more efficiency of the parts dimension cutting, [8]. The boxes with corrected faces have, generally, the same characteristics as the boxes with natural faces have, but they are more rigid because of the thicker cover film. The boxes with corrected and pressed face are made of bovines skines which have many surface damages. After the cover film is deposited and the artificial face is generated, the wanted drawing is embossed by hot pressing and it can represent imitations of exotic or natural hides, of bison aurochs skins etc. The hides with pressed faces have a good surface efficiency because of the drawing uniformity but they are rigid. The finished ooze leathers have a fine and a velvety aspect. These leathers are more resistent then the finished faces lethers are. The finished hides as cover split are cheaper and they are oftenly like artificial leather because of the thick finishing film. These hides may be used together with other kinds of leathers, in that furniture areas which are less visible and more stressed [7]. Finaly, the manufacturer must deliver to the client, a furniture piece which, when it is anlyze, seems to have its upholstery made of one leather roll, with a uniform structure and aspect. In that areas, where different nuances and damages

appear, these must be covered under a design or it can add another furniture parts or pillows, so that, the final product must have an aesthetical aspect [2,4].

The cloth is used for the back face of the rest pillows and of the seat pillows. The batting is used as a filling material. The sewing of the furniture parts is made using threads which have 20 Nm, 30 Nm, 50 Nm finess, depending on the place and on the type of the joint [3].

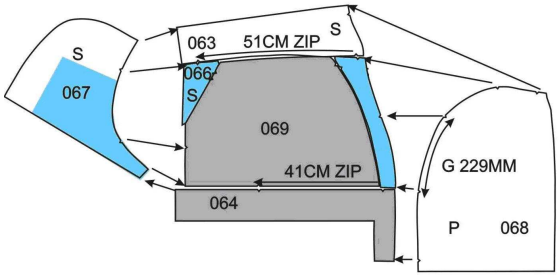
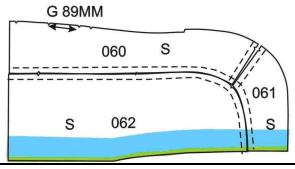
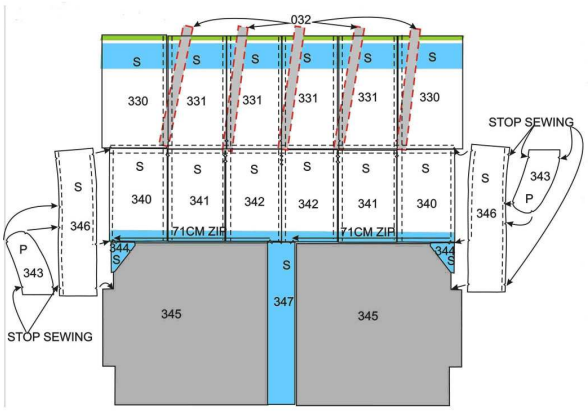
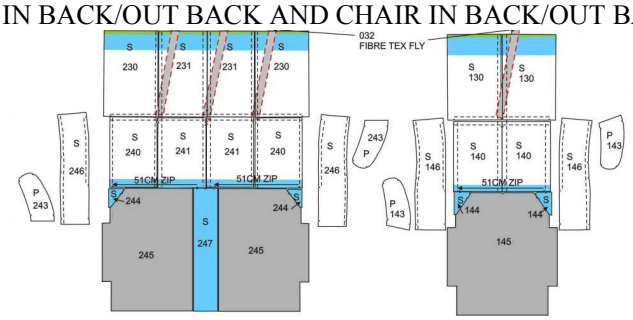
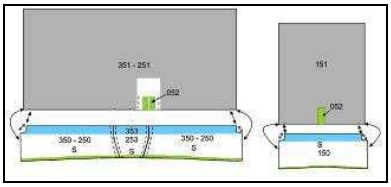
When the upholstering of the furniture pieces is realized, the joint of the component parts is made based on some algorithms which are conceived considering the assembling tables [5] .Usually, the assembling tables of the furniture components are realized considering all three kinds of pieces so that, the next step must be made to decide the way for their producing knowing that they may be individual pieces or sets of pieces. These steps must be followed because some series of pieces and their assembling way are the same both for the armchairs but for the sofas with two or three seats,too.

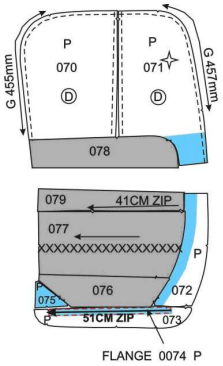
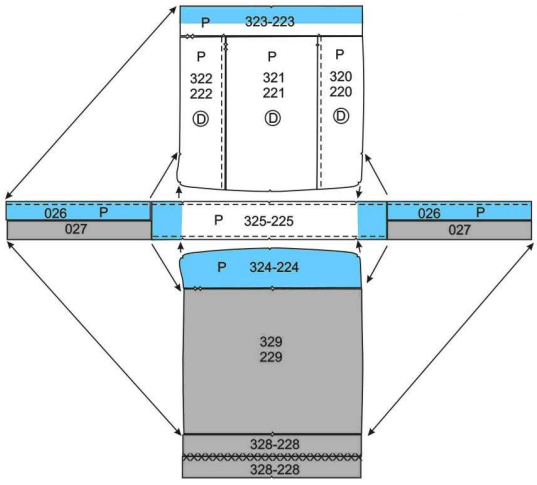
2. CONCEIVING OF THE ALGORITHMS USED IN THE FURNITURE PARTS ASSEMBLING

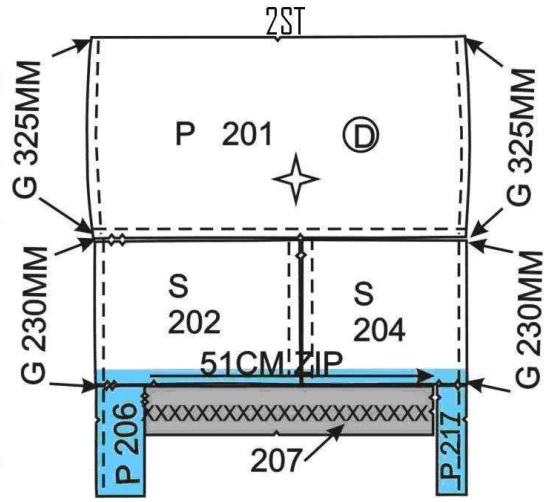
Some opperations of some certain phases of the fabrication process applied in the upholstering of the armchairs and of the sofas with two or three seats, take place following the same algorithm. this is the reson for that, the algorithms of the parts assembling are simultaneously conceived for the entire set. [6]. The paper presents algorithms applied in the assembling of the parts used for the upholstering of one furniture set, represented in figure 1; the considered set has one armchair, one sofa with two seats and one sofa with three seats.

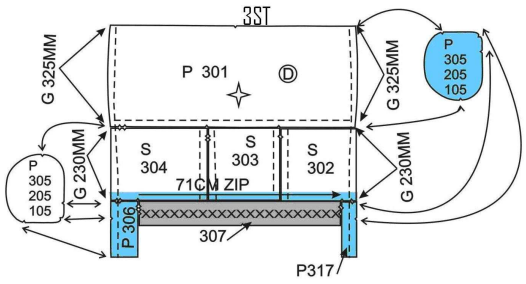
Figure 1: Set which has one armchair, one sofa with two seats and one sofa with three seats

When the algorithms of the parts assembling were conceived, there were used the following notations: P- the leather parts; S – the parts made of covered split; C – the parts made of cloth (Dacron); D - the parts made of batting; G- areas where the parts are shrinked before sewing; A, B, E, F, H- ends of the parts or of some parts assemblings which are jointed together; the arrows represent the direction of sewing. The parts of the armchair were codded begining with 100, the parts of the two seats sofa were codded begining with 200, the parts of the three seats sofa were codded begining with 300 and the parts which are common for these three kinds of furniture pieces were codded begining with 001. The assembling algorithms were conceived simultaneously, for the interior arm, exterior arm, face rest frame, rest frame, back, basement, seat frame, arm pillows, seat pillows, rest pillows, for the entire set. Table 1 se presents the tables of the assembling parts and the succesion of the main **operations [9].**

Assembling tables	Algorithms of the parts assembling
IN ARM x pair 	1. Sew 41 cm zip (no head) to 069 front to back. 2. Sew on 065 and 066 to 069. 3. Sew a 51 cm zip (no head) to 063 front to back as shown. 4. Sew to top of 069. 5. sew on 067 to side as shown. 6. Sew on 064 to bottom. 7. Gather on 068. 8. Sew on to side as shown match all notches..
OUT ARM x pair 	1. Sew 060 to 061. 2. Twin needle seam, (tape behind). 3. Sew on 062 as shown, (snip corners). 4. Twin needle seam, (tape behind). 5. Gather on 060 as shown.
3ST IN BACK/OUT BACK 	1. Sew 331 and 330 together as shown. 2. Twin needle seam, (tape behind). 3. Sew 340, 341 and 342 together as shown. 4. Twin needle seam, (tape behind). 5. Sew on zips (no head) as shown. 6. Sew 344, 345 and 347 together as shown. 7. Sew onto zipped panels. 8. Sew on 346 as shown. 9. Twin needle as shown, tie off ends. 10. Sew on top panels, (330 and 331) from notch as shown.sewing in 32 f/tex wensewing in. 11. Twin needle across, tie off ends. 12. Sew on 343 as shown match all notches.
2ST IN BACK/OUT BACK AND CHAIR IN BACK/OUT BACK  Observation: 2ST and Chair Sewn Same Method AS 3ST.	
SEAT PLATFORMS 	1. Sew 350-250 to 253-353 (2st. and 3st. only). 2. Twin needle seam, tape behind. 3. Box in corners son 250-350 (2st. and 3st. only). 4. Sew on from notch on 250-350 to end of 251-351 as shown (2st. and

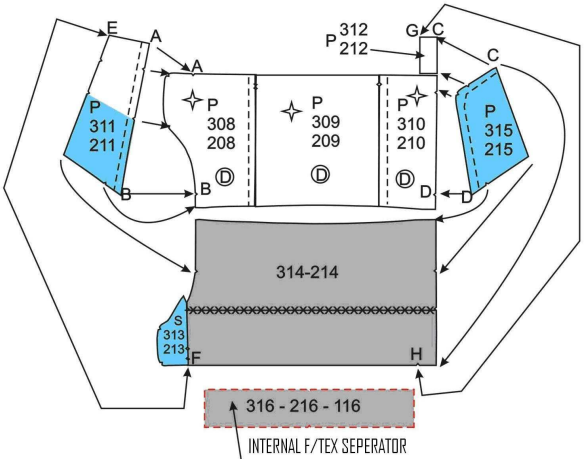
	3st. only).
ARM PADS Xpair 	1. Sew Dacron to 070 and 071. 2. Gather 070 and 071. 3. Sew together. 4. Twin needle seam. 5. Sew on 078. 6. Sew chain zip to 077, slit and fit head. 7. Sew a 41 cm zip (with head) front to back as shown. 8. Sew onto 077. 9. Sew 075 to 076. 10. Sew onto 077. 11. Sew on 072 to side. 12. Sew on 074 flange to 073, between notches. 13. Sew on 51 cm zip (with head) front to back. 14. Sew to top of 076. 15. Sew front to back,(leaving botton open). 16. Top sew on 070 -071, back tack on 078. 17. Finich sewing bottom of arm pad together turn match all notches.
SEAT CUSHIONS 2ST AND 3ST X pair 	1. Sew Dacron to 220-221-222 (320-321-322). 2. Sew together. 3. Top sew on 220 (320) and 222 (322) as shown. 4. Sew on 223 (323) to top. 5. Sew 224 (324) to 225 (325). 6. Top sew on 225 (325) as shown. 7. Sew 026 to 027. 8. Sew onto 225 (325), stop sewing at end of 026. 9. Sew onto front of cushion, make a pair. 10. Top sew on 225 (325) to 026. 11. Sew 229 (329) to 027. 12. Finich sewing 027 to 225 (325), then 224 (324) to 229 (329). 13. Make up 28 zip strip with 10 mm turnover fit head. 14. Sew into top of seat cushion turn match all notches. Chair has 2 shaped sides.
BACK CUSHIONS HEAD ROLL (2ST AND 3ST X pair)	1. Sew Dacron to 201 (301). 2. Gather on 201-202-204 (301-302-304). 3. Sew 202-203-204 (302-303-304) together as shown. 4. Twin needle seams. 5. Sew on a 0/E zip (with head), between notches as shown.





6. Sew onto 201 (301).
7. Top sew on 201 (301).
8. Sew chain zip to 207 (307), slit and fit head.
9. Sew on 206 (306) and 217 (317) to sides as shown.
10. Sew onto zipped panels as shown.
11. Sew bottom of 206 (306) and 217 (317) to 201 (301), to form a tube.
12. Sew in 105 (205), (305) to both sides.
13. Top sew on 201-202- -204 -206 (301-302-304-306) and 217 (317) as shown, tie off ends . this will sew to lumber after match all notches.

BACK CUSHION LUMBER



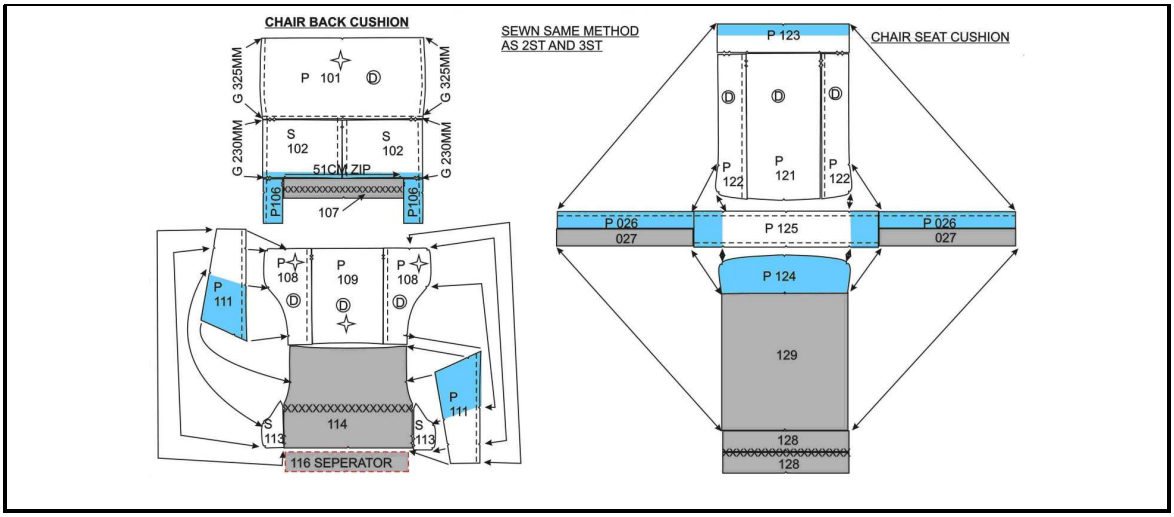
2ST AND 3ST x pair

1. Sew Dacron to 208 –209-210 (308-309-310).
2. Sew together.
3. Top sew on 208 (308) and 210 (310) as shown.
4. Sew on 212 (312) as shown.
5. Sew on panel 211 (311) from A TO B.
6. Sew on panel 215 (315) C TO D.
7. Top sew on these panels as shown.
8. Sew chain zip to 14, slit and fit head.
9. Sew on panel 213 (313) to side.
10. Sew together bottoms of front and back.
11. Sew together from E to F and G to H.

SEW TOGETHER LUMBER TO HEAD ROLL

1. Put head roll inside lumber.right sides together. shaped sides together. maching front and back.
2. Sew round in a circle.

sew in 116 (216), (316) internal F/Tex separator to 107 (207),(307) F/Tex seam and 114 (214), (314) F/Tex seam.



3. CONCLUSIONS

- The upholstering algorithms of the furniture pieces are conceived based on the tables of the component parts assembling.
- The tables of the parts assembling are realized for each mean part of the furniture pieces. In the armchairs and sofas case, there are realized tables for arms, face, back, rest frame, seat frame, arms pillows, rest pillows, seat pillows.
- The succession of the operations is common almost for the entire manufacturing process of the armchairs and sofas with two and three seats. When the upholstering process is designed in an optimum way, it is recommended to realize the tables of the parts assembling simultaneously, whatever the manufacturing way, of the furniture pieces, is as individual pieces or sets.
- The conceiving of the parts assembling tables goes to some optimum solutions for the cutting-on of the leather parts, finished on a side or on the other side, and of the parts, finished as covered split hides. The leather parts, which will be placed in visible and more stressed areas of the furniture pieces, will be realized using that leathers areas which have very good structures and with no surface damages. The leather parts, which will be placed in visible and less stressed areas, may be made from less resistant areas of the leathers but with no surface damages, too. Those areas of the furniture pieces, which are less visible and less stressed, may be upholstered using less resistant leathers with few surface damages or using covered split hides. This is recommended because of the different leathers qualities and being cheaper.
- When the tables of the parts assembling are realized, it must take care to give the impression that, finally, for the upholstering furniture piece, all the component parts were made using one single roll of leather with an uniform structure and aspect.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

RESEARCH ON PROCESSING OPERATIONS PARTS INDUSTRY LEATHER

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Abstract: The leather manufacturing a product requires going through several stages in the manufacturing process by which materials are made. Stages of their characteristics involving any number of individual or associated technological changes and differentiates depending on the particular model used equipment, raw material characteristics. Processing component parts of a leather product, includes any number of different technological transformations. Their purpose is to prepare parts for assembly, finishing or getting them an aesthetic. The leatherindustry meet the following processing: smoothing parts, thin parts, paint the edgesof parts. With the advent of advanced technology and new materials they have brought some operations such as peeling parts, marquetry, printing, plotting, weaving, embossing.
Key words: processing operations, leather goods, product diversification, examples, steps of implementation.

1. INTRODUCTION

Whatever type of leather product assortment obtaining required going throughseveral stages in the manufacturing process by which materials are made. Stages of their characteristics involving any number of individual or associated technological changes and differentiates depending on the particular model, equipment used the characteristics of raw materials [11].

Technological transformation is defined as the action of objects work suffers one change can be in shape, appearance, size by using a specific working tools and a single technological regime. Choice of technological change and establish the sequence of their execution must take into account: such materials that are made landmarks, the position marker in combination, such as interior linings; class quality.

2. PROCESSING OPERATIONS PARTS

Processing component parts of a leather product, includes any number of different technological transformations.Their purpose is to prepare parts for assembly, finishing or getting a nice aesthetic. The leather industry meet the following processing: smoothing parts, thin parts, paint the edge parts, parts bent edges, cartooning parts, punching parts, pinking edge parts [4; 5 7; 8; 10].

With the advent of advanced technology and new materials they have brought some operations such as peeling parts, marquetry, printing, plotting, weaving, embossing [1; 2; 6; 9].

2.1 Heat treatment

Operation is used when the mark is intended to provide a space form (fig. 1) [3]. Applies to any type of finished leather. The operation is done manually.

Stages of operation are:

• Cut parts of desired shape.

• Place the fleshy part on a heated surface.

Sometimes skins require previous soaking to get a better result. The dimensions of the marks must be greater than the final reserve calculations becausetechnology is very difficult to carry and

that is through experimentation. Edges that come into contact with hot surface darkens or burns and it is recommended thatthe edges of parts to be processed further as burnt edge.

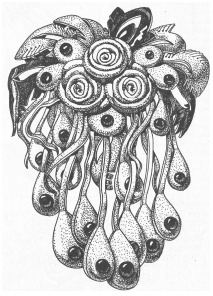

Figure 1. Example of heat treatment

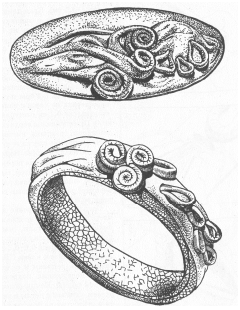

Figure 2. Example of corrugating

2.2 Parts corrugating

The goal of surgery is the beauty of the product. Embossing means to print rows of parallel folds and wavy fabric on a table on a paper (fig. 2). Putting on a design embossed material. It is used extensively to diversify products and leather goodsnamely handbags, belts, boxes, jewelry, paintings. Corrugating operation is achieved with very thin skin, destiny manufacture of gloves. Adhesive is used forfinal connections of resistance, which is deposited in two layers and to obtain better resistance. This operation is not recommended to use temporary adhesive joints, since there is strong and occurs during detachment of parts.

2.3 Drawing parts

The goal of surgery is the beauty of the product. The operation is performed manually, to make them used: strips of leather or artificial leather. Earlier, it made holes, then draw out the holes of bands (fig. 3) [9].

Strip of skin can provide a medium strength, because it has more than decorative. It is recommended that gaza should not be too tense, creating is an aestheticallymore pleasing. The ends of the strip to be fixed with glue or stitching.

Tracking operation is performed on assembled parts. When drawing is all over the part to be fixed by stitching heads when assembling parts. After tracing operation put pressure land marks rest (several hours), before slightly moistened skin.

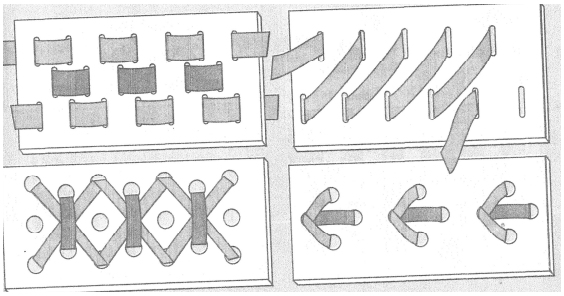

Figure 3. Example of tracing the parts

2.4 Intertwining parts

The goal of surgery is the beauty and product assembly. Blending operation is performed manually [9].

2.4.1 Blending operation in beautifying parts

This operation achieved the following milestones: shoulder strap, handles, bracelets, belts etc. Width strips of leather needed is 3-5 mm. The ends of strips is recommended to be attached to a stick, then move to their weaving. Anothersolution is that the ends are attached by sewing a strip of leather. The work is intended that files may not twist, and assembled parts are not visible. After blending the product or blank hammer, moisten and spread to dry on a woodenfixing the deal. Blending operation can be achieved in various ways, from imagination can get a lot of options.

2.4.2 Blending operation to assemble parts

Hand in making leather products by fusing assembly is the most common. To dothis assembly must be punched as land marks. Perforation edge parts can be done manually (perforating punches, drilling devices, etc.) or mechanical (drilling machines, presses, etc.). The leather industry using several types of knitting, but most often used are simple weaving, braiding Venetian, blending letter V cross weaving, braiding knotted.

2.5 Printing parts

Print runs for beauty of leather goods. Print job is to produce drawings or inscriptions on the main benchmark of a leather product, printing methods areused in leather industry [8]:

- Xerographic.
- For hot or cold.
- The high frequency currents.

2.5.1 Xerographic printing

It consists in transferring a certain drawing, mono or polychromatic through aspecial site on the main landmarks of leather products. Sita is a special fabricmade of silk or synthetic fabrics based on polyamide fibers. Screens are stretched on frames made of wood or metal. Sieves made will keep for 2-3 months at a temperature of 18 to 30 ° C and a humidity of 80%.

The operation is done manually, as follows: landmark sits on the table face up, the marker is placed sieve, pour the solution into the filter necessary, pass the brushonce and in one direction; dry for 5 min at room temperature. When the drawinghas more color process is repeated.

2.5.2 Printing hot or cold

Drawing on the principles of training apply compression with presses and die.When finished leather products, colorless drawings can be obtained by printing from a hot or cold drawing, executed in relief on molds, made of zinc.Temperature at which the print job is dependent on the tanning of leather. Thus:

- For vegetable skins: 60 - 70 ° C.
- For mineral skins: 90 ° C.

Printing by hot pressing or cold, after the manner of execution, may be continuousor discontinuous. Printing is implemented using metal rollers on lateral surface of which is now a design in relief and apply the straps, belts, watch straps.

Stability print material design is influenced by humidity, pressure, temperatureand pressing time.

2.5.3 Printing high-frequency currents

The artificial skin products, use special copper molds, rubber, silicone or bronze, using the plants dependent on high frequency currents. Printing the drawing tothermoplastics is possible due to warming up to streamline the top layer (temperature of 150-180 ° C), and fixation is due to reduction temperature up to 20 - 50 ° C. Quality of surgery is influenced by material properties, material heating time, cooling time, etc. Thus, heating time varies between 10-30 and the nature of materials, cooling time must be 20 - 40 s and higher thickness not exceeding 1/3 the depth of the mold design.

2.6 Operation "print"

The goal of surgery is the beauty of the product. The operation is performed manually and is painting materials, parts, finished product, and has found use inleather industry. Shall use the following products: boxes, book covers, albums, handbags etc. Made of vegetable tanned leather unpainted, rarely on vegetable tanned leather unpainted, and less on light colored leather.

Stages of operation are: the reference to draw desired design, parts that neednot be colored cover with a thin layer of paraffin or cial (in liquid and hot). For waxto fall on items faster than necessary it is mixed with oil in a 2:1 ratio. Cial and if not at hand can use natural rubber. Cial when cool, the remaining areas not covered with wax stains, if the drawing is more colors start with the lightest color. Allow to dry, then cover with nancial those portions of the design, which mustobtain a pleasant shade without removing cial layer of the unpainted areas. Followed by staining of the drawing.

The skin can get a design that mimics a bottle cracks. For the following stages:

• The skin is covered with nancial, wax dry cracks.

• The skin is placed in a pot of paint.

• Paint enters the cracks, which form an interesting design on the skin.

After the work, dry skin and remove wax or natural rubber (with a dull knife or ragsoaked in petrol). Product ready to polish with a soft cloth, sometimes covered with enamel.

2.7 Operation of marquetry

Marquetry is a technique used to decorate furniture, consisting of wood engravingof plates and strips of bone, ivory, pearl, etc, or another color wood which wastaken in the leather industry [9]. For operation of marquetry is used inchrome leather of various colors. The goal of surgery is the beauty of the product. Applies to a few products such as: boxes, paintings, that during exploration are notsubject to the following requests: each, bending, action of moisture, because theassembly parts are made by bonding.

To achieve operation following stages:

• basic marker to show a 1,5-2 mm thick, which are drawn the desired design;

• cut and remove certain portions of the drawing, which will be another color;

• the skin color cut necessary parts, they must submit an appropriate thicknessand stick to areas already cut the benchmark base;

• marker is affixed to the cardboard base, you can press to get a better resistance of the joint.

2.8 Peeling operation

The goal of surgery is the beauty of the product. The best operation is ob tained skins peeling varnish. Operation is made of small leather products because it is avery delicate operation but also simple. Peeling operation can be achieved in twopeeling drawing or background [9].

Stages of operation are:

• Draw the desired design guide.

• Cutting the parts needed, at a depth of ¼ the thickness of the part of the base.

• Landmarks in the flesh is wet, so water to reach the top layer.

• Wearing is better to start at one end and it is recommended that surgery be donesimultaneously all over the landmark.

2.9 Knife engraving operation

Engraving is to dig an image, an ornament, or letters, etc, in material using instruments or special technical means to achieve a cliché prints or decorative purposes. Etching operation is more complex and gives a very good product. In the past this operation was highly praised and sought after. Operation using the followingproducts: key chain, portochelari, book covers, boxes, various jewelry, etc.

It works only on high-quality vegetable tanned leather for manufacture of the base. It follows that skin not covered with a protective layer that prevents water penetration inside the skin. The coating can be removed with acetone.

The stages are:

• The marker to draw the desired design, with engraved knife.

• Cutting the benchmark can be dry and the wet mark. It is recommended to markwet, moisten with warm water for several hours after the mark becomes easier to work.

• Excess water should be removed. If the pressing water marker can not appearto work, but if the skin under the knife is then the part is still damp curls or sharpknife is not good what is not allowed.

• Skins thick enough (1,5-2mm) may elongate to avoid skin stretching doubles with cardboard and afterwards proceed to the transactions. Cutting is drawing toa depth of 1/3 up to 2/3 of the skin thickness. Etching operation is a long process, when dried and mark cut line maintains its shape can be moved to processing the next line. If you stop the operation mark should be placed in a sealed packagefilm to avoid drying. When they start working landmarks may dampen slightly.

2.10 Etching operation by firing

The goal of surgery is the beauty of the product. Operation is applied to vegetab letanned leather and chrome than those usually on colored skins. It beautifies the following products: jewelry, boxes, book covers, belts and purses.

Stages that go through:

• Draw the desired design.

• Perform the operation.

Thickness of the lines depends on body temperature and speed of workemployed the worker. Not to get burned portions worker recommended that bodynot to retain the one place, and the temperature must be adjusted depending onskin type. Different lines can be obtained using various working bodies will change depending on the trim device. The operation begins with the baseline andthen supporting lines.

3. EXAMPLES OF PRODUCTS

Figure 4 presents examples of products made by the authors, using the above processing operations.

Figure 4. Examples of products

4. CONCLUSIONS

Finally we find the following:

1. Identified processing operations allow diversification of leather, which will leaddirectly to an increase in sales and business development.
2. Stages of the processing operations presented in the paper does not requirea great effort from management companies.
3. Most machining operations can be made from waste obtained from croiriiparts.

4. Recovery of materials surface defects, applying processing operations, such as peeling, shaping etc.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CONTRIBUTIONS TO THE CLASSIFICATION SEAMS INTERLACED MODE OF ATELTHE FOOTWEAR INDUSTRY

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Abstract: In this paper the classification nominated stitches depending on how fusing threadin the shoe industry. The proposed classification contains the following criteria: the principle of training, after the manner in which, after fulfilling the role, as classstitching, the degree of rigidity of the parts. This paper presents a case studyneeded to identify the most common stitches used in the manufacture of footwear. To make the case study were analyzed 100 pairs of shoes. Our study revealed the following aspects: the vastly seam stitching is simple with two threads, followed by zigzag stitching and manual stitching, hand stitching meet the following types, for example, moccasin, moccasin type and footwear for children.
Key words: Footwear, grading, sewing, classes, criteria, principles of training.

1. INTRODUCTION

The process used to merge, the most commonly used and the oldest is the mechanical stitch, which was conducted from the late eighteenth century and early nineteenth century with the advent of the first sewing machines [4] .

The stitches are used to assemble cut parts from various materials, to create semi and final shoe product. One or more threads have multiple opportunities to obtain knitting stitch steps, leading to a variety of destinations and seams with different characteristics. Due to different variants of arrangement of a number of increasingly large steps that make up the seam thread, it was necessary their classification and coding [5, 10, 11].

The stitches are divided into two distinct groups (fig. 1):

I. Seams depending on how fusing thread.

II. Seams where the parts overlap mode.

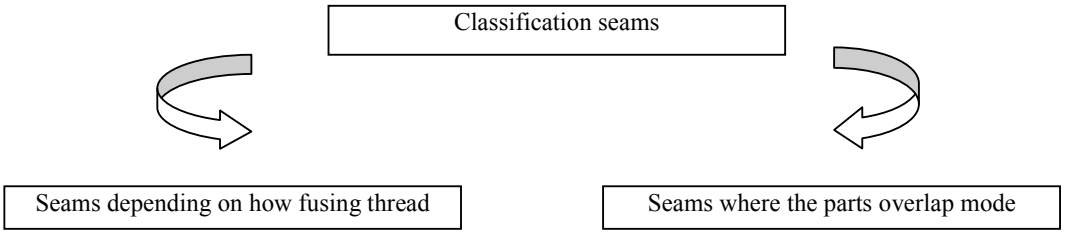

Figure 1. Classification seams

2. CLASSIFICATION SEAMS INTERLACED MODE OF ATEL

ISO 4915-1981 "Textiles - Stitch types - Classification and terminology" seam is defined as a structural unit resulting from passage through a different loop thread loops formed by the same thread (fig.2.a), passing a loop of thread another loop of thread through a different (fig.2.b) or braiding (fig.2.c) one or more loops of thread or thread, the depth or the material [5, 10, 11]

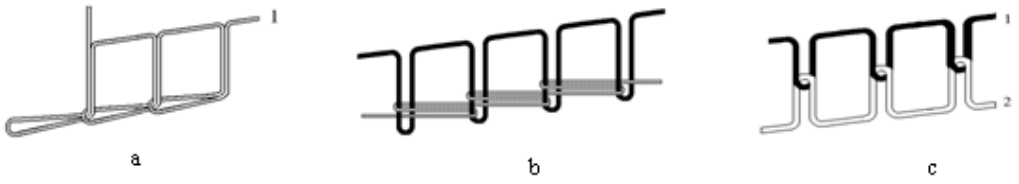

Figure 2. Principles of formation of seams

Classification of seams [1-5, 8-11, 13]:

1.After training principle is:
• the spool stitch made on the principle of blending the two systems of threads. Appears as a key feature that is not extensible, so that seams are called rigid;
• chain stitches made on the principle of passing a loop of thread through a loop formed by the same thread another or passing a loop of thread through a loop of thread another different one or more thread systems. Presented as a central feature extensibility reason are called elastic seams.

2. After how to do are:
• handmade seams;
• sewing machine made.

3. After fulfilling the role are:
• decorative stitches to embellish landmarks visible role in the composition of products;
• joining seams are those seams which is achieved through joining two or more parts of the composition of a product;
• building seams are designed to strengthen joint between two parts sewn above;
• seam edge coverage are designed to strengthen joint between two parts sewn before, this is usually carried out on the parts;
• hidden seam stitching are those through which the assembly is made of two or more parts of the composition of a product, but the seam is not visible on the outer parts.

4. Depending on the degree of stiffness of parts:
• flexible seam for joining parts (all upper shoe);
• seams for joining rigid parts (frame on the insole, the whole frame of the shoe upper and insole, the foot frame).

5. After stitching class are:
ISO 4915-1981 is 6 classes, denoted by three digits, the first number represents class and the other two - subclass, so [13]:
• Class 100 - chain stitches formed by one or more threads on the principle of passing a loop of thread through a loop formed by the same thread another;
• Class 200 - hand sewing;
• Class 300 - stitch the spool made of two or more systems weave a thread on principle;
• Class 400 - chain stitches made of two or more systems on the principle of passing a thread loop another loop through a string of different threads;
• Class 500 - stitch the edges binding made of one or more thread systems crossing the principles of a loop of thread through a loop formed by the same thread another and passing a loop of thread through a loop of another different thread. The main feature is the development thread over the edge of the material;
• Class 600 - seam cover made of three or more systems on the principle of passing a thread loop another loop through a string of different threads. The main feature is the cover material on both sides of the seam.
According GOST 12807-2003 there are 7 classes, denoted by three digits, the first number represents class and the other two - subclass, so [3]:

• Class 100 - chain stitches formed by one or more threads on the principle of passing a loop of thread through a loop formed by the same thread another;

• Class 200 - hand sewing;

• Class 300 - stitch the spool made of two or more systems weave a thread on principle;

• Class 400 - chain stitches made of two or more systems on the principle of passing a thread loop another loop through a string of different threads;

• Class 500 - stitch the edges binding made of one or more thread systems crossing the principles of a loop of thread through a loop formed by the same thread another and passing a loop of thread through a loop of another different thread. The main feature is the development thread over the edge of the material;

• Class 600 - seam cover made of three or more systems on the principle of passing a thread loop another loop through a string of different threads. The main feature is the cover material on both sides of the seam.

• Class 700 - welded seams, the class contains two subclasses 701 (welding service) and 702 (continuously welded).

The literature mentions the class 800 (seams combined, for example, consists 804 of 301 and 503) [2, 8, 9].

3. CASE STUDY

The case study was conducted to identify the seams are commonly used in the footwear industry. For the study were analyzed 100 pairs of shoes.

Shoes analyzed are classified as [6, 7, 12]:

a) After the selection:

- Boots
- Shoes
- Sandals

b) After confection system:

- Shoes with feet flat
- Soles sewn on frame
- Sole stitched through insole
- Shoes tubular
- Combinations

c) After sex:

- Female
- Masculine
- Teens
- School
- Care
- Children

d) After the season:

- The transition (spring-autumn)
- Hot (Summer)
- Cold (Winter)

e) After landing:

- Sports
- Consumables
- The Gala
- Leisure
- House
- For children
- For older people.

The study revealed the following:

1. The seam is vastly simple 2 thread stitching, zigzag stitching and stitching followed by manual.
2. Hand stitching meet the following types, for example, moccasin, moccasin type and footwear for children.

4. CONCLUSIONS

In this study we conclude:

1. This paper presents contributions to the classification based on how seam fusing thread.
2. The case study identified the most commonly encountered types of seams in the shoe industry.
3. The proposed classification differs from those already known by the presence of criteria, for example, the degree of stiffening of parts.
4. The study highlighted the need for a standard which will include types of stitches for the footwear industry.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

THE INFLUENCE OF THE MODEL CONTRUCTION ON THE SPECIFIC CONSUMPTION AT CUTTING LEATHER SUBSTITUTES

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Abstract: this paper is a study on the factors that influence material consumption norm, so that it is as low as possible, but this does not affect products quality, implicitly their price.
Key words: specific consumption, leather substitutes, textile, footwear.

1. INTRODUCTION

In manufacturing footwear products, a very important role plays the rational use of leather or leather substitutes materials, which is reflected in the price of products, but also in their quality.

Given the price-quality ratio, this paper is a study on the factors that influence material consumption norm, so that it is as low as possible, but this does not affect products quality, implicitly their price.

Rational use of materials during marks tailoring for footwear uppers, is an important issue, as a percentage of 65-70% of the footwear cost is determined by the raw material cost. Thus, reducing the material consumption is possible by rational design of patterns representing mark contours of the upper parts of shoes, but also by rational tailoring of marks on the material.

Rational design of patterns leads to obtaining some marks whose configuration allows their intermingled placement when tailoring on the material surface, leading to a placement/layering factor, whose value is reflected in the size of normal waste, resulting in minimum values for these waste quantities. Also knowing the number of groups and the width of a group can be established the optimum width of material out of which marks will be cut, so that marginal waste is reduced. An important role is also played by waste by decalage that appear at intercalation marks in their framing on the surface of the material, which contribute to a very good productivity use of the material.

Starting from these aspects, this paper presents the results of the research on the way in which patterns assembly influence the specific consumers value obtained after tailoring individual marks on the surface of leather substitutes.

2.EXPERIMENTAL PART

To highlight the way in which the marks assembly influences the specific consumption for shoe upper marks, theoretical layering was made, using AUTOCAD program,[1] for each item in the composition of shoe models, taken from various shoe factories.

To estimate the specific consumption one proceeds to layering the marks on the surface of the substitute to determine the number of marks that can be tailored to the width and length, Figure 1.

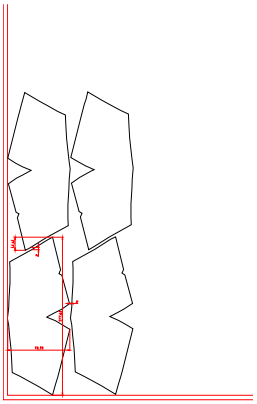

Figure 1: Placing the counter with intertwining contours on the substitute length direction

In order to estimate specific consumption several stages should be fulfilled:

- ✓ The number of marks possible to fit on the width direction, respectively the length of material, is determined by calculations, with the relations[2]:

$$\mathbf{n_B - 1 = \frac{B - (b + \Delta B_1)}{b \pm \Delta b}} \quad \textbf{(1)}$$

$$\mathbf{n_L - 1 = \frac{L - (l + \Delta L_1)}{l \pm \Delta l}} \quad \textbf{(2)}$$

where: n_B- number of marks placed on the width;
n_L- number of marks placed on the length;
B-width of material, in mm;
L – length of material, in mm;
ΔL_1 şi ΔB_1- marginal losses at the beginning of tailoring,
equal to 4-5mm;
l – length of mark, in mm;
b- width of mark, in mm;
Δb – marks' interpenetration (sign "-") and distance (sign "+") on the width direction;
Δl - marks' interpenetration, respectively distance on the length direction;
:

- ✓ Final marginal losses sizes on the length and width direction, ΔB_2 şi ΔL_2, are determined by the relations:

$$\mathbf{\Delta B_2 = B - \Delta B_1 - n_B \cdot b \mp (n_B - 1) \cdot \Delta b} \quad \textbf{(3)}$$

$$\mathbf{\Delta L_2 = L - \Delta L_1 - n_L \cdot l \mp (n_L - 1) \cdot \Delta l} \quad \textbf{(4)}$$

These losses, the end of tailoring, must be smaller than the length and width of o mark .

- ✓ Specific consumption is calculated for each mark with the relation:

$$C_S = \frac{B_{\max} \cdot L_{optim}}{n_B \cdot n_L} \cdot m, \qquad \text{in dm}^2\text{/piece.} \quad \textbf{(5)}$$

where:

$\mathbf{L_{optim}}$- length of material pile, corrected according to final marginal loss size ΔL_2;
$\mathbf{B_{max}}$ – width of material B to which admitted tolerance is added.
m- number of similar marks of the product

3.CASE STUDY

To exemplify three models of shoes for women are presented, whose marks are tailored from leather substitutes and whose configuration can be seen in Figure 2, for which theoretical layerings

are made, given that the direction of maximum solicitation of the mark, must coincide with the direction of minimum stretch of material[3,4].

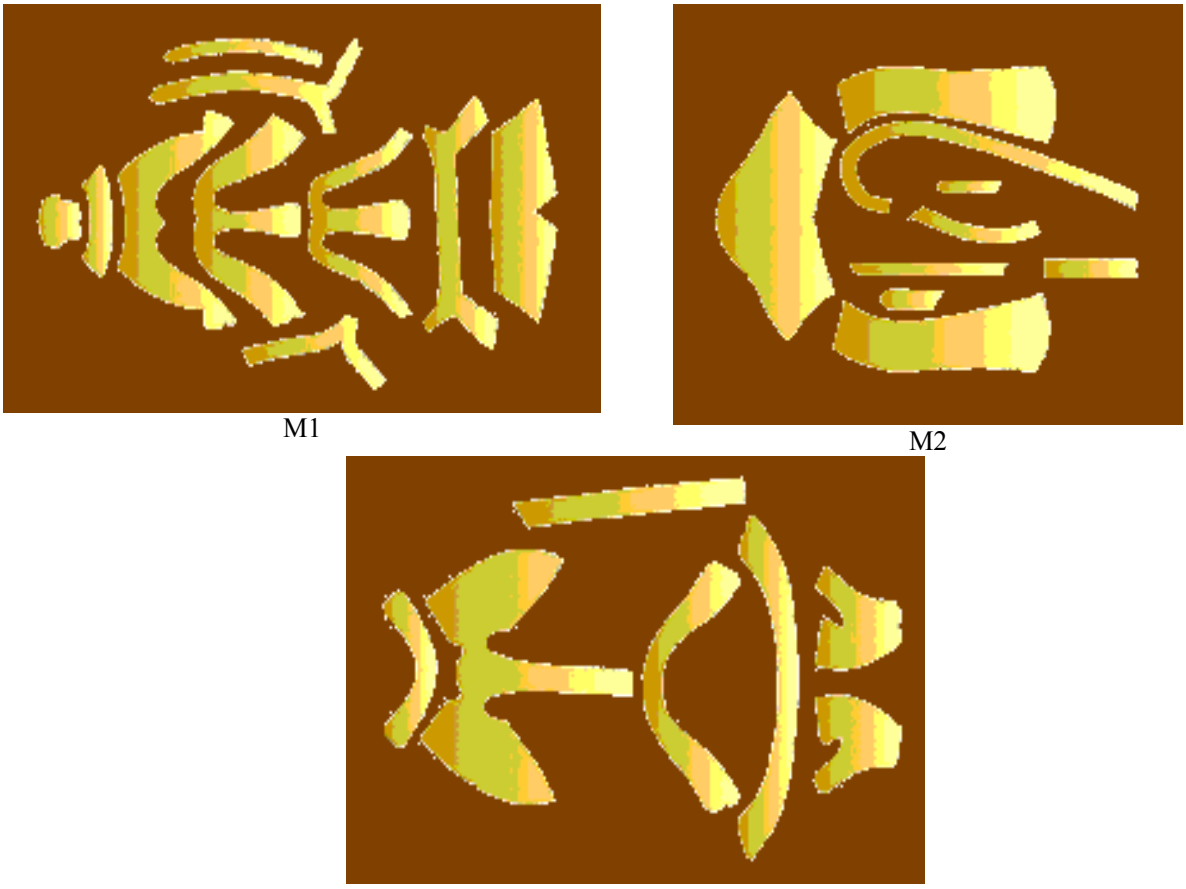

Figure 2: Configuration of models component marks

Theoretical layering of models are created for each component mark of the models structure that were analyzed, fig.3 and 4. It is noted that at each mark layerings were made with and without devalage, and calculation of consumption norm was made for different widths and lengths of material to determine the best framing option considering the mark's configuration[5].

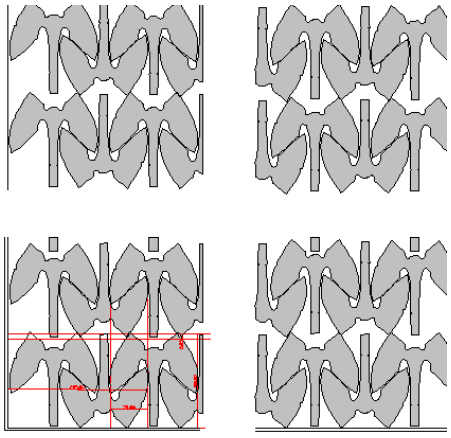

Figure 3: Layering mark by mark the instep

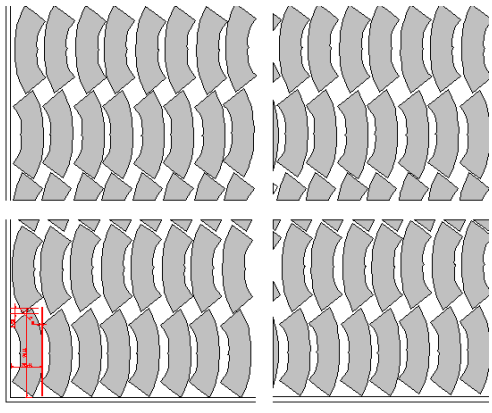

Figure 4: Layering mark by mark the strap

Thus in Table 1, 2 and 3 models are presented for three values obtained for consumption norm when layering mark by mark, corresponding to each optimum framing variant of each component mark of the model.

Table.1: Model 1

Mark code	Mark name	ns/per	B, mm	L, mm	n_b	n_L	Nc, dm^2/per
R1	Instep tip	2	1392	50000	15,5	1070	0.41
R2	Instep 1	2	1408	50000	8	700	2.50
R3	Instep 2	2	1392	50000	4.5	421.5	3.66
R4	Instep 3	2	1392	50000	5.5	467	2.70
R5	Contour	2	1400	50000	19	153	2.40
R6	Back strap 1	2	1408	50000	36	235.5	0.83
R7	Back strap 2	2	1408	50000	17.5	131	3.07
R8	Back strap 3	2	1400	50000	15	115.5	2.02
R9	Front strap	2	1408	50000	127	296	0.36
R10	Instep strap	2	1400	50000	46	289.5	0.52
	Total	20					18.47

Table.2. Model 2

Mark code	Mark name	ns/per	B, mm	L, mm	n_b	n_L	Nc, dm2/per
R1	Instep	2	1400	50000	3.5	539	3.71
R2	Exterior top	2	1400	50000	10.5	260	2.51
R3	Interior top	2	1392	50000	11	235	2.54
R4	Inside backstrap	2	1408	50000	69	301	0.33
R5	Strap 1	2	1408	50000	107	183	0.35
R6	Strap 2	2	1400	50000	80	465,5	0.18
R7	Braid 1	2	1392	50000	14	174	2.85
R8	Braid 2	2	1400	50000	85	228	0.39
	Total	16					12.86

Table.3. Model 3

Mark code	Mark name	ns/per	B, mm	L, mm	n_b	n_L	Nc, dm^2/per
R1	Strap tip	2	1392	8000	13.5	260	0.62
R2	Instep	2	1392	50000	6.5	289	3.70
R3	Exterior top	2	1392	50000	12	331	1.75
R4	Interior top	2	1400	50000	12	342.5	1.70
R5	Lock strap	2	1400	50000	78	132	0.68
R6	Wrist strap	2	1400	50000	8	1224	1.42
R7	Back strap	2	1400	50000	31	119.5	1.13
	Total	14					11.00

For a more suggestive illustration of the values resulted in Figure 5 is shown the variation of specific consumption for each mark separately.

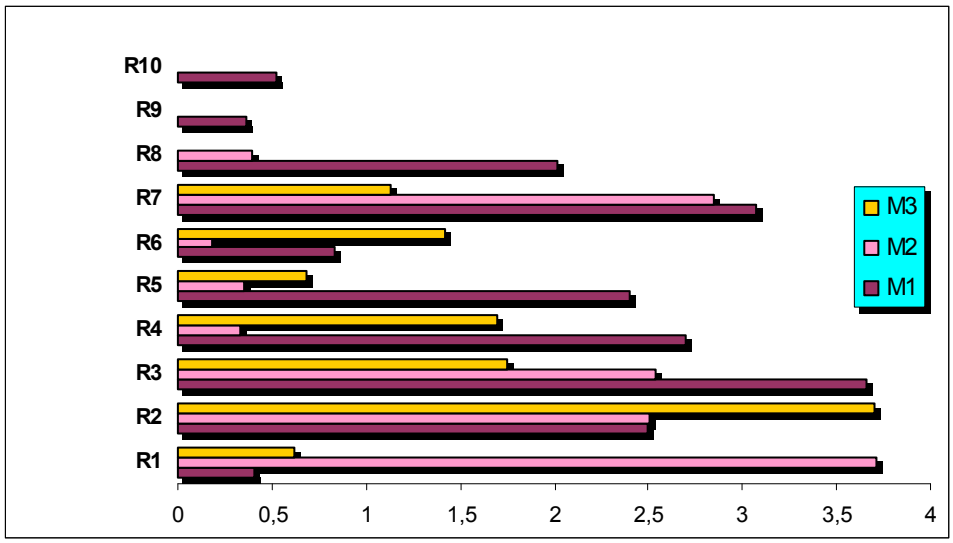

Figure 5: Variation of consumption norm when placing mark by mark on the substitute surface

For Model no.1, it is observed for the instep mark (composed of 3 marks) we get a bigger consumption compared with model 2 and 3 where for the instep we obtain 3,71 dm^2/per.
For Model no. 2 it is observed that higher consumption norm values are obtained , respectively, around 2,5 dm^2/per, for the top of the shoe marks (interior and exterior) because the configuration of these marks, allow only a smaller overlap, when arranging them mark by mark.
For the third model we note that for shoe tops, configuration allows overlap of marks both on the width direction, and on the length, which is reflected in consumption norm value obtained for this mark.

We should note that the configuration of marks that make up the top assembly of the shoe product correlates with the shape and nature of the material out of which are cut out the shoe upper marks.

Thus Fig.6 presents comparatively the rate of consumption for leather and leather substitutes, for the three model variants.

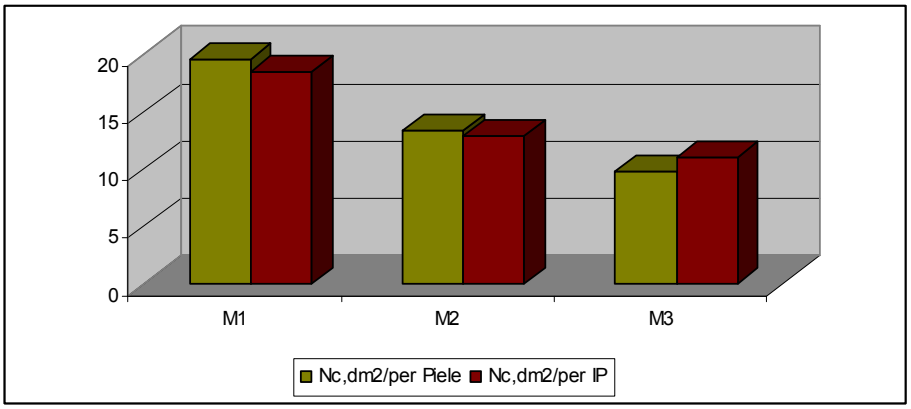

Figure 6: The rate of consumption variation for leather and leather substitutes

In conclusion, for models 1 and 2 the consumption ratio for the tailored marks cut from leather substitutes has a close value to that of marks cut out of leather, and for model 3 we obtain better values if the marks are cut out of the leather, due to a better correlation between the marks form and the direction they are arranged during tailoring.

4.CONCLUSIONS

-An important role in determining the standard of consumption is quality of the material out of which tailoring is made, so from this point of view we can compare leather that has more surface defects to leather substitutes that have a uniform structure without defects. A great advantage related to leather we have concerning the number of directions the marks can be arranged as compared to leather substitutes, where we have only two directions.

Worker-qualification/skills is an important factor in the process of cutting the marks, in order to obtain optimum material consumption.

It is recommended to obtain small quantities of waste materials when tailoring the materials by:

- combining the arrangement of patterns of the same model or different models to minimize normal losses;
- estimating the specific consumption during the creation of models so the configuration of marks could be intervened upon in order to reduce normal losses.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CURRICULUM EVALUATION: FOOTWEAR DESIGN AND PRODUCTION TRAINING

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Abstract: The training of shoe-making in vocational education has existed in relation to the mentor system as a handcraft transmitted from father to son in workshops. In our country, shoe-making sector has recently developed swiftly as in other sectors. Enterprises have quickly increased the number of machines used in manufacturing and improved the conditions of production. However, traditional methods are also used in shoe-making training. The education given at the university level is new in our country. Therefore, it is very essential that the curriculum of footwear design and production should be developed and upgraded.
This research aims to evaluate "Footwear Design and Production Curriculum" in two-year vocational high school in terms of objectivess, contents, learning and teaching activities, testing and evaluation based on the students' opinions.
Key words: Shoe, shoe-making education, vocational education, the evaluation of program

1. INTRODUCTION

Vocational education is education that provides individuals with knowledge and skills related to work, and work habits and improve individuals' abilities in many respects [1, p.1]. Technical education is advanced education which requires advanced science and mathematical knowledge with applied technical skills. What is more, it gives necessary knowledge, skills and habits that are essential for the level between middle and high management in occupational hierarchy. Although technical education is common in general engineering, it is not restricted to this area. It develops into the fields of health, nutrition, trade and other fields in parallel with scientific and technological developments [2, p.8].Vocational and technical education, in the integrity of national education system, includes planning, researching, developing, organizing, coordinating all kinds of vocational and technical education services with agriculture and service sector. It is also a combination of management, supervision and teaching activities. Vocational education is a compulsory education that supplies individual, social, economic, cultural and national needs. Vocational and technical education is a three-dimension whole consisting of individuals and education. The success of vocational and technical education is in proportion to behaviors developed as a result of education and the suitability of these behaviors to real work situations. At the end of the education of the individual, adaption to work requires developing a detailed curriculum program. Planning for education may have different extents and features according to the results. Some of these plans require long-term team work. Curriculum is a detailed plan and it indicates all the components of teaching and learning situations in system integrity. The general strategy that is prepared for a lesson in vocational and technical education, and that will be followed in curriculum, is much flexible rather than being rigid [4, pp.26-27]. Therefore, in order to solve education problem, Konya Chamber of Shoemakers in Turkey made some studies. As a result of these studies, in 2001-2002 academic years, "Footwear Technology Department" was opened in Konya Meram Atatürk Girls' Vocational High School. Afterwards, again with the cooperation of Selcuk University and Konya Chamber of Shoemakers, "Department of Footwear Design and Production" was opened in Higher School of Vocational and Technical Sciences for the first time at Selcuk University.

In our country, shoe-making sector has recently developed swiftly in terms of technology as in other sectors. Enterprises have quickly increased the number of machines used in manufacturing and improved the conditions of production. However, traditional methods are also used in shoe-making training. Although hand tools have become completely mechanical, handcraft preserves its importance. Handcraft somehow exists in any stage of production. 63% of the enterprises in the sector have become mechanical and 34% of them are enterprises that produce by hand tools. In Turkey, footwear education given at university level is new. Therefore, it is essential to evaluate, develop and upgrade footwear design and production training given in two years at higher vocational schools.

2. MATERIAL AND METHOD

The aim of the paper

This research aims to evaluate "Footwear Design and Production Curriculum" in higher vocational school in terms of objectives, contents, learning and teaching activities, testing and evaluation based on the students' opinions. The curriculum is for two years. Selcuk University, Higher School of Vocational and Technical Sciences, opened Footwear Design and Production department in 2006-2007 academic year. In 2011-2012, the school board applied in order to open the night courses because of the intensity on the program. During education, students take Footwear Machines, Technical Drawing, History, Art and Footwear Fashion, Footwear Materials and Auxiliaries, Computer-2 (CAD), Footwear Design-1, Footwear Cutting and Upper Stitching Technologies, Industry Based Training (IBT)-1 (30 workday), Footwear Design-2, Computer Aided Design-1, Footwear Pattern Making-1, Footwear Assembly and Finishing Technology, Foot Anatomy and Biomechanics, Footwear Production Management and Quality Control, Computer Aided Design-2, Footwear Design-3, Computer Aided Footwear Pattern Making, Footwear Marketing and Management, Footwear Pattern Making-2, Quality Control and Standards, Human Resources and Cost Analysis, Industry Based Training (IBT)-2 (30 workday)as well as general knowledge.

3.METHOD

This is a qualitative study based on interview technique. The participants of this research consist of second year students of Higher School of Vocational and Technical Sciences, Department of Textile, Clothing, Footwear and Leather Design and Manufacturing in Selcuk University in 2010-2012 academic year. First grade students are not involved in the research because they do not have a chance of evaluating the whole curriculum. 24 participants are involved in the study.

In the research, interviewing is used as a technique to get students' opinions. The question forms were prepared by the researcher to apply to the second grade students in the Department of Footwear Design and Manufacture of Textile, Clothing, Footwear and Leather Design in Selcuk University Higher School of Vocational and Technical Sciences. Questions were developed by receiving experts' opinions and making necessary corrections. The form includes open-ended questions about personal information of students, the reasons for choosing the department, the time of lesson, sufficiency of technological devices, the aim of the lesson, teaching atmosphere, students' expectations and suggestions.

In the analysis of data obtained from the interview with the students involved in the research, appropriate classifying was done according to the answers. After the data was transferred to the computer, Microsoft Excel was used in order to make statistical analysis. Through the aid of this software, frequency (f) and percentage values (%) were calculated. These values were displayed in tables.

4. FINDINGS

Table 1: The range showing the graduation of participants

Graduation	F	%
Konya	7	71
The country	17	29
TOTAL	24	100

Table 2: The range showing graduation field of participants

Graduation Field	F	%
Footwear Design and Production	15	63
Out of field	9	38
TOTAL	24	100

Table 3: The range showing genders of participants

Gender	F	%
Male	15	63
Female	9	38
TOTAL	24	100

Table 4: The range showing the entranceways of the participants

Entrance ways	F	%
Transfer	12	50
Through exams	12	50
TOTAL	24	100

Table 5: The range of the participants' reasons for choosing the department

Reason for choosing	F	%
Those who do not have prior knowledge about the department	6	25
Those who knows the department	18	75
TOTAL	24	100

Table 6: The range showing affective conditions of the participants

Attendance to lessons voluntarily	F	%
I attend voluntarily	14	58
I have troubles	10	42
TOTAL	24	100

Table 7: The range showing participants' evaluation of lesson duration

Time of the lessons	F	%
Those who thinks time of the lessons should be more	8	33
Those who states there is no problem with time of the lessons	8	33
Those who asks for one day off in a week because of the time intervals between lessons and states they have a little chance of not attending the lessons	8	33
TOTAL	24	100

Table 8: The range showing participants' views on techniques and models in the lessons

Techniques and models in the lessons	F	%
Those who find techniques applied in the lessons of computer-aided design and footwear pattern making sufficient and states they have difficulty in the lessons of footwear cutting and upper stitching technologies and the lesson requiring footwear machine	20	83
Those who find techniques in design insufficient and make evaluations about developing them	3	13
Those who state they have difficulty in the lessons of computer-aided design and footwear pattern making and say that the techniques of design lesson are ineffective (Those who graduated from Manufacture Program)	1	4
TOTAL	24	100

Table 9: The grade displaying information about sources used by the participants

The sources used in works	F	%
Internet, the modules produced by the ministry of education	16	67
Internet	8	33
TOTAL	24	100

Table 10: The grade showing participants' opinions about achieving their goals

The aim of the curriculum	F	%
I think I will reach my goals.	11	46
I don't think I will reach my goals.	13	54
TOTAL	24	100

Table 11: The range showing participants' opinions about the similarities between participants design and models created in the lesson and the ones on the market

The similarities between the products in the lesson and the ones on the market	F	%
They have similarities.	11	46
Those who thinks they produce more professional products than the ones on the market	9	38
Those who states they have no opinion	4	17
TOTAL	24	100

Table 12: The range of showing whether participants' products draw interest outside the school or not

Drawing interest of the products outside the school	F	%
They are liked by people.	18	75
They do not draw interest due to the lack of information about the department	6	25
TOTAL	24	100

Table 13: The range showing participants' opinions about providing materials

The difficulty in providing materials	F	%
Those who states they have difficulty in time and transportation	17	71
Those who state they do not have any trouble	7	29
TOTAL	24	100

Table 14: The range showing the evaluation of the equipment of workshop in terms of technology

The evaluation of the equipment in terms of technology	F	%
Insufficient in terms of technology	24	100
TOTAL	24	100

Table 15: The range showing participants' opinions about the size of the workshop

The size of the workshop	F	%
Those who think it has enough size	18	75
Those who do not think it has enough size	6	25
TOTAL	24	100

Table 16: The range showing participants' opinions about the suitability of education to the real Work situations

The suitability to occupational life	F	%
Those who find it sufficient	11	46
Those who thinks it is not suitable	10	42
Those who state it depends upon their own effort to improve themselves and the place where they work	1	4
Those who do not have any opinion	2	8
TOTAL	24	100

5.DISCUSSION AND CONCLUSION

Selcuk University, Higher School of Vocational and Technical Sciences, Department of Textile, Clothing, Footwear and Leather Design and Manufacture Program were founded for the purpose of adapting to ever-changing technology in Turkey and in the world and following the changes. Various researches about the education given in this program indicate that the special footwear workshop equipment requires time to improve the conditions of them because it has recently opened. Most the students of Footwear Design and Manufacturing state they voluntarily attend the

lessons and 42% of students state they experience difficulty in the lessons. 33% of the students state that theoretical lessons are enough but footwear design lessons should be more. 33% of the students state that the intervals of the lessons are long and thus they do not have many chances of not attending lessons and they need one day off in a week in order to do research. Most of the students in Footwear Design and Manufacturing say that they find the techniques sufficient in the lessons of computer-aided design, computer-aided footwear pattern making, footwear pattern making and design. Moreover, they state the machines used in the lesson of footwear cutting and upper stitching technologies are insufficient in terms of the techniques. 23% of the students find the techniques in footwear design are insufficient and make evaluations about developing them. 4% of the students, who graduated from footwear design and manufacturing in high school, state that they have difficulty in computer-aided design and computer-aided footwear pattern making and also they think the techniques in computer-aided design lesson are ineffective.

Most of the students make use of Internet, the modules produced by the Ministry of Education and the experts working in the sector as a source. 33% of the students state they do not use any other source except for the Internet. Most of the students in Footwear Design and Manufacturing think they will not reach their goals after the education given. 46% of the students think that they will reach their aims at the end of the education. 46% of the students say that they follow the products on the market and they inspire from them at a certain extent. Therefore, they state their products have similarities in the ones on the market. 38% of the students say that there are more professional and original models than other products on the market. 17% of the students state they do not have an opinion about this matter.

Most of the students state their products made in the lessons are liked outside school. Because 25% of the students do not know the department well enough and their designs are not presented enough, their products do not draw attention. Most of the students say they have difficulty in providing materials used in production because of time and transportation. 29% of the students state they do not have any trouble with providing materials.

All of the students cannot evaluate the equipment in the workshop because it has newly opened.

Most of the students in Footwear Design and Manufacturing state that they find the size of the workshop sufficient and 25% say the opposite. Most of the students say that the education is suitable for the occupational life. 4% of the students state this depends upon their efforts for self-improvement and the place where they work.

Students suggest necessary things should be done in order to promote the department. For this, it is useful to attend seminars and exhibitions, and to be on the people's minds.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

COLOR–THE ROLE OF COLOR IN PRODUCTS DESIGN PART I

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Abstract: The colors became essential means having salutary effects in different fields. The paper presents a classification of colors according to the physiological, mental and emotional effects of those. Also, the paper presents the criteria on which are based the preferences for colors and some general guidance for color selection and color harmony. Taking into account the created impression we can speak about warm colors which give the impression of closeness and cold colors which give the impression of distance, i.e. increasing space.
Key words: color, physiological, mental and emotional effects, color harmony

1. INTRODUCTION

"De gustibus at coloribus non disputatum". Nevertheless, in the present phase of knowledge, colors became essential means having salutary effects in different fields, from medicine and pathology up to labor productivity raising and of course to aesthetic training.

White light is decomposed through a triangular prism in seven spectral colors (light scattering), with this phenomenon being reversible because the white light results from the spectral combination of colors. The visible light spectrum covers electromagnetic waves with wavelengths between 4000 and 8000 Å. Each spectral color has an interval of 200 till 600 Å, except for red which holds a quarter of the visible spectrum. The white light can appear also from the superposition of only two spectral color. These pairs of colors are called complementary colors [1].

The reflection properties, expressed through the reflection coefficient, have higher values for light colors which reflect more light than dark colors which have lower reflection and higher absorbtion.

Colors are classified as:

- primary colors (basic colors), which cannot be decomposed in other component colors or, what is happening in practice, cannot be obtained from other colors: red, yellow, blue;
- secondary or binary colors (composed of grade 1) result from the combination of two primary colors. Binary colors are the complementary to primary colors; the pairs of complementary colors being: blue-orange = blue+yellow+red; red-green = red+yellow+blue; yellow-violet= yellow+blue+red. While the combination of complementary spectral colors yields white light, blending of color complementary paints yields gray.
- tertiary colors (composed of grade 2) result from the combination of binary colors; for example: orange+violet=redish brown; orange+green=ochre; green+violet=gray bleu.

Another way of classifying colors can be also as follows [3]:

- fashionable colors – those colors that are not used only for a short period of time (for example: : turquoise is decreed the 2010 year color);
- one generation colors – those colors accepted and used most frequently for a category of products over one or more generations (for ex. green can represent for a certain generation the color of ecology);
- cultural colors – those colors related to countries, religions, some specific traditions of certain cultures (for ex. green represents the Islam color);

archetypal colors – those colors that have archetypal values (of initial model, original), for ex. green represents renaissance, renewal, youth.

Finding the most adequate color leads in general to increased tonus, productivity as well as increased labor and life pleasure. Excessive use of some color nuance leads to monotony and implicit to negative effects. It is for example the case in which excessive use of lime color in factories, cars and objects has created a cold atmosphere and a boring ambience.

The phenomenon is known as „malady of lime", and has lead to opposite effects than expected, determining D. Huisman and G. Patrix to write in „ L'estetique industriel" the same thing: „Drop the green".

Physiological, mental and emotional effects of colors

We are influenced in a remarkable way by colors which can induce various states of mind, experiences and emotions both through their nuance as well their saturation. The color information is obtained both visually and by light that induces the sense of sight.

In fact, not colors by themselves but their chromatic value, spatial disposition, harmonizing and balancing of different tones and chromatic nuances are those that have a bearing on the human soul. The study of colors, their harmony and their impact on our life concerned many researchers who have brought their contribution to a better understanding of the color perception mechanism, to the interpretation of human-color interaction and to the influence of color on the mental state, memory and health of the individuals.

The physiological and emotional effects of colors are used to impress aesthetically. Taking into account the created impression we can speak about warm colors (red, yellow, orange) which give the impression of closeness and cold colors (blue, green, indigo) which give the impression of distance, i.e. increasing space [4]. Besides this classification, each color is attributed a certain meaning and physiological effect which dictates its use in industrial spaces and machinery as follows:

- *Red* is a very warm, exciting color that catches the eye, retains the attention; symbolizes force and passion. But, red must be used with cautious. The excess of red can become even tiring because of the physiological effects that it induces i.e. rise in muscular tone, accelerated breathing, increases blood pressure. A too dark red, blood-red or purple can cause uncontrolled shaking or even depression. A too light red can create a serenity impression.
- *Light pink* suggests softness; a more pronounced pink gives the impression of intimacy and distinction.
- *Green,* although considered a cold color facilitates nervous disconnection, favors meditation, contemplation and idea association. In general, it is an invigorating color, but also the most demanding and most ambiguous of colors. Pale green conveys delicacy, gold green suggests energy, yellowish green suggests fatigue while dark green suggests sickness and depression.
- *Yellow* is the most cheerful color and the least exhausting color among all warm colors; it is a youthful color that induces the feeling of closeness, warmth and satisfaction. Thus, it maintains concentration and mobilization capacity as well as vigilance. However, olive yellow suggests decomposition and it is a depressive color.
- *Orange* has the same effects like yellow. So, it induces optimism, joy and sociability. It invigorates and facilitates the communications and pleasant emotions while also giving the impression of cleanness and intimacy. The orange color accelerates the heart rhythm, maintains good blood pressure, favors gastric secretion and digestion.
- *Blue* is a very cold color, restful and induce serenity as well as a predisposition towards concentration, peace of mind and nostalgia. Too much blue conveys the feeling of space, of infinity. Light blue is the color of health while a too dark blue (indico) can be depressing. Blue decrease the blood pressure and the muscular tonus, calms breathing and pulse rate.
- *Violet* is a cold color, daunting, distant, serious and solemn. Being a compound color made up of red and blue it has contradictory effects, i.e. attraction and departure, optimism and nostalgia. On the physiological level, violet increases the cardiovascular and pulmonary activity.
- *White* makes us expansive, pure, strong, bright and confident in our own forces. It induces expansiveness, easiness, suavity, robustness, innocence, coldness; it is tedious through the lightness given by the its capacity of total reflection.

- *Black* is a neutral, cold and depressive color. It is the mourning color, but when it is given shine it can also suggest elegance and distinction.
- *Grey* with various tones is the result of blending white with more or less black. These are neutral tones which can fade the effects of pure colors or can also highlight their brightness, depending on the ratio between white and black.
- *Bronze* is a universal color symbolizing solidity and persistence. It is a color which is never vulgar or brutal.

The significance of colors is however different in various geographical areas, depending on tradition [2]. For example, in some African countries, black represents the good spirit while white the bad spirit. In Europe the situation is reverse. For an European, black significates sadness or mourning. For Chinese and Japanese the mourning color is white. Green for European symbolizes envy while for Asian it means happiness and hope. Yellow for Europeans represents cowardice and jealousy while for Asian people it symbolizes purity.

Because of the significant number of nerve functions triggered by visual perception, the sensorial system responsible for vision is one of the important causes of the fatigue phenomenon.

Each color has its own psyhological effects, very different, depending on the person but alike in most cases.

From the point of view of their psychological effects chromatic colors can be characterized as follows:

- a color is more warm the closer to red it is and more cold the more blue predominates;
- dark colors have a depressive, discouraging, negative effect;
- light colors have a stimulative, joyful, positive effect;
- too vivid colors are tiring.

The preferences for colors are based on the following four criteria:

- objective criterion – considers the color properties like: luminosity, purity and intensity;
- psychological criterion – a color is stimulating, calming, heating, etc;
- associative criterion – a color can be liked or disliked depending on the emotion or memory that it awakes;
- semantic criterion – through which a color is confered an expressive feature (liveliness, fatigue, aggressiviness).

An interesting classification [5] of a car buyer, depending on the chosen car color, is presented under the title „ The car buyer is like the chosen color".

- yellow car body – determined driver, drives superficially, impatient, wishful of news, relaxed and happy; in a yellow car people sing and hum more than in other cars;
- blue car body – a driver with faithful soul, but lonely and liable to depression, yearns for quiet;
- green car body – a driver inclined to defensive driving and stubborn.

Some general guidance for color selection and color harmony would be as follows:

- the nature of the surface needs to be taken into account together with pigmentation and granulation as well as with the nature of incident light (natural light, internal artificial light, white light, constant or variable light);
- the chosen colors will be clear, saturated under full light and more deep in semidarkness, on backgrounds;
- the eye prefers combinations which do not involve too many colors; favorable results are obtained by the combination of maximum three colors. Harmony can be also achieved with one color of different intensities and saturations (known as composition tone in tone);
- the eye prefers certain optical intervals: closed, similar (the color varies in intensity and saturation) or spaced , contrasting (complementary colors);
- the eye prefers variety in the ratio between the occupied surface area and its color intensity: an inverse proportionality ratio is recommended (high intensity- small area and also reverse).

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

PRINCIPLES FOR THE DEVELOPMENT OF A NEW DESIGN FOR CONTRIBUTORS UNIFORM NETWORK OF STORES "LINELLA" THE MUN. CHISINAU

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Abstract: This paper aims to establish principles to develop a new corporate uniform design, taking into account that, at present, this attribute has become a prestigious recognition at national and international company. To achieve its purpose were carried out following activities: studying requirements imposed on the company to designs clothing products; analysis of working conditions of staff and services delivered; developing new models of uniform style accepted and recognized within the company, currently being style popular costumes. We resorted to select the most specific elements, which largely characterizing the given style, so that finally to obtain a series of original new designs. Thus, the methodology for developing designed models clothes for all employees, assuming adapting each product model fashion depending on the activity they carry out in-store employee. Uniforms proposed product is developed in strict correspondence with the whole set of requirements imposed, providing high quality, aesthetics and comfort.
Key words: principles, uniform, design, style popular, costumes, requirements

1. INTRODUCTION

Today we are witnessing a "fierce battle" of companies for clients, working every day to creating products that would attract demanding buyer.

Design a fashion product derives from technological, economic conditions, changes and developments in society needs and evolution of the art. All these factors directly influence the design and causes constant transformation. Thus, the latest technology means designing products for people with different social status.

Contemporary effort to explain the aesthetic presences and place clothing is a necessity products resulting from amplification process even human awareness, accompanied by all economic requirements of our age.

Everywhere, in our century is obvious concern that the product (uniform) intended to be practical and beautiful (a).

David Pye and other design professionals believe that such forms design is characterized by certain conditions such as:

• construction and formal logic to justify by reference to quality product with a specific use;

• the components the shape to be correlate geometric, according to the purpose for which the product is to be made;

• materials and structural elements of the form to be chosen with regard to the requests arising from the functions or uses parts;

• development and product procurement that does not involve excessive economic efforts;

• product so made to be as easy to use;

• product type design to provide maximum comfort and efficiency possible at that time;

• require minimum product costs for maintenance or operation.

In our opinion, the above idea would add, the interrelationship between environment and business, the product must meet the compulsory requirements for employee protection in the

workplace. Good design can not be defined, products are considered to have a good design combines qualities such as:

- utility;
- desirable aspect;
- easy;
- profitability;
- differentiation

The benefits of good design can be seen in products that are clearly differentiated. Differentiation can be made by consumer desires in new ways, by Product Excellence through some physical feature or by providing services related to goods

2. REQUIREMENTS FOR PRODUCT DESIGN CLOTHES

Among the products requirements imposed on is a tendency that they meet requirements hygiene, ergonomic, aesthetic, operational, functional, technical and economic in correspondence with their use.

Products must provide proper conditions of comfort, to have appropriate shapes and sizes wearer; seams aesthetic, soft, elastic, not traumatized skin tissue recipient; to have dimensional stability during the operation (wear and washing).

Requirements imposed by the uniform design firm are:

- to use the corporate colors of the network of shops "Linella": red and green;
- contain elements of national style, applying corporate ornament;
- be comfortable, and beautiful;
- to take into account the fact that winter team "Linella" must not freeze at work;
- and a final important aspect: the existence of several categories of employees - dealers, cashiers and consultants.

Vendors serving the refrigerators (food products, meat, cheese, etc.), Cashiers - serving the cash register, and consultants are those who take care of shelves in the room. Uniforms for them can be identical, but can also be different.

Therefore will develop products to meet business requirements but also to provide a balance between "function - form - structures" is a must to be taken into account when designing the products constantly. In this equilibrium,

- Function expresses its destination (purpose for which it is made),
- Configuration expressed as the sketch is a product of human labor as a commodity, and
- Structure expresses how willing the matter, the arrangement for its composition.

The design is such a demanding contemporary and aesthetic imperatives products improve the condition forces us to think that there must be synchronism between the tastes of those who opt for a product and tastes of performing product, but do not forget to protect employees of various risk factors [1].

In developing new product designs used clothing as required nominated miljoacele will offer some features that give them certain shapes, sizes, volumes, colors, etc. These are basic premises which is reflected throughout this process is finally admiring or insulting.

As a result of contact between man and product appear as a first form, outlined intuitive, aesthetic categories. Due to repetition, primary aesthetic reactions begin to take shape and, depending on the temperament and psychological structure of man, they are rational, conscious, begin to rank the categories.

3. DEVELOPMENT OF NEW MODELS FOR EMPLOYEES UNIFORM NETWORK OF STORES "LINELLA"

Taking into account that a requirement for employees prepare for the new network design shops "Linella", is to match style costumes were reviewed and selected the specific elements of this style of dress.

Developed with the forms of social life, folk Romanian [3, 4, 5] show that one of the cornerstones of this culture materials. Knowing his own character allows understanding of the Romanian people and contributes to the definition of ethnic specificity.

We propose to analyze the specific elements that largely characterized costume. The role that it has clothing in human existence; the traditional costume is a living document, decoding and analysis of the elements making up, being able to clarify important issues of ethnogenesis.

The specific elements costumes are shown schematically in Figure 1, parts for both men and women.

Thus, new models clothing is a product obtained as a result of actions by changes in the composition structure outside of the initial model. Develop string models are initiated by selecting the basic theme of the composition of the main model and determine the permissible means change and substitution in composition.

Any change in the product shall be in correspondence with the compositional model solution. It was found that the products have a certain compositional solution can change an element of the composition without affecting their quality, for other compositions these changes are unacceptable.

The study bibliographic showed that industrial production no concrete recommendations for appropriate changes in the compositional structure of the model to generate sequences of patterns.

Fashion design is a process that evolves according to the technical development and evolution of human society. In the fashion design process, experts groups established models of products are designed and presented to the public for sales and consumer behavior.

To ensure appropriate models to satisfy most consumers and most refined tastes should take into account the parameters used in creation [2], such as:

- destination;
- fashion line;
- proportion;
- balance;
- pace;
- focus;
- unit;
- color harmony;
- material used in manufacturing.

Solving the best conditions of the unity of form, structure and function is the determining factor in the aesthetics of industrial products. Introduction of good taste is the best selection and this is private and personal quality each individual creative work clothing.

So finally after careful analysis and study of all conditions, has developed new product design clothing that is uniform for staff network of shops "Linella". These in turn have harmonious folk elements in modern clothes and meet predetermined requirements (Figure 2).

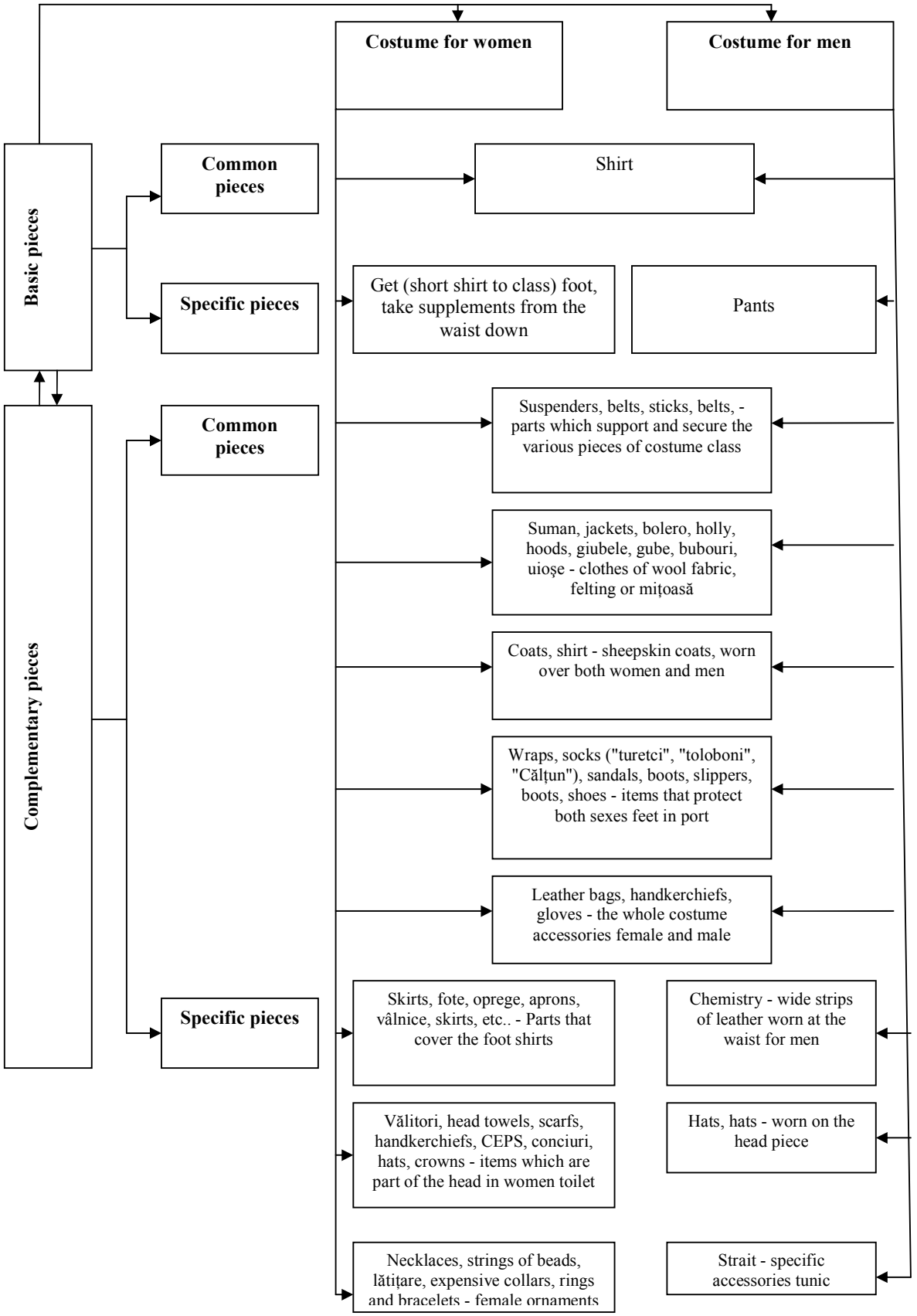

Figure 1: Specific elements popular port

Figure 2: Network design uniforms for employees of stores "Linella"

4. CONCLUSIONS

From the research conducted have established the ground in developing a new network design uniforms for employees of stores "Linella". From all this information we can mention that to meet the requirements of the company and the requirements they must meet uniform is necessary to take into account the purpose and functions that meets product, the product composition, of materials which are made and manufacturing technologies.

Designing clothing for employees is a difficult process and requires a thorough preventive study, because the garment must conform to both the employee and to meet product requirements, because it, in a directly or indirectly to promote activity they perform.

Function, form, structure, line, design, decoration, style, color, symmetry, proportion, harmony and contrast, are aesthetic categories by which we appreciate, in terms of aesthetic products.

Changing the development model means the production of new values and new quality criteria, involves finding new forms of economy and production, and involves major changes in lifestyle and daily behavior of each of us.

Designers can play a role "giving form" a world that is changing and "providing opportunities" new behaviors. The new design not only deals with the design objects in serial production, as did classic design, but dealing with a new relationship between humans and artificial world, a world consisting of a mixture of technology, information services, so close to humans that become second nature.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDIES ON THE FUNCTIONS OF FOOTWEAR FOR CHILDREN

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Abstract: Children's footwear is meant to fulfill the physiological functions of the foot. The shape and internal dimensions of footwear, the material properties of the product from which is made, manufacturing technology etc., all influence children's feet and the comfort that they need. To get comfortable footwear is necessary to perform a correct choice of materials that are appropriate for shoes, rational design and execution of its corresponding technology. Purposes of personal use for current use or special particular conditions, modern shoes have multiple functions. Children's footwear perform several functions, which can be grouped in gnosiological functions, aesthetic features, ergonomics, comfort functions that ensures thermal resistance, providing psychological convenient functions. Establishing the correct number of functions and provide the manufacturer with them will get their suitable importance: reductions in production costs; simplify manufacturing processes; manufacturing cycle times; meet user requirements in greater measure.
Key words: Footwear, functions, children, classification, requirements.

1. INTRODUCTION

Children's footwear to the foot to fulfill its physiological functions. Shape and internal dimensions of footwear, material properties of the product is made, manufacturing technology and other factors influence children comfort they need. To make a comfortable footwear is necessary to perform a correct choice of materials that are structured shoes, rational design and execution of its corresponding technological [4].

2. FUNCTIONS OF FOOTWEAR FOR CHILDREN

Shoes have a large social utility, but all together is an individual, of each user, the affirmation of personality and a system for aesthetic values. Purpose of personal use for current use or special conditions particular, current shoes have multiple functions [4]. The main content of footwear function is man-made balance between the demands submitted by footwear and response to these requirements. Shoes expresses our goals, aspirations and preferences. Therefore, the position presents and confirms the artistic product of its image. For any items of footwear is important functional logic. With the development time changes, develops and improves functions, construction, form, rationality and argumentation usefulness of various types of footwear. At present various approaches to meet the presentation functions footwear, various authors differ footwear products following functions: utilitarian (practical), aesthetic, erotic, magical, social, moral, related to age, religious, professional, religious. Because shoes at the same time fulfills many functions, they are in a certain relation depending on its destination, one or more may be dominant (most important). Children's footwear, as that for adults, is meant to protect the human body actions weather (high and low temperatures, rain, snow, wind, dust) and various external mechanical action. Starting from the fact that shoes appeared in antiquity as a necessity to protect the feet of negative environmental actions can be said that the first function of the protective footwear was. At the same time it performs several functions, which in our view the functions can be grouped aesthetic, ergonomic features, functions thermo providing comfort, convenience features that provide psycho as presented below for shoes to children [1-5].

Protection function

1. Covering the body that expresses the product's ability to cover and protect the human body. Given the peculiarities of anatomy and biomechanics of the foot children in developing footwear construction for this consumer group option is recommended to those items that have a greater body coverage. We know that children are most active, so, shoes have to defend the various injuries such as scratches, bites, bruises, cuts, and the action of atmospheric agents used physical dust, moisture, excessive heat or cold excessive. In this respect, are recommended for children advantageous type boots or shoes.

Safe operating functions

2. The possibility of observing the wearer by others expressing the signaling capacity of user presence in the media or special situations. Children's footwear design is associated with notions of invention and innovation. Today we witness a series of inventions and innovations, for example: shoes baby noises while driving; shines shoes while walking child; periodic appearance of a light on a part of the shoe. All these innovations help parents and others to observe the child for the presence of an emergency. At the same time they create a happy baby move.

3. Safe operating expressing capacity the product to be used without affecting the health of the consumer. Currently being discussed more and more about environmental trends on the development of clean technologies and products replace human impact on eco products. This prohibits the marketing of textiles and leather that contain over a certain heavy materials, dyes, adhesives are toxic, however generating carcinogenic diseases. An analysis that identifies sources of pollution are toxic compounds may enter text by: dyes, and technological processes for textile or leather by using auxiliary chemicals by impurities in raw materials, water and fibers used. Using quality products and aimed at improving environmental and maintaining the child's life in a healthy and ecologically pure. To reduce levels of harmful agents is recommended confection following systems: footwear with injected, flexible footwear, footwear returned, shoes with soles stitched to the frame, shoes with soles stitched through insole.

Function features that provide comfort thermo

4. Thermal insulation represented thermal resistance. Thermal protection properties plays an important role, because that leg temperature is maintained within normal limits. As a result of exchange of substances in human body forms a significant amount of energy that cells do not use it fully. Additional energy is converted into heat, which must be eliminated from the body, otherwise its temperature would increase greatly. Since walking out different leg movements (bending, lifting, rubbing) is reached at different temperatures on its surface: dorsal surface temperature is 2-3 °C higher than the planting area and calf temperature by about 3-4°C higher than the dorsal surface. Under normal conditions, the leg area temperature must be kept within 20-30 °C. Foot surface temperature rise above 33 ºC lead to overheating and his sweat significant growth and reduce the temperature to 18 °C and even below, causes the sensation of cold, both create uncomfortable situations. Foot descent below -9 ºC temperature can cause frostbite [3; 4]. Human body temperature is generally higher than ambient temperature, so heat transfer is allowed from the foot to the shoe environment. Heat transfer in case of natural leather, leather substitutes and other materials used in footwear mainly depends on the degree of porosity. Materials with low toughness, with a structure that blueberries, with a large pore volume, provides a lower heat transfer materials than compact structure and small pore volume. Thermal protective properties of footwear confection depend on the system. Thus, the sole method of fixation affects the thickness and structure of all lower layers of air the size of parts joined. Systems in which the sole is attached to provide better thermal protection than systems that soles foot is stuck, provided the thread to adhere perfectly to the hole and groove seam placement to be closed perfectly. Summer footwear thermal properties depend to a great extent colored material sides. At ambient air temperatures of 16°C, temperature faces beige leather footwear is 39 ºC and the black of 47 ºC. Therefore, depending on the type and purpose footwear through appropriate choice of materials and thickness of their nature, how to structure and assembly technology, can influence the thermal protective properties of footwear in the phase of creation projectors [3;4] .

5. Absorption of moisture represented hygroscopicity. Normally the welfare of the leg and whole body is characterized by the following indicators: air temperature 21-33 °C, relative humidity

60-73%, CO2-0,8% content. Removing moisture from inside the footwear is made by: evacuation of a quantity by mechanical vapor with air sweating by the action of "piston" of the foot during walking or even when stationary, when, by involuntary movements, changing support from one leg to another; transfer to the outer vapor diffusion through internal and external phenomena; absorption of moisture in liquid, its accumulation in the inner layers of footwear and wearing disposal outside discontinuing the product. On the exchange of moisture in footwear influence of complex factors which are basic: the openness of footwear, construction features, properties of materials used in the product structure.

Removing moisture inside the shoe is done mechanically at a rate of 40% of them. This dynamic effect occurs mainly while walking and directly depends on the openness of the shoe. In open shoes (eg sandals, shoes, cut the tip and the heel, sides with perforations directly outdoors in an even higher proportion than 40%. The shoes shoes type with a large opening at the top, higher air temperature inside the shoe, compared to the ambient effect of bending piston movement of the foot during walking and / or running and air circulation around the shoe favors the mechanically removing moisture. Moisture transfer by diffusion phenomenon is influenced by: footwear design, thickness of material systems that form the two assemblies, character combining layers in the system, the presence or absence of insulating layers, hydrophilic character of the material, the vapor layer permeability external gradient temperature and humidity gradient. At the beginning of moisture is absorbed unevenly worn shoes of all parts of upper and lower. Time to reach equilibrium moisture of different materials depending on the nature and intensity of sweat released. Moisture absorption intensity of the whole upper parts is always greater than the whole lower parts. Moisture vapor start running outdoors by side in a time when the whole bottom is not yet saturated with moisture. Absorption of water vapor molecules begins with superficial absorption depends on surface characteristics, its electrostatic charge, in particular finishing materials for external cladding. Water absorption is greater on surfaces with-OH groups. Porous structure of the skin, temperature and humidity affect how the absorption of water molecules. Micro capillary diameter less than 10-6 cm are filled by absorbing water vapor and micro pores 10-3 -10-5 cm diameter only by direct contact with liquid water [3-4]. Therefore, parts of mineral leather absorbs moisture more easily than those of vegetable tanned leather, vegetable tannins decrease since particles diameter pores. Tanned, but unfinished, has a very high vapor permeability. These properties often are reduced by applying the coating film finish.

6. Transfer moisture represented vapor by permeability transition. Amount of moisture absorbed by the shoe is highest in the first hour of use, then decreases due to external diffusion process (evaporation through the outer side). Moisture absorbed in the layer of lining material will diffuse through the action of temperature gradient, pressure and the humidity. The amount of removed water vapor diffusion in the environment and surface properties of the material. Temperature during wear shoes reach 32 ºC, while the outside temperature may vary within limits -30°C+30°C [4]. Temperature difference between surface material system increases the speed of diffusion of the heated surface to the cold, so the shoes outside diffusion increases with decreasing partial pressure of vapor in outdoors and vice versa. Thus, during operation footwear sweat secreted by the foot is removed out through a complex process which involves diffusion [4]: absorption, passage and water vapors in the space between the sock and the sock lining; absorption, and elimination of moisture passing through the space between the lining and trim sides; absorption, transfer and evaporation of water vapor in the atmosphere by surface uppers. The system as material thickness is greater (in the absence of insulating layers, adhesive films with continuous structure), the more moisture exchange is made on terms more favorable. Ability to transfer moisture from the inside of the shoe assembly is done primarily through education, which generally has a smaller number of layers to the lower assembly and insulating adhesive layers are missing. The peak area and the heel, where bombs are placed and counter generally not moisture is transferred. This diffusion process is appreciate that from the inside of the shoe is removed 10-15% of the amount of sweat secreted by the foot. This process occurs while the component parts of footwear has a good absorption capacity and water vapor permeability. Materials are considered appropriate for girls permeability water vapor within 10-20 mg/cm2.8h and 40 mg/cm2.8h absorption capacity. All the materials with lower vapor permeability of 10 mg/cm2.8h not provide comfortably worn shoes [3-4].

7. Ventilation capacity represented by air permeability. At the surface of the foot is removed carbon dioxide to be removed from the interior of footwear and bring fresh air from outside. Breathing skin pores that oxygen supply and thus the blood is responsible for the overall health of the body. If

starting with the tip foot, heel, ankle and lower leg are insufficiently irrigated with oxygenated blood, can occur while weakening muscle tone and joints. Therefore, for shoes for children are recommended assortment of leather, which by itself capillary-porous structure, providing currency air in both directions [3-4].

8. Minimum effort for behavior that expresses the product's ability to require a minimum mechanical work, body wear process. In these systems users anatomy of the foot did not reach full capacity, they are in the process of evolution, and a shoe with too much mass that constitutes a heavy load can cause abnormalities of the foot. A real opportunity to reduce weight shoe is the use of new porous materials with low densities, to obtain insole and insole roof and use toe counter and nonwovens impregnated or coated with thermoplastic polymers. Children's footwear must be, if possible, not easy to increase the amount of energy consumed by the leg muscles when walking bare foot walking shoes to [4]. Effort will ensure minimum wear and footwear products achieve the minimum bending stiffness, and flexibility feature called shoe. This is regulated standards by type and destination of products from shoes (age and sex of the wearer), the materials and overall lower system confection.

Function to ensure comfort psycho

9. Psycho comfort is expressed sensations generated by the product-body mechanical contact by pleasant sensations or unpleasant sensations. This raises a number of specific issues related to children's interaction with the leg materials, the mechanical properties and surface characteristics of the material are of special importance. A well designed footwear will create the sensation as "pleasant". While a shoe not complied with this group of carriers will create discomfort, eg biting skin allergies, too narrow or wide, will appear static load effects, itching, stinging, "sticky humidity". The comfort and psychologically means the wearer is shoes and dressed in a certain manner, style, conformation and destination that fits, is consistent with the view of the wearer through the prism of its social and economic status [3-4].

Function the ergonomics

10. Correspondence dimensional expressing anthropometric body-mail product. For correspondence dimensional great importance is to determine the main dimensions lasts for serial manufacture of footwear. When switching from the series lasts individual block is necessary to know that change sizes with the basic dimensions of lasts the number of sizes and widths. It is recommended that the top shoe to be slightly high for ease of movement of children. An important factor in choosing shoes at the foot area to prevent slip ping on top shoe foot. This is achieved with the correct choice of footwear width. Children's footwear must be provided on the top with the addition of 10 mm, containing necessary both for increasing leg, while walking as well as elongation of the fingers [4]. Lack of addition that also leads to abnormalities fingers curved, carved foot. Shoes in top shape to meet children's foot, characterized by the right thumb.

11. Easy to shoe-to take off one's shoes, expressing the shoe-to take off one's shoes convenience with minimal effort. Children's footwear should allow easy foot entry within it the shoe and therefore the footwear for adults, vamp should be as short as possible, there by ensuring a wide open quarters. This requirement is justified by the need to avoid excessive demands of the area when placing your fingers in a shoe foot opening rather small, since the muscles provide flexion-extension movement of the fingers and associated ligaments are not fully formed to meet their activities, systems are evolving anatomical foot and fingers are slightly bent position. Effort to reduce children to take off one's shoes shoe and footwear are recommended fixing systems zipper, strap tape "velkro", button closure and buckle, elastic, combinations.

12. Ease of use product features (pockets, belts, straps), that allows use of pockets, straps, boules.

Function to prevent incorrect development of the foot

13. Ensure the proper development of the foot in correct footwear construction, which necessarily must have counter, insole, shank, toe. Presence counter avoid rigid heel joint movement and the emergence of abnormalities of the foot; shank inside the shoe serves to support the longitudinal arch of the foot, sock elastic-plastic properties, spatial format, allows increasing the contact surface of the foot and support plan, that a distribution efforts on a surface as possible, thus

reducing high local pressures. Heel height of 10-15 mm. provides the relative position of foot bones in relation to leg bones requiring minimum system and reduce muscle discomfort [4].

Aesthetic functions

14. The novelty of the model, which expresses the degree of alignment with the latest trends in fashion and design originality. Fashion involves, essentially, change, innovation, originality, creativity and is defined as a sequence of trend or fad, the short term. This in itself is an ephemeral event, a current generated by a complete data base of social, political, economic, cultural-specific period, current is supported by an elite and the imitated and assimilated gradually the other groups who want to integrate the new life style. Continuous on fashion implies exercise requires creative design skills leading to a wide range of products whose range extends from the base to there are and developed. Children's footwear should not blindly follow fashion trends. Factors such as tip shape, form and thickness of the sole, heel height form and must meet certain requirements for building natural anatomical morphology of the foot. The shoes for children regardless of fashion trends is not recommended too sharp-tip shoes and high heels. To ensure the aesthetic function of footwear designers to develop collections of models can be successfully applied techniques such as point or spot, line, color, decorative elements, materials texture, repetition, parallelism, rhythm, contrast, symmetry and asymmetry, etc.[5].

15. Concordance model with life style and clothing of the wearer, that the degree of integration of product and fashion lifestyle of the user.

16. Product appearance, expressing how to harmonize aesthetic system produced in the body-worn and whether the product determines the act of purchasing. Product designer task is to use the correct materials, shapes and colors so that the new product to meet specific requirements for accurate compositional style and originality, plus items such as quality of design and execution. Shapes and lines proposed, all the ornaments and color palette can be used in evidence at face value only through aesthetic work man ship, allowing recruitment of the required product to the consumer parameters.

17. Aesthetics processing technologies, this function is perceived and evaluated subjectively by the user informed, who can give him a certain importance. For realization of this function at the appropriate level, the manufacturer has the technical means to achieve specific objectives of this function.

Functions gnoseologic

18. Function of advertising, which is known, for example, logos. Logos provides information about the product but, more importantly, they help to establish or clear outline of company image. An image is a general impression about a company, maintained or retained by the consumer to think of a product in a certain way. Leads to a logo to grant a certain product credibility in the message you send it. If parents are children's shoes who procure product, and therefore they have certain demands or expectations in terms of quality footwear. When an image is well established, dedicated, consumer feels that in some way identifies with that image is.

19. Carrier of information: the presence of explanatory labels. Mark the labels in a visible place on fabric, sintetic, paper, or woven tapes, attached by stitching or gluing. Some manufacturing companies made direct marking on the lining inside the product by mechanical stamping. The presence of labels is mandatory, as they inform the buyer about the number of size and width footwear, manufacturing footwear brand, article, sign technical quality control body etc. Besides the product label must contain instructions for maintenance.

Function of mounting the product on body

20. Fixing the product on the body that expresses the product can support the body. Construction of footwear for children shall provide for maintaining stable footing, recommended various fastening systems (eg, braid, strap ribbon "velkro" close button or buckle, zippers, elastic, combinations), using counter and collar in the back of the shoe. All these are necessary for proper fit in the shoe and foot to avoid while wearing the deformations and anomalies (eg foot valgoid or varus).

Reliability functions

21. Resistance to mechanical product while expressing resistance to extreme mechanical stress

and the cycle repeated requests mild. One of the basic conditions required materials is to provide sufficient strength to provide safe operating footwear products. While wearing footwear parts are subjected to mechanical components which can not be avoided. An important feature is the elasticity of their materials to ensure product appearance and wearing comfort by molding the foot, and flexibility when worn. Each type of material is characterized by a kind of tensile behavior and other applications, so knowledge of physical and mechanical characteristics of materials for foot wear and their correlation package allows optimal choice of materials [3-4].

22. Resistance to surface wear behavior expressing surface friction materials in the wear and maintenance. In the operation of footwear, outdoor wear marks lining friction especially in the heel region and little finger. Abrasion, slightly lower intensity, is subject to the top of the shoe opening, total edge joining foot, and sometimes pressing its soft tissue. For this reason, the upper outer lining of the surface is recommended to complete the leather lining, this representing a superior abrasion resistance compared to other cladding materials. Counter, by position, is a landmark whose damage is unusable shoes. As a result, he has made of a material to keep the form used throughout the shoe. On top counter must have less rigidity to not cause erosion of the foot, but also to establish good foot. The children's shoes is a landmark called collar, the role of protecting the heel region. Bombs prevent wear on the tip faces, wear can occur due to thumb pressure on the inner surface faces the bending shoe. Pressure has different values, for example 4-7 daN/cm2 in front foot and foot area around 2daN/cm2 below previous tarsus as pressure is higher, the more galling is more intense [4]. Due to high local pressure, occurs below the surface of the foot while walking a rise in temperature from 80-100°C, which leads to intense wear pad due to its friction on the bearing surface [4]. To slow the wear pad is best to choose the correct nature of the damping material and capacity to take into account climatic conditions and the particular driving carriers.

23. Stability forms and dimensions that expresses stability product forms and dimensions, obtained by design and manufacturing, while wearing and maintenance. Maintaining children's shoe shape can be solved by using counter, bombs, heel and shank in product design and by using suitable plastic material with elastic properties. Last but not least it depends on the parametric technology to manufacture the product.

24. Resistance to biological factors that express the product's ability to resist the action of degradation caused by biological factors. People living near green plants encompass a world invisible to the naked eye but visible under a microscope. Microorganisms live every where, in soil, air, food, the body of plants, animals and man. Children are a category of consumers who want to know every thing, are curious, interested in things around them. For this reason, shoes are always in contact with all kinds of microorganisms, some of them can harm children when they are creating beneficial conditions for development. Beneficial microorganisms grow very fast and natural materials, but also the synthetic, which is a poorer food source, but due to the great powers of adaptation of microorganisms after a while, they become susceptible to attack microorganisms. This causes the value dimimarea shoes, even if the attack does not cause changes in the micro chemical materials. There are changes unsightly such as patches, migration color, cracks, unpleasant odor. Some of these microorganisms exert a negative influence on the human body and shoes that can be a source of infection that lead to various diseases of the feet, especially mycosis type. Dermato mycoses feet, whose occurrence is common epidemiological particularly common use of skin surface conditions it is difficult to cure. Growth of microorganisms in the shoe during wear depends on the microclimate that is created within it, which in turn is conditioned by the materials used to manufacture them. From these considerations must be carefully chosen materials. It requires that shoes be resistant to biological factors in a case or source of food necessary for their development.

Maintainability features

25. Low maintenance product that expresses the ability to be maintained with minimal costs. A number of constituents of sweat accumulate while in parts of footwear; gradually clog the capillary spaces formed between the structural dimensions. Along with this influence of dust, microorganisms that have favorable conditions for development within the shoe and also multiple deformations and surface friction foot interior parts lead to significant descent of resistance, the fragility of the structure and cracks, leading to reduction in both footwear sustainability process and in the use of storage in adverse conditions. An important role in combating these deficiencies is required: treatment to protect against soiling and staining; antibacterial and antimycotic treatment based on combinations so no

surface activity, as well as combinations based on the work surface. These treatments eliminate the unpleasant odor of sweat, dirt and microorganisms accumulated during wear.

26. Ability to recondition expressing renovation and repair capacity of the product.

3. CONCLUSIONS

Getting the functions for various types of shoes and giving due importance to their producers can bring the following benefits: reductions in production costs (not including unnecessary functions), simplifying manufacturing processes, product quality, healthy children, reducing manufacturing cycle time, satisfying the growing extent of user requirements.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CAPITALIZATION OF FOLKLORE ELEMENTS IN ROMANIAN FASHION CREATIONS

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Abstract: The ethnographic and folkloric reality of contemporary Romania continues to be an archive that keeps alive significant values for the Romanian culture. Our duty is to know these values, to acquire, treasure and capitalize them in different forms, from expositions and printings to modern contemporary clothing.
The new social-economical realities existing in our country following World War II profoundly influenced the people mentality towards the inborn cultural tradition and implicitly both ordinary and festive clothing. Gradually even the peasants started to partially or completely abandon the traditional costume, adopting different types of industrial-made products.
Considering this, it is mandatory the study and exploitation of the traditional costume on a deeper level than purely ethnographically.
The purpose of this paper is to transfer the popular Romanian motifs in knitted structures, respecting both chromatics as well as the folkloric motif.
Key words: folklore, creation, knitting, process, product.

1. INTRODUCTION

The economical and social realities of our country profoundly influenced the people's mentality towards the inherited culture and implicitly the quotidian and festive clothing. For quotidian clothing many villagers have accepted serial manufactured garments that replaced the functionally similar pieces previously home-made, considering the execution, maintenance and usage facilities. Despite this the festive and ceremonial outfits of peasants from Bucovina and Iasi continue to be ruled by the traditional costumes deeming that only this way the villagers can completely express their regional affiliation and cultural identity.

Because of the variations that the Romanian folkloric costumes knows, it is required understanding this genre as an inspirational source for the modern man. As such, study and capitalization of the Romanian traditional costume is necessary to be made on another level than the purely ethnographical one, considering the fact that it is absolutely necessary that the youth knows, understands and is educated in the spirit of love for our ancestral attires. Thus diverse possibilities of enriching and embellishing the modern fashion products are created, by adapting the Romanian traditional ornaments and chromatic.

2. DEFINING CHARACTERISTICS OF THE TRADITIONAL COSTUME IN MOLDAVIAN ETHNOGRAPHICAL AREAS

The costume pieces that compose a folkloric woman's attire can include: hair or neck ornaments, shirt, traditional skirt, traditional vest, pouch and traditional leather shoes.

As neck embellishments beads (that in the past had a magical meaning also) were used, in one color or in combinations of two-three colors. Especially artistic are „collars" used in all the Moldavian villages.

The most beautiful are the geometrical motifs called „looped flowers" in white, green, black, brown, blue and pink. The combination of these colors creates the ornaments.

The decorations on the folkloric costume pieces are concentrated on the sleeves, chest,

cincture and vest. For the ornaments colored wool was initially used. Ulterior, conjoined with the economical growth and life standard rising different types of colored cotton, silk yarns, golden or silver metallic yarns, small porcelain or glass beads and tinsels were adopted.

Figure 1: Type of woman's traditional costume

The decorative compositions are distributed in well-defined ornamental fields. On the sleeves the decor is divided in three distinct segments. The shoulder segment concentrates a register of successive motifs (geometrical, vegetal and zoomorphic), clustered in cases or ordered in chromatically differentiated groups of lines. The „rippled" is a 7 – 10 cm wide band that is always sown in a geometrical composition based on diamond shaped motifs that serve the purpose of separating the shoulder segment from the rest of the sleeve. „Rivers" or „rows" are represented by parallel or oblique lines. Their number varies from a single column placed in the middle of the sleeve to three, five or more when they are arranged obliquely. The flounce or the sleeve cuff is also decorated with wrap-round ornamental motifs. On the chest section of the shirt, on each side of the opening, a column of embroidery is realized. On the back of the shirt two more rows of motifs are situated towards the sleeves.

The embroidery techniques imply multiple types of points, whose variety is dictated on one side by the time in which the pieces were realized and on the other side by the specific of each ornamental field. The beads and tinsels served in the Bucovinean costume only as accentuating points for embroidery motifs, with the role of highlighting or limiting different motif categories in the sleeve decorations.

The chromatic of the Bucovinean costume is dictated by the wearer's age characterized by a refined and discrete polychromy in which tones of red can create the dominant for festive pieces or young women and new wives and burgundy, brown and blue in combination with tones of yellow and olive form the chromatic panels for older women and wives.

2.1 Components of Romanian motifs

As far back as Thracian times, in the culture and popular art people transposed in the national sowing décor their observations and knowledge synthesized and generalized in forms that render both geometrical and non-geometrical figures. The ornamental elements and motifs like „flower, leaf", etc. have been permanently reproduced by the village artists and the craft of the women practicing the sowing art made possible the simplification, stylization and processing the motifs to the most perfect classic morphology.

The Romanian motif adorning an object varies depending on the use given to the sown piece: as clothing, ornament or household object.

For ornamental pieces (shawl, handkerchief, towel etc.) are used motifs that contain stylized flowers, birds and insects.

For clothing and household pieces, especially festive clothing (traditional women and male shirt, breastplate, sheepskin coat) are used motifs like flowers, geometrical elements, household and agricultural tools, animals, cosmic elements all in a stylized form.

The ornaments are classified in three different groups: abstract, realistic and symbolist.

In the embroided décor that contains these elements, part of a segment, they never appear separated from each other, on the contrary they are sown closely interwoven or merged in the same motif.
On the Trotus valley, **ornamental abstract motifs** (figure 2) are frequently encountered, resulting from material structures, a technique game with dots, lines, overlapped lines, triangles, squares and rhombs etc. As such, morphologically they are part of the geometrical style.

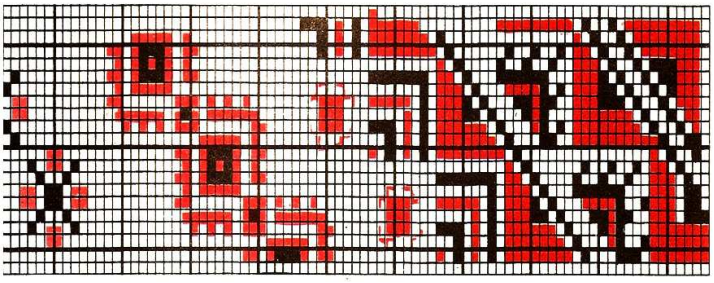

Figure 2: Abstract ornamental motifs

Just as frequently met, realistic ornamental motifs are divided in 3 big categories: physiomorphic, skeuomorphic and social. From these, the greatest distribution was known by the physiomorphic motifs that are in turn divided in four subgroups: „cosmic", „phytomorphic", „zoomorphic" and „anthropomorphic".

3. TRANSFER OF ROMANIAN FOLKLORIC MOTIFS IN A KNITTED STRUCTURES COLLECTION

In all the Moldavian ethnographical areas a predilection for polychromatic stitches is seen. It is resorted to colors especially to limit an embellished field and to spotlight an element, motif or composition, opposed to the monochromic stretch of the piece's background (the white of the used material, unembellished monochromic space). This way the decorative character of the piece and the artistic value of some ornaments are accentuated. This esthetical conception is strongly underlined in the context of Moldavian embroided ornament chromatic.

The purpose of this paper lies in the transfer of Romanian folkloric motifs in knitted structures respecting both the chromatic and the traditional motifs. Per se, a transposition of national folkloric motifs sown in cross-point was realized, in samples of knitted structures that can be used in confectioning different clothing products or accessories.

3.1 Models collection

3.1.1 Floral motifs (phytomorphic)

In the group of „phytomorphic" motifs are included representations of the vegetal world: plants, leafs, flowers, fruits. The flowers frequently reproduced in sewing are: daisies, roses, mountain peonies, sweet marjoram, sunflowers, etc. rendered stylized, up to a global geometric form. There are areas that are characterized by a non-geometric rendering, in a free hand-drawn manner, representing the forms closer to their natural look. The most encountered fruit motifs are: grapes, apples, pears and plums. In the stitches also appear smaller or larger fir trees or fir branches. In figure 3 some examples of phytomorphic motifs are presented.

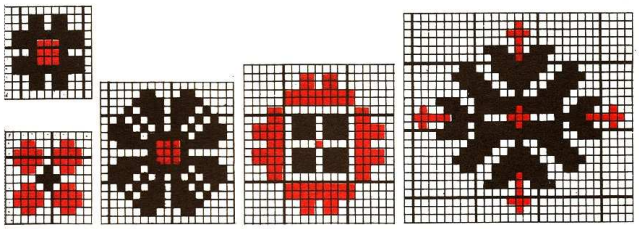

Figure 3: Ornamental phytomorphic motifs

In figures 4, 5, 6 are presented four floral motifs transposed in jacquard knitted structures (full jacquard, partial or layered).

In all cases the floral motif and the area specific chromatic was respected. Usually in the monochromic background – white, the floral motif was realized in colors of red, black, yellow and green, in order to easily stand-out.

Figure 4: Folkloric floral model transposed in knitted structure as design, type full jacquard in three colors

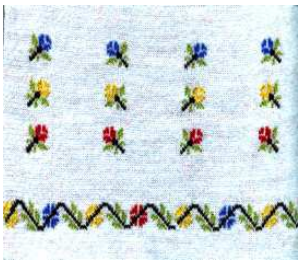

Figure 5: Folkloric floral model transposed in knitted structure as design, type layered jacquard

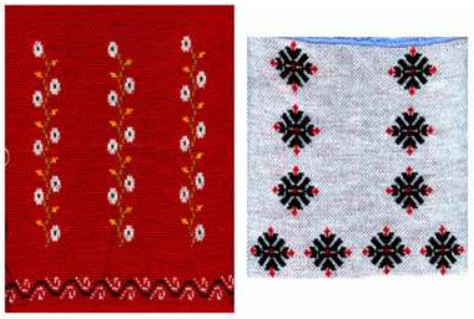

Figure 6: Folkloric floral models transposed in knitted structures as designs, type birdsey jacquard in three colors

3.1.2 Zoomorphic and bird motifs

Zoomorphic motifs – „ram horns", „ox head" (fugure 7) are very old and wide-spread on both versants of the Carpathians. The zoomorphic motif – ram horns has been realized in a layered jacquard knitted structure in two colors: red and black (figure 8).

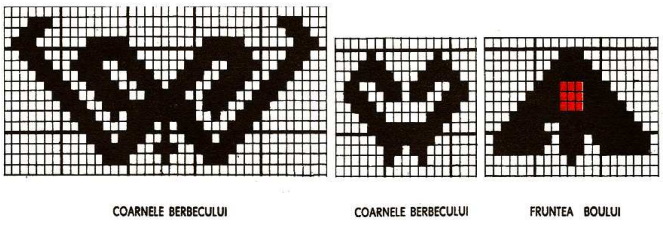

Figure 7: Zoormorphic ornamental motifs

Figure 8: Knitted structure (layered jacquard in two colors) with zoomorphic folkloric motif

Most common **bird motifs** are: the sparrow, the rooster, the pigeon and the pair of birds separated by a flower of a small fir tree (figure 9).

The motif – pair of birds separated by a small fir tree that represents the tree of life has been transposed in a partial jacquard knitted structure in three colors: white, red and black (figure 10).

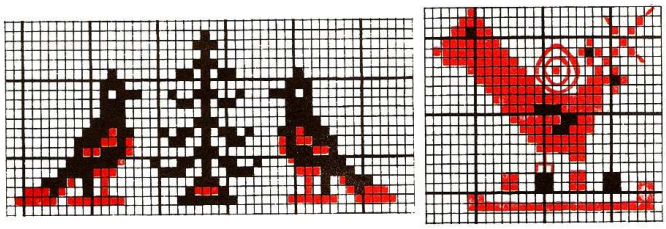

Figure 9: Ornamental bird motifs

Figure 10: Knitted structure (birdsey jacquard in three colors) with folkloric bird motifs

3.1.3 Skeuomorphic, cosmic and geometric motifs

The **skeuomorphic motifs** present a morphologic evolution in a continuous thematic variety. The motif range in this category is very varied: hack, hayfork, rake, stilt, plough etc. (figure 11). In figure 12 the skeuomorphic motif of the plough stilt is presented in partial jacquard in two colors.

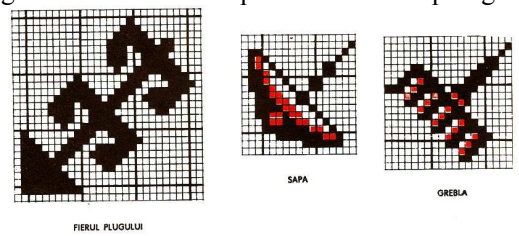

Figure 11: Skeuomorphic ornamental motifs

Figure 12: Birdsey jacquard structure in two colors with skeuomorphic folkloric motif – plough stilt

Cosmic motifs (figure 13) include decorative elements that render celestial orbs (the star, the Sun), cosmic phenomena (lightning, Milky Way, etc.). In figure 14 a full jacquard knitted structure in three colors with the cosmic motif of the Sun is presented.

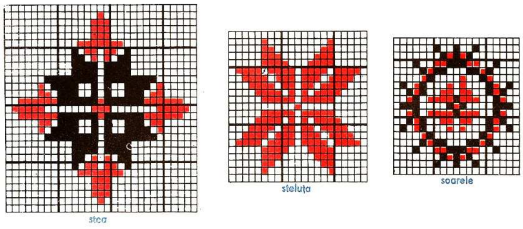

Figure 13: Cosmic ornamental motifs

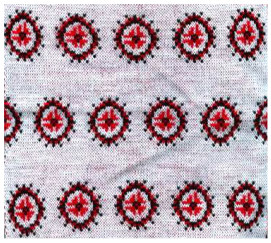

Figure 14: Full jacquard in three colors structure with the cosmic folkloric motif – Sun

In figure 15 a geometric motifs is illustrated in a knitted structure type full jacquard on one fonture.

Figure 15: Geometric folkloric motif transposed in a knitted structure with a design type full jacquard on one fonture.

3.2 Presentation of products realized from the knitted structure collection

The knitted samples with Romanian folkloric motifs have been the base of realizing some accessories (purse, pouch – figure 16), but they can be also used in creating exterior clothing products. The purse made has a rectangular shape, and as shoulder sustain element is fitted with a braided strap from PNA yarns in two colors. The knitted used in the production of this purse and pouch is a full regular jacquard in three colors (white, red and black), frequently encountered in traditional Moldavian costumes, so it renders as closely as possible the adopted folkloric motif (the pair of birds separated by a small fir tree representing the tree of life), as well the specific chromatic of the Moldavian area.

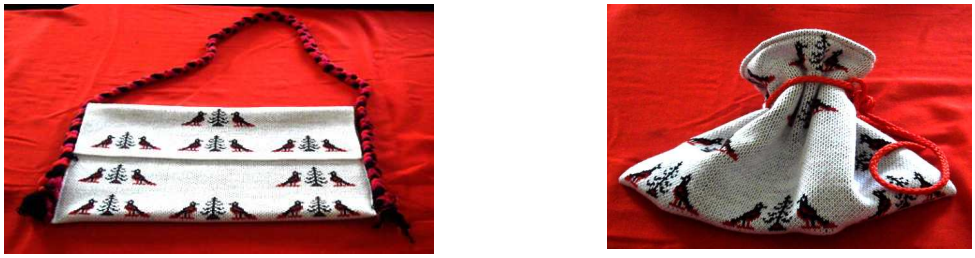

Figure 16: Realized accessories

The representation of the used knitted structure for the two accessories, through specific methods is illustrated in figure 17, 18 and 19.

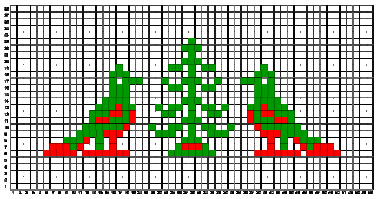

Figure 17: Chromatic aspect of partial jacquard in three colors

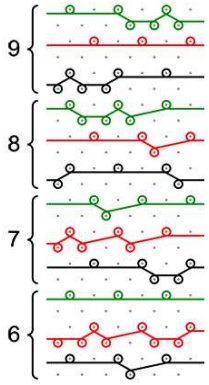

Figure 18: Section in stitch rows for the chosen knitted

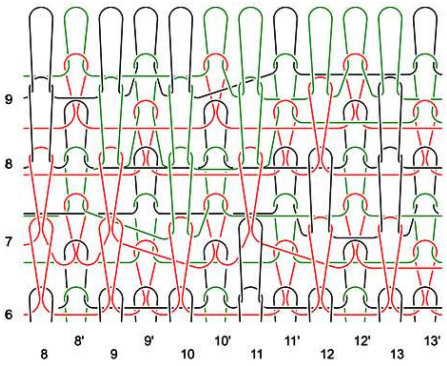

Figure 19: Structural representation for birdsey jacquard knitted in three colors with bird folkloric motif

4. CONCLUSIONS

The Romanian ornamentation in its ensemble represents the main source of inspiration and knowledge that can be successfully capitalized in textile creations.

The folkloric motifs sown in cross-point can be successfully transposed in knitted structures, our popular art being an art in which the geometric and the stylization are preponderant. The vegetal or animal, realistic or geometric motifs as well as their chromatic variety offer originality to the creative idea that doesn't imitate or copy but is inspired by them. The decorative spirit of the folkloric creator, its artistic conceptions in understanding and interpreting the beauty of the surrounding nature put their mark on the traditional ethnic specific that can be deciphered in each creative category of ornamental motifs, compositions, chromatic palette and realization techniques. In the traditional ornamentation, the decorative point and line are basic elements of the compositional fields that through the variety of shapes and simplicity of the elements transposed in the knitted structure represent an inexhaustible source of inspiration in the knitted design.

The classification of decorative points regarding shape, array (linier or circular), grouping, gradation, dispersal and chromatic has been structured from a design perspective and can become a working instrument in the diversification of decorative knitted structures.

Because of the variants that the Romanian traditional costume knows, it is necessary understanding this genre as an inspirational source for the modern people. As such, studying and capitalizing the Romanian folkloric costume is critical to be made on a level other than the purely ethnographical one because of the fact that it is absolutely necessary for the youth to know, understand and be educated in the spirit of love for our ancestral attire. This way, diverse possibilities of enriching and embellishing the modern fashion products are created, by adapting the Romanian traditional ornaments and chromatic.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

DETERMINATION OF NATURAL COLORANTS IN PLANT EXTRACTS BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY

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Abstract: One of the most important and effective ways for reducing pollution is the replacement of pollution materials and chemicals by eco-friendly natural materials. Calendula offinalis is an annual plant. Catetula whion yield a yellow dye for cloth, CI natural Yellow 10. The purpose of this investigation was to apply a simple, rapid and reproducible HPLC procedure for quantitative analysis of Rutin **1** and to find out new Rutin **1** sources. HPLC analysis of Rutin were perform on Nucleosil C18 250 x 4,6 mm column by using water:methanol:acetic acid 75:20:5 as mobil phase and isocratic elution, flow rate 0,5 ml/min. The peak was identified by comparation of retention time of standard Rutin which was found to be 11 min. The proposed HPLC method shows an excellent performance to separate and quantitative of flavonoid Rutin in plant extract.
Key words: *eco-friendly dyes, Rutin, HPL,C chromatography,*

1. INTRODUCTION

Natural dyes comprise colourants that are obtained from animal or vegetable matter without any chemical processing . During the last decade the use of natural dyes, obtained from animals or vegetable matter without any chemical processing has gained momentum due to increased demand for these dyes by food, pharmaceutical, cosmetic as well as the textile colouration industry.

Textile processing industry is one of the major environmental polluters. In order to process o ton of textile, one might have to use as much as 230 to 270 tons of water. The effluent generated by this much water would pollute the environment as it contains a heavy load of chemical including dyes used textile processing.[1,2]

Over 700 000 tonnes and approximately 10000 different types of dyes and pigments are produced world-wide annually. It is estimated that 10-15% of the dye is lost in the effluent during the dyeing process.[3]

Thus, there are two main ways to limit the environmental impact of textile processing. One is to construct sufficiently large and highly effective effluent treatment plants and the other way is to make use of dyes and chemicals that are environment friendly.

Natural dyes are mostly eco-friendly, biodegradable, less toxic and less allergenic as compared to synthetic dyes.

A few plants containing Rutin 1, for example *Calendula offinalis*, an annual plant. This compound is a dye for cloth, CI natural Yellow 10 (fig. 1). Rutin, also called quercetin – 3 – rutinoside is the glycoside between the flavonol quecetin and the disaccharide rutinose.[4,5]

Generally the quantitative determination of Rutin **1** on plants dyes and preparations has been carried out by gravimetry, polarography, UV-spectrophotometry and high performance liquid chromatography[5-7] for commercial textiles and archaeological dyeing of fibers. The method of choice for the qualitative and quantitative analysis of flavonoids is HPLC. Since its introduction in the 1970s, HPLC has been used for all clases of flavonoids and hundreds of applications have been published.[8]

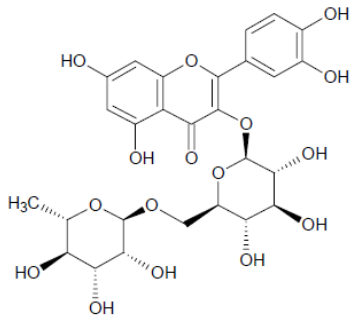

Figure 1: Structure of Rutin **1**

For the analytical HPLC of Rutin, the stationary phase, solvent and eluent composition have to be optimized.

A very high proportion of separation are run on octadecylsilyl bonded (ODS, RP-18) phase. As solvents for application, acetonitrile-water or methanol-water mixtures, with or without small amounts of acid are very common. Occasionally, other solvents such as tetrahydrofuran, isopropanol or n-propanol are used. Acid modifiers are necessary to suppress the ionization of phenolic hydroxyl group, giving shorter peaks with less tailing.[6,7]

2. EXPERIMENTAL

The method of choice for the qualitative and quantitative analysis of Rutin is HPLC. Chromatographic analysis was carried out by Nucleosil reversed-phase column (4,6 x 250 mm), packed with 5 μm diameter particles. Rutin was quantified following RP-HPLC separation at 257 nm. Flow rate and injection volume were 0,7 ml/min and 20μl, respectively. All chromatographic operations were carried out at ambient temperature.

The most frequently used detection method for HPLC is UV spectrophotometry, typically based on measurement of UV absorbtion. Quantification was carried out by the integration of the peak using external standard method.

2.1. Equipments

The HPLC analysis was performed using o chromatographic system Able&Jasco consist of: pump module PU-1580, ternar gradient module LG-980-02S, degasor module DG-980-50, UV detector module UV-1575, manual injector Rheodyne.

2.2. Reagent and materials

Methanol, acetonitril and acetic acid were of HPLC grade (Merck). Ethanol was of analytical grade. Deionised water was prepared in laboratory. Rutin standards were purchased from Sigma Company.

2.3. Preparation of standard solutions

Standard stock solutions of Rutin was prepared in ethanol of concentration 0,250 mg/ml. Standard solution was prepared by diluting standard stock solution so as to obtained standard solution with concentration 10 -100 μg/ml. Sample was filtered through 0,45 μm membrane filter.

3. RESULTS AND DISCUSSION

3.1. Optimisation of chromatographic condition

Rutin is a polar molecule. In the beginning, various proportions methanol-water or acetonitrile-water system was chosen as a mobile phase but separation was not satisfactory. It was found that methanol-water system (75:20 v/v) gave a much better separation, but slight tailing peaks were observed in this chromatograph.

The presence of acid in a mobile phase system can improve peak tailing of compounds and change pH value of the mobile phase, having a significant effect on the resolution of compounds. Therefore, on the basis of methanol-water-acetic acid system was suitable for Rutin **1** separation. The result is present in figure 2.

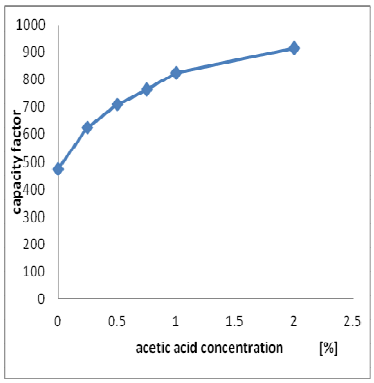

Figure 2: Effect of acetic acid concentration on the value of the capacity factor

The concentration of acetic acid in the mobile was varied from 0,0 to 2,0%. The calculated capacity factor increases as the concentration of acetic acid increases. In addition, colume oercent of acetic acid in a mobile phase is crucial for column lifetime. The bigher concentration acud added in mobile phase may produce more better sample separation, which in turn shorts the HPLC column lifetime. For above these reason, 1% of acetic acid was chosen.

As a result, a mixture system of methanol-water-acetic acid 75 :20 :1 was confirmed as the optimum mobile phase. Under this system, the chromatogram f rutin standard solutionn is shown in figure 3.

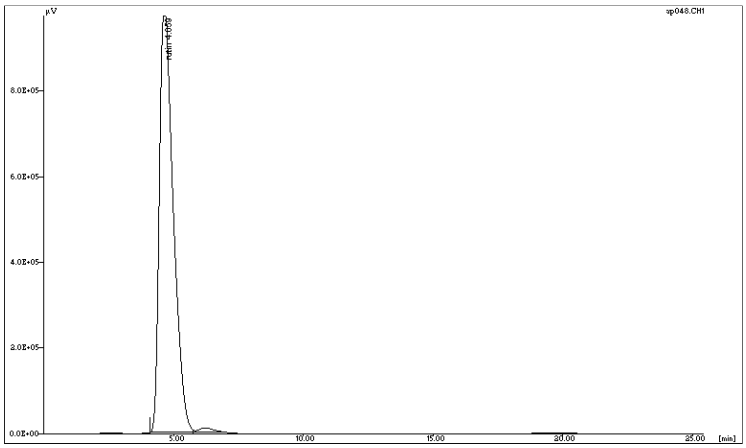

Figure 3: Chromatogram of Rutin standard solution

It can be seen from figure 3 that a good separatin can be achievedusing conditions described.

3.2. System suitabulity test

A standard mixture solution of 25 μg/ml Rutin **1** was analyzed five times to determine the reproducibility of meak areas and retention times under yhe optimum conditions in this experiments.
The relative standard deviation (RS.D.) of the peak areas and retention time were 1,06 and 1,73%.
A series of the standard solutions of Rutin **1** were tested to determine the linearity between the standard mixture concentrationand peak areas.

The detector response was linearity correlated with concentration un the range 1 – 1oo μg/ml. The regresion corelation and correlation coefficients were determined as y = 154623,7 x - 87342,6 and r^2= 0,998.

4. CONCLUSIONS

In this paper is present an original method for determination Rutin, CI natural Yellow 10, with good sensitivity, precision and reproducibility.

The method can be used to determination natural dyes in plants, textile, cloth or pharmaceutical preparation

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

INNOVATIVE ORGANIC TANNING FOR LEATHER

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Abstract: Even the optimization of common chromium tannage, and combined tannage with chromium and other tanning materials have led to outstanding results related to the lowered pollution level in effluents and sludge, the problem has not been solved wholly. The single solution for this problem is finding out an environmentally friendly alternative to chromium tannage. This work also is within the above line, aiming to obtain wet-white leather by an organic tanning process.
Key words: tanning, wet white leather, free of chrome leather, sustainable development, clean technologies

1. INTRODUCTION

Chromium III salts are used extensively in the tanning process. Approximately 90% of the leather manufactured around the word is tanned using chromium III. It has been used in the leather industry for almost 100 years, primarily because it remains the most efficient and versatile tanning agent available; it is also relatively cheap. Due to toxicity of chromium III, which can convert to chromium VI with higher toxicity, tanners around the word are often place under pressure to reduce the chromium content of their effluent discharges and the resulting sludge. [5]

While much of the chromium used in the tannery may be recycled or reused or removed from waste streams on-site by precipitation as insoluble chromium III hydroxide, a small amount may be discharged to the sewage treatment works. This chromium will be disposed of with the waste sludge from the treatment works and this is one of the main disposal routes by which waste chromium leaves the tanning industry.

By the term „tannage" we understand an additional grind-like interlinking of the skin's collagen network, which results in stabilization against heat and micro-organisms and production of a material which remains supple after drying, retaining the flexibility of the fiber structure. Chrome tannage is quite obviously particularly suited to obtaining these desirable new properties in the hide material. These can be no other explanation for the 70-80% share held by this method in the main tannage of leather produced around the world and the resulting international Cr tanning agent consumption of approx. 400000 tons per annum [4].

If we look at alternatives to chrome tannage it is necessary to consider the extent to which a comparable tanning effect and the achievement of the required characteristics are possible at all on basis of the existing natural circumstances. To permit optimum stabilization of the hide material by the tannage process, it is necessary for the tanning agent to penetrate into the interior of the fibrils to cross-link the polypeptide chains. A stable bond is formed with the hide in the case of tanning with reactive organic substances as a result of reaction with the reactive groups in the collagen. The fact that the shrinkage temperature of leather tanned in this way hardly, in contrast to chrome tannage, exceeds the 80^0C mark is an indicative of stabilizing effect. One class of syntans that has found application in high stability organic tanning is resins [2,3,4]. In this paper pretannage of cattle hides with a prepolymer based on resorcinol is discussed.

2. GENERAL INFORMATION

2.1 The basic procedure

The pre-tannage is performed *in situ* by making use of two pre-polymers, one based on a dialdehyde and the other on a diphenol, in the pickling bath. Having bound in hide the above two materials, the pH is risen up to 4.6 – 4.8 by sodium hydrogen carbonate or magnesium oxide. During this time a tanning resin is made within the leather that increases the hydrothermal resistance of leather, resulting in a shrinkage temperature of 70 – 72°C. Regarding the proportion of prepolymer used it is considered that 3% is the optimum dose for tanning using this new technology. The wet white leather may be subsequently processed with less chromium or only with vegetable and synthetic tanning agents according to the finished leather type to be obtained. The selection of a synthetic or vegetable re-tanning will depend on each individual case, selecting the synthetic re-tanning for clear colours and high lightfastness, while the vegetable re-tanning can be used for darker colours. The obtained leather is white and resistant to the mechanical operations. (Figure 1)

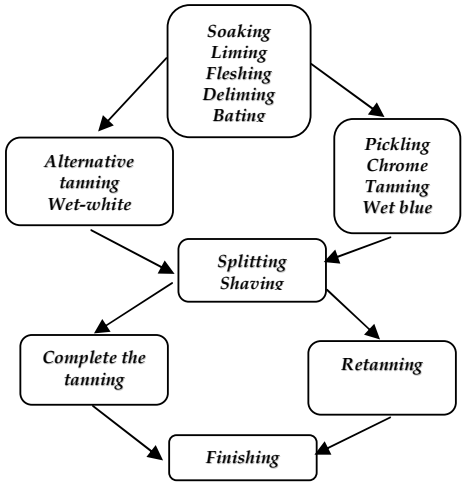

Figure 1. WET-WHITE vs WET-BLUE Tanning Technology Flow Chart

The process is capable of fitting into the current process flow and use existing equipment. The flow chart, comparing „normal" practice with „wet-white" production indicates that this can be achieved.

This procedure was developed for shoe upper leather from bovine hides. This allows good quality, metal-free shoe for garment and upholstery leathers to be produced with no problem.

Table 1. Chemical analysis and physical test of leathers

Test	Chrome tanned leather	Wet white tanned leather
Moisture,%	16.14	17.06
Total Ash,%	6.30	3.22
Cr_2O_3,%	5.24	2.35
Extractible fat and grease,%	9.27	5.42
Total Nitrogen,% 1. Nitrogen from protein,% 2. Nitrogen from syntan,%	13.98 13.98 -	15.87 13.98 2.31
Hide substance,%	78.58	78.58
Total soluble matters,%	0.79	0.82
Combined tannin,%	10.94	15.51
Degree of tannage ,%	18.30	25.94
Tensile strenght, N/mm^2 - at break	9.8 11.4	15.2 22.7
Elongation,%		

- 10N/mm - at break	65 74	33 61
Tear strenght, N/mm	44.7	51.4

Obs: All results related to 0% moisture

2.2. The effect on leather quality

The quality of the crust leathers was directly comparable with those from standard procedures (Table 1). The determinations of physical parameters of the leathers have shown to be compliant with the limits required for footwear articles manufacture.

3. THE ENVIRONMENTAL IMPACT

3.1. The environmental impact of shavings

One of the main benefits is the elimination of chrome shavings, which occur at a quantity of approx. 5-10% of the hide weight as a permanent by-product of the chrome main tannage process (in the whole of the Single European Market to approximately 100 000 tons per annum is produced) [4]. For the wet-white shavings produced as a result of organic tanning, in contrast, according to studies not only the recovery of protein hydrolyzate, but also use for fertilizers [6] and for gelatin, glue and other industrial products.

The comparative chemical composition of shavings from wet blue stock vs. wet white stock is given as Table 2.

Table 2. Chemical composition of shavings

Tests	Wet blue shavings	Wet white shavings
Moisture,%	59.0	67.06
Ash,%	16.6	0.6
Cr_2O_3,%	5.24	2.35
Extractible fat and grease,%	1.2	5.6
Total Nitrogen,%	12.7	15.13
Hide substance,%	78.12	85.01
Cr, mg/Kg	4.2	2.1
pH	3.5	6.0
Digestibility, %	52	65

3.2. The environmental impact of effluents

Legal requirements relating to the chrome content of tannery effluent also cause problems in the chrome tannage process. The high chloride, sulfate and chromium concentrations play a decisive role. The advantage of the new process is that, besides reducing the salt load of the effluent (about 50% of the total sulfate load arises during tanning), the ash content of a skin is reduced. Also, in the next step, the chrome uptake was improved and the volume of sludge was reduced.

4. FEASIBILITY AND FINANCIAL VIABILITY

As wet-white stabilization can be carried out with equipment that is already available, no further machine or drum investment will required. The process costs can be estimated, but no significant increase of costs are anticipated. When fully optimized savings due to improved auxiliary exhaustion and reduced disposal costs can be expected.

5. CONCLUSIONS

The wet-white leathers obtained have a white shade and a shrinkage temperature of 70-72^{0}C. It can be mechanically processed in the same way as wet blue leather. After treating this tannage with chromium, the shrinkage temperature can be increased over 100^{0}C with synthetic or vegetable replacement tannins, the shrinkage temperature can be increased to 90-95^{0}C. This allows good – quality, metal-free shoe, garment and upholstery leathers to be produced.

This new „wet white" procedure does not claim to be a replacement for chrome tannage, but an alternative. It is a pretannge of hides which can be tanned after with chromium, vegetable or synthetic tanning agents.

Organic tanning implies a significant benefit in that it is possible to considerably reduce the environmental impact produced during the tanning process and at the end of the lifecycle of products manufactured using this kind of leather.

The advantage of this system is that the shavings arising are metal free and, therefore, a valuable by-product. Like untanned solid waste, they can be recycled and used as a starting material for gelatin, fertilizer, glue and other industrial products.

Finally, it should be highlighted that there is a growing interest on the metal-free leather market, both inside and outside the European Union, as proven by the interest shown by the footwear, upholstery, garments and leather goods products manufacturers in assessing the performance of organic-tanned leather.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

PHYSICAL-CHEMICAL CHARACTERISATION OF OXAZOLIDINE-TANNED LEATHER

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Abstract: Nowadays chrome tanning is the most widely used technique for leather production, accounting for more than 90% of leather tanned worldwide. This process gives leather excellent physical properties but may pose an impact on the environment. At present, the leather industry is looking for chrome-free tanning processes, more environmentally friendly.
The Centre for Technology and Innovation (INESCOP) is researching into the feasibility of oxazolidine tanning in the framework of the project titled "Environmentally-friendly oxazolidine-tanned leather (OXATAN)", co-funded by the European Commission through the LIFE-Programme. This paper presents the results obtained from numerous pre-industrial scale oxazolidine tanning tests on cattle hides and sheepskins.
Key words: Leather, tanning, oxazolidine, environment, chromium.

1. INTRODUCTION

The transformation of an animal's skin into tanned leather involves carrying out a series of chemical processes and mechanical operations where a putrescible material, consisting especially of proteins, becomes a stable and resistant material that can be used in the manufacture of footwear, leather goods, upholstery, clothing, etc.

The traditional tanning process, used in more than 90% of leather tanned worldwide, entails applying trivalent chromium salts, which interact by chemical bonding with the carboxylic groups of collagen in the skin, giving leather its strength and stability properties (Figure 1).

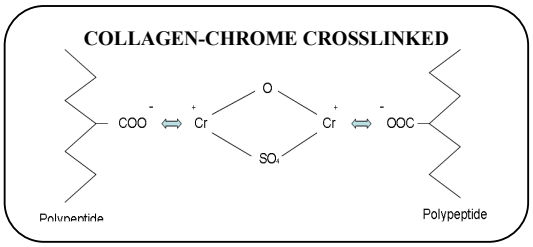


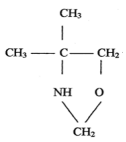
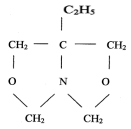
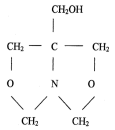
Figure 1. Collagen-chrome crosslinked

This process gives leather excellent physical properties and high stability for the footwear manufacturing processes. However, in some cases, it may pose allergy to chromium or even can change its chemical characteristics, with considerable impact on the environment.

Furthermore, the crisis that the leather sector is experiencing and the competition of third countries with low labour costs leads to the need for new market strategies. Within this context, eco-design is presented as an innovative instrument contributing to the development of more environmentally friendly and competitive products. That is why it is very important to implement new chrome-free tanning techniques thus avoiding the problem at source. In this sense, previous research studies demonstrated that using oxazolidine as a tanning agent combined with other (vegetable or synthetic agents) allows quality leathers to be obtained, which can be used by footwear and upholstery industries.

Oxazolidines are saturated heterocyclic compounds prepared by reacting primary amino alcohols with formaldehyde. Monocyclic or bicyclic oxazolidine ring structures are formed depending on the choice of starting chemicals, it is therefore possible to synthesize a variety of oxazolidines from different amino alcohols. Oxazolidines are highly useful chemicals for a wide range of applications: corrosion inhibitors, emulsifiers, diluents or tanning agents. The oxazolidines marketed for use as tanning agents [1] (Table 1) are water soluble compounds, compatible with most chemicals normally used in tanning operations and can be added at different points in the tanning process.

Table 1. Properties of the oxazolidines used as tanning agents

Type	Oxazolidine A	Oxazolidine E	Oxazolidine T
Name	4,4-Dimethyl-1-oxa-3-azacyclopentane	5-Ethyl-1-aza-3,7-dioxabicyclo [3,3,0] octane	5-Hydroxymethyl-1-aza-3,7-dioxabicyclo [3,3,0] octane
Molecular structure			
CAS Registry No.	51200-87-4	7747-35-5	6542-37-6

The reviewed literature [2, 3] and preliminary tests conducted by INESCOP on a laboratory scale show oxazolidine as an effective alternative for use as a tanning agent. Tests results presented in this document were obtained using this product in different proportions (3% and 5% by weight). As a tanning agent, oxazolidine will undergo an irreversible reaction with the hide substrate over a wide pH range (best success is attained when the pH is 4.0 or higher) and at a rate which is readily controlled by operating conditions (dosage, time of addition, etc.).

The capacity of oxazolidine to tan leather is based on the formation of a reaction intermediate due to:

- the protonation of oxygen of each ring in an acid medium, which weakens the C-O bond or,
- the oxazolidine rings opening caused by hydrolysis in an acid medium to provide an intermediate with two N-(hydroxymethyl) groups,

and the subsequent nucleophilic attack of the collagen amino groups to this intermediate species (Figure 2).

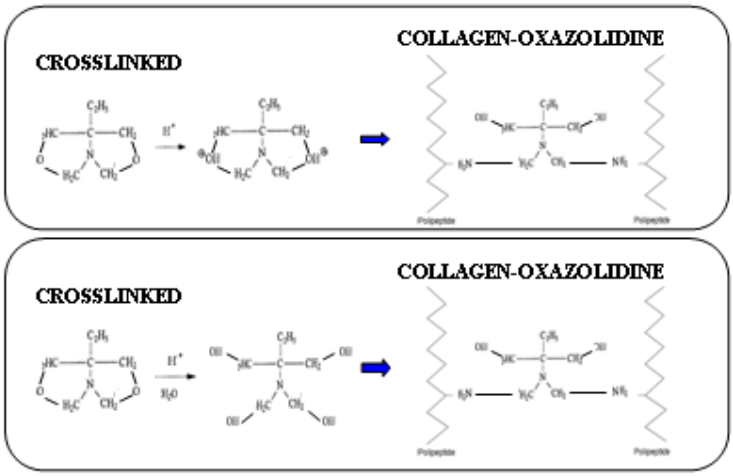


Figure 2. Collagen-oxazolidine E crosslinked

Leather tanned with chromium salts has a high stability, determined by a shrinkage temperature (Tg) over 100° C, while leather tanned with oxazolidine alone reaches shrinkage

temperatures of below 75º C. It is therefore necessary to carry out oxazolidine tanning in combination with synthetic or vegetable tanning agents to achieve higher shrinkage temperatures and obtain leather of comparable quality to that of chrome tanned leather.

This paper presents the results obtained to date, coming from different tanning tests on calf and sheep leather, on a semi-industrial scale, using oxazolidine in combination with synthetic or vegetable re-tanning agents as an alternative to traditional chrome tanning. This paper also presents the procedures followed, physical and chemical characterisation of the obtained leather, as well as the impact of this technology on wastewater and solid waste generated.

2. GENERAL INFORMATION

2.1. Experimental procedure: materials and methods

Tests on oxazolidine tanning in combination with synthetic or vegetable re-tanning were conducted in INESCOP's pilot tanning plants (Figure 3) and the operating conditions were determined in previous trials on a laboratory scale. The tanning tests with oxazolidine were carried out on rotating tanning drums of 900 and 1,200 mm diameter respectively and 400 mm width, made of bolondo wood and featuring systems for automated control and dosage of water and reactants.

Figure 3. Tanning drum used in tanning tests on a semi-industrial scale

In each test with calf hides, whole pickled hides of 2.5 mm thickness divided into sides (half hide) were processed. After the tanning process, the calf leathers were shaved to 1.5 mm for the dyeing and fat-liquoring processes. Similarly, in tests with sheepskins, whole pickled and degreased skins were used, 1.2 mm, thick so no shaving operation was needed.

In the tests carried out, skins were tanned using 3% or 5% oxazolidine combined with:

- synthetic re-tanning agent: condensation product of sulphone and aromatic sulphonic acids with low phenol and formaldehyde content
- vegetable re-tanning agent: mixture of tara, quebracho and mimosa extracts

and performing a subsequent re-tanning, dyeing and fat-liquoring process common to all of them.

Likewise, the same combinations were carried out using basic chromium salts as a tanning agent in order to use these leathers as a comparative reference. The obtained leather has an acceptable appearance and adequate smoothness, softness, fullness and flexibility. The evaluation of the results of the tests carried out is done through the characterisation of obtained leather and effluents in accordance with accepted standards.

2.2. Physical characterization of obtained leather

Calf and sheep leather samples obtained in the tests on a semi-industrial scale underwent various quality tests according to international standards (EN-ISO) to check their applicability to the manufacture of footwear. The determinations of the physical parameters of leather showed to be compliant with the limits required for footwear manufacture. Table 3 shows the results of the physical characterisation of the obtained leather (average values).

Table 3. Physical tests on calf leather and sheep leather tanned with oxazolidine

PARAMETER	CALF LEATHER	SHEEP LEATHER	RECOMMENDED VALUES
Thickness (mm)	1.9	1.5	> 1.1
Tear strength (N)	187	69	> 50
Tensile strength (N/mm^2)	20	16	> 15
Elongation at break (%)	103.5	76	> 40
Grain burst (mm)	9.3	9.9	> 8
Shrinkage temperature (ºC)	80	77	> 70

The degree of tanning of leather was checked through the determination of the Shrinkage Temperature (Tg), giving values between 76 and 82 ºC for all leather tanned with oxazolidine, which were acceptable for footwear manufacture. Furthermore, no significant differences were observed in the addition of a greater proportion of oxazolidine, therefore it is considered that 3% is the optimum dose for tanning using this technology.

Finally, the suitability of oxazolidine-tanned leather has been checked through the manufacturing of different shoe models (Figure 4). The manufacturing process is carried out as usual and no differences were observed in the processes or in the final appearance of the models produced. Likewise, some tests on vulcanised footwear manufacture were also carried out and, although the heat setting temperature is around 140 ºC, this leather also proved to be suitable for this kind of footwear.

Figure 4. Women's footwear, children's footwear, occupational footwear-clogs, men's penny loafers, casual and vulcanised footwear made from oxazolidine tanned leather.

2.3. Chemical characterization of obtained leather

The chemical validations of oxazolidine tanned leather to manufacture footwear were carried out through the chemical characterisation of leather in accordance with accepted standards (EN, ISO, etc.) and by checking the compliance with the criteria of the European Eco-label for footwear (Decision 2002/231/EC):

- Cr (VI) in leather ≤ 10 ppm
- As, Cd and Pb in leather: not detected
- Formaldehyde in leather ≤ 150 ppm
- Pentachlorophenol (PCP) in leather: abscence
- Tetrachlorophenol (TCP) in leather: abscence
- Azo-dyes in leather: absence

The determinations of the chemical parameters of these leathers showed to be compliant with the limits required for the European Eco-label for footwear, except for formaldehyde content in leather that exceeded the limit (150 ppm). In order to solve this problem, it was necessary to study and optimise reduction alternatives by means of the addition of products able to react with free formaldehyde present in leather, thus transforming it in a soluble product that can be removed by rinsing with water, without compromising leather quality.

The test results showed that the optimum solution was adding a 2% ratio of a sequestering agent during the final rinsing, thus obtaining leather with a formaldehyde content lower than 50 ppm, which is far below the limit established (<150 ppm). Furthermore, using a higher percentage of this

product allows a greater reduction of formaldehyde content in leather to be achieved, although this implies an increase in production costs that should be considered by the user.
Likewise, it was checked that adding this product did not produce leather detanning, since the shrinkage temperature and the physical properties of the leather were maintained.

2.4. Characterization of the tanning waste bath

The assessment of the impact of the oxazolidine tanning process on wastewater was achieved by the characterisation of the tanning waste baths obtained in the different tests carried out, determining the most significant parameters in accordance with international standards.

Table 4 shows the results obtained (average values), compared with typical values of conventional chrome tanning, both for tests with calf leather as well as with sheep leather.

Table 4. Characterisation of effluents from calf hide and sheepskin oxazolidine tanning.

PARAMETER	CALF LEATHER	SHEEP LEATHER	CHROME TANNING RANGE
pH	5.7	4.7	3.8 – 4.0
Conductivity (mS/cm)	110	90	70 - 80
COD (g O_2/l)	123	92	40 - 100
BOD (g O_2/l)	45	32	15 - 40
TKN (mg/l)	4,275	152	500 – 3,000
Cl^- (g/l)	41	112	20 - 60
Total Cr (g/l)	ND	ND	3 – 6
Toxicity (U.T.)	4,100	2,343	2,000 – 4,000

ND: NOT DETECTED

Regarding the characterisation of wastewater, the values of the parameters set by oxazolidine tanning, although slightly higher, are comparable in order of magnitude to those obtained using chromium salts. Also, oxazolidine tanning effluents are chrome-free; therefore, the possible trivalent chromium oxidation into hexavalent chromium is prevented and the sludge derived from wastewater treatment is more likely to be reused, eg. for agriculture.

2.5. Biodegradability tests on obtained leather

Through these tests, an estimate of the degree of biodegradability of leather according to the tanning technology employed (chromium or oxazolidine) is obtained, which allows both technologies to be compared regarding the environmental impact of their waste.

Since there is currently no method or specific standard for determining the biodegradability of tanned leather, a method designed and optimized by INESCOP and the Universidad Miguel Hernandez (Elche-Spain) [4] was employed.

This method is based on a standard for assessing the aerobic biodegradation of polymers in the presence of municipal wastewater (ASTM D5209-92) using collagen as the reference standard substance and tannery wastewater as an inoculum for measuring biodegradability. The tests were carried out on equipment in which the leather dust sample gets in contact with the inoculum on bacteria material culture, while maintaining constant agitation and temperature for a period of thirty days. The biodegradation of the samples is assessed by indirect measurement of the CO_2 generated as a function of time and the degree of biodegradability is calculated based on the relationship between the theoretical maximum production and the actual production of CO_2, based on the content of soluble organic carbon content in each leather sample.
In the test carried out, the biodegradation of chromium-tanned calf leather, oxazolidine-tanned calf leather and a pure collagen pattern was compared. As expected, pure collagen, used as test pattern, showed a biodegradation rate of 85%, while chromium leather showed 12% and oxazolidine leather 55% (Figure 5).

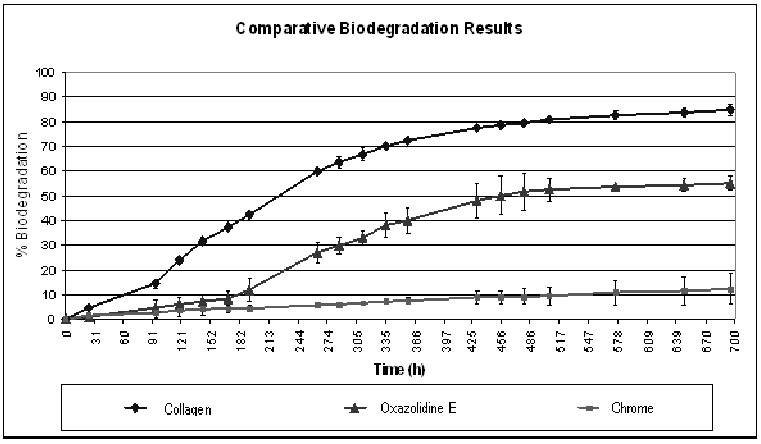


Figure 5. Biodegradability results obtained in collagen, oxazolidine-tanned leather and chromium-tanned leather

Biodegradability tests on leather showed that oxazolidine-tanned leather waste is 43% more biodegradable than chrome-tanned leather waste. These results show a significant improvement in the biodegradation of waste coming from oxazolidine leather with respect to chromium leather and support the use of oxazolidine as an alternative to chromium salts in the leather tanning process, since the waste generated is biodegradable and therefore easier to be treated.

3. CONCLUSIONS

The results show that by tanning with oxazolidine, in combination with synthetic or vegetable re-tanning, the obtained leathers have good physical strength and adequate smoothness, softness, fullness and flexibility, and no significant difference between the two combinations has been detected.

The determinations of physical and chemical parameters of oxazolidine tanned leather have shown to be compliant with the limits required for footwear manufacture and the criteria for the European Eco-label for footwear, and the suitability of oxazolidine leather has been checked through the manufacturing of different shoe models.

Regarding the environmental impact, oxazolidine tanning effluents are chrome-free and the sludge derived from wastewater treatment is more likely to be reused, e.g. for agriculture. Furthermore, biodegradability tests on leather showed that oxazolidine-tanned leather waste is more biodegradable than chrome-tanned leather waste.

In short, oxazolidine tanning implies a significant benefit in that it is possible to considerably reduce the environmental impact produced during the tanning process and at the end of the lifecycle of products manufactured using this kind of leather.

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5. ACKNOWLEDGMENTS

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

IMPROVING QUALITY OF LIFE BY APPLYING OF STANDARDS RELATING TO ERGONOMICS

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Abstract: A lot of standards relating to Ergonomics were adopted or revised in the last years, in the aim of improving the quality of life, for workers and consumers. Standards are developed internationally (ISO - International Organization for Standardization), regionally (CEN European Committee for Standardization) and nationally (ASRO - Standardization Association in Romania), which adopte, translate and disseminate in Romania the European or ISO standards. Coordination of these three levels is ensured by common structures and cooperation agreements. In the field of Ergonomics, there is, of these three levels, Technical Committees: ISO – TC 159; CEN – TC 122; CT 54. Organization of work in the textile industry is not essentially different from that of other industries.
Key words: *ergonomics, standards, standardization, textiles, quality of life*.

1. INTODUCTION

1.1. Ergonomics

Ergonomics is a word which derived from the Greek ergon (work) and nomos (laws) words, to denote the science of work, which now applies to all aspects of human activity. From a lot of definitions, the following definitions of Ergonomics have been approved by the council of the International Ergonomics Association (IEA) in 2000:

"Ergonomics (or human factors) is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design in order to optimize human well being and overall system" [4].

The International Ergonomics Association (IEA) is today a federation of forty-two individual ergonomics organizations from around the world, founded in Zurich. The mission of the IEA is to elaborate and advance ergonomics science and practice, and to improve the quality of life by expanding its scope of application and contribution to society.

1.2. Standards and standardization

Standard is a document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context [ISO/IEC Guide 2:2004, *Standardization and related activities – General vocabulary*].

The standardization is an activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context [ISO/IEC Guide 2:2004]. Important benefits of standardization are: improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation.

1.3. Certification

The certification is a procedure by which the third party is giving a written assurance that a product or a service is in conformity to the required specifications [ISO/IEC Guide 2:2004]. Certification of products can assist consumers in making better-informed purchasing decisions.

2. CONSUMER EXPECTATIONS

Today, when the number, diversity and availability of products greatly increased, the consumers have oportunity to choose. In their choice, they will take into account the needs and expectations they have on a particular product. But, how they will know wich product is better and better fits their expectations? It may be helpful statements of the supplier, testing laboratory reports, reports of inspection bodies or, better, the product certification. Certification of products can assist consumers in making better-informed purchasing decisions, because attesting that it complies with safety features and is proper for use.

A specialized working group of ISO Committee on consumer policy (COPOLCO) has indentify the priority areas of consumer interest in international standardization: safety and health, protection of environment, fitness for purpose (technical efficiency, reliability, durability, convenience in use), *ergonomics and anthropometrics, including impact of increasing age on mental and physical capabilities*.

International Standards are voluntary rules and guidelines that help to ensure: safer, healthier, more environmentally sound products and services; products with improved quality and reliability; better operational compatibility between products and greater consistency in the delivery of services; improved choice and access to goods and services; better product or service information [3].

3. WORKER NEEDS

The most important for workers is a healthful and productive work environment, which offer them safety, protect them from injuries or accidents and ensure an efficient work process. Ergonomics (or human factors) is the field of study that seeks to fit the job to the person, rather than the person to the job. Ergonomic interventions aim at mutual adaptation of the four components: the executor, the task, the equipment and the working environment.

Organization of work in the textile industry is not essentially different from that of other industries. However, should take into account the some particularities of this branch industry such as: prevalence of manual and mechanical work to the detriment of automated; wide variety of manufactured products closely linked to the alternation of seasons; interacting powerful of operations of the technological process; influence the total cost of production mostly of material costs; large number of types of jobs; large fluctuation of human resources in enterprises; its crucial role in obtaining quality characteristics of products finished [2].

An ergonomic study on the organization of work includes: analysis of ergonomic conditions of work in the identification of major existing ergonomic risk factors (especially related to physical loads worker while performing his work) and recommendations for improving working conditions [1].

4. STANDARDS RELATING TO ERGONOMICS

If 20 years ago the standardization was a reserved area only a few specialists, today, because of several factors such as European economic integration, quality requirements, technical and technological developments, the standardization is an essential discipline for all, businesses, workers and consumers, which realize that they must play an active role in this area or be willing to accept standardization taking place without their input or without consideration of their interests.

Standards are developed internationally (ISO - International Organization for Standardization), regionally (CEN European Committee for Standardization) and nationally (ASRO - Standardization Association in Romania), which adopte, translate and disseminate in Romania the European or ISO standards. Coordination of these three levels is ensured by common structures and cooperation agreements. In the field of Ergonomics, there is, of these three levels, Technical Committees: ISO – TC 159 (subcommittee TC 159/SC 1 General ergonomics principles; TC 159/SC 3

Anthropometry and biomechanics; TC 159/SC 4; Ergonomics of human-system interaction; TC 159/SC 5 Ergonomics of the physical environment); CEN – TC 122; CT 54.
A lot of standards relating to Ergonomic were adopted or revised in the last years, under the direct responsibility of Technical Committee ISO - TC159 and its subcommittees in the aim of improving the quality of life, for workers and consumers.

Table 1: Standards under the direct responsibility of TC 159

ISO 1503:2008	Spatial orientation and direction of movement - Ergonomic requirements
ISO 6385:2004	Ergonomic principles in the design of work systems
ISO 7250-1:2008	Basic human body measurements for technological design - Part 1: Body measurement definitions and landmarks
ISO/TR 7250-2:2010	Basic human body measurements for technological design - Part 2: Statistical summaries of body measurements from individual ISO populations
ISO 7726:1998 ISO 7730:2005 ISO 7933:2004 ISO 8996:2004 ISO 9920:2007 ISO 10551:1995 ISO 11079:2007	Ergonomics of the thermal environment
ISO 7731:2003	Ergonomics - Danger signals for public and work areas - Auditory danger signals
ISO 9241	Ergonomic requirements for office work with visual display terminals (VDTs) / Ergonomics of human-system interaction
ISO 9355	Ergonomic requirements for the design of displays and control actuators
ISO 9886:2004	Ergonomics - Evaluation of thermal strain by physiological measurements
ISO 9921:2003	Ergonomics - Assessment of speech communication
ISO 10075	Ergonomic principles related to mental workload
ISO 11064	Ergonomic design of control centres
ISO 11226:2000/Cor 1:2006	Ergonomics - Evaluation of static working postures
ISO 11228	Ergonomics - Manual handling
ISO 11399:1995	Ergonomics of the thermal environment - Principles and application of relevant International Standards
ISO 11428:1996	Ergonomics - Visual danger signals - General requirements, design and testing
ISO 11429:1996	Ergonomics - System of auditory and visual danger and information signals
ISO 12894:2001	Ergonomics of the thermal environment - Medical supervision of individuals exposed to extreme hot or cold environments
ISO 13731:2001	Ergonomics of the thermal environment - Vocabulary and symbols
ISO 13732	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces
ISO/TS 14415:2005	Ergonomics of the thermal environment - Application of International Standards to people with special requirements
ISO 14505	Ergonomics of the thermal environment - Evaluation of thermal environments in vehicles
ISO 14738:2002 / Cor 2:2005	Safety of machinery - Anthropometric requirements for the design of workstations at machiner
ISO14915	Software ergonomics for multimedia user interfaces
ISO 15265:2004	Ergonomics of the thermal environment - Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions
ISO 15534:2000	Ergonomic design for the safety of machinery

ISO 15535:2006	General requirements for establishing anthropometric databases
ISO 15536	Ergonomics - Computer manikins and body templates
ISO 15537:2004	Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs
ISO 15743:2008	Ergonomics of the thermal environment - Cold workplaces - Risk assessment and management
ISO/TR 16982:2002	Ergonomics of human-system interaction - Usability methods supporting human-centred design
ISO/TS 18152:2010	Ergonomics of human-system interaction - Specification for the process assessment of human-system issues
ISO/TR 18529:2000	Ergonomics - Ergonomics of human-system interaction - Human-centred lifecycle process descriptions
ISO/TR 19358:2002	Ergonomics - Construction and application of tests for speech technology
ISO 20282-1:2006	Ease of operation of everyday products - Part 1: Design requirements for context of use and user characteristics
ISO/TS 20282-2:2006	Ease of operation of everyday products - Part 2: Test method for walk-up-and-use products
ISO/PAS 20282-3:2007	Ease of operation of everyday products - Part 3: Test method for consumer products
ISO/PAS 20282-4:2007	Ease of operation of everyday products - Part 4: Test method for the installation of consumer products
ISO/TS 20646-1:2004	Ergonomic procedures for the improvement of local muscular workloads - Part 1: Guidelines for reducing local muscular workloads
ISO 20685:2010	3-D scanning methodologies for internationally compatible anthropometric databases
ISO/TR 22411:2008	Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities
ISO 24500:2010	Ergonomics - Accessible design - Auditory signals for consumer products
ISO 24501:2010	Ergonomics - Accessible design - Sound pressure levels of auditory signals for consumer products
ISO 24502:2010	Ergonomics - Accessible design - Specification of age-related luminance contrast for coloured light
ISO 24503:2011	Ergonomics - Accessible design -Tactile dots and bars on consumer products
ISO 26800:2011	Ergonomics - General approach, principles and concepts
ISO 28802:2012	Ergonomics of the physical environment - Assessment of environments by means of an environmental survey involving physical measurements of the environment and subjective responses of people
ISO 28803:2012	Ergonomics of the physical environment - Application of International Standards to people with special requirements

5. CONCLUSIONS

Machines, tools, equipment, products must be appropriate and comply with capacity limits of human response, taking into account also, the usefulness, purpose and context conditions are used. Also, workplace organization must comply with ergonomic principles in order to eliminate risk factors, improving working conditions and ensure an efficient work process. A lot of standards relating to Ergonomics were adopted or revised in the last years, in the aim of improving the quality of life, for workers and consumers. Today, the standards are reference documents on economic and trade relations between partners and they are increasingly used in jurisprudence.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY ON BAMBOO FIBER"PROCESS OF CREATING-PROPERTIES-APPLICATION"

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Abstract: Bamboo fiber is a cellulose fiber which is extracted from naturally grown bamboo, is the fifth-largest natural fiber after cotton, linen, wool, silk. Bamboo fiber has good air permeability, water absorption, strong wear resistance and good dyeing and other features, but also has natural antibacterial, antimicrobial, mites, anti-odor and anti-ultraviolet. Bamboo fiber is a real natural environment-friendly green fiber?

There are two types of fiber derived from bamboo. The first is usually described as mechanical and the second as chemical. The growing of bamboo is environmentally friendly but the manufacturing of bamboo into fabric raises environmental and health concerns because of the strong chemical solvents used to cook the bamboo plant into a viscose solution that is then reconstructed into cellulose fiber for weaving into yarn for fabric. Bamboo fabric and clothing has wonderful potential as a sustainable and environmentally friendly product if it can demonstrate that it is sustainable and friendly to the health of the planet, manufacturing and garment workers, and consumers.

Key words: bamboo fiber, green fiber, chemically manufactured, regenerated cellulose, environment

1. INTRODUCTION

Everyday more and more companies are releasing "green" products. While this is great for the planet & consumers there is a down side. That down side is that products are released and called "green" and people buy it and embrace it with good intentions of making safe choices for their families but they are not always "green". Unfortunately bamboo fibers are one of those products.[1][6]

The bamboo species for textile production is Phyllostachys heterocycla pubescens, commonly known as Moso bamboo. It is primarily grown in China where there are the most textile mills. Moso bamboo is the largest of the temperate zone bamboo species, is grown on family-owned farms, provides edible shoots, but is not what beloved panda bears eat. All sounds good until the manufacturing process is investigated.[4]

Bambooforest Botanically categorized as a grass and not a tree, bamboo just might be the world's most sustainable resource. It is the fastest growing grass and can shoot up a yard or more a day. Bamboo reaches maturity quickly and is ready for harvesting in about 4 years. Bamboo does not require replanting after harvesting because its vast root network continually sprouts new shoots which almost zoom up while you watch them, pulling in sunlight and greenhouse gases and converting them to new green growth. And bamboo does this the natural way without the need for petroleum-guzzling tractors and poisonous pesticides and fertilizers.[3]

2. PROCESS OF CREATING A BAMBOO FIBER

There are two types of fiber derived from bamboo. The first is usually described as mechanical and the second as chemical. Very little of the mechanical fiber is in circulation and is not widely used. The fiber produced via solvent spinning is technically classified as 'viscose' and is properly labeled as 'viscose from bamboo'. Viscose from bamboo is the fiber that we use today.

The process of creating a bamboo fiber:

The crushed bamboo cellulose is soaked in a solution of 15% to 20% sodium hydroxide(also known as caustic soda) at a temperature between 20 degrees C to 25 degrees C for one to three hours

to form alkali cellulose; The bamboo alkali cellulose is then pressed to remove any excess sodium hydroxide solution. The alkali cellulose is crashed by a grinder and left to dry for 24 hours;Roughly a third as much carbon disulfide is added to the bamboo alkali cellulose to sulfurize the compound causing it to jell; Any remaining carbon disulfide is removed by evaporation due to decompression and cellulose sodium xanthogenate is the result; A diluted solution of sodium hydroxide is added to the cellulose sodium xanthogenate dissolving it to create a viscose solution consisting of about 5% sodium hydroxide and 7% to 15% bamboo fiber cellulose.The viscose bamboo cellulose is forced through spinneret nozzles into a large container of a diluted sulfuric acid solution which hardens the viscose bamboo cellulose sodium xanthogenate and reconverts it to cellulose bamboo fiber threads which are spun into bamboo fiber yarns to be woven into reconstructed and regenerated bamboo fabric. [5]

Sodium hydroxide does not remain as a residue on clothing as it easily washes away and can be neutralised to harmless and non-toxic sodium sulphate salt. A chemical used in this step that can cause nervous system damage with chronic exposure is carbon disulfide. If handled properly there are no negative side effects for humans and environment as sulphur containing by products can easily be transformed into sulphuric acid which is needed for the spinning process.

Although chemical processing is not environmental friendly but it is preferred by many manufacturers as it is a less time consuming process. However, recently developed processes (in 1992), such as closed-loop systems for processing of Lyocell and Tencel fabrics, use safer solvents such as acetic acid. These may also be used more frequently for organically-processed bamboo textiles. However, this depends upon how much the consumer is ready to pay for, as these processes involve huge expenditure. Apart from the chemicals destroying the natural advantages of bamboo fibers, the other drawback of bamboo fabric is that it shrinks a slightly higher than cotton.[6]

Bamboo fiber used in spinning yarn for textiles is manufactured the same way as Lyocell (wood fiber) -with the same organic solvent N-methylmorpholine-N-oxide (amine oxide). This solvent is non-toxic and completely recycled during the manufacturing process. So although bamboo is classified as rayon by the FTC because it is made from cellulose it is actually a subset of rayon that uses a separate process from viscose to convert the bamboo cellulose to a spinnable form (bamboo rayon is NOT therefore the same as viscose rayon). One of the great advantages of this process is there is no formation of a derivative and therefore the natural characteristics of the cellulose are retained in the final product.[9]

Chemically-manufactured bamboo rayon has some wonderful properties which are adored by conventional and eco-aware designers and consumers.

3. PROPERTIES OF BAMBOO FIBER

Bamboo has many advantages over cotton as a raw material for textiles.

Bamboo fabric has a natural sheen and softness that feels and drapes like silk but is less expensive and more durable.

Bamboo fiber is naturally anti-bacterial, UV protective(UV transmittance of bamboo fiber is 0,06%, UV resistance of bamboo fiber is 41,7 times of cotton) , green & biodegradable,anti-static (12 times more effective than cotton products), hygroscopic (60%improvement in comparison cotton products) breathable & cool, strong, flexible, soft and has a luxurious shiny appearance.[2]

Bamboo fiber absorbs and evaporates sweat very quickly. It's ultimate breathability keeps the wearer comfortable and dry for a very longer period. It is 3-4 times more absorbent than cotton fabrics.

Bamboo fiber can be softer even than silk fiber when spun into yarn. It has a basic round surface which makes it very smooth and to sit perfectly next to the skin.

Some people with chemical sensitivities can not tolerate bamboo clothing. We are not sure if this intolerance is due to the intrinsic nature of bamboo but it more likely because of other chemicals added or used during the manufacturing and finishing processes of the clothing.

Bamboo is naturally anti-bacterial(3 times more effective than cotton products) and anti-fungal supposedly because of a bacteriostatis agent unique to bamboo plants called “bamboo kun” which also helps bamboo resist harboring odors. “Kun” is also sometimes spelled “kunh”. The bamboo kun in bamboo fabric stops odor-producing bacteria from growing and spreading in the

bamboo cloth allowing bamboo clothing to be more hygienic and to remain fresher smelling(30% improvement in comparison with cotton products).[8]

Bamboo clothing is hypoallergenic.

Tests by the Japanese Textile Inspection Association shows that, even after fifty washes, bamboo fabric still possessed these properties. It makes bamboo fabrics healthier, germ free and odor free.

Fabrics made from bamboo fiber are highly breathable in hot weather and also keep the wearer warmer in cold season. Bamboo is naturally cool to the touch. The cross-section of the bamboo fiber is filled with various micro-gaps and micro-holes leading to much better moisture absorption and ventilation. It is also very warm in cold weather, because of the same micro structure as the warm air gets trapped next to the skin.[5]

3. APPLICATION OF BAMBOO FIBER

After gaining popularity as a green fiber, bamboo has found place in significant fashion circles. However, questions are often raised due to textile chemicals applied to bamboo for making them usable as fibers for clothing and other textile products.[6]

Pure bamboo fiber yarn spinning can produce 60Nm at the maximum, standard count is 24Nm, 36Nm, 48Nm. Pure bamboo yarn is for fabric, mat, bed sheets, curtains, scarves. The inherent anti fungal and antibacterial properties of bamboo fabrics make it suitable for such clothing as underwears, t-shirt and socks. It is especially preferred for making summer clothing as it gives protection against UV rays and for being naturally cool. The softness, sheen and drapabaility of bamboo fabric make it suitable for fashion clothing and fashion accessories like scarves. As it has good absorption and is breathable, it can be used in making any type of garments especially sports wear and inner wear.

Bamboo pulp is used for making non woven fabrics that are then used in making hygiene products such as sanitary napkin, masks, mattress, absorbent pads, food-packing bags. Again, they are preferred for such products due to anti-bacteria and absorption properties.[7]

If blended with polyvinyl alcohol, it can produce thin fabric. Also it can be blended with cotton, wool, linen, silk and chemical fiber for weaving or knitting, producing all kinds of woven fabrics and knitted fabrics. Woven fabric can be used to make jackets, casual wear, suit suits, shirts, bed sheets and towels, bath towels and so on. Knitted fabric suitable for making underwear, shirts, T-shirts, socks . If bamboo fiber content is less than 30%, it is more suitable for underwear, socks, can also be used to make medical care.[6]

4. CONCLUSIONS

The bamboo is grown on managed farms/plantations in Southeastern China. Since all of the fiber processing is done in China and there is an abundance of bamboo growing in China, we use the bamboo grown there. Bamboo is also very sustainable to grow as it does not require the use of pesticides and grows very quickly in favourable conditions.

Bamboo fibre has many excellent properties that make it ideal for processing into textiles. What people find most surprising is that bamboo fabric is exceptionally soft and light, almost silky in feel. This makes it breathable and cool to wear. It is also incredibly hydroscopic; absorbing more water than other conventional fibres such as cotton .

There are two types of fiber derived from bamboo. The first is usually described as mechanical and the second as chemical. Very little of the mechanical fiber is in circulation and is not widely used. The fiber produced via solvent spinning is technically classified as 'viscose' and is properly labeled as 'viscose from bamboo'. Viscose from bamboo is the fiber that we use today.[6]

Bamboo fiber is a real natural environment-friendly green fiber?

More and more companies are releasing “green” products. While this is great for the planet & consumers there is a down side. That down side is that products are released and called “green” and people buy it and embrace it with good intentions of making safe choices for their families but they are not always “green”. Unfortunately bamboo fibers are one of those products.

The growing of bamboo is environmentally friendly but the manufacturing of bamboo into fabric raises environmental and health concerns because of the strong chemical solvents used to cook

the bamboo plant into a viscose solution that is then reconstructed into cellulose fiber for weaving into yarn for fabric. Bamboo fabric and clothing has wonderful potential as a sustainable and environmentally friendly product if it can demonstrate that it is sustainable and friendly to the health of the planet, manufacturing and garment workers, and consumers.

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