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INTERNAL AUDIT OF THE QUALITY

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Abstract: In quality management, the audit means a review of products quality, services, processes of an enterprise or of quality systems in general. The audit results are defined the corrective required actions , which takes into account the identification and elimination causes of nonconformities detected to prevent their repetition.
"Quality audit is a systematic, independent and documented process, in purpose of obtaining the audit proofs and evaluate them objectively to determine the extent to which audit criteria are fulfilled." [6]
Audit quality is an essential tool for management, achieving organizational objectives in quality; its main purpose is to assess the corrective actions necessary to eliminate deficiencies and highlighting opportunities to improve the organization's quality system, processes and products that made in the quality system certification against international standards in this field.
Key words: *audit, quality, quality management, process, report*.

1. INTRODUCTION

1.1. Standards relating to audit of quality

ISO 9000 (SR EN ISO 9000:2006) - ISO 9000 (ISO 9000:2006) - entitled "Quality management systems - Fundamentals and vocabulary" - describes the fundamental principles of quality management systems and specifies the terminology for quality management systems.
According ISO 9000: 2006 :the audit is not only an inspection activity or supervision of quality, for keeping control of a process or product, it encompasses evaluations of maintenance activities under control of processes, providing a management tool that is confirmed and evaluated the functionality and efficiency of quality, were identified fields that need correction or improvement.
ISO 9001 (ISO 9001:2008) - entitled "Quality Management Systems - Requirements" - specifies requirements for a quality management system where an organization needs to demonstrate its ability to provide products that meet customer and the regulations to apply and to increase customer satisfaction[5].
ISO 9001 standard requirements related to internal audit are set out in paragraph 8.2.2. Internal Audit: A mandatory requirement of ISO 9001 management system is to have a procedure "Internal Audit", as documented (written). When implementing a quality assurance model for contractual situations in accordance with ISO 9001: 2008, it is provided the obligation of the organization to plan and perform internal audits on the basis of written procedures. The frequency of audits is determined by the nature and extent of enterprise activity.
SR EN ISO 19011 "Guidelines for guality management system auditing"- in this standard we found such data concerning the principles of auditing, managing audit programs, the way to perform quality management system audits and auditor competence system.

2. INTERNAL AUDIT OF QUALITY

According to ISO 19011 the audit is "a systematic, independent and documented process in order to obtain audit evidence and evaluate them objectively to determine the extent the audit criteria that are accomplished"[6].

SR EN ISO 9001 requirements related to internal audit are formulated in paragraph 8.2.2. Internal Audit.

Organization must conduct internal audits at planned intervals to determine whether the quality management system:

a) conforms to planned modalities, the requirements of this International Standard and with the quality management system requirements established by the organization and
b) is effectively implemented and maintained.

The audit program is a combination of one or more audits, that have a specific purpose are scheduled at fixed intervals.

An audit program should be planned, taking into account the status and importance of processes and areas which must be audited and the results of previous audits. Criteria should be set, application domains, frequency and audit methods. Selection of auditors and how to conduct the audits shall ensure objectivity and impartiality of the audit process.

Responsibilities and requirements for planning and conducting audits for reporting results and maintaining records, must be delegate de la managementul cel mai inalt. The management responsible for the audit should ensure that they are taken without undue delay action to eliminate detected nonconformities and their causes. Follow-up activities should include taken actions and report verification results.

The objectives of the audit

For the planning and performing audits must set objectives that meet the organization's management priorities. Also these objectives must be in accordance with requirements of the management system, contract regulations, customer requirements, with its commercial intentions and other interested parties.

3. AUDIT TEAM AND ITS TASKS

The responsibility for managing an audit program should be attributed to people who know and understand the principles of audit and have competent auditor.

Quality responsible shall prepare annually a list of internal auditors and updates whenever necessary. List of internal auditors is analyzed, verified and approved by the general manager. For the nomination of internal auditors in the list are available the following criteria:

- participation in preparing documents for the Quality Management System within the organization;
- participation in instruction, at least two days, based on reference standards SR EN ISO 9001:2008, SR EN ISO 19011:2003;
- participation in formation as an auditor at least two audits of the Quality Management System;
- skills, knowledge and behavior qualification criteria of SR EN ISO 19011:2003;
- irreproachable conduct, exemplary professional activity;
- participation at least once a year to internal or external training.

Quality Management Representative develops the internal audit plan that called auditors, taking into account their independence from the auditee and comply the experience requirements and training necessary for the audit process. Audit team leader shall have acquired additional audit experience to develop knowledge and skills. This additional experience may be gained by acting as audit team leader under the direction and guidance of another auditor who is competent as an audit team leader.

Audit task of team members is to analyze the relevant information on assigned audits and to prepare working papers for them.

The auditor shall prepare the audit plan, which provides detailed information about auditor and auditee upon the terms of reference documents that are subject to audit, hourly programming and participants. The audit plan is submitted to the Quality Management Representative.

The auditor shall prepare internal audit questionnaire. This is working document of the auditor and serves to assess the implementation requirements documentation standards and practical to perform activities in accordance with the provisions of the documentation. Internal audit questionnaire is kept as an annex to the audit.

Actual audit take place by examining the process by auditors took into account and determine whether the applicable documents and implementation of quality management are correct and complete.

The auditor reviews internal audits reports and records, including reports of noncompliance with related corrective actions. Internal audit is performed according to standard SR EN ISO 19011:2003. The auditor led the opening session, closing session and all discussions with the auditee. His has overall responsibility for all phases of the audit.

The auditor:
- evidence collected through interviews, examination of documents and observing activities and conditions of interest. Clues that seem significant which sign non-compliance shall be noted, even if not included in the audit questionnaire. Verify information obtained through physical observations, measurements and recordings;
- verify the effectiveness of corrective actions since the last audit, if the check was not made otherwise documented. In case is found that the corrective actions achieved are effective for solving such non-compliance, the respective non-compliance is recorded in the audit report noncompliance;
- shall produce a statement for each non-compliance or observation, excluding observations resolved during the audit. They will mention only the audit report. Reports of noncompliance shall be signed by the auditor, who decides on how to verify the corrective action results. Reports of noncompliance shall be signed by the representative of the auditee and the acknowledgment and recognition of non-compliance status.

The auditor: at the end of the auditing session:
- signs audit questionnaire completed during the audit;
- draw up the audit report in two copies, sign it is responsible for its accuracy completeness. The audit report is signed by the Quality responsible.
- diffuses the audit report the Quality auditee responsible.

The audit report should provide a complete, accurate, concise and clear the audit, and should contain or refer to the audit objectives, field of auditing, audit findings and conclusions criteria.

The audit report with all attachments constitutes a record of the Quality Management System and it is controlled and maintained in accordance with the "control records". In a short time after the closing session, the leadership of the auditee (organization) will communicate written, the auditor corrective actions for resolving nonconformities and deadlines for achieving them, if these terms were will not agreed before the end of the audit. Checking the effectiveness of corrective action is made by the auditor after an appropriate period of time. Checking may take place, as the case, at a time set with the auditee management, the audit of a prosecution or the next scheduled audit. If the audit report established a follow-up audit, the audit will be planned audit program.

The audit is considered completed only after verifying the implementation of of corrective action and closure.

On the date set for verifying implementation of corrective actions, internal auditor verify the implementation of corrective actions. If corrective actions were not effective, sets new auditee to implement corrective actions, with responsible management and quality audit establishes a new effective date.

If corrective actions were effective, the auditor concluded "Corrective Action Report". The audit may specify monitoring by the audit team that adds value by using their expertise. in such cases must take care to maintain independence in activities of further audit

4. CONCLUSIONS

Audit findings could indicate either compliance or noncompliance with audit criteria. When is specified in the audit objectives, audit findings and identify opportunities for improvement.

The audit findings may lead to recommendations for improvement, business relationships, certification, or future activities of the audit, if specified in the audit objectives.
Internal audit reports are used as inputs to the meetings of the integrated management system analysis.

Taking as starting point the conclusions of audit reports could be initiated actions to improve the overall quality system, with favorable implications on the performance of all quality management activities.

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AN INTERNATIONAL SIZE LABEL

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Abstract: The current paper argues on the importance to provide apparel retailers, supply chain members, stakeholders, and consumers with a meaningful size (showing actual garment measurements at specific points) and shape (showing actual garment target morphology) labeling system.
Its benefits, at the consumers' level, would be to improve shopping satisfaction. It would also help manufacturers, wholesalers and retailers order the right sizes and shapes for their target market(s); reduce returns and exchanges diminishing mark-downs, garbage.
A number of issues need to be addressed for such a project to succeed. On the positive side: a large proportion of consumers state that they would appreciate the availability of a more informative size label. On the more problematic side: more than eighty percent of our respondents claim not knowing what their key body measurements are. The question then becomes "how to gather (and regularly update) these body measurements and ensure that the consumer has this information when shopping".
Key words: Apparel, Labeling, Fit, Consumer behaviour, Service

1. INTRODUCTION

The present paper takes its origins in a number of different literature streams.

The first focuses on apparel sizing and women's dissatisfaction with fit and difficulties in identifying a garment suited to their bodies. As demonstrated, this not only impacts on the consumer's shopping experience but also on the efficiency of different participants in the apparel supply chain as well as on their ultimate profitability.

The second literature stream deals with sustainability and the green supply chain management. As mentioned by a number of authors, sustainability not only has to do with the preservation of non-renewable resources but also with reverse logistics and waste management. Unsold apparel that needs to be re-worked, returned to its manufacturer (or to the retailer in the case of e-commerce), or destroyed, belongs to that third category.

Thirdly, this paper also looks into the literature on new technologies, such as 3D body scanning and Mass Customization which are often presented as panaceas to the apparel fit problem.

We summarize some of our research of the last few years and conclude by presenting what we feel is a possible, realistic solution to the fit problem, and all its corollaries: the adoption of a unified, international size label providing more pertinent information on apparel sizing and potential fit. We end by cautioning the reader that even this approach poses its lot of difficulties and that a number of issues still remain to be resolved.

2. LITERATURE REVIEW

2.1 Fit dissatisfaction

Apparel accounts for a substantial portion of a country's retail sales (5.8 % in Canada [5]) and household spending (4.9% in Canada [6]). Yet finding the correct garments' size/fit has become a daunting task for both fashionistas and casual shoppers.

Part of the explanation comes from the fact that, in North America, one finds 12 size charts for females (Junior, Misses, Women, etc.), each subdividing into three to eight sizes. In Europe, one notices that a size 42 in France will be a 40 in Germany, a 38 in Sweden, a 44 in Italy, while the same is a 9 in Japan and a 12 in the UK [9]. Moreover, in the American market, sizes vary between designers, manufacturers, and retailers who do not respect the proposed size charts. This is due to a number of reasons: obsolete charts (the USA chart is based on a 1941 population study); niche marketing (charts being conceived for X shape women when one may wish to serve other silhouettes), *vanity sizing* (increasing actual measurements using a same size “number” to flatter the consumer), lack of quality control, manufacturing processes that are incapable of meeting specifications, etc. [12].

The fact that a size label is only complementary information appreciated by consumers [15] , a tool to assist consumers in selecting the best fitting garment [7], and that it generally conveys no information whatsoever on the underlying garment shape leads to a trial-and-error process in finding the right size and fit. Alvanon an international leader in apparel fit consultancy states that 67% of U.S.A. consumers are dissatisfied with garment fit and that 85% will return to a brand name because of fit assurance based on past experiences [1]. Our research shows that 53% of in-store female consumers will take two identical garments in different sizes to the fitting room and that 46% of merchandise purchased by catalogue will be returned [11]. A situation which translates in wasted materials and useless transportation, in the case of returned merchandise.

2.2 Sustainability

The complexity created by apparel fit problems translates, at the supply chain level, into a difficulty in purchasing the right garments in the right sizes for one’s clientele. Although numbers are hard to come by, often being considered trade secrets, Ghemawat and Nueno [14], in a study of Zara, state that 15-20% of this chain’s sales result from discounted prices (at a 15% mark-down) while most of its European competition will generate 30-40% of sales at discounted prices with an average 30% mark-down. That is when unsold merchandise, which may account for 10-20% of inventories [4] is not destroyed [16] or wasted.

Green Supply Chain Management (GSCM) literature focuses on environmental sustainability in the processes of product design and innovation, operations (production and logistics), and distribution to the consumer. It discusses three possible avenues of improvement: green manufacturing, reverse logistics (returns from the market at the end of a product’s life cycle, defectives, etc.), and waste prevention and management [8].

Sustainability is more and more expected, or requested, by consumers who look for sustainable products, and by policy makers, who are concerned with sustainable consumption and production [18]. Companies in the apparel industry must therefore emphasize sustainability in their strategy [13]. This emphasis may in part be placed on waste management through better management of the sizing issue; which the new technologies may help improve.

2.3 New technologies

In the early days, some saw 3D Body scanning as the magic that would enable order givers to solve the garment fit problem once and for all. This technology has been accepted in the apparel industry for almost 20 years [20]. Yet, as Ashdown [3] states, a number of difficulties arise when measuring certain parts of the body (e.g. waist). Moreover, it may be difficult to acquire exact measurement with 3D Body scanners due to subject’s position, landmark indications, as well as the instruments position [10]. Over and above these precision difficulties, the fact that scanners still cost tens of thousands of dollars, and that their operation requires technical expertise, poses a problem when trying to make them available to all consumers.

In 2001, Istook *et al.* [17] proposed that *3D* body scanning and Computer Aided Design (CAD) would enable the implementation of mass customization in the apparel industry. The book *A Consumer-driven model for mass customization in the apparel market* was published in 2002 by Anderson *et al.* [2]. Yet [17] data transmission is complex with errors occurring during transfer. The fact that a 3D body sends some 300 000 pieces of data per body scan certainly does not help [3]. Moreover, technology in itself does not take into account what Ashdown [3] calls the hidden information: consumer wish for ease in a garment, preferences in terms of fit, textiles drape, etc.

One can conclude that the existing technology does not yet allow us to solve the fit problem by mass customizing each and every garment that we buy. One must therefore look at other solutions. What appeared as an obvious solution to the early proponents of 3D Body scanning, the creation of new standard sizes soon proved to be dysfunctional as more than 30 different sizes would need to exist to more or less fit women of every size and morphology [12].

3. METHODOLOGY

The solution we propose to the apparel fit problem, enabling the industry to not only better satisfy its consumers but also to act in a more sustainable manner, is to adopt a universal size label providing (1) the targeted wearer with morphological and (2) specific measurement information. Figures 1 and 2 show a draughts of what such a label could look like.

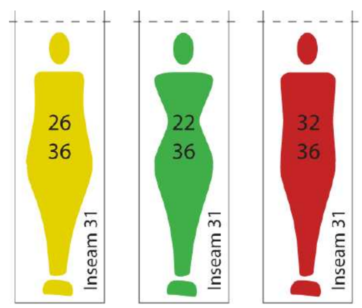

Figure 1: Draught of size label

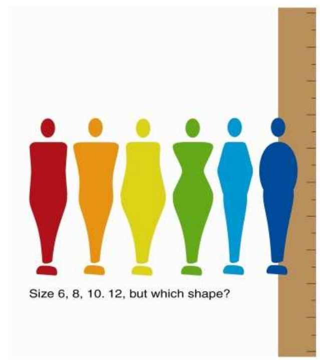

Figure 2: Draught of size label

In a preliminary research, published in 2010 [12] we reported on a pretest we conducted in Hong-Kong on a very small convenience sample (33 participants) where consumers expressed interest in such a label. Building on this information, we prepared a 12 point questionnaire which we distributed to 2618 respondents in Québec (Canada) asking them mostly about their perceptions on size labeling and their attitude toward a potential new label. The province of Québec was chosen for convenience and for the fact that (1) it uses the standard North-American sizing systems and (2) is generally presented with the same apparel offer, from mostly the same retailers, as the rest of North-America. The sample was non-probabilistic using a snowball, or chain sampling, approach. It was passed in person during the month of October 2011. The data was analyzed with SPSS.

4. RESULTS

Our sample was comprised of 1618 females and 1000 males their ages ranging from 15 to "over 65". Although we had a definite over representation in younger age groups (15-24 and 25-34) which should sound an alarm bell when trying to generalize our findings, we had sufficient numbers in all groups to validate our results (our smallest group being the 55+ with 206 respondents). Our sample was also fairly representative of the Canadian population in terms of education with a slight over representation of respondents with a college or university degree. Yet since the Canadian statistics date back to 2006 and educational accomplishments have improved since, our sample is probably very close to the population.

Our first question aimed to ascertain that consumers used the size label. To the question *When, in a store, you find a garment that you may be interested in trying on/buying, what do you check first?* the size label comes second to the price label which indicates that, after a garment's appearance obviously, its potential fit is of importance. Although 62.4% of the respondents find the size label useful or very useful, 45.7% state that they regularly buy a garment of a different size from their "normal" size, and 54.6% will often or always bring a same garment in two different sizes to the fitting room to try them on. These results confirm that the size label is used as a first step in the garment selection process but that the information provided is only indicative of fit; the only way to find the best fitting size is to try a garment on.

Our objective being to determine whether a size label identifying body morphology and measurements would be useful, we asked our respondents if they knew their measurements. As previous research had led us to expect a qualified "no" to this question; 67.4% answered "not at all" or "very poorly". Not surprisingly, in view of the previous answer, only 35.0% of the respondents stated that that they would "like" or "very much" like garments tagged with size labels showing a silhouette (similar to figures 1 and 2) and 32.1% answered in the same manner for measurement information. Yet, interestingly, there was a direct link between the respondents' knowledge of their body measurements and their interest in a size label identifying the garment's measurements (Pearson correlation of .392, sig .01) and a somewhat weaker one with the interest in seeing a label showing a silhouette (Pearson correlation of .083, sig .01).

Table 1: Results

	Analysis	**All respondents**	**Men only**	**Women only**	**45+ years women**	**Δ male-female T test-sig**
1	Usefulness of size label	62.4 %	65.5%	60.5%	53.1%	t 2.688 sig .007
2	Regularly buy different size	45.7%	39.1%	49.6%	49,5%	t -7.063 sig .000
3	Regularly try 2 garments of Δ sizes	54.6%	46.7%	59.5%	56.0%	t -9.055 sig .000
4	Measurements non-knowledge	67.4%	67.4%	67.3%	56.7%	t 1.480 sig .139
5	Label with measurements	35.0%	29.7%	40.0%	34.5%	t -2.068 sig .039
6	Label with silhouette	32.1%	26.7%	32.5%	41.8%	t -7.727 sig .000
7	Correlation 4 & 5	.392		.374	.390	
8	Correlation 4 & 6	.083		.088	.152	

It is somewhat surprising to find (see table 1) that, although the difference between males and females is statistically significant (based on a t-test comparing the two groups' means) in the above results, men's answers are similar to women's and show that they also experience some level of difficulties with the current size labeling system. Yet the discourse one often ears in the industry is that males are easier to dress than females and that the size labeling used, closely linked to actual garment/body measurements, serves the population much better. It is interesting to note that their interest in a more informative (measurements and silhouette) is slightly lower than womens' (by some 6%); which probably reflects the fact that they less often purchase garments of a size that differs from their normal size than women do (39.1% versus 49.6%).

We also note that older women appear to find size labels less useful than younger women (53.1% versus 60.5%) which would confirm the existing literature stating that garments are often designed with the young woman in mind and that older woman has more difficulties in finding a fitting garment. Yet these results are not confirmed by some of the other questions (i.e. number of garments taken to fitting room or percentage of times one buys garments of a size different from one's "normal"). Maybe older women have more of a tendency to stay with a known brand and therefore "know" which garments will fit and which will not.

5. CONCLUSIONS AND RECOMMENDATIONS

Our results confirm the literature on size and fit in that the current North-American size labels are only indicative of measurements and fit. Hence women have to try multiple sizes on to identify the best fitting one. In the case of in-store shopping, this translates in the necessity for the retailer to have personnel on the floor to assist consumers and to put items back on the rack after they have been tried on. For distance retailers it simply means a higher percentage of returns to merchandise sold with the ensuing costs and loss of profitability; ultimately, this may translate into lower sales or the incapacity to increase e-commerce volume in apparel. This also translates in the retailer having more difficulties ensuring that the stock on hand will fill the consumers with a corollary of having to order more garments and/or being left with large inventories on hand at the end of the season. For the manufacturer, the implications are somewhat the same since his sales forecasts will normally be based on his customers' orders and, in the new retailing world where major chains (such as Sears, Walmart, etc.) dictate their rules, he oftentimes will have to accept the return of unsold merchandise. At the consumer level, the end result is one of dissatisfaction with the apparel shopping experience. More unexpected yet, our study also shows that the same difficulties exist in the male apparel industry. Although slightly less important, the problem of size and fit also exists for menswear.

Whether the difficulties arise at the consumer, retailer, or manufacturer level, the end result is diminished effectiveness and efficiency of the supply chain with increased wastes and costs as consequences.

Our initial proposition was that a universal size label, identifying body shape and measurements of a garment, would contribute to solve the fit problem. One must come to a number of conclusions: (1) consumers do not know their body measurements, and (2) they are consequently not very interested in having a size label with measurements and silhouette. Which brings about another question: how to inform consumers (give them the tools to determine and know at all times) about their body measurements and morphology?

This opens a number of avenues for future research: are women interested in knowing their body measurements? How can one implement a body measurement campaign? What is the best way for women to have their body measurement information constantly on hand? Should such an endeavour be imposed by governments or should the option be left to individual retailers who may then use it as a competitive advantage?

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CREATIVE RECYCLING – A POSSIBLE SOLUTION FOR ROMANIAN SMALL TEXTILE COMPANIES

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Abstract: Every year, more than 5 million tons of textiles are generated in the European Union, and only a small amount (25%) is recycled, that is why there are strongly encouraged strategies, programs and business plans based on recycling of pre-consumer and post-consumer textile waste [2].
This paper presents in short a few projects made by the students from the *Faculty of Textiles, Leatherwork & Industrial Management.* They did intense research work and then they gave practical solutions for creative recycling of the textile industrial waste. There are shown some types of original products that can be used as an inspirational source by Romanian investors for developing small business.
Keywords: industrial waste, textiles, recycle, technical creativity, small business.

1. INTRODUCTION

One of the biggest problems of the 21st century is to protect our environment by finding creative ideas for doing this. *Creative economy* means to transform original ideas into successful business. Creative economy refers to a range of economic activities which exploit in a creative way information, knowledge and materials. United Nations published its first report about creative industries in 2008. Later, in 2010, it was published a similar report which concluded that world economy needs creativity and innovation for finding new opportunities of development, especially during turbulent times [1].

Recycling materials can be seen as a part of environment protection. *Creative recycling* is a concept related to methods of reusing waste by creating beautiful and original products that are suitable to be sold on the market. Each item has a unique "personality" because it is made from various recycled materials, and you cannot create identical products 100%.

All over the world small companies are trying to identify an idea that can become the base for their profitable business. At the beginning, it must be done a market research for the selected product. Also it is very important to estimate the quantity, the availability and the costs of necessary waste materials.

At the national scale, it can be set up a network in the field of recycling. In this network must be included producers (waste generators), local collectors, transportation companies and recycling waste companies [4, 5].

Talking about Romania, creative recycling of the textile industrial waste can be a good business solution for development of the small companies. These materials can be bought from the clothing sector and no special skills are required for the employees.

Each year there are organized fairs where people can buy traditional items, vintage textiles or modern products handmade. It is noticed a great interest for the country lifestyle and for the work made by using simple tools. On the occasion of these fairs, small companies can sell their textile products. Only in France there are over 30 annual fairs for handicrafts and limited production items. Also the new products from recycled materials can be sold in the local stores and with the help of the virtual stores from internet websites.

2. EXPERIMENTS

2.1 Preliminary experiments conducted in 2009

The first experiments at the *Faculty of Textiles, Leatherwork & Industrial Management* were organized in 2009, on the occasion of the "Creative Recycling of Textile Materials" Workshop. There were set three main goals:

- to make students aware about the recycling textile products;
- to stimulate their technical creativity;
- to evaluate students' satisfaction.

The total number of students who participated of this workshop was 14. All students were asked to create products at their choice, by using old textile items or waste given by the textile companies from Iasi. They had to make original combinations with yarns, leather, plastic and other types of materials.

The results were divided in four groups: clothing & shoes, textile accessories (gloves, bags, belts), interior decorations (wall decorations, pillows) and other items (textile toys, Venetian masks). Taking in consideration the number of items in each category, there were computed the percentages – as shown in the Table 1 and Figure 1. It can be seen that clothing and shoes were the favourite products chosen to be created from recycled materials.

Table 1: Structure of the textile products created from recycled materials (2009)

Clothing & Shoes	Textile accessories	Interior decorations	Other	Total
5	4	2	3	14
35.71%	28.57%	14.29%	21.43%	100%

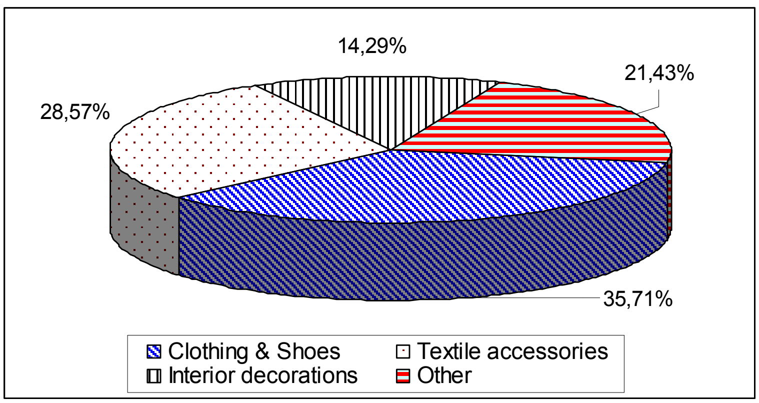

Figure 1: Types of products created by students in 2009

As for technical creativity, students were invited one by one to explain their projects, what combination of techniques they used and what kind of materials they recycled. The average level of technical creativity was 3, on a 1 to 5 scale. The Venetian mask that won the 1st prize is shown in Figure 2. It had the highest degree of complexity and it was made by hand sewing. The decorations were hand sewn or done by machine embroidery. There were used five types of recycled materials.

Figure 2: Venetian mask made from recycled materials

For evaluating the degree of satisfaction, each student was asked to express her feelings during the innovation process. Most of them (10 from 14 students) showed a great interest for doing something new from recycled materials.

2.2 Second set of experiments

In 2010, there were organized with 24 master students from “Assurance Quality” specialization two types of experiments:

- three dimensional embroidery - practical simulation;
- creative recycling of textiles - Origami style.

The most important goals were to improve students’ technical creativity and to guide their thinking for discovering new business ideas.

At the beginning of the simulation process, students did a research for more than 30 days regarding manual and mechanical embroidery and how it can be added a 3D effect to them. As a conclusion, all four participants selected the cut work embroidery, decorated with small beads, metal flakes or other tiny recycled accessories. Each student had to simulate three dimensional embroidery, placed in different regions on an evening dress and a wedding dress. Images were taken from internet, at their choice.

Their creative work was exhibited for one year in the *Department of Engineering & Design of Textile Products* (Figure 3). The degree of satisfaction was evaluated as “good” by talking to them after the official opening of the exhibition. A very important contribution to this level of satisfaction brought professors and other students who expressed their admiration for the exhibits.

Figure 3: Simulation of 3D embroidery

It has to be mentioned that all projects suggested by students can become real, giving value to any garment. The cut work embroidery can be done by mechanical or computerized embroidery machines, and the decorations can be added by manually sewing.

For the Origami set of experiments, 20 master students were asked to create fully functional products from recycled materials. Also they had to give an estimated price for each new item and the economic benefit if such products would be produced by simple means.

Why to adapt Origami technique to the textile field? The answer is simple: many waste materials have small sizes which made me think how to use them in a creative way. There are known 80 different types of Origami. One of them is called "modular Origami" and its basic element is a small paper triangle. That is why, in the first stage, students were taught how to create traditional Japanese paper triangles. Also they analyzed real modular Origami products and they discussed the pictures showing textile dresses and accessories (hats, bags) inspired by the Origami art. After 2009, young fashion designers became more and more interested in creating new shapes and lines of their garments. They were fascinated by new ways of changing the natural silhouette with the help of unconventional clothes. A good promoter was Lady GaGa who was admired in 2008 wearing Origami inspired dresses and accessories.

In the second phase, all students participated to a short session of productive thinking. They had to give ideas for new products (during limited time). There were evaluated originality, fluency and flexibility.

- Originality is the ability to think unusual ideas.
- Fluency is related to the number of ideas given in a certain period of time.
- Flexibility means the ability to imagine solutions by thinking from different points of view.

In the end, students had to design original textile products using as inspirational source modular Origami. There were required written projects containing a short description of the techniques they have used, the list of the materials, technical consumptions, and estimated costs per unit.

In the present, the best of their results are part of a permanent exhibition (Figure 4).

Figure 4: Origami style products (exhibition)

It was evaluated the originality of the products created from recycled materials. Originality took in consideration how many items of the same product were made by students. The highest level of originality means the smallest number of items from the same type. From the total number of 20, a percentage of 65% were different products, which means an average originality level.

Table 2: Structure of the Origami textile products made from recycled materials (2010)

Clothing & Slippers	Textile accessories	Interior decorations	Other	Total
5	7	5	3	20
25%	35%	25%	15%	100%

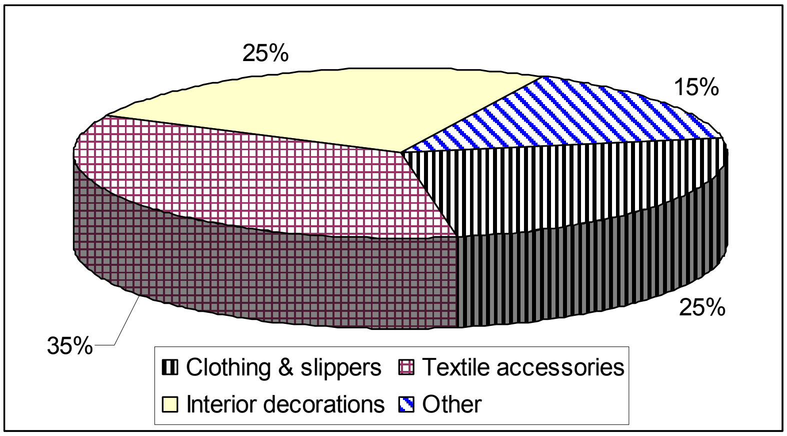

Figure 5: Types of Origami textile products created from recycled materials

Students believed that is an efficient business to produce interior textiles like decorative pillows of all sizes. It is easy to manufacture them, you can recycle as many materials as you want and the projects inspired by Origami art allow you to play with your imagination and create many different designs. The average selling price is 7 lei per product. Depending on the complexity of the design, the price can go up to 12 lei.

The degree of satisfaction was bigger at the female students (14) than the male students (6). The explanation is related to the little ability of men to do delicate operations, necessary for folding and sewing tiny textile pieces of material.

2.3 Final set of experiments

During the year 2011 there were planned the final experiments consisting of:

- Quilting & Patchwork products from recycled materials;
- Venetian masks from recycled materials;
- Manual tapestries inspired by Cucuteni culture.

For the Quilting products it was conducted a research regarding this technique, wide spread especially in Western Europe, USA and Australia. Many fiber artists and fashion designers try to use Quilting for exploring new colour combinations and special visual effects. Our goal was to find new ideas of using industrial waste, ideas that can be developed in Romanian textile companies.

Only one student had the possibility to end the Quilting experiments. Her research work was presented at the graduation exam, in the summer of 2011. The student has chosen two categories of products to be done: decorative quilts (interior textiles) and functional quilts (textile accessories). She created the a technological project for every product she made. Two examples are shown in Figures 6 and 7. There were estimated the total cost and technical consumptions for every new item.

Figure 6: Decorative quilt from recycled woollen fabrics (decorative pillow)

Figure 7: Functional quilt from recycled woollen fabrics (textile bag)

The main goal of the Venetian masks project was to develop both technical and artistic creativity for master students by using recycled materials. At the beginning of the project, students had to find as much information as they can about Venetian masks (types, materials, symbolic meaning, history, etc). These products can be included in the handicraft category because almost entire work is handmade.

After the initial phase, students concluded that they would design and create masks for high class Venetian people, showing luxury and wealth. Each student had to imagine one female mask and one male mask. They were asked to use butterfly as a second source of inspiration.

In the Figures 8 and 9 there are shown the left side and the right side of the exhibition organized with their beautiful masks.

Taking in consideration their enthusiasm, it was obtained the highest degree of satisfaction by comparison with all experiments conducted between 2009 and 2011. The creative process was scheduled after the daily academic program; sometimes students left university late in the night, which was completely unusual. On a scale of 1 to 5, the degree of satisfaction was estimated at "5" (maximum possible).

The last experiments in 2011 were focused upon creating traditional woollen tapestries based on processing the patterns found on the Cucuteni pottery. The research was followed by a long period of time of drawing original patterns - one pattern drawn by the students is shown in Figure 10. The most original patterns were chosen to create tapestries on a vertical loom (as seen in Figure 11).

Figure 8: Venetian masks made from recycled fabrics (left side of the exhibition)

Figure 9: Venetian masks made from recycled fabrics (right side of the exhibition)

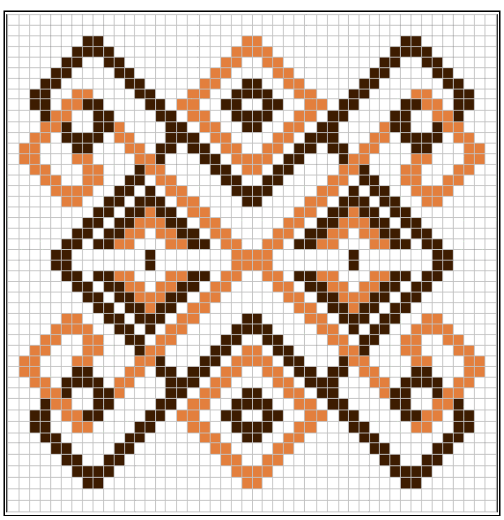

Figure 10: Pattern drawn by students (one example from a total number of 20)

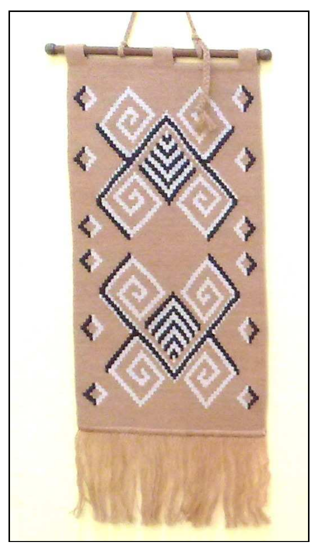

Figure 11: Manual tapestry inspired by the Cucutenian pottery

3. CONCLUSIONS

The recycling of waste materials is a problem for any sustainable economy [3]. Creative recycling is a new concept and many innovative companies try to find efficient solutions for adding value to waste. During the past 3 years, 60 students from *The Faculty of Textiles, Leatherwork & Industrial Management* participated at creative projects related to creative recycling. Their ideas can become a good starting point for small companies because there are not needed special abilities, big investments and large production spaces. It is important only to enjoy crafting and learn how to use old techniques, as Origami or Quilting, for creating original textile products from waste.

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SPECIFIC REGULATIONS REGARDING THE SOLVING OF LABOR DISPUTES IN ROMANIAN LEGAL SYSTEM

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Abstract:The paper aims to briefly review specific provisions of labor legislation for the solving of labor disputes. Those rules are found in matters of discrimination in the payment settlements, the public sector staff as well as some personnel status or disciplinary (work stops at Status of Teachers) and established a derogation from the common law (Labor Code Law nr.62/2011 of Social Dialogue) in resolving individual labor conflicts (former conflicts of rights). The role and importance of these regulations is that they give the parties the employment relationship, particularly employees, way, way more for rights enshrined in law. Appeals, complaints or expressions of individual grievances be settled outside the judicial system organ (the courts), authorizing officers, judicial administrative organs, which aim at restoring order violated.
Key words*:* special rules, body, authorizing officers, disciplinary colleges, labor jurisdiction

1.GENERAL CONSIDERATIONS

Current labor law system of Romanian law contains a number of special rules, enshrining a derogation on labor disputes. The material analyzed is the common law provisions of law. 62/2011of *the Social Dialogue Law* and *Labor Code*, art. 248, 249, art. 281-289 and art. 291. Also have implications in the regulation of individual labor dispute resolution, *Law no. 304/2004 on Judicial Organization* especially those relating to judicial assistants, Code of Civil Procedure provisions on unlimited jurisdiction of the courts in resolving individual labor disputes and appellate jurisdiction to hear appeals against judgments of first instance and other provisions of the Code of Civil Procedure, which according to article 291 of the Labor Code and art.216 of Law.62/2011a social dialogue is the common law.

Special rules are included in the discrimination field, the regulations on public sector wages staff as well as some personal or disciplinary statutes allow employees dissatisfied with decisions of employers to use different ways to challenge their courts prior notification. [1, p.891]. With all that free access to justice any person, including employees remain guaranteed, non-judicial procedures for resolving grievances of employees is an additional guarantee to protect their rights.

2. REGULATIONS OF THE DISCRIMINATION FIELD

Thus, the discrimination field by the Government Ordinance nr.137/2000 on preventing and sanctioning all forms of discrimination and that the Law nr. 202/2002 on equal opportunities between women and men, are established bodies (collegiate) to recommend special work in individual cases, then there is the possibility of referral to the court of common law of labor, that the tribunal.

According to art. 19, letter b of the Government Ordinance nr.137/2000 on preventing and sanctioning all forms of discrimination republished, National Council for Combating Discrimination his duties in the following areas: the prevention of discrimination, mediation acts of discrimination, investigating, finding, sanctioning discrimination monitoring discrimination cases, grant specialized assistance to victims of discrimination. The provisions of art. 20 of the enactment expressly lay down the right person who feels discriminated against in the sense of the order, to notify the National Council for Combating Discrimination, within 1 year from the date of the offense or the date on which the commission may acquaint them. By application lodged, the person who feels discriminated against is entitled to request the removal of the consequences of discriminatory acts and restore the situation prior to the discrimination. College Council will have specific measures a finding of discrimination, mandatory attendance of the parties, their failure to resolve interference of referral. College director decision may be appealed to the administrative court under the law. Also, art. 27 of Government Ordinance nr. 137/2000 on preventing and sanctioning all forms of discrimination republished, stipulates expressly the right person who feels discriminated against by the formula, before the court, a claim for damages and restore the previous situation of discrimination or cancellation of the situation created by discrimination, according the law, request that is exempt from judicial tax and is not subject to referral to Council.

3. REGULATIONS ON THE WAGES OF PUBLIC SECTOR STAFF

Also, according to special rules on unit wage paid staff of public funds, the determination of appeals in relation to individual base salaries, the bonuses, prizes and other financial rights is for the officers. Article 34 of the Framework Law no. 330/2009 establishes the possibility that dissatisfied to appeal within five days from the date of acknowledgment of the administrative act establishing the wages, dispute to be settled within 10 days. The unhappy person regarding the solution may appeal officer or administrative court, where public officials or competent court to settle labor disputes, if contract staff (employees) of budget entities within 30 days from appeal date of settlement. [2, pp.440-441]

It thus appears that, under those laws within the employees, employed with individual labor contracts and service personnel in relations with public authorities and institutions, etc. Both passengers must follow so first procedure prior to appeal the decision on which to address officer, within 5 days. (article 34 paragraph 2 of Law nr. 330/2009).

After disclosure of the officer's response on how to handle appeal will run for 30 days for notification of the competent court. If the complaint was not resolved within that period or the lack of communication response, the complainant may appeal the court immediately, without action to be dismissed as premature because the response was not officer [3, p.1064].

Against the decisions of these bodies, appellants can file a complaint within 30 days of the disclosure, the administrative and fiscal department of the High Court of Cassation and Justice, the decisions leading board of the court or, where appropriate, the Court of Appeal to other decisions.

It considers legal practice but that if the request concerns the payment of compensation equal to the remuneration not granted, require the employer to pay magistrates seniority at work or make appropriate entries in their work books, settlement of the case is for the jurisdiction labor.

4. DISCIPLINARY STATUTES AND STATUTES OF STAFF - TEACHING STAFF

The Law on Social Dialogue has not repealed special provisions for the settlement of individual labor disputes by bodies other than courts. These provisions continued to apply the exception to the norm of the common law expressly provide labor and organization, functioning and powers of bodies (councils, colleges etc) In terms of solving specific individual labor conflicts. Thus, according to special regulations (Ex. National Education Law nr. 1/2011, Government Emergency Ordinance no. 59/2000 on the status of forest, Law nr. 307/2004 on the profession of nursing and the profession midwife and the organization and functioning of nurses and midwives in Romania who have.) *disciplinary councils (the subject) or disciplinary boards* have the common feature that it is in certain sectors, characterized by a specific labor discipline, more rigorous. They are composed of experts who know closely in their specific duties and responsibilities of that activity. Proceedings before such tribunal differs in some respects, differences may exist from one college to another discipline, in accordance with the law.

The National Education Law nr. 1/2011 (Teaching Staff), in pre-work: College discipline College to school inspectorates and central discipline of the Ministry of Education, Youth and Sports article 280 Section 9 of the Act expressly lays down the legal rules on the composition, organization and operation and functions of these colleges are established by regulations approved by the Minister of Education, Youth and Sports.

We believe that by adopting the regulation will apply the provisions of Regulation no. 04/04/2007approved by Order no.847 of April 4, 2007 which provides for the organization, functioning and powers of the Central College of discipline from the Ministry of Education, Youth and Sports and colleges in the county school discipline adopted pursuant to Law no. 128/1997 on the status of teachers.

According to article 5, paragraph 2 of *Regulation staff and training / practical training, auxiliary staff and the management* direction and control of education liable to disciplinary action for breach of duty incumbent by law, the individual labor and applicable collective labor contract and for breach of conduct that harms the interest of education, professional prestige and internal regulations. The penalty is determined by the seriousness, the circumstances in which they were committed, the consequences of their behavior and the person concerned. The sanction is applied and communicated no later than 30 days from the date of acknowledgment about committing the crime / facts constituting misconduct.

In secondary education, teachers punished in accordance with art. 116 points d)-f) of Law no. 128/1997, as amended previously, has the right to appeal the disciplinary sanction to the Central College of the Ministry of Education, Youth and Sports and the sanction in accordance with Art. 116 points a)-c) at colleges in the county school discipline, within 15 days from notification. Article 116 of the Teaching Staff Statute provides that disciplinary sanctions that may apply to the teaching staff are: a.written observation, b.warning, c.base salary reduction, combined when appropriate, compensation management, coaching and control , up to 15% over a period of 1-6 months, d. suspention for a period up to three years to entry to a competition for a teaching positioner obtain higher education degrees or a function of leadership, guidance and control, e. dismissed from the management, guidance and control of education, disciplinary ending of the employment contract.

The Central College of discipline from the Ministry of Education, Youth and Sports and colleges in the county school discipline are administrative and jurisdictional organs. (Art 9 from The Regulation nr. 04/04/2007 on the organization and functioning and powers of the Central Disciplinary Board of The Ministry of Education and Colleges in the country , school discipline, published in the Official Gazette nr 283 of 27.04.2007. Central College of discipline by a motivated decision, admitted (in whole or in part) or reject the appeal based on the evidence and contradictory claims of the parties. College can maintain the sanction applied, can reduce or change the legal classification of the offense that led to the application of disciplinary sanctions. Also, if the sentence has allowed the appeal and reinstatement according to the applicant, the Board Rule on the rights of retroactive wages.

Thus, the appeals of competence or the Central College of discipline or the discipline of colleges in the school inspectorates, his secretary convenes its members and summon the parties at least 15 days before the meeting, or the vice president that the conditions of quorum for a meeting statutory board and leads its work.

At the request of the parties, the college may grant a single term for the defenseless, the fully reasoned. In case that, despite being legally summoned, the parties presented the College proceed to judgment in default if it was requested by a party. Otherwise, the college has suspended settlement of the case.

Board members are obliged, under law, to continue in the truth to resolve the appeal and to give judgment and legally sound. On the facts and legal arguments raised by the parties to support their claims and defenses, the College is entitled to ask them to explain, orally or in writing, and to put in their debate any factual circumstances or right, even if not mentioned in the complaint or defense.

The debates are recorded in the minutes of the meeting signed by members of the college. After the hearing, Board members decide on the appeal justified based on the evidence and submissions of the parties, the decision was taken by simple majority of members present.

College Decision is drafted, is motivated both in fact and in law, signed by the secretary and the president or the vice and to the parties. College may delay delivery up to 7 days for submission of written conclusions, why the delay in its decision mentioning (article 15 paragraph 1 of the Regulation).

Unsatisfied judgment against the college may appeal the court action, section specialized in labor conflicts radius surrounding the school tax office or school with which the appellant is in employment relationships, within 30 days from communication (Article 17 of the Regulation).

Decisions of the colleges of honor and discipline to notify the person concerned within 20 days of the notification and the right person sanctioned (by the administrative - judicial) to address the courts is guaranteed.

In higher education are considered applicable to the Regulation of 16 March 2009 on the organization, functioning and powers of honor Central College from Ministry of Education, Youth and Sports, and colleges of honor at higher education institutions.

According to these provisions, the teaching staff, auxiliary staff and the management, direction and control of higher education, sanctioned in accordance with Art. 116 points. a)-c) the status of teachers has the right to appeal the sanction, in honor of the *colleges of higher education* institutions and staff sanctioned in accordance with Art. 116 points. d)-f) of the said legislative act, the *Central College of honor from the Ministry of Education, Youth and Sports*, within 15 days of the decision.

Unless determining the composition of the two judicial administrative organs mentioned are their own rules contained in Regulation of 16 March 2009 and of staff in higher education are common with Regulation 04.04.2007, both in powers of two colleagues and the procedure by which disputes are resolved.

The new reglementation of the National Education Law no. 1/2011 makes no specific reference to the operation of such judicial administrative organ at higher education institutions, thus ensuring only the right employees in this area to address the courts.

5. CONCLUSIONS

The Labor jurisdiction is certainly a guarantee of employee rights, conferred on them by the entire labor legislation in force. Ensuring continued access to justice employees of the various decisions of employers dissatisfied, special rules analyzed derogate from common law individual employment dispute resolution, enabling the continuation of employment, without the intervention of the judiciary, with obvious advantages. Thus, the applicant is exempted from payment of charges imposed by the use of judicial proceedings. Accessibility court or tribunal is provided by any stamp duty exemption applications and procedural documents labor disputes (285 of the Labor Code), in the same vein, Article 15 of Law nr.146/1997 letter, Official Gazette 173 of 29 July 1997, as amended, provides that legal fees are exempt from stamp actions and claims, including those for redress, on the conclusion, execution and termination of individual employment contract, any rights arising from labor relations, the tax on income from wages, rights deriving from the collective agreements and the settlement of collective agreements and enforcement of judgments rendered in such litigation. Although accessibility is a principle governing the jurisdiction of labor representation in litigation, including employees, is usually achieved through elected representatives (lawyers), which involves additional costs, sometimes significant for employees.

Speed in solving the cases of employment and implementation of decisions on labor disputes is another principle which governs labor jurisdiction but legal practice do not always apply, for various reasons [4, pp.20-21; 5, p.871]. Thus, settlement of conflicts, disputes arising between the parties to the employment relationship at this stage of their deployment, with the participation of the main credit of the various administrative bodies for judicial economy determines the resumption of employment with positive effects on the production process itself.

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THE FUTURE HYPOTHESES FOR TURKISH APPAREL INDUSTRY

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Abstract: Turkey, as a full package provider and as a country in its transition phase of producer and marketer regarding the apparel and the fashion industry, feels the pressure from the lower waged emerging countries. The removal of the quotas forced Turkey to put effort on the anticipation of the future and the development of competitive strategies.The strategies which are developed considering the future scenarios and future hypotheses that form scenarios have much strength to be successful. The aim of this study is to carry out the hypotheses or future images which cover the events that are probable to occur in future of 10 to 15 years and to assess Turkish situation within the conditions 22 hypotheses under 8 titles are established considering the current situation and dynamics of the world with an expert group involving specialists from both academia and the industry. The number of hypothesis is reduced by considering their probabilities to occur using a technique similar to Delphi. The current situation of Turkey is then evaluated using these findings.
Key words: Future, Hypothesis, Apparel Industry, Turkey

1. INTRODUCTION

Turkish apparel industry has made great contribution on Turkish economy and growth since the 1980s [17]. It came across a harsh competitive environment recently after the abolishment of quotes because of the increasing strength of the emerging countries in terms of apparel trade [16]. This urged the companies to well position the industry and determine the possible enhancements by foreseeing the future environment. The purpose of this study is to carry out the hypotheses and the concepts of the scenarios for identification of future image, which cover the events that are most probable to occur in future of 10 to 15 years and assess Turkey within that position

Scenarios which are the detailed portrait of plausible future world can be very effective to define the postulated sequences of the events that can reasonably take place based on the complex network of the influential factors [13]. Godet presents a systematic, modular way for development of future scenarios [8]. Godet scenario methodology begins with the identification of the key variables and determination of the actor strategies [8]. In identification of key variables steps, the factors that are supposed to be influential in the future events are identified and then subjected to a classification in order to find out the key variables based on their influence and dependency properties on each other using a method called MICMAC (Multiplication Appliqnce a un Classement or cross impact matrix-multiplication applied to classification). In the second step, the actors' strategies and approaches towards these key variables or the issues related with these key variables are found out establishing a method called MACTOR (Matrix of Alliances and Conflicts: Tactics, Objectives and Recommendations). In this regard, the key fields are determined for which the hypotheses will be developed considering the ongoing trends and possible changes in the direction of these trends using secondary resources and the expert knowledge. In this way, the morphological spaces with the hypotheses that form the scenarios are determined. In the final stage, the hypotheses are reduced in number whose most possible combinations of these hypotheses called scenarios are determined.

This study specifically covers the establishment of the morphological space for which the eight fields are determined as "Types of suppliers" , "Trading partnership", "The consumer market", "Textile and apparel production patterns", "Labor", "E-commerce and IT applications", "Health and Comfort", "Brand preferences" based on the results of study[21] that applied Godet's scenario methology. Within this context, the study gives the detailed cues from the literature in order to develop hypotheses. The hypotheses are then reduced in number in order to find out the most probable future events for which Turkey's position is evaluated.

2. METHOD

The data used in this paper is obtained from the results of the Saricam's study [21] and the secondary resources. The establishment of the analysis in the end is achieved with the experts that are selected from the scholars and the industrial experts.

22 hypotheses, reached at the end, were subjected to the reduction process. Involving the repeated assessments, the reduction process held was similar to the Delphi process. The experts firstly identified the top ten hypotheses, then they reviewed the initial results with the preferances of the other experts, finally they determined top 10 hypotheses again but this time by giving '10' to the most probable hypotheses to occur.

3. HYPOTHESES AND RESULTS

3.1. Development of HypothesisTypes of suppliers: The supply patterns of the large apparel buyers vary from each other [7]. Retailers like Wal-Mart, C&A and Marks&Spencer have suppliers especially in low cost countries. Marketers like Liz Claiborne, Nike, Reebok, always make their production overseas. Branded manufacturers supply intermediate inputs from the offshore suppliers in their closely neighborhood in order to benefit from reciprocal trade agreements such as 807/9802 program in US [6]. Nonetheless, some changes may be expected in the supplying pattern of these actors. For instance, retailers may develop their own private labels making them closer to branded manufacturers and marketers [6]. This means that the full package producers that act as strategic partners may be more demanded.

Trading partnership: Enterprises develop horizontal partnership to increase capital, resources and capabilities; vertical partnerships to minimize cost. The joint ventures will play a significant role and two types of strategic partner will be the companies based in high cost location with access to high value added markets and the companies having manufacturing facilities in low cost countries [22]. Regarding the partnership activities in vertical direction, the full package providing seems to be an important factor for being selected as a partner. Abernathy et al.[1] state that, the economic principles of international trade are factor prices, exchange rates, shipping cost and tariff rates adding that tariffs would be used as a control mechanism after the quotas. Therefore, the trade blocs and regional trade agreements need special concern. On the other hand, the consolidations on horizontal way seem to gain an increasing trend. For instance, European market improved into small number of bigger corporations from large number of different and independent stores through mergers, acquisitions and joint ventures [10]. For Turkey to be effective in European market, it might be proposed to build branding and licensing agreements which may lead Turkey to expand its activities and penetrate the market. Based on these, the countries should assess alternative partners regarding the trade agreements as the partnership activities might occur within the members of trade bloc and regional trade agreements. Alternatively, the companies might expand their business relations by being close to the countries enjoying being in trade bloc or preferential partner.

The consumer market: Consumer preferences and shopping behaviors change according to the demographic characteristics, cultural differences and economical properties specifically the purchasing power and purchasing tendencies. But, the expenditure on clothing was losing its significance in advanced economies. Canada and UK had the highest clothing expenditure per capita, Spain and Australia had the lowest among developed countries whereas China came far behind reaching 1/10 of the clothing expenditure of developed countries [11]. The emerging markets are highlighted in terms of textile and apparel trade. According to Sakarya et al.[20], emerging markets are the ones that have the potential of long term growth. In this regard, Argantina, Brazil, China, Indonesia and Turkey were stated to be the emerging markets with their increasing disposable incomes, large population of young consumers and economic liberalization. But actually, the emerging markets may substitute today's market or not is not known, the niche markets are more in concern instead.The companies that developed niche markets like Lands' End, Burlington Industries and

Tommy Bahama gained success in US which is another advanced market [18] and European Union companies built solid and reliable customer via niches [10].

Textile and apparel production patterns: The apparel industry is one of the labor intensive industries, which generally takes place in the earlier times of the developing countries [1]. In time, the production type changes and the low value added production shifts to the other developing and least developed countries having the advantage of lower/lowest wages [4]. China is stated not to be able to maintain its competitive advantage because of increasing costs. The labor cost advantage will face with problems that rise costs because of weak financial systems, embryonic capital markets, high levels of crime, etc. [12]. The region of the shift is actually related with three main concepts which are cost, lead time and quality. For instance, US companies work with the Mexico, Dr-CAFTA and CBI countries when the lead time has the most important contribution; and with the Asian countries when lead time is not so important or the cost can compensate the delay in lead time. Low cost apparel production is highly related with material and shipping costs. Although many African nations such as Madagascar and Kenya are among the cheapest labor providers, they cannot compete in US market with Mexico that has raw material advantage [1]. The apparel industry is usually located in places with strong input conditions in order to form transportation clusters such as Guangdong in China, Chinese cluster. The activities in these regions are even supported by the government like establishment of special economic zones, execution of the favorable economic regulations and low taxes as in the case of Guangdong [4]. This means that the clusters formed as collaborations of manufacturers which are geographically close to each other will serve as exporting hubs [22]. For this reason, the low cost countries may try to improve their distribution channels and seek new distribution solutions.

Labor: Being highly labor intensive, labor is a critical parameter for the apparel industry. The industry may enjoy producing at lower costs if the wages are low or it may have the advantage of qualified labor if the major aim is producing value added products. The synergy created between skilled labor and capital increases the productivity creating the technology-skill complementary as indicated by Yasar and Paul [12]. The demand for specific valued, technically improved, design intensive and differentiated products might increase the demand for skilled and qualified workforce.

E-commerce and IT applications:B2B e-commerce involves procurement, logistic and administrative processes between firms [-4]. Large companies will probably go on investing on information technology to reach real time access for inventory levels, manufacturing progress, expected delivery times and quality [22]. B2B e-commerce forces the companies to fulfill some requirements like improving the infrastructure in order to provide quick response ability and lean communication with the back and front office systems in the internet platform [14]. Therefore, the companies may invest on improving their infrastructure that easies B2B.

B2C commerce is increasing worldwide in recent years, the share of regular internet users covered 60% of population in 2009 in Europe. Nonetheless, the B2C commerce is not taken for granted by many internet users because of confidentiality and reliability issues. 84% of online shoppers stated that certainty about legal rights is crucial for ecommerce safety [5]. The other concerns were specified to be credit card security, privacy invasion and inefficiencies of websites [24]. The governments, producers, logistic companies and the banks may develop a more reliable e-commerce transaction in the frame of rules and laws. Beside these technical and ethical problems, some consumers stated they were not comfortable with online shopping because of lacking of hands on interaction with products, dissatisfaction with the products shipped [24]. Moreover, almost 30% of the apparel sales were returned because of fit [19].

Health and comfort: Health and comfort is getting credit from the consumers. It has two aspects commonly as direct and indirect effect to the health of the people. The direct affect covers the impact of the apparel on human body enabling the people feel better and comfortable in their clothes. The indirect effect, on the other hand, is related with the impact of clothing and apparel production and the environment so human nation. The comfort characteristics are usually provided with high technology. High-tech materials which keep the athlethes dry and comfortable are used in the production of high performance outdoor apparel and have 9 billion dollar market size in USA [19]. The medical and industrial textiles are technology intensive products in protective clothing and sportswear that are shown in favorable niche markets [18]. People believe in the fact that organic apparel is healthier for especially the ones that suffer from allergies and have sensitive skin [2]. There is a potential demand for organic apparel especially about for the young children apparel [15]. USA consumers are aware of environmental issues and prefer environmentally friendliness in the purchased products [3]. In a study by Cervollen et al. [2] claimed that the green apparel is not preferred by European consumers because of lacking glamour.

The brand preferences: The branding is one of the primary differentiation marketing strategies in apparel industries. Since the brands are intangible assets that are difficult to be understood and imitated by the competitors. Although brands are losing their impact as an indicator of quality, they have still significant importance in Mediterranean countries, especially among teens and more than half of of Europeans. The companies would develop their own dichotomies and there would be mega brands, niche brands, owned brands, retailer owned brands, national brands and tailored exclusives but, brands should narrow their target consumer segment and apply specific retailer's strategies in order to be successful [11]. It can be concluded that although the number of brands should increase, their consumer base should be narrowed at the same time. On the other hand, there are two different strategic groups for which the key factors of success change; the first group includes the ability to influence fashion trends with strong brand image and the second group devises effective quick fashion formulas [9]. Fast fashion is very favorable among EU companies such as H&M in Sweden, Zara and Mango in Spain and New Look in UK. Considering that, the most fast fashion providers are first initiated in Europe as identification of 40-50% of adults in European countries as the fashion follower [11], the variability and season numbers might be supposed to be increased.

3.2.Selection of the hypothesis and building scenarios

Given above the facts and the evidences, 22 hypotheses were developed under 8 titles. The hypotheses are then ranked as explained previously in the method section. The list of developed hypotheses and their rankings are presented in Table. 1. The most favored ten hypotheses become:
1. The low cost countries will lose their advantages as the wages will increase
2. The demand for technologically improved garments will increase
3. The number of brands will increase; the customer base will decrease in extent
4. The environment friendly product will gain popularity
5. The trade partnership activities within the trading blocs will increase
6. The product portfolio will enlarge; the variability and number of season will increase
7. The companies will cooperate with their supplier in order to improve their infrastructure to ease B2B level e-commerce
8. Niche markets will increase in number
9. The production of niche products will shift to new production zones like sub-saharan countries
10. New requirements like high tech and performance propertiesfrom garments will emerge

Among these top ten hypotheses, the first six hypotheses are carried out to be more important as the top six hypotheses get closer and higher ranks with each other while the last four hypotheses got lower ranks. Therefore, the first six hypotheses can be taken into account for developing scenarios. The hypotheses show that the brands, technological improvements and environmentally friendliness will be major driving forces for the future.

Considering Turkey having the experience of full package production and producing high quality garments within the set of most probable six hypotheses, Turkey seems to have higher potential in the first, fourth and the sixth hypothesis. The first hypothesis implies that the low cost countries active in this market today will not continue to produce at these price ranges. This means, the pressure put on Turkey by the low cost giants will decrease. Nonetheless, Turkey should improve itself in terms of producing quality garments in affordable price ranges. The fourth hypothesis claims that the environmentally friendly products will gain popularity. Being one of the important organic cotton producers, Turkey has an advantage in terms of organic apparel production because of having the raw material. Besides, most companies in Turkey make their production in compliance with the environmental regulations and standards provided. Finally, the sixth hypothesis states that the variability and seasonality will increase which will require the companies to produce fast fashion. Turkey has the potential of producing fashionable garments due its highly skilled, experienced and flexible labor force. Besides, Turkey can be preferable partner for the companies making fast fashion because of its proximity in the large markets.

However, Turkey seems to be disadvantageous in terms of second, third and fifth hypothesis. Although, Turkey is efficient in mass production, research and development is among the weakest points of Turkey. Moreover, Turkey has not much known brands in the world, and it requires high investment and promotional activities. Finally, the trading blocs are usually related with the political relations of the countries. Although, these three hypotheses create more differentiation and have the power to make the countries more effective, Turkey should have to put great effort in order to overcome the obstacles.

Table 1 : Ranking of the hypothesis by the expert

	Types of suppliers	Experts									Average
		1	2	3	4	5	6	7	8	9	
1	The countries which are close to the developed markets continue to produce export based production				6		1	1			0.89
2	The number of full package suppliers will increase	5				2		2		1	1.11
3	Full package suppliers will be new branded manufacturers					1	2				0.33
Trading partnership											
4	The brand acquisitions and licensing agreement will increase in amount in order to enter new markets.		1		2			7			1.11
5	The trade partnership activities within the trading blocs will increase	6	2	5		9	3	9	10	2	**5.11**
6	The trade partnership activities with the companies in the trade blocs will increase										0
The consumer market											
7	Today's high consumption market will move to new emerging markets.			3		3	4		3		1.44
8	Niche markets will increase in number	2	7		3			3		10	2.77
Textile and apparel production											
11	The low cost countries will lose their advantages as the wages will increase	10	3	4		10		10	9	3	**5.44**
9	The production of the basic product will shift new production zones like sub Saharan countries.	8								9	1.89
10	The cluster of apparel producers will emerge with strong transportation channels.		8		1						1
Labor											
12	The need for skilled labor will increase in order to make a differentiation				4		5				1
E-commerce and IT applications											
13	The companies will cooperate with their suppliers in order to improve their infrastructure to ease B2B level e commerce	7		1	5	4	6		4	8	3.89
14	The governments will reach a negotiation on e-trade laws and general rules will be developed for the reliability of the activities.								2		0.22
15	The size and fit characteristics will be standardized according to the countries where the products are sold								1		0.11
Health and comfort											
16	New requirements like high tech and performance properties for garments will emerge.		10	6							1.78
17	The demand for technologically improved garments will increase	4	9	9	7	8	10	5	8	4	**7.11**
18	The garments made up of healthy fibers will be preferred			2							0.22
19	The environment friendly product will gain popularity	9	6	8	8	6	7	6	5	5	**6.67**
The brand preferences will change											
20	The amount of investment made on brands will increase	3									0.33
21	The number of brands will increase, the customer base will decrease in extent		4	7	9	7	9	8	6	6	**6.22**
22	The product portfolio will enlarge, the variability and number of season will increase	1	5	10	10	5	8	4	7	7	**6.33**

4. CONCLUSION

This study was established with the purpose of determination of the future images of the apparel industry with a perspective of Turkey that is a country in transition phase. The results revealed that six hypotheses will be more in the point of concern within 15 year period defining some roads ahead of Turkey.

Based on the results, in order to remain competitive, Turkey or Turkish companies should consider implementing strategies that should be successful in one or more of these hypotheses. The companies may select either to improve themselves in terms of development of the technically advanced products by putting effort into R&D studies or to focus on the production of fashionable green apparel. Besides, individual or collective effort can be given on the creating and promoting the brands. The competability of Turkey will be assessed from the success of Turkish companies and Turkey itself, in overcoming the obstacles and achieving in these conditions described in the hypotheses.

Although, the study was established to develop perspective ahead of Turkey, the results are quite general for the other countries to benefit because of the subject being global. The future study that develops scenarios based on these hypotheses will be quite useful for determination of the possible combination of the hypothesis by defining the exact points for the strategies.

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MARKETING MIX ADOPTED BY COMPANIES IN TEXTILES AND LEATHER INDUSTRY

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Abstract: On the emergence of marketing in the state economy focus to provide customer requirements, to adapt their products to these requirements and consumer resources. Paper aims to address the issue of promoting and improving the image of the companies in textile and leather industry, analyzing policies and strategies of economic and technical activities and techniques to promote the image of the companies in Romania and internationally area. Article begins by presenting the marketing mix components used, then we continue with an analysis for promoting techniques to improve the company image by presenting a case study on product, price, promotion and distribution. The article concludes by analyzing promotional companies in the textile and leather industry, giving brief details about each chapter.

Key words: marketing mix, companies, textiles, leather industry

1. INTRODUCTION

On the emergence of marketing in the state economy focus to provide customer requirements to adapt their products to these requirements and consumer resources.

The emergence and implementation of marketing concept work is a response to many concerns created by the development activity as a whole, the need and demand to know the motivation to discover new sources of sales under increasing competition. The goal is to provide a superior marketing mix of competition, so the differential advantage.

This differential advantage can be obtained theoretically by any element of the mix marketing. [6]

Promotion of global marketing company, based on best efforts, requires a coherent set of practical actions performed on specific programs.

2. THEORETICAL ASPECTS OF MARKETING MIX

Marketing mix is the set of marketing tools that business uses to achieve marketing objectives target market. In order to achieve objectives, the company must consider all the variables involved in contact with classical market - product, price, distribution, promotion - and to handle them skillfully so with minimum effort to achieve maximum effect.[5]

Marketing mix components must be dependable and to support each other. Elements of the 4 P must be interdependent; change brings an element of the mix effect on other components. Examples: sales force size depends on the channel's distribution and intensity, branding the product be improved by applied brand pricing.

Philip Kotler argues that the marketing of services is both internal marketing (marketing company, to the quality and employee performance in relation to motivation) and interactive marketing (emphasizing influence and perceived quality of relationship quality services by not only a technical, but also functional, favored by the interactive). In the marketing world can talk about a global marketing mix that can be standardized to the extent that it can be effective, provided that uniform variables sour mix proves effective in terms of cultural and costs.[4]

With emergence of relational marketing, replacing marketing transactional marketing mix also has a relational orientation as follows:

Table 1: Content marketing mix

Product Policy	Price Policy	Promotion policy	Distribution policy
Co-production	Value for buyer	Relations	Individualization
- Quality - Skills buyers - After sales services - Sales related	- Loyalty Bonuses - Discounts for large purchases - Other financial facilities	- Individual dialogues with consumers - Database Systems - Direct Marketing	- Consumer Clubs - Cooperation

3. MARKETING MIX COMPONENTS

The defining elements of the marketing mix are product, price, promotion and distribution:

3.1 Product

Product concept which refers to companies and non - profit organizations provide potential consumers.

Set of elements that can trigger the market demand is a product.

Product is defined by:

- Range: size (width, depth, length), structure (quality, innovation, diversity)
- Attributes (tangible and intangible): design, color, packaging, name brand aftermarket, other basic features
- Communications relating to product
- Product image

Product components can be grouped into:

1) body parts - all the physical, chemical, merchandising material substance data and functional utility of the product

2) intangible components - name, brand, operating instructions, patents, licenses, prices and all services with the product to increase its usefulness, maximize customer satisfaction and increase company revenue and profits

3) communications on the product: all information submitted by the manufacturer environment, distributors, agents, sellers, buyers, consumers

4) product image, including "mental representations such synthesis cognitive, emotional, social and personal product" among the public

3.2 Price

Price is the only marketing mix variable that leads to profit, all other not generate than spending or investment.[2]

Psychological price category are:

- Price of prestige, high cost of promoting the image quality
- Price leader
- Price "bait"
- Price Magic

For a good base for decision recommended price is going through a procedures consist of the following steps:

a) target market analysis
b) analyze the economic factors that influence the price
c) establishing targets to be achieved through price
d) selecting a pricing strategy
e) the basic price and the adoption of temporary

3.3 Promotion

As a marketing mix variable, the term "promotion" suggests the set of actions to boost the penetration of products (services) and consumer market, to boost sales.

Means of promoting the most common are:

- Means of direct (personal) sales forces, direct
- Non-personal promotional tools (mass): advertising, sales promotion, public relations
- Exhibitions, product is the central place.

Promotion is basically the link between its activities, reflected in the product, price and distribution customers, actual or potential.

3.4 Distribution

Philip Cateora considers that the main factors affecting any particular channel of distribution are the following "6C" - cost, equity, control, coverage, character and continuity.[2]

Characteristics of function "distribution" are:

- channels
- distribution systems
- location
- selling techniques
- transport
- storage
- storage
- other parts logistics

4. THE OBJECT OF THE COMPANIES OF THE TEXTILES AND LEATHER INDUSTRY, CLIENTS, COMPETITORS OF THE UNDERTAKING, SWOT ANALYSIS

The object of the company of the textiles and leather industry will include, without limitation, the following:

a) Finishing of textiles
b) Manufacture of films by tricocare crocheted
c) Manufacture of knitted or crocheted
d) Manufacture of clothing and textile
e) Intermediation activities wholesale
f) Wholesale of consumer goods other than food
g) Retail trade in specialized stores, other products
h) Handling and storage

The main competitors of the company:

a) suppliers
b) customers
c) potential competitors
d) direct competitors
e) social and political forces

For the textiles and leather companies, the clients consists of business men, people from the trainings, conferences and various other actions, such as product launches and company.

Suppliers are companies, organizations, institutions that provide material resources - raw materials, energy, equipment and services - consulting, financial, advertising necessary to carry firm.

Placement company, is possible due to differentiation strengths or the strengths and weaknesses of the company, on the one hand and the opportunities offered by the market in opposing the threat.

The following table presents SWOT analysis for the textiles and leather companies:

Table 2: SWOT analysis

Strengths	Weaknesses
- Made products competitive price/quality for the domestic market - Has a stable workforce and well trained, that can train in a short period and cost; - Requires relatively low costs for modernization, retrofitting to other industries; - Has the ability to capitalize on higher raw materials (wool, hides for leather garments and fur)	- Location - Lagging behind the technical and technological - Line of products is limited - Poor market image - The productivity is low - Difficult access to finance
Opportunities	Threats
- Acquisition of new premises in the area - Developing a diversified product - Developing a new market - Vertical integration	- The purchasing power of local client - Slow growth of the market - Bad government policies - Economic recession - Demographic changes [7]

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 to purchase specific equipment requirements main selling markets to promote business, to hire specialists to provide early changes in fashion trends and new product range.[1]

Market dynamics determines three types of strategies:

A. growth - adopted by companies that are expanding the production and marketing, and developing, influencing consumer demand

B. maintenance - applies if the firm operates in a market saturated or is limited availability of resources

C. restriction - used when the market is in decline or change their company profile, focusing on other markets or products.

5. CASE STUDY: MARKETING MIX USED BY COMPANIES IN TEXTILES AND LEATHER INDUSTRY: PRODUCT, PRICE, PROMOTION AND DISTRIBUTION

5.1 Product Policy

If policy approach international market for textile products hould be identified, analyzed and resolved several key issues.

They are:
- The scope of product policy,
- Constraints
- A new product requirements

Policy Program at a textile company are focused on four interrelated elements:
- Nature of textile products subject to sale
- The range of textile products (strategy, product mix and program)
- Position and amplitude combination textile product mix and program and type of product with one or more distribution.

In principle, as experience shows, most textile firms remain domestic long as it allows the corresponding gains. As soon as they begin to show signs of deteriorating sales and profits in Romania, companies try to cover short comings by resorting to export. This pragmatic policy dictated by considerations of each company has different impact on the life cycle of various textile products in foreign markets.

In this context, we must distinguish between policy on exports of textiles produced in manufacturing and product policy to export new products:

a) Export product policy for goods in process of manufacture in society

b) Policy of textile product export for new textile product

The end result of positioning in the textile companies is a strategy to maximize profit by product, advertising, distribution, service and prices. Will benefit companies that provide textiles with a combination of attributes generating better satisfaction than the competition.

Table 3: Age of customer segments in a textile and leather company

Segments of age / years	Percent
In winter season	
0 – 14 age	15%
14 – 30 age	45%
30 – 40 age	25%
40 – 60 age	20%
After 60 age	5%
Total	100%
In summer season	
0 – 14 age	10%
14 – 30 age	28%
30 – 40 age	47%
40 – 60 age	10%
After 60 age	5%
Total	100%

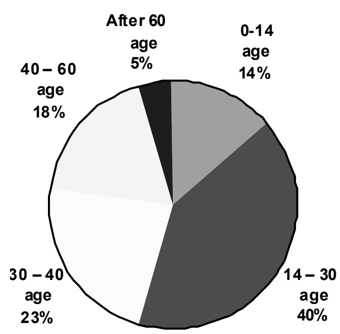

Figure 1: Age of customer segments in a textile and leather company- Winter

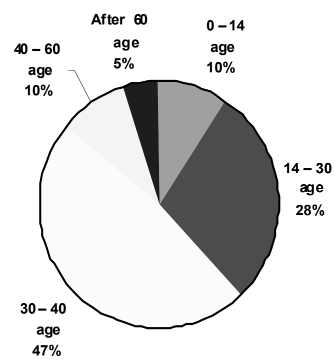

Figure 2: Age of customer segments in a textile and leather company- Summer

5.2 Pricing and tariffs policy

In marketing practice are three pricing strategies that the company of textile and leather adopted that is: the cost-oriented prices, demand and competition.

Steps in the procedure price:

a) Step 1: Analysis of cost
b) Step 2: Market analysis
c) Step 3: Determination of price limits
d) Step 4: Determine objectives of price
e) Step 5: Calculation of the price structure
f) Step 6: Price quotes and quotations for sale

We know the following pricing methods:

- Standard cost method
- Target rate recovery method
- Normative method

5.3 Promotion policy

The main stages of an advertising campaign in the company of textile and leather as:

- Determining role in the marketing strategies of the company
- Establishing budgetary constraints
- Selection of target markets

- Setting advertising objectives within each target market
- Selection of advertising agencies and media
- Assessment of efficiency

As part of a specific marketing strategies, advertising in the company of textile and leather, shall provide (as well as promotion in part):

- Informing potential customers about the existence of a particular textile product market supplied
- Stimulating the interest of Romanian and foreign customers and distributors to ensure its sale (through mass media campaigns or other ways)
- Promoting events
- Announcement of price cuts to make textile products granted under certain conditions
- Creating a brand image to highlight the company of textile and leather

5.4 Distribution policy

The company producing/commercial recovers in cash resources invested in the production/marketing of products with a profit for the work, and the consumer/user shall receive the necessary goods.

The factors to be considered by the firm in determining a particular distribution strategy are:

- Need to maintain price competitiveness if the textile is not sufficiently differentiated, and the final price is calculated according to the price consumers are willing to pay;

- Ability to distribute physical distributors textile saccording to existing infrastructure, taking into account that some customers may be in inaccessible areas.

The company producing and those which offer services tend to be increasingly involved directly in the distribution.

6. CONCLUSIONS

Great clothing and textile manufacturers are moving their activities in countries with the lowest production costs, but it is not just a question of costs, but also productivity.

The main purpose is to stimulate the Romanian companies to develop their collections, both for domestic and export market, to reduce dependence on the production system "Iohn".

Through this participation we tried to cover almost all areas of production, selecting specialized fairs: ladies wear, menswear and interior textiles. Under current conditions, the great Romanian producers is most advantageous to have both Iohn production and own production, ideally as one third of production to be Iohn, third to the domestic market and third export it self.[9]

The textile companies apply standardized products market strategy, and it sell the same types of pants, both domestically and in another country. Prices are determined according to the distribution channel used and vary depending on the type of material or design complexity.

To get the best Italian market, by example, the company chose the best distribution channels and the most appropriate partners, such selling to retailers who have experience and know the market well. Promotion is based on the website and participation in fairs and exhibitions organized in Romania and outside, which are effective means of communication and attracting more customers.

In order to market products may be new possibilities for structuring the distribution channels, so instead of physical distribution could use electronic commerce and so, instead of traditional retailers, online retailers could use.[8]

Also, using e-commerce company could use online catalog of pants with three-dimensional models that allow customers to search by color pants or special models. Exports of clothing on the export market proves to be profitable, and the strategies adopted are found to be effective, because the textile companies has increased exports to Slovenia in recent years.

Romania has potential in this regard and the future can be a reliable business partner in Western Europe.

We must be realistic and recognize that currently can not be waived Iohn production system. But it is important for manufacturing companies to develop their own collections to build an identity.

Because the crisis is estimated lower production by 25%-30% compared to previous years and also will decrease significantly and the number of employees.

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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PRECONDITIONS OF SERBIAN TEXTILE INDUSTRY COMPETITIVENESS AND PROSPERITY

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Abstract: Despite the present problems, the textile industry is of great importance in Serbian economy, and it has the perspective to become the one of the most important economy branches if it employs all advantages and successfully overcomes the key problems.Textile and clothing competition is possible only if the following factors are taken into account: price, as the factor that usually stands out, and non-price factors such as product quality, design, rich assortment, top-line standardisation, and market organisation and delivery term. Due to non-price factors, many companies in textile industry from developed countries acquire high competition. Because the performances of high quality are dominating factor of competition in the developed countries' markets, Serbian exporters are not competitive in this sector, and it creates the necessity to improve the competition position on the international market that will be based on the non-price factors of competition.
Key words: textile and clothing industry, competition, non-price factor

1. INTRODUCTION

Serbian textile industry has been on the turning point for many years and it has to decide whether it would develop into internationally concurrent economy branch or it would stay in the survival phase that will eventually make this economy branch of less importance even in Serbia. Some of the problems textile industry has faced and is still facing with are common for all economy branches in Serbia. They include labour force restructuring problems, disloyal competition in grey economy domain, hard or impossible access to the financing sources and similar problems. However, textile industry specificities in comparison to other economy branches, as well as drastic changes on the international market, have caused textile industry to face with the additional problems it could not adjust. The incurred problems have disturbed the business dealings of this economy branch, and it can be said that Serbian textile industry is one of the greatest losers during the 1990s and first transitional years. Shortly, faced with the loss of international market and drastic shrinkage of domestic market and people's purchasing power and large number of employees, the majority of textile industry companies could not continue doing business in a way it used to which led to bankruptcy of many previously successful companies. Simultaneously, the private sector developed dynamically, and it produced and traded beyond official canals. However, the majority of these companies are facing the strong competition form the import after transferring into official canals what endangers its business dealings. Minority of the textile industry companies in Serbia is relatively still successful, and has business arrangement and perspective, while the majority of the companies does not work or is bankrupt.

The textile industry in many countries represents one of the most important industrial sectors and it is anticipated to stay that way when adequately restructured in the future. In the developed parts of the world, textile and clothing sector has undergone the series of radical changes due to technological growth, increase of the production costs and the emersion of the important international competitors. The textile and clothing industry in the developed countries has begun the long-term process of restructuring and modernisation by applying the technological development. The companies have improved their competitive advantage by shutting down the large companies and massive production and by eliminating the production of simple fashion items, focusing themselves on the wide range of various products with higher benefit.

In order to make stable market position and to create conditions for uninterrupted growth and development, the textile industry companies must to invest extraordinary business efforts to optimise the business functions of marketing, research and development, and quality and their common actions, seen through:

- Accomplishment of the products' and services' quality of the global category,
- Development of the production program based on the proper development results,
- Acquiring the higher flexibility level of the developmental and production potential of the company.

In such conditions, the main factor in gaining the competitive advantage in improvement of business activities' quality. The term quality has many meanings. According to Deming [1], quality represents the multidimensional category – for a company it secures the survival on the market, and for the executive management, quality represents the production of planned items number according to the specification.

Quality of business activities is based on the improvement of work and knowledge productivity. Improvement of the quality of business activities is the basis for the improvement of other factors influencing the company's competitive ability in international scope, especially the productivity of business activities and price formation. The implementation of quality system and permanent improvement of built-in quality system makes higher productivity of work and of entire business, which enables the cost decrease and price competition on the international market.

Due to the investment interests in countries with low production costs, the key measures that must be taken in this sector in our country are those concerning economy, finance and technology, and these measures must be taken because Serbia is becoming closer the EU membership. Each improvement in the textile industry will significantly influence the Serbian economy and its stability.

2.ECONOMY ANALYSIS AND ANALYSIS OF THE SERBIAN TEXTILE CONDITION

Nowadays, Serbian textile industry is in tough position, because the textile factories, organised in great systems, underwent the crisis that caused the large number of the employees, decreased sales volume, problem of acquiring the raw materials due to sanctions, inability to trade on the international market and inability of tracking down and acquirement of the new technologies that seized the region and increased its competition. The structure of Serbian textile companies has changed in the past few years due to privatisation process and adjustment of inflexible and large organisations to the new market conditions. The textile industry was one of the leading export economy branches in SFRY, and within SFRY, Serbia was the largest textile producer. In the past few years, the number of employees decreased in the textile industry, as well as in the yarn, fabrics and clothing items production.

Hardships occurred in the first transitional years have disturbed the business activities of the sector and our country, which led many previously successful companies to deteriorate and changed the structure of textile companies.

This is intensively working economy branch where labour force represents strong competition factor. The labour force price in Serbia, and especially in the textile industry, will be low the following years, which will have a positive influence on the export price competition of these branches. Alongside, our comparative advantage is our nearness to the EU market, in comparison to the Far East countries, and opposite to the East European countries, we have experience in textile and clothing production for the European market lasting for decades.

Because of a very hard situation the textile workers had to face in the previous decade, the number of employees in the textile industry was reduced a great deal. However, if the negative trends continue, and which has been going on since 1989, the number of employees could be cut down to some 15-20000 [5]. From the number of 67638 workers who were employed in the textile industry in 2003, that number of the monitored period was reduced to 26477 workers, that is, even 39.14%. It is the result of the permanent decrease of business activities in this field as well as the closing of a great number of enterprises within this field.

Table 1: The number of employees in the textile industry in the period from 2003 to 2010.

Year	2003	2004	2005	2006	2007	2008	2009	2010
In total on the level of the textile industry	67638	56781	49589	42287	36898	34275	29080	26477
In total on the level of the state	1611632	1580140	1546471	1471750	1432851	1428457	1396762	1354637

Source: Federal department for statistics [6]

The participation of employees in the textile industry in relation to the total number of employed workers in Serbia in 2003 amounted to 4.2% in 2004 it amounted to 3.59% in 2005 to 3.2% in 2006 to 2.87% in 2007 to 2.58% in 2008 to 2.4% and 2010 to 1,96%.

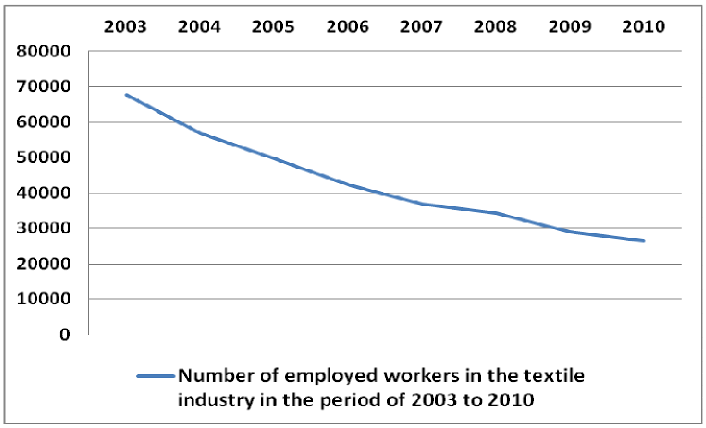

Figure 1: Recording the number of employed workers in the textile industry in the period of 2003 to 2010

One of the main problems of textile industry is high participation of grey economy (illegal economic activity or unregistered production and employment and income that are not registered to the competent the tax authority) and its disloyal competition. It is hard to determine the participation of grey economy, but according to some assessments, it is approximately 50% to 60% of the entire textile production. Female labour force is dominant in the textile industry. It is estimated that 80% of entire labour force are women, which brings the problems of motherhood and maternity leave. Clothing industry in Serbia as in other countries employs more women than men. Serbian textile industry is typical example of intensively working sector with traditionally low salaries, which employed growing number of female labour force. Textile and clothing industry is very important working-intensive economy branch in providing the employment for the population capable to work. As intensively working economy branch employing many women, it has great influence of the women health, environment and human development. The age structure of the employees in the textile industry is unfavourable, because the average number of years is 45 and there is no interest of the young for this vocation. Insufficient number of skilled and creative cadre (creators, designers) or at least, there is poor organisation in their hiring, that is, there is poor connectivity between the companies and scientific and educational institutions. The previously mentioned produces low working productivity.

The equipment is technically and technologically old, and new technologies are slowly introduced or are not introduced at all. The technology level of production capacities varies contingent upon the industry part. The technology in spinning-mills and weaving-mills is mainly conventional containing small proportion of automated equipment. The equipment is old approximately 70 %. The existence of illegal sector is bad for the country, due to liability payment failure to the state. Uncontrolled import of the textile and the existence of disloyal competition on the textile market (illegal import from China and Turkey) – the large quantities of goods are imported at low customs basis or without any customs duty as an temporary import which is not.

3.POTENTIAL SOLUTION FOR IMPROVING THE COMPETITIVE PRICE OF THE TEXTILE INDUSTRY

Many economic experts believe that Serbia has the potential to attract significant foreign investment in textile sector and that the abolition of quotas on the EU market will increase the export by 30 to 40%. According to some estimates, with investments of about $ 150 million for the revitalization, this industry could reach the level of exports from year 1991, particularly through the finishing processes for partners from the EU.

Union of manufacturers of textile, leather and footwear proposes the reduction of contributions to employees' salaries by 50%, exemption from customs duties for import of raw materials that are not produced in the country, the abolition of customs duties and VAT on raw materials to goods for export, as well as tax exemption, which is subcontracting production intended for export. The Union is thinking about the redirection of funds from the accounts of all companies to one of the local banks, so there can be a possibility to make an influence via Board about lending to factories that can trigger the production of raw materials.

There is a consortium formed between the producers of textile yarns and textiles and clothing manufacturers for joint appearances in the foreign market. A precondition for the expansion of exports of textile products is to improve the competitive position of domestic firms in international markets. Textile products from Serbia are of low finalization products and for competitiveness, they can thank to low prices and good references from previous periods. Low prices are partly a consequence of low salaries in this sector. The demand is greater than the possibility of delivery due to lack of working capital [11].

Price level is close to Turkey, Pakistan, Asian countries and countries of an Eastern Europe. Now, exports represent a necessary matter in order to import, and not cost-effective work in the function of textile industry. The problem is that economic growth in Serbia is not based on the increased productivity that results from improving technological base of production, but it rises because of reducing the number of unemployed. There is a relatively small number of capital-intensive products with which the Serbian economy could equally apply to the world market. Competitive products of the textile industry in Serbia are primarily labour intensive.

4. NON-PRICE FACTORS FOR ACHIEVING THE TEXTILE INDUSTRY'S COMPETITIVENESS

Despite all existing problems, the textile industry is of great importance for the Serbian economy, and it has the potential to stay one of the most important economy branches if it uses all the advantages and overpasses all key problems.

Competitive products of the textile industry in Serbia are primarily labour intensive. At the present, the main comparative advantages of our textile industry are:

- proximity to markets of major foreign trade partners,
- a long-standing tradition in the production and export
- qualified and experienced workforce,
- relative competitive labour costs [5].

The above comparative advantages are not sufficiently exploited, and have not quite outgrown in competitive advantage. In addition, their importance is became less because many other countries in the region have similar characteristics, especially the competitiveness, which comes from cheap labor, slowly begins to lose. An additional problem is the fact that most of these features affect the price dimensions of competitiveness, but not qualitative dimensions [8].

It should be recalled that the overall liberalization of international trade in textile products, and the upcoming further liberalization of the domestic market, will lead to equalization of business conditions, so that only those manufacturers which can be competitive abroad, will be able to survive on the domestic market. At the same time it must be kept in mind that there is no one who can price-to-compete with producers from East and Southeast Asia.

The starting point in marketing is that the effects of price competition will fail if it is not based upon adequate non-price elements of marketing program (product quality, design, market shaping of a product, product flexibility, after sales service, delivery terms and various forms of marketing support through the sales canals and promotion activities) [3].

The factors of non-price competitiveness are the following:

- national productivity,
- work and capital productivity,
- quality, amount and product design,
- the abundance of assortment,
- production efficiency (new technology),
- delivery terms,
- top standardisation.

Due to non-price factors, many companies from developed countries achieve high competitiveness (quality, design, rich assortment, top quality standardization, delivery). Because the quality performances have become the dominating factor of competitiveness in the market of developed countries, the entire Serbian exporters are not competitive in this sector. One of the factors that may affect the successful operation of textile and clothing industry is the creation of products with some other distinctive features [2]. Distinction can be achieved by promotional activities that will create a specific brand, orientation to satisfy the specific needs of specific market segments, exceptional quality, design, implementing of new technological achievements and so on [5].

Due to the above-stated reasons, the necessity of strengthening the competitive position will be based on non-price factors of competitiveness. It mainly involves the following:

- Achieving high quality goods and services;
- Production of products with higher added value;
- Monitoring trends in the world market in relation to the new technological solutions, as well as for changes in foreign demand, and timely response to them;
- Creating a recognizable brand [5].

On the international market, Serbia must be competitive with finished clothing items, high fashion and brands [9]. The brand value of a textile product must be defined according to the marketing effects attached to the brand itself. No company can win if its products and offers are similar to other products or offers. The companies must take care of the relevant positioning on the market and must differentiate themselves in comparison to the competition. The company must invest into marketing program in order to continuously increase the brand value [4].

The value of textile product brand should be defined according to the marketing effects assigned exclusively to the brand. Neither company can win if its products and offers are alike other product or offer. The companies must consider of the relevant positioning at the market and differentiating in comparison to the competition. The company must invest in marketing programme in order to increase the brand value continuously.

The potentials that are possible to create in the near future are the development of the proper brand for textile and clothing items, because the Serbian industry lacks the proper products that could be offered to the EU market, andso far the greatest export part involved the finishing work [6] [11]. Along the increase of the employees' number and their competence, it is extremely important to bring the yarn and fabrics production alive (so-called primary production), the export and product placement to Russia must be elaborated (customs duties are 0.5% in contrast to the products imported in Russia form the EU and China), and the development of the competitiveness regarding the production quality, design, colour and price must be elaborated.

5. CONCLUSION

The competitive advantage of Serbian textile industry must arise from the innovation, quality through the technology improvement, greater employees' competence and interest. The unavoidable strategic function is quality because by improving the product quality simultaneously the productivity improves. The organisations that want to stay on the market must change its business philosophy and must produce according to the consumers' desires. The organisation that have product, business and result quality will secure success and prosperity. On the international market, Serbia must be competitive with finished clothing items, high fashion and brands, because Serbian industry lacks proper products that could be offered on the EU market, and so far the largest export part involved the finishing work.

Textile and clothing industry competitiveness is possible if the non-price factors, such as product quality, its market shaping, delivery terms, after sales services and so on, are taken into account along with the price that is usually pointed out as the most important competitive factor. Stronger competitive position based on the non-price competitive factors include: high quality of goods and services; items production with higher added value; monitoring the trends on the international market; new technology solutions; creation of recognisable trade marks.

Good clothes design, strategically sophisticated and realised marketing activities, along with good organisation of production, sales and marketing from foreign partners create the basis for different and better position of domestic companies. Experiences gained in this kind of business cooperation can create conditions in the future for independent outbreak on domestic and international market, by creating strong and well-positioned trademarks.

The organisations that want to stay on the market must change its business philosophy and must produce according to the consumers' desires. The organisation that have product, business and result quality will secure success and prosperity.

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QUALITY SYSTEMS MODELS APPLICATION IN TEXTILE PRODUCTS ENTERPRISES BY IMPLEMENTING OF ISO STANDARDS

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Abstract: In application of their theoretical models of excellence has many efforts and difficulties that can move, often unnoticed, when activities are carried out in normal course, without difficulty, but the subject of much technical analysis when there are disturbances of industrial activities. The materialization of these efforts is the "know - how" is specific to each enterprise, which is the basic element of industrial competitiveness. In many of clothing organizations, management systems are seen as internal dynamics, ie: as marketing, design, sales, production, distribution, financial services, accounting, etc.. The deficiencies analysis of current quality inspection types is to support the effort to draw conclusion of procedures and quality documentation, necessary to obtain quality products, by moving accent from the checking products to management and assurance processes undertaken in manufacturing companies.
Key words: textile, clothes, level of quality, quality control, management systems.

1. INTRODUCTION

In application of their theoretical models of excellence has many efforts and difficulties that can move, often unnoticed, when activities are carried out in normal course, without difficulty, but the subject of much technical analysis when there are disturbances of industrial activities. The materialization of these efforts is the "know - how" is specific to each enterprise, which is the basic element of industrial competitiveness.

In practice is occurring more and more necessity of transposition in application of the famous slogan "quality concerns us all". This it is a great truth, especially if concerns we integrate all organization levels within quality's sphere, whether it deals with the general policy of the company, product design, system design, production in itself or in selling

Employees of the same company, to questions on the concept of quality, perceive different actions taken to transposition of this concept into practice, in most cases based on subjective criteria. If company policy is based on transforming the quality in an engine of the company, it is necessary to establish the exact meaning for quality, economically significant, such that it becomes general agreement for all employees.

In attempts of organizing for quality it is absolutely necessary a unitary coordination for quality programs [8]. Thus, a person from the organization should have responsibility in this direction, to be able to coordinate quality objectives on all presented stages. This implies that people with these tasks to take place leading to higher levels of organizational structure. Position in the hierarchy, power and influence at their disposal can vary from one organization to another, because the importance given to quality is not always the same.

Organizational measures are reflected both by organizing flexible at the organizational level and through written documentation of the deployment of processes. The way the activity it is organized the quality of organization activity, depends directly and directly improve profitability and enhance the capitalization of raw materials, ensuring maximum efficiency in terms of used and realized indicators.

In many of clothing organizations, management systems are seen as internal dynamics, ie: as marketing, design, sales, production, distribution, financial services, accounting, etc.. The main functions of quality, these organizations are considered the proper control and improve quality levels. Even the coverage of both sides of the quality is unchanged. The control itself is effective execution control (with appropriate means and methods) to detect the causes of failure of defective or scrap generators and establish the necessary measures to prevent and eliminate them, while improving function or preventing is to research and analyze complaints, conducting technical analysis that refers to any resulting scraps and sometimes even performing comparative studies with similar products manufactured by competitors.

These limitations are also reflected in the organizational charts, after their research remarking the fact that in the vast majority, the operational structure it is outdated, by pyramid scheme (Figure1).

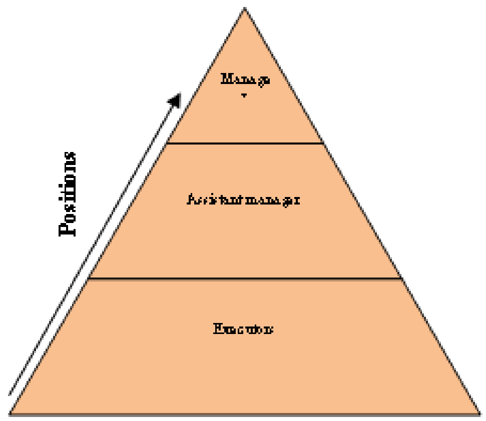

Figure 1. Outdated operational structure

With this pyramidal organization must be noted that effort of organizing activities related to quality must cover the specific tasks, all phases of product life (quality loop). Adjusted to the size of the company, at present, in the specialized companies are seen following types of organization:

- for large companies, the quality it is considered as a department by itself (Fig. 2.)

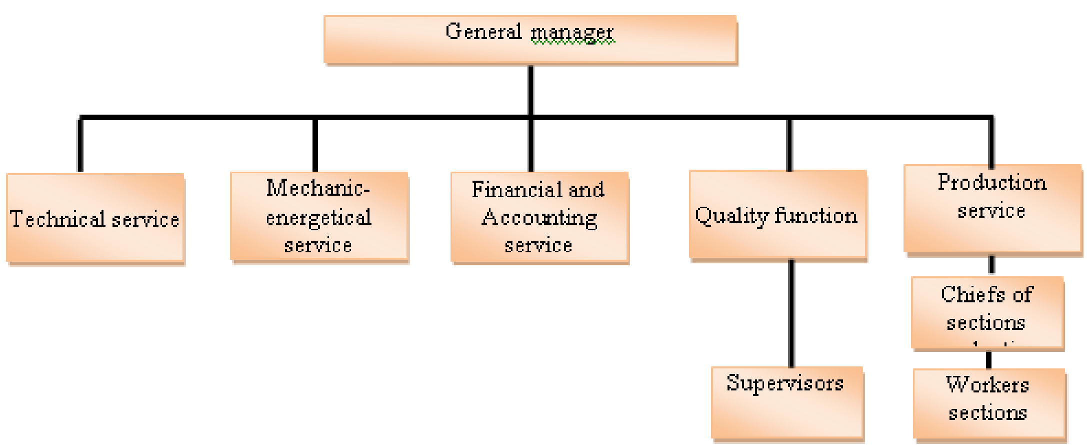

Figure 2. Organization where quality is considered a service by itself

In this case the benefits consist in function of quality placing, subordinated directly to top management (general manager), thus establishing the conditions that the quality objectives to be negotiated in the same position between the various functions of the company. In this situation drawbacks consist in the impossibility to evaluate permanently of production function that another function of the company can control the quality.

- for small and medium companies, quality is directly subordinate to the technical function (Figure 3).

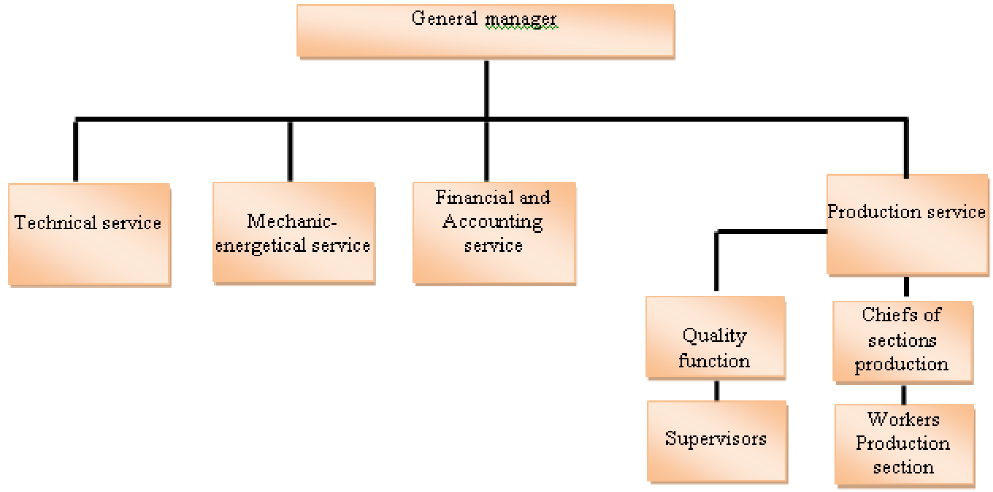

Figure 3. Organization in which quality is dependent on manufacturing

The advantages of this organization consist in unique leadership and quality production. The drawback is given by the fact that, often, the technical department within the technical function has a tendency to give priority for technical criteria to the detriment of trade, such that at level of organization:

– difficulties arise in establishing of precise quality on membership of quality;

– the policy of quality is hard to implement policy at the enterprise level.

A variant near the flexibility requirements of ISO standards is in which quality is placed in the functional position or called "staff" found, both in the case of large corporations and those average which are interested in the quality management (Figure 4.):

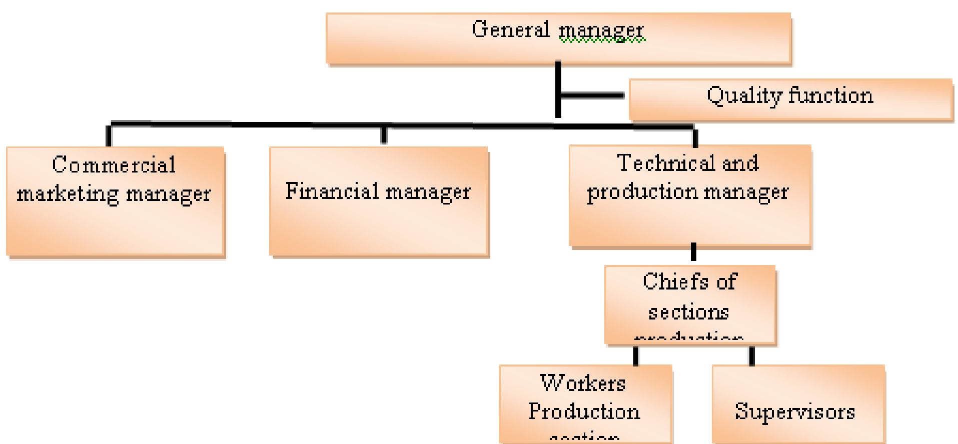

Figure 4. Organization where the Quality function is in the "staff" position

This type of organization has the following advantages:

- is placed as a "specialist" position, which must be consulted for any activity of the enterprise;
- is in the direct relationship with the leaders and independent by others functions;
- controllers may depend on technical support monitoring established procedures for quality.

The drawback is given that:

- the function quality losing direct control over the workplaces tasks, even if they are well monitored by controllers who have specific tasks for this;
- they are found in large enterprises with over, or around 200 employees, small businesses, the function quality is assumed by controllers person responsible for the quality and its subordinates (if exist).

This type of functional approach of organizations can no longer meet the needs of flexible and dynamic organizations, to be able to "adapt on move" to customer requirements. For this reason a change is needed, passing to an organization that includes and integrates outside of processes, the interests of customers and suppliers, thus relying on the concept of partnership. The role of quality function is to make from quality an inseparable aspect of performance and responsibility of each employee. This modern approach of functional organization and profile companies materialize through quality which can be in the center of the organization, and must be equipped with resources for measuring expectations and degree of satisfaction of internal and external customers (Figure 5).

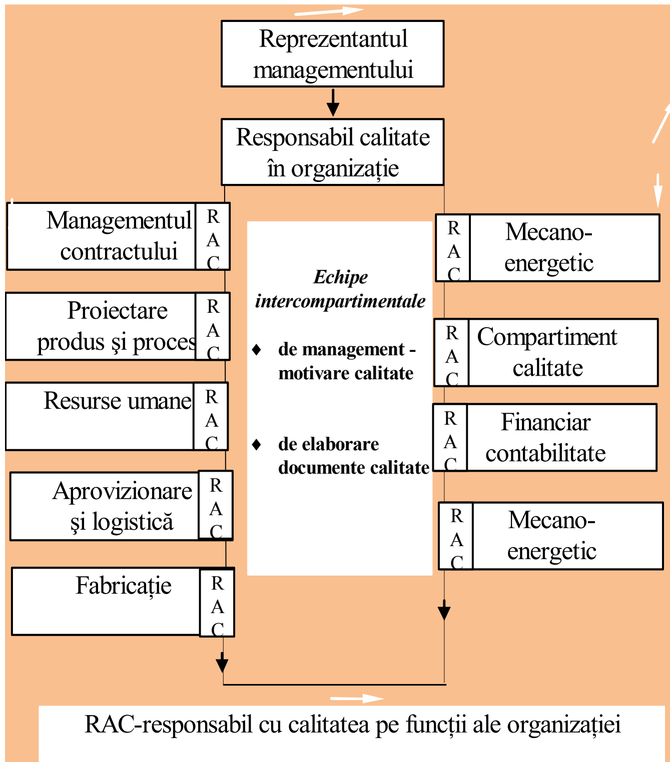

Figure 5. Flexible organization for the implementation of quality management

Since all activities must meet the general quality requirements for convergent quantity, time and while minimizing costs and an optimal level of quality and function is considered of quality horizontally as opposed to others that are considered vertical.

As a conclusion detaches the fact that an integrated approach to the problem of quality is important for each organization:

- In an organization in which the quality can be a determining factor will be a quality coordinator and subordinated to one of the leaders of the company.

- In organizations where the importance of quality is lower, quality coordination can be left to a person without significant influence in the conduct of processes.

In both cases must be recognized the importance of a unitary conception related to quality functions to achieve effective control in order to achieve organizational objectives [3,4].

From structural point of view, the general organization of quality activities and associated jobs should allow the normal course of activities in laboratories the flow of manufacturing to final inspection so that it is possible an active control (Figure 6). For the operation of this structure is necessary to define the duties of each employee of function of the company, so that everyone can answer some questions clearly: what to do, for whom produces, for what and not least: how.

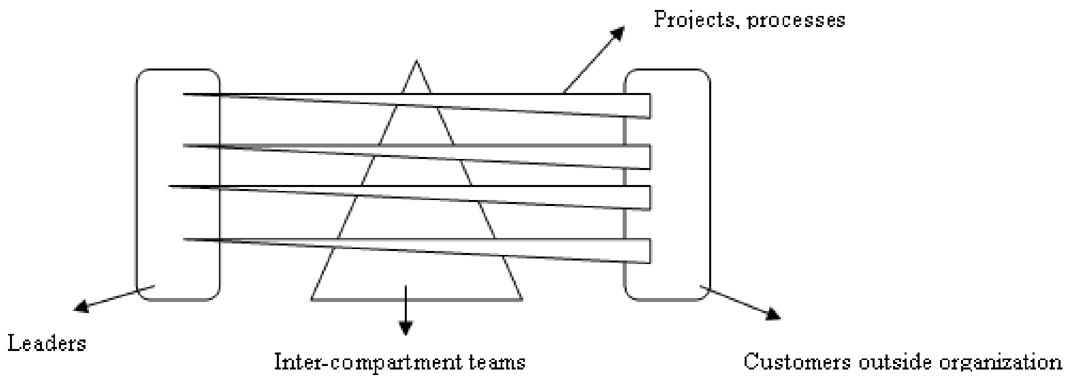

Figure 6. Responsibilities in decentralized quality at the level of each operational compartment

Defining duties of each employee of the company provides certain that:

- at the level of embedded quality in the product reflects the actual costs for work properly performed by the person designated to provide it;
- avoid malfunctions in industrial activity.

Although the importance of this activity is acknowledged by many companies, it requires a discussion of the main advantages and disadvantages of the general terms of the types of control systems.

Self control is used in all specialized enterprises by including additional time (small) for control operations. However it is more or less made the following reasons:

- lack of time;
- uncertainty on the level of acceptable quality;
- self-indulgence;
- lack of efficacy;
- low motivation for quality: it is rarely primary in relation to productivity of workers relying mostly on controllers to stop defects.

Control during manufacture is thought of as an active factor, being done by a trained supervisor or a part of his time working for a foreman.

Analysis of this type of control shows that:

• it is insufficient, no matter how well designed, as evidenced by the failure rate of subsequent control stations;
• is conducted mostly by the head master or workshop, which is not given adequate time percentage, the percentage ranging between 10% -40%, being dependent on the availability of which it runs;
• supervisors are rarely trained to do a systematic check of production, usually for good tracking process and requires a controller to 60-70 workers;
• there is little systematic information or are not communicated for workers so that they lead to further improvement of work.

The **final control**, as a most common form of verification, encountered control as 100% of production achieved in the form of spot checks of lots prepared for shipment, the following limits:

Full control analysis reveals the following products:

• although set to be achieved at 100%, has in reality an efficiency of up to 70%, according to statistics available in the literature [5,6];
• achieving its repetitive risk causing further products for time control;
• lack of importance of product stops to rebuild the vast majority of heads applying slogan. "goes and so";
• control is expensive, representing approximately 37% of the cost of poor quality and about 2% -3% of turnover;
• stopping faults is done too late, the two final control filters and of lots ready for delivery by turning on average only 91% of defective products.

Spot checks of consignments present the following limits:

• the need to establish a statistical control plan, especially for large homogeneous lots;

• extrapolate the results obtained by checking a sample of the entire group may take some inaccurate steps, rendering increased risk of the supplier or beneficiary, as the case.

The deficiencies analysis of current quality inspection types is to support the effort to draw conclusion of procedures and quality documentation, necessary to obtain quality products, by moving accent from the checking products to management and assurance processes undertaken in manufacturing companies.

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CROSSLINKING ANALYSIS OF COTTON FABRICS WITH 1,2,3,4-BUTANETETRACARBOXYLIC ACID AND INFLUENCE OF THE ALKALINE LAUNDERING

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Abstract: Cotton fabric is treated in BTCA and SPH solution. We studied the aqueous extract pH in order to check if some modifications of the pH were performed when comparing cured and uncured samples with and without alkaline laundering. These results show that it is necessary to wash the fabric with alkaline solution after the treatment with BTCA in order to remove the unreacted acid from the fabric. The esterification of the polycarboxylic acid with hydroxyl groups in the fibers has been confirmed by FTIR analysis. We studied the peak ratio of 1720 cm^{-1}/3336 cm^{-1} and the results show that the treatment is more effective when the fabric is cured at high temperatures.
Key words: BTCA, cotton, FTIR, crosslinking, aqueous extract pH.

1. INTRODUCTION

The major undesirable properties of cotton fabric are shrinkage and wrinkling. Therefore, those fibres are generally treated with crosslinking agents to provide new properties to cotton fabric such as durable press property. Reagents used for crosslinking react with hydroxyl groups in cellulose molecules with primary chemical bonds [1].

Since the 1980s, extensive efforts have been made to use multifuntional carboxylic acids to replace the traditional dimethyloldihydroxylethyleneurea (DMDHEU) due to increasing concern with the toxicity of formaldehyde [2,3]. Among these acids 1,2,3,4-Butanetetracarboxylic Acid (BTCA) appear to be the most promising crosslinkers for cellulosic materials [4].

In this study we used as crosslinking agent to treat cotton fabric in conjugation with hypophosphite as catalyst under elevated temperature, those conditions are required for curing and conduct the reaction between acid and cellulose [5,6,7]. Finally, we washed the samples with and without neutralization using ammonia (NH_3).

We use FTIR spectroscopy to evaluate the effectiveness of the BTCA as crosslinking agent, also we studied the aqueous extract pH in order to check if some modifications of the pH were performed when comparing cured and uncured samples with and without alkaline laundering.

2. EXPERIMENTAL

2.1 Materials

We used a 100% cotton fabric with the weight of 210 gr/m^2. All cotton fabric samples were impregnated with solutions containing the polycarboxylic acid, using 1,2,3,4-butane-tetracarboxilyc acid (BTCA) supplied by Alfa Aesar and sodium hypophosphite monohydrate ($NaH_2PO_2 \cdot H_2O$) (SHP) supplied by Aldrich, was used as catalyst for the reaction of cellulose with BTCA.

2.2 Crosslinking Procedure

Cotton was crosslinked following the procedure of dry crosslinking. This included padding with BTCA and SHP, drying at 85ºC, and crosslinking at 180ºC. The formulation and conditions of crosslinking are shown in Table 1.

Table 1. The content of the policarboxylic acids in the reaction bath and the conditions of crosslinking.

Concentration Acid (g/L)	80
Concentration Catalyst (g/L)	40
Driying temperature (ºC)	85
Driying time (min)	4
Curing temperature (ºC)	0, 180
Curing time (min)	2

Finally, we washed some samples with neutralization using ammonia (NH_3) to remove the unreacted acid on the fabric. The rest of the fabrics were untreated.

2.3 Instrumental techniques

The changes on the pH of the different samples, were determined by aqueous extract, according to UNE 4007480.

A BRUKER IFS 66/S FTIR espectrometer was used to analyze the spectrum. Resolution for the infrared spectra was 4 cm^{-1}, and there were 64 scans form each spectrum.

3. RESULTS AND DISCUSSION

Results of aqueous extract pH for every sample are shown in table 2:

Table 2: Aqueous extract pH for each sample

Sample	Washing	Aqueous Extract (pH)
Untreatment fabric	-	7,02
80 BTCA + 40 SPH	-	2,75
80 BTCA + 40 SPH	Only water	5,45
80 BTCA + 40 SPH	With ammonia	6,12
80 BTCA + 40 SPH_curing	-	3,42
80 BTCA + 40 SPH_curing	Only water	5,30
80 BTCA + 40 SPH_curing	With ammonia	6,43

The aqueous extract pH of the treated samples without washing reveals that there is unreacted acid on the fabric. If these samples are washing, we obtained a higher pH. But we only got the neutral pH, washing the samples with ammonia solution.

The existence of ester linkage was verificated by FTIR analysis (Fig. 1). The infrared spectrum of the cotton fabric treated shows the carboxyl carbonyl band which appears at 1725 cm-1 this represent the total amounts of carbonyl groups in the esters formed between BTCA and cellulose. Spectro show that this band is more intense when the fabric is cured at 180ºC for two minutes. When the cured fabric is washed with alkaline solution a band at 1550 cm-1 appears in the spectrum, due to convert the free carboxyl to carboxylic acid salt [8]. The carboxylic acid salt show a very strong, characteristic band in the region 1650-1550 cm-1 due to the asymmetric stretching vibration of CO_2^- [9].

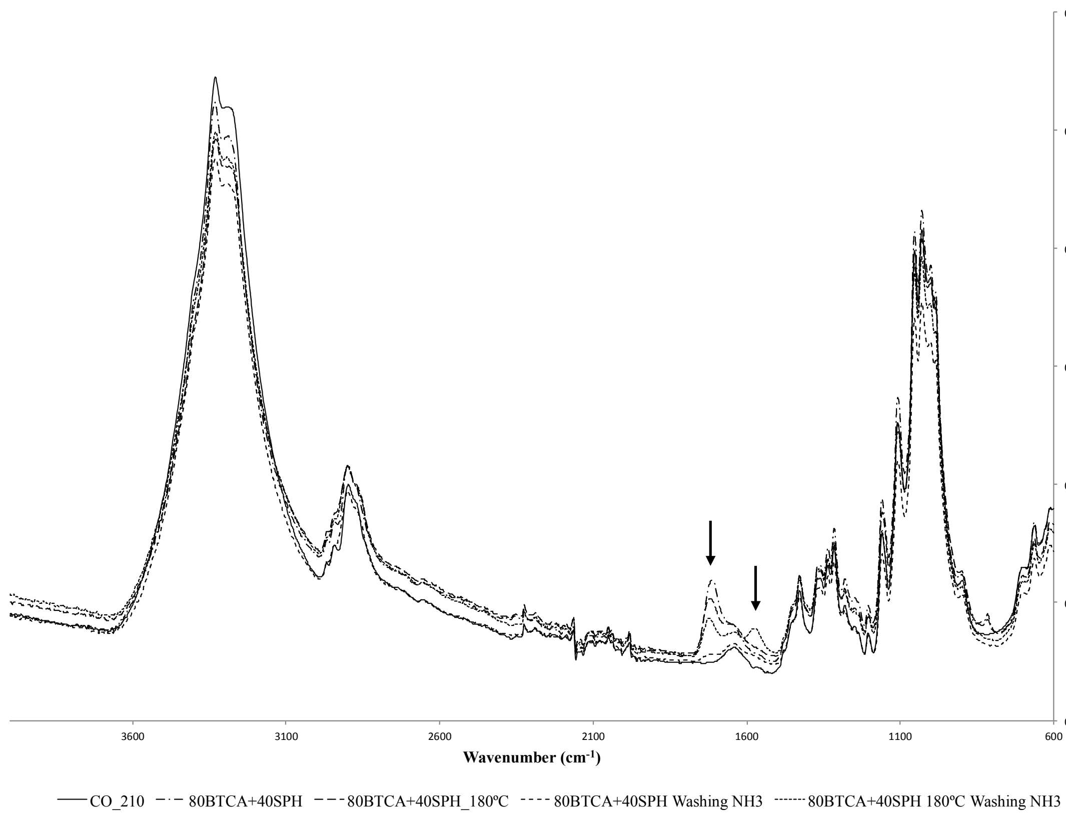

Figure 1: Infrared spectra of the samples.

In this paper we use the peak ratio method (ester carbonyl peak at 1725 cm^{-1} versus –OH bending peak in cellulose at 3335 cm^{-1}) [10], which was developed to determinate the ester formed on the treated fabric, and the effectitiveness of the crosslinking reaction.

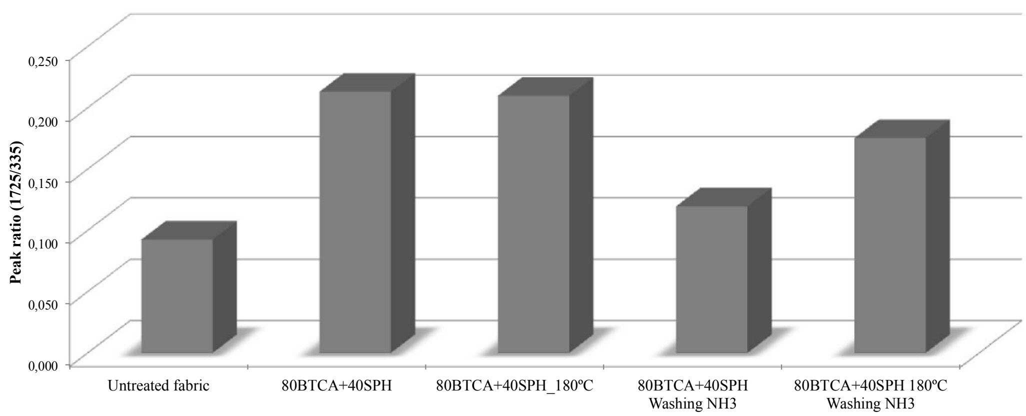

Figure 2: The FTIR analyzed peak ratio of 1725/3335.

It can be seen from the results that, the proportional intensity of the bands ester (1725 cm^{-1})/hydroxyl (3326 cm^{-1}) is the same in the case of the samples without washing, with or without curing at 180ºC. It can be explained as a consequence of not removing the no esterificated acid on the fabric. Futher analysis with whashed samples shows that the curing improves crosslinking effect if the number of ester bonds is used as a critera for crosslinking effiency.

4. CONCLUSIONS

In this work the influence of the washing and curing by analysis of the pH of extract aqueous was studied to obtain the amount of acid that has reacted with the cellulose. These results show that it is necessary to wash the fabric with alkaline solution after the treatment with BTCA. We use Fourier transform infrared (FTIR) spectroscopy to evaluate the effectiveness of the BTCA as crosslinking agent. The carbonyls retained in the fabric exist in three forms: ester, carboxylic acid, and carboxylate anion. These groups show the same band, which appears at 1725 cm^{-1}. Then if we want to separate the ester from three carbonyls, it is necessary to convert carboxyl to carboxylate at all using alkalyn solution.

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COATING PCM´S ON FABRICS

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Abstract: A wide variety of microcapsules has been used with fabrics in order to improve textile garments functionalities. Some active ingredients can be used in order to regulate the user temperature so as to avoid enormous changes in temperature. Phase Change Materials (PCM) are the most extended and they can be applied in different ways. Coating is one of the most feasible ones however, polymeric resin used can influence on the heating or cooling effect. This studi suggests a way to measure fabrics and the influence of the resin which adheres microcapsules to fabrics.
Key words: fragrances microcapsules, resin, active materials, skin moisturizers, insect repellents

1. INTRODUCTION

Microcapsules are frequently used in order to functilalise some fabrics [1]. It is commonly known that usually they exhibit their active ingredient when rubbed as the shell is broken. The active ingredient is protected as otherwise it will be lost. If a fragrance has been used it will be lost a few minutes latter the shell has been broken. On the contrary, sometimes the active ingredient must be kept all life long. Thus, implies that shell should not be broken or the effect will be lost as soon as its protection has been damaged.

Depending on the microcapsule nature, different tests are conducted to demonstrate their effectivity [2,3]. Different sistems have been studied to paste or adhere them on the fibre surface, the most commonly used is padding however, alternative systems can be used such as coating. In this procedure, microcapsules will be recovered by the coating polymer protecting them from external aggresions.

Coating can be considered as a suitable choice to apply Phase Change Materials (PCM) onto fabrics. The active ingredient must be protected because in case the microcapsule shell is broken the active ingredient will be spread on fabric surface and the thermal regulation they are supposed to confer will be lost.

In this study we will study if coating can be an alternative to apply microcapsules and demonstrate that this procedure does not break microcapsules. Moreover, we will try to study if the fabric treated with PCM show different behaviour and if the polymer used to obtain the coating has influenced the changes on the thermal behaviour.

In order to characterize the fabrics and the microcapsule presence and status Scanning Three fabrics will be compared, cotton without treatment, cotton with polymeric coating and the same polymeric resin with PCM included in the recipe. Electron Microscopy (SEM) will be used to study observe the coating containing microcapsules. Thermal behaviour will be evaluated with an IR thermal camera.

2. ANALYSIS TECHNIQUES AND METHODS

2.1.- Materials

Fabrics used were 100% cotton. Microcapsules pastes for coating have been prepared as Table

1 shows.

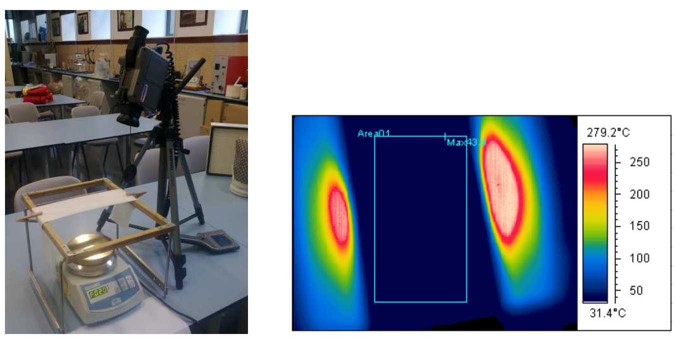
Table 1: Coating paste compositions

PRODUCT	**PCM-STK**	**PCM -PU**
MICS	20g	20g
RESIN	90g	90g
CLEAR	3g	3g
AMONIA	1mL	1mL
WATER	40g	40g

Two kinds of resin have been used, referents PCM-STK equals an acrylic resin while PCM-PU implies a sample with polyurethane resin.

2.2.- Evaluation methods

In order to evaluate thermal behaviour a structure has been designed, so as to keep textile samples near a heater. An IR camera, CANTRONIC IR 980 E0010 has been used to record changes in temperature while the experiment was conducted. Figure 1a shows how the sample was holded with a wooden structure in a constant distance to the heater, and the camera location. Figure 1b shows how the camera software offers an image with different colours, which indicate the temperature range in each surface. Cantronic software allows determining an average temperature from a surface. In our study we selected an area enclosed by cyan square and software offered the average temperature.



a) *b)*

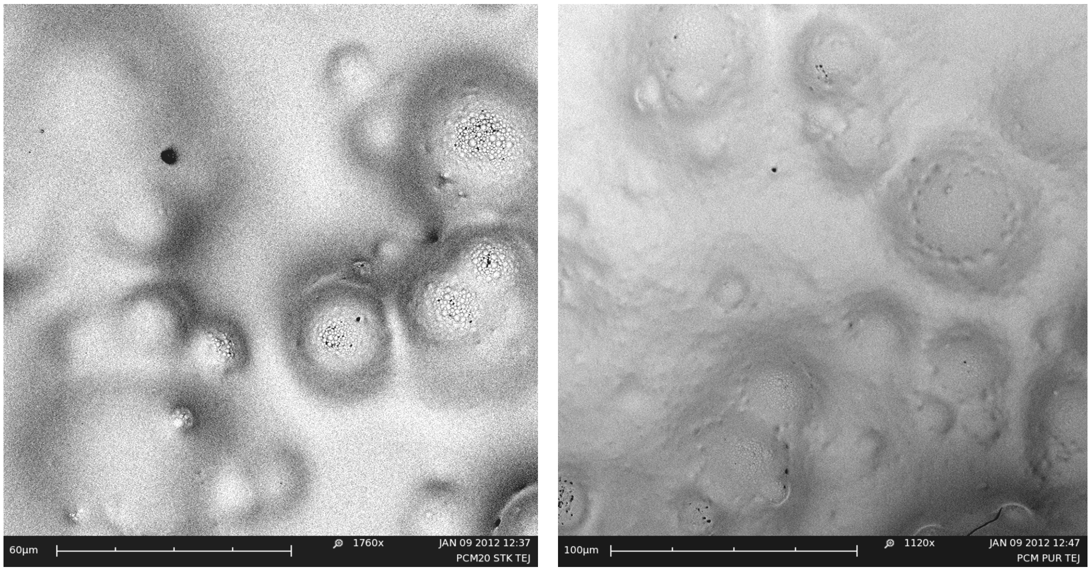
Figure 1. Thermal measurement system

Laboratory conditions were controled while the experiments were conducted, room temperatura was 23 º C and relative moisture was 70 %.

In order to study the fabric surface 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.

3. RESULTS AND DISCUSSION

SEM analysis show the presence of microcapsules on the fabrics but as figure 2 shows, it can be clearly observed that microcapsules have been covered by the coating resin. In both cases Figure 2a (acrylic resin) and figure 2b (polyurethane resin) it can be seen a homogeneous distribution of microcapsules on the treated surface.



a) b)

Figure 2. PCM on cotton fabric surface after coating.

It is worthy to note that a wide variety in sizes of microcapsules can be appreciated in both samples. As PCM microcapsules were comercial ones, results show that it is really likely to find samples with differnt sizes for the same active ingredient.

When termal analysis is studied, a graphic such us the one showed in figure 3 can be represented.

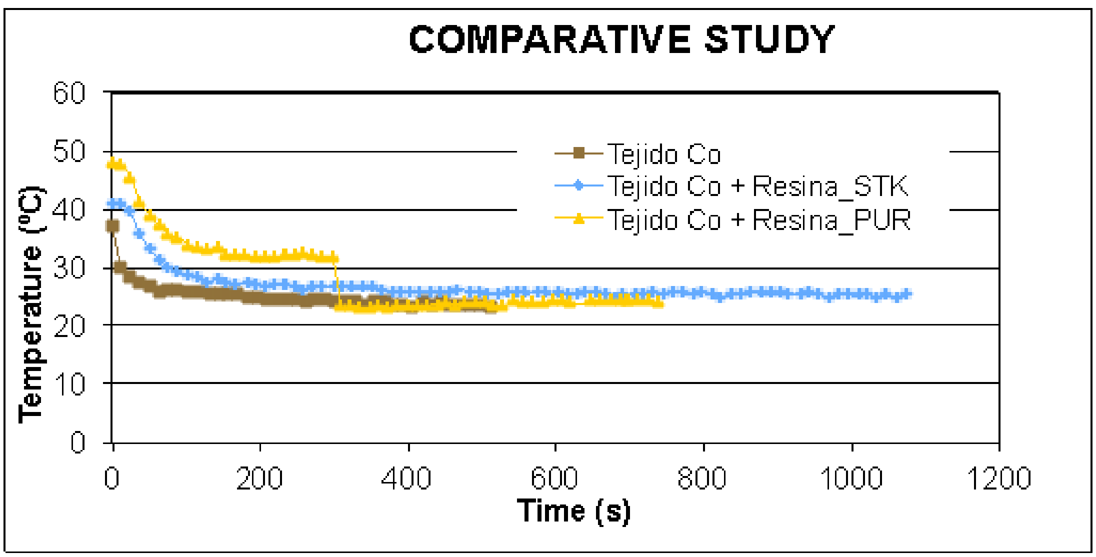


Figure 3. Thermal behaviour of fabrics.

It can be clearly observed that when PCM are on the fabric a difference in temperature is obtained. However, results evidence that the nature of the resin inlfuences the final result.

4. CONCLUSIONS

Some PCM have been applied on fabrics by coating. In this paper a method to evaluate the thermal behaviour of fabrics with PCM microcapsules has been developed. Moreover, the nature of the resin used for coating paste can influence the thermal behaviour.

5. AKNOWLEDGEMENTS

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FUNCTIONALITY OF MICROENCAPSULATED FABRICS

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Abstract: The presence of microcapsules has increased in the textile field. They have been applied as a possible means of introducing new products to textiles, such as fragrances, antibiotics, skin hydrants, etc. This work is focused on the characterization of different fabrics impregnated with diverse nature microencapsulated commercial products. Diverse analysis techniques such as scanning electron microscopy (SEM), counter apparatus, foured transform infrared spectroscopy (FTIR), etc., and methods such as hydration effects, insect repellent test, etc., have been used in researches in order to characterize the fabrics functionalization. We concluded that analysis techniques and methods proposed allowed to be used for qualitative and quantitative characterization.
Key words: fragrances microcapsules, resin, active materials, skin moisturizers, insect repellents

1. INTRODUCTION

Nanotechnology processes are present into the textile field. One of these processes involves encapsulated nanoparticles or nanoproducts, known as microcapsules.

They are used by the more developed countries into textiles to confer new properties and added value, for example into medical and technical textiles. It has encouraged the industry to use microencapsulation processes as a means of imparting finishing and properties on textiles which were not possible or cost-effective using other technologies [1].

Textile manufacturers are demonstrating an increasing interest in the application of durable fragrances and skin softeners to textiles. Other potential application include insect repellents, dyes, vitamins, antimicrobials, phase change materials and specific medical applications, antibiotics, hormones, and other drugs [1-5].

Microcapsules present an active core, which is protected by means of an external polymer. The composition of microencapsulated products can be different because they are made of different shell materials and diverse core materials. The core material will define the use, i.e. medicine, food, etc. The nature of the shell is considerably wide nevertheless, it is not common to find reactive polymers that can react with fibres surface.

Microencapsulated products can be applied on fabrics by impregnation, bath exhaustion, foam, spraying and coating. The most extended industrial application is by padding. To paste microcapsules to fabrics, they should be in contact with a bath, which contains microcapsules, resin and water. The resin allows the microcapsules adhesion to the fabrics' fibres.

The effect of microcapsules is usually measured by the presence of a property such as odour measurements when flavours are encapsulated. Nevertheless, some properties such as hydration, insect repellent, antibacterial, etc., can't be tested without analytical methods.

This work is focused on the characterization of different fabrics impregnated with diverse nature microencapsulated commercial products. These microencapsulated present different active core such as fragrances, insect repellent and hydrating properties. Diverse analysis techniques and methods have been used in the study in order to characterizate the fabrics functionalization.

2. ANALYSIS TECHNIQUES AND METHODS

Fabrics used were 100% cotton. Microcapsulated commercial products were supplied by different chemical and textile products companies. A resin has been used as a binder. Commercial microcapsules were applied by padding. Samples were thermally fixed.

Microcapsules are too small to be observed by human eyes. They can be seen by means of Scanning Electron Microscopy (SEM), the magnification of wich increases the surface of the fabrics over 2000 times. Nevertheless, it is not easy to quantify the microcapsules on the fabric surface.

The quantity and the size of microcapsules contained in commercial products were measured by a BECKMAN COULTER® (Multisizer Z1, Coulter electronics).

Different analytical methods have been used in different researches in order to characterize the fabrics functionalization.

2.1 Flavour microcapsules

Fragance encapsulation is one of the application of microencapsulation technology in the textile sector. Microencapsulation technology allows us an opportunity that can favour its durability on fabrics.

The aim of this research is to evaluate the durability of the fragrance present in microcapsules previously deposited on cotton fabrics when textiles are washed. Some normalised treatments were carried out on fabrics with an active substance to evaluate their effects on the maintenance of fabrics conditions. Different analysis techniques were subsequently carried out to check their presence.

For fabric surface observation, a scanning electron miscroscoscope (SEM) Phenom microscope (FEI Company) was used. SEM micrographs were used to check presence, surface distribution, preferred join position in textile fibers and washing effects.

Baths treatment were composed of 10g/L of resin and 60g/L of flavour commercial microcapsules. Baths had been optimized previously [6]

Washing process was carried out in a Heraus Linitest applying the standard ISO STANDARD 105 C10. Wastewaters from washing cycles were collected in order to analyze them. The particle size distribution and the quantity of microcapsules contained in wastewater were measured by BECKMAN COULTER® (Multisizer Z1, Coulter electronics).

In order to determinate the quantity of microcapsules that were left on the fabric, we analyzed the bath that we used to treat samples before padding. As we know the pick-up and the weight of the fabrics, we can calculate the quantity of microcapsules which are on the fabric surface [7]. When we analyze wastewater from washing cycles, we should be able to calculate the quantity of microcapsules that remain in the bath by particle measurement, so we can calculate how many microcapsules are washed out the fabric and the process involved.

The Foured transform infrared spectroscopy (FTIR) technique (Nicolet Magna 550 spectrometer) is used to as an objective method of quantifying the presence of microcapsules on the surface of fabrics. IR spectra of the textiles were obtained to determinate the presence of microcapsules, which was corroborated by SEM techniques.

SEM technique does not allow quantifying how many of microcapsules remain on fabric surfaces after treatments . X-ray photoelectric spectroscopy (XPS) can be used to analyse the surface chemistry of a textile. Results offer information about the elemental composition. A previous research [8] has shown that XPS technique is a suitable analysis to detect microcapsules on fabric surface when shell is composed of a polymer with nitrogen in its structure.

2.2 Microcapsules with hydrating properties

Some nonserious skin infections can be treated by hydration and antibacterial control. Microcapsules contained aloe-chitin are often used to treat this kind of problem. The aim of this work was to develop a product to increase the hydration level of the epidermis and does not allow microorganisms to grow up. With this aim, fabrics were prepared and tested to check their hypoallergenic and hydration effects on skin. To ensure no microorganism are on fabrics surface, sterilization was carried out by radiation process.[5]

Subsequent tests were carried out to check the effect of the treated fabric. The first involved hypoallergenicity and the second the skin-hydrating effect. The hypoallergenic test was performed on

55 persons and demonstrated that the produc developed (microcapsules emulsion) added to fabrics posed no danger to skin. Results showed that the product applied to fabrics was hypoallergenic.

The hydration of the epidermis was evaluated by capacitance methods. This test was carried out in two parts for each subject, one for the specific test and the other as a placebo. Epidermal hydration was determined as the difference between hydration in the treated zone with respect to that covered by the placebo. The increase in skin hydration was due to the effect of the aloe contained in the microcapsules. To check it is due because microcapsules have been broken and aloe dissapears from fabric. SEM micrographs allowed us observe some chitin wall that show not sphere shape, because it has been boken, consequently aloe has gone out and get in contact with skin.

Fabrics were sterilized by electron beam and were subsequently analyzed to determine the effects. SEM technique were used to check presence microcapsules in the fabric before and after sterilization, to satisfy the antibacterial requisite (ASTM E2149-01). The SEM analysis showed that were no apparent effects on microcapsules due to sterilization process. The study of antimicrobial effectiveness and antibacterial activity confirmed that the microcapsules had lost nono of their properties. The microbiological analysis confirms the effectiveness of the sterilization process in reducing total fungi population and aerobic bacteria.

2.3 Insect repellent microcapsules

People initially applied mosquito repellents on their skin directly as a lotion. It is effective for a few hours and most of them can be harmful to human beings as they are coming in direct contact with the skin. Due to these reasons, people now prefer mosquito repellent textiles, as they may remain effective for up to a week when applied to clothing. A repellent applied to clothing normally retains its effect longer than on skin because there is no loss by abrasion, no loss due to skin absorption, etc. There are many chemicals available for achieving mosquito repellency on textiles, but most of the chemicals are banded by World Head Organisation (WHO) due to their side effects on humans beings and as well as their harmfulness towards environment. Microencapsulation technology can be used for encapsulation these chemicals products and reduce the environmental impact and the human risks on the skin. [9]

This work is focused on studying insect repellent microcapsules useful ife on cotton fabrics. Fabrics have undergone several washing cycles in order to determinate the method effectiveness.

For fabric surface observation, a scanning electron miscroscoscope (SEM) Phenom microscope (FEI Company) was used. SEM micrographs were used to check presence, surface distribution and washing effects.

Washing process was carried out applying the standard UNE EN ISO 6330.

SEM techniques do not allow quantifying the insect repellent action. A insect repellent test applying the normative STI-Norm MV-02 was carried out in order to evaluate the method effectiveness.

The insect repellent test allows us that the method is effectiveness. These chemical products applied on fabrics reduced the bites number. If you rubbish the fabric, the effect is increased due to the fact that microcapsules are broken and the core material released.

SCUTUM project is real application of insect repellent microcapsules on sheets. This project has been carried out by INNOVATEC Spain (Independent Enginnering Company) with the help of two ONG´s (Vicente Ferrer Fundation and Anchorage).

3. CONCLUSIONS

Microcapsules have been used in textiles for a long time, however their previous characterization, adhesion behaviour and permanence on the fabrics are not well know. Commercial brands usually use them as the supplier recommends without any control or testing because it is not easy to characterize commercial products, how the microcapsules adhere to fabrics and their functionality.

The results of different researches show that analysis techniques and methods proposed allow characterizate the fabrics´ functionalization.

4. AKNOWLEDGEMENTS

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY CONCERNING THE INFLUENCE OF THE RAW MATERIAL ON THE FRICTION RESISTANCE OF SOCKS

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Abstract: This paper presents the results of testing to friction until deterioration for the knitted fabrics made by yarns of different nature and fineness. The tests were performed according to SR EN ISO 12947-2/2002 with the Nu-Martindale device.
Key words: *abrasion, resistance, Nu-Martindale, cotton, bamboo, soybean*

1. INTRODUCTION

The socks are necessary part of clothing and it must be comfortable, affordable and is desirable to maintain their quality throughout theirs life. The most significant problem is the abrasion, which can reduce the material's life. It will be useful for the producers and costumers to identify the nature of the parameters who are affecting the sock resistance to abrasion. [5]

Abrasion usually occurs on the heel, sole and toes of the socks. The span life of the socks is shorter than other textile materials because of higher abrasion within the shoes, slippers or even the ground during usage. The first stage of abrasion unravels of the loose fibers from the fabric surface, eventually breakdown of fibers and a hole occur. If the sock consists of synthetic fibers with natural fibers, during rubbing action natural fibers, which give the desirable properties of the sock, move away, only synthetic fibers remain. This situation stated as thinning and gives the sock undesirable appearance and decreases the overall fabric thickness. [5]

The properties of knitted fabrics are influenced by many factors: the nature of raw materials, knitted fabrics geometry and density, technological parameters of the knitting operation and finishing.[3]

In the purpose to estabilish wich of the yarns are most apropiate for knitting socks from the point of view of resistence to abrasion were realised tests according to SR EN ISO 12947-2/2002 standard. The tests were performed with the Nu-Martindale device.[1]

For knitted materials, the deterioration point is reached when a yarn is broken and a hole emerges.[6]

The abrasion tests were made on socks knitted from yarns of different nature and fineness: cotton, viscose, polyester, bamboo and soybean yarns.

2. SAMPLES

For tests were used plain knitted fabrics made from different raw material (table 1.)

Organic cotton is generally understood as cotton and is grown in subtropical countries such as the United States of America and India, from non genetically modified plants, that is to be grown without the use of any synthetic agricultural chemicals such as fertilizers or pesticides.[5]

Cotton has better fiber characteristics such as strength and moisture content than bamboo. But in case of elongation, short fiber index, mean length and uniformity index, bamboo fiber is better than cotton fiber.[5]

The soybean protein fibre has many of the good qualities of natural fibres, and also has some of the mechanical performances of synthetic fibres. Textiles made of this fibre have the following features: luxurious appearance, good comfort, good mechanical & physical performances, health-care function, good chromaticity.[4]

Table 1: Yarns for socks

Nr. crt.	Raw material	Yarn fineness [Nm]
1	Organic cotton 100%	34 / 1
2	Cotton 100%	34 / 1
3	Cotton 100%	40 / 1
4	Cotton + Polyester	40 / 1
5	Cotton + soybean	34 / 1
6	Bamboo + Viscose	34 / 1

3. EQUIPMENT

Samples were made using circular knitting machines with small diameter ($3^{3/4}$'') MATEC – Mono 4 (figure 1), 14 Ef, 144 needles.

The tests were performed on Nu-Martindale abrasion and pilling tester model 864 (figure 2) and were annalysed with a magnifying glass (figure 3).

Figure 1: MATEC – Mono 4

Figure 2: NU-MARTINDALE

Figure 3: Magnifying glass

4. METHOD

Before sampling the test specimens from the laboratory samples, theese was conditioned free from tension, for 18 h on a smooth horizontal surface with free access of air exposed to the standard atmosphere: (20 ± 2) °C and a relative humidity of (65 ± 5) %.[6]

The tests were performed in according to the EN ISO 12947-2:1998 standard. A circular specimen, mounted in a specimen holder and subjected to a defined load, is rubbed against an abrasive medium (standard fabric) in a translational movement tracing a Lissajous figure (figure 1), the specimen holder being additionally freely rotatable around its own axis perpendicular to the plane of the specimen.[6]

The Lissajous (figure 4) is created by movement which changes from a circle to gradually narrowing ellipses, until it becomes a straight line, from which progressively widening ellipses, develop, in a diagonally opposite direction before the pattern is repeated. [6]

The evaluation of the abrasion resistance of the textile fabric is determined from the inspection interval to breakdown of the specimens. In according to EN ISO 12947-2:1998, the samples were inspected evry 2000 cycles with a magnifying glass.[6]

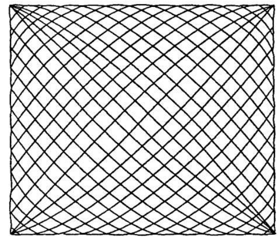


Figure 4: Lissajous figure[6]

The number of rubs is recorded at which specimen breakdown is not yet observed (this number of rubs is the upper limit of the time elapsed before specimen breakdown and at the same time the lower limit of the abrasion interval at which specimen breakdown occurs). [6]
The advantage of the Martindale abrasion test is that the fabric sample gets abrasion in all directions. Stress develops along the fiber from the orce acting transverse to the fiber axis as a result of surface friction; the magnitude of surface friction developed is directly related to the harshness of standard worsted fabric abradant.

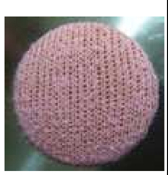
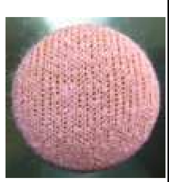
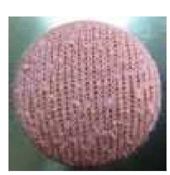
5. RESULTS

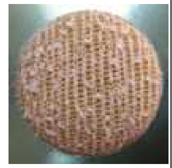
In the table 2 are presented the samples after 2000, 4000, 6000, 8000 and 10000 rubs. The total effective mass of the abrasion load (the mass of the specimen holder assembly and the appropriate loading piece) are (595 ± 7) g (nominal pressure of 12 kPa).[6]

Table 2: Results

Sample	**Raw material**	**Yarn fineness [Nm]**	**Degree of deterioration**				
			after 2000 cycle	**after 4000 cycle**	**after 6000 cycle**	**after 8000 cycle**	**after 10000 cycle**
1	Organic cotton 100%	34 / 1	4-5	3-4	3-4	2-3	1-2
2	Cotton 100%	34 / 1	4-5	3-4	3-4	2-3	1-2
3	Cotton 100%	40 / 1	3-4	2-3	2-3	1-2	1-2
4	Cotton + Polyester	40 / 1	2-3	1-2	1-2	1-2	1-2
5	Cotton + soybean	34 / 1	4-5	4-5	4-5	4-5	3-4
6	Bamboo + Viscose	34 / 1	4-5	4-5	3-4	3-4	2-3

Table 3: Degraded samples

SAMPLE	**Degree of deterioration**				
	after 2000 cycle	after 4000 cycle	after 6000 cycle	after 8000 cycle	after 10000 cycle
1					
2					

3					
4					
5					
6					

6. CONCLUSIONS

As a result of the performed analysis for testing the following conclusions may be drawn:

Sample 5 (cotton + soybean) has the best friction resistance; second is bamboo + viscose (sample 6).

For the same raw material, cotton 100%, (samples 2 and 3), the friction resistance increase if fineness of yarn increase with 18% , table 3.

Organic cotton sample and 100% cotton, with the same yarn fineness (sample 1 and 2) have the same resistance to abrasion.

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DIVERSIFICATEX: STRATEGIC TOOL FOR DIVERSIFICATION IN THE TEXTILE SECTOR

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Abstract: After the globalization, one of the possibilities of the textile Valencian companies is diversification. The majority textile companies do not know the possibilities that offer them the new markets. They found barriers of entry that consider cannot overcome. The companies need tools that allow them to think about which are his possibilities. Tools for the strategic reflection, that allow them to analyse his technology and know how to make and to commercialize new products. Funded by IMPIVA (II Plan of Competitiveness of the Valencian Company) and ERDF: European Regional Development Fund, and in collaboration with the UPV GIITEX GROUP (Integrated Management Group Textile Industry Technical University of Valencia), the Association of Textile Businessmen of the Valencian Community (ATEVAL) has developed the project "DIVERSIFICATEX". The result of this project is a tool specific promote diversification and assist companies to make strategic decisions based on technology and the market.
Key words: Diversification textile, strategic tool, reflexion tool.

1. INTRODUCTION

The Spanish textile sector has been experiencing for many years a radical change that could be identified at an early stage of growth and modernization, and later, by a very rapid globalization. Given the impact of globalization companies must adopt change strategies to improve their situation [1]. The case of textile of Valencia region in Spain shows the current economic situation, a decrease in the number of employees from 2010 to almost 60% of its value [2].

An alternative to change that can bee adopted by companies and has good prospects is diversification. The aggregation of existing activities other than those considered a sufficient condition, and almost necessary, to transform or remain a dynamic company with a future [3]. We can say that the reason for companies to diversify is to look for synergies or a reduction in the overall business risk.

However, in a 2009 study by ATEVAL, Association of Textiles Businessmen of the Valencian Region, more than 100 textile companies, found that companies are unable to think of new business opportunities due to the diversification mainly to two causes, the lack of new markets and the existence of entry barriers in some of them [4].

2. STRATEGIC THINKING TOOLS OF THE TEXTILE SECTOR

To start a process of diversification, companies previously need to define a global strategy in the company in that direction. The use reflection strategic tools can help achieve this objective because the tools require reflecting, to analyze situations, evaluate opportunities and suggest alternatives, both of which favor the making good decisions later in the company, according to its mission, vision and values.

With respect to strategic thinking different types of tools exist and the use of one or the other depends on the inputs they want to be valued in the company. There are tools for analyzing internal aspects of the company, external aspects, technology strategy and specific tools even textile sector.

With regard to internal analysis, a complete analysis is obtained through the matrix of Igor Ansoff [5] (Table 1), which helps companies to determine which growth strategies, including diversification, are more suited to their behaviors.

Table 1: Ansoff Matrix

		Products	
		Existing Products	**New products**
Mar-kets	**Existing Markets**	Market penetration	Product development
	New Markets	Market development	Diversification

With regard to external analysis, the study through the Porter's Five Competitive Forces [6], which analyzes potential competitors, buyers, substitutes, suppliers and existing competitors, is one of the most comprehensive analysis existing.

The refection tools of technology, as discussed by Escorsa and Valls [7], Steele [8] or Matthews [9], must combine technology strategy with overall business strategy, determining the important relationship that exists in the iterative process in the development of Corporate and Technological strategy. The "technology-product matrix" proposed by Jacques Morin [10], allong to appreciate quickly, technologies that require different products at once or products that require different technologies. With respect to this tool is an adaptation for the textile sector by Diaz and Montava [11] that relates very well with technical products textile technologies; however this tool does not analyze the market and competitors. But on this option, do not forget the advice of Thomas Duran [12] which indicates that it is suicidal to change market and technology at the same time, and that is probably more difficult for the company to change market than technology.

Analyzed the importance of the tools of reflection, we can say that any business decision, including textile diversification, should do not result from an impulsive decision it, is the result of a systematic analysis for the consideration of all possible strategies, according to the personality of the company and environmental conditions, which will be facilitated with the help of the use of self-reflection tools that facilitate the task of generating competitive options.

Funded by IMPIVA (II Plan of Competitiveness of the Valencia Company) and ERDF: European Regional Development Fund, and in the collaboration with the UPV GIITEX Group (Integrated Management Group Textile Industry Technical University of Valencia), the Association of Textiles Businessmen of the Valencian Region (ATEVAL) has developed the project "DIVERSIFICATEX". The result of this project is a tool specific to allow reflection for textile companies on the possibilities of diversification of products made with their productive capacities towards higher value added markets.

3. DIVERSIFICATEX

The tool designed integrates three parts, one relating to technological capabilities (Applications and techniques), one for the commercial (Markets) and another to see who is already present in these markets (Manufacturers) (Figure 1).

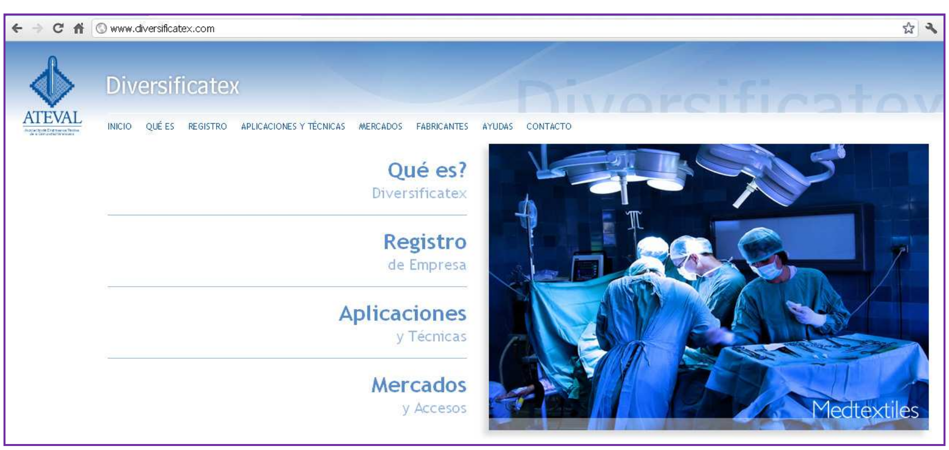

Figure 1: Home diversificatex tool

Part of Applications and Techniques (Figure 2) is based on the matrix developed by Diaz and Montava [11], where they cross different textile technologies with high added value products, which allows to know the different textile technologies and what articles technicians can be manufactured.

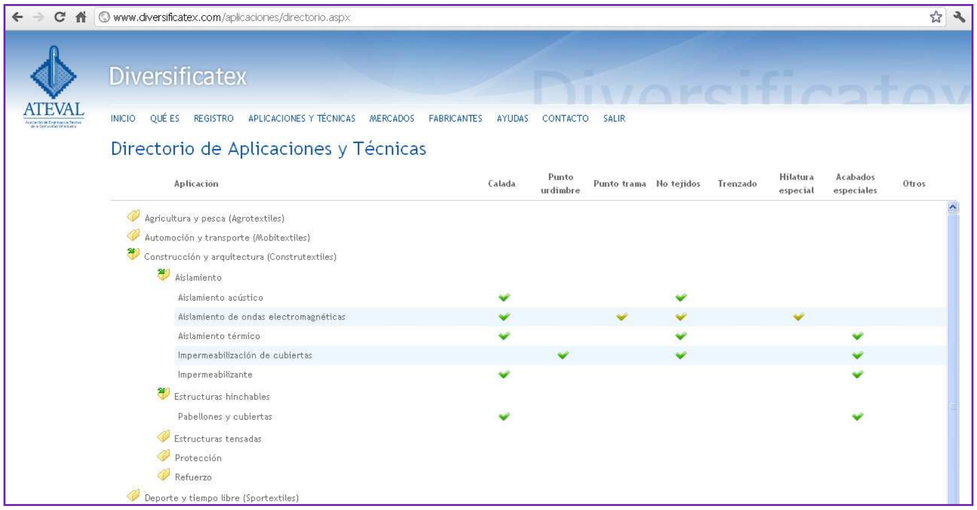

Figure 2: Page Applications and Techniques

Related Diversificatex 12 sectors, structured in 71 subgroups and approximately 380 specific applications. Currently about 80% of these crosses are illustrated with detailed examples of its technical characteristics (Figure 3), to encourage reflection by the user.

Figure 3: Detailed example of technical characteristics

This part of the tool also allows the realization of specific searches, which is organized by production technologies and / or textile sectors and subsectors. For example, we find that textiles are made of openwork weaving or that textile technologies used in different items for the sport sector. The analysis under "Markets" includes:

- A SWOT analysis of each of the areas of technical, it helps to know at first that strengths, weaknesses, threats and opportunities this sector represents for companies that want to enter it.
- A section on advice and assistance for the expansion, which are organizations, associations, technical institutes, organizations, etc.., Who can advise and assist the entry into a particular sector.
- The most important fairs.
- Distribution channels and the most important representatives of each sector (Figure 4).

Finally, in the part of manufacturers it can be found with which manufacturers have to compete a company that wants to access a particular sector. Searches can be conducted by technical, application or country, and the tool also lets you save searches.

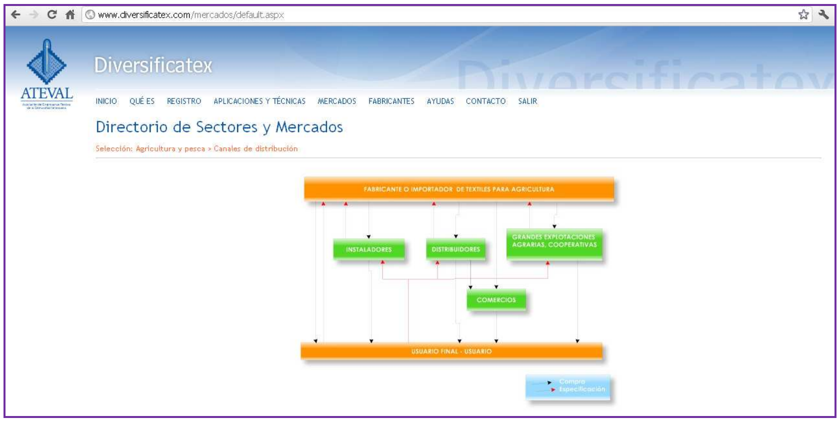

Figure 4: Page distribution channels in the Market. Example: Agrotextiles Sector

4. CONCLUSIONS AND OBJECTIVES ACHIEVED

Diversificatex web platform available to SMEs textiles, it is an interactive thinking tool, easy to use and intuitive, which allows you to perform self-diagnosis with accompanying solutions along the entire process of product diversification, both in the phase of new development proposals: alternatives, information on technical advice, as in the marketing stage such as developments: niche markets, distribution channels, competitors, business advice, etc...

The diversification of production is important to the survival of the sector. Just keep in mind that in a scenario like this, to restrict consumption on the one hand, and excess of demand on the other, there is an escape productive by creating new products and services that meet commercial spaces less commercial pressure and therefore higher expectations of business success.

The platform, studies ways to reuse resources of the company in its production machinery shed, in order to provide new forms of production to manufacture and / or different services. It generates an extraordinary development potential for the Textile Sector.

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EFFECT OF STITCH LENGTH AND YARN COUNT ON GREY AND FINISHED WIDTHS OF 1X1 FLAT KNIT FABRIC

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Abstract: Knit fabrics provide outstanding comfort qualities and have long been preferred as fabrics in many kinds of clothing .Since knit fabrics are produced on different machines with different knit stitches and conditions to create different patterns and fabric types. In this paper, the Effect of yarn count and stitch length on width of flat knitted rib fabrics have been studied and an attempt is made to find out the effects with ANOVA.1x1 rib fabrics were produced with three different yarn counts of spun Acrylic yarn in three different stitch lengths .Effect of Yarn count and Stitch length were represented in bar diagrams. The measurement results were also analyzed by two factorial analysis of variance (ANOVA).It was found that yarn count has more impact on fabric width than stitch length.
Key words: knitted Fabric, Yarn Count, Stitch length, width and ANOVA.

1. INTRODUCTION

The consumption of knitted fabric is constantly growing in the clothing industry because the knitted structure offers several advantages, such as extensibility, drape, wrinkle recovery and cheap production cost. The art of knitting has been rapidly progressing in the developed countries of the world. In Bangladesh, knit sectors already hold the highest position, if compared with weaving or other small sectors related to textile. Knit RMG is the highest foreign currency earning sector of Bangladesh. The industry is also growing very fast due to strong backward linkage, less capital investment requirement and higher profitability. For these reason more research should be carried out in this sector.

Many works on physical and geometrical properties of knitted fabrics have been carried out and it has been reported by Doyle and Munden that for an extremely wide range of relaxed plain knit fabrics, the fabric dimensions are completely determined by the knitted loop length. Many studied have also been conducted to analyze the relationship between basic knitted fabric parameters and loop length produced in circular knitting machine. But less works have been done on flat knitted fabric. The application of statistics to analyze is there any difference in mean number of yarn count differences due to shift and machine number. So, two ways ANOVA may be useful to do this analyze.

2. MATERIALS AND METHODS

2.1.1. Raw materials:

- Fiber type: Acrylic
- Yarn type : Spun
- Yarn linear density: 1.56 Ne, 1.867 Ne and 2.13 Ne
- Colourization: Yarn dyed

2.1.2 Machine used
Type of the machine : V-bed rib knitting machine
Total Needle Bed Length : 91 cm

Total No. of Needles : Front Bed- 126
Back Bed-126
No of feeder : 2
Active feeder : 1
Gauge : 3.5G
Used needle Bed length : 45 cm
No. Of Needle Used : 125
Yarn feeding system : Negative feed

2.1.3. Equipment Used:
1. Measuring Tap
2. HATRA Course Length Tester.

2.1.4 Knit structures

1x1 rib structures was chosen for this experiment because the 1x1 rib is a common structure normally used for trim or in the body portion of garments and it has a high production rate and is relatively inexpensive to produce.

2.2 Working Procedure:

The experimental 9(nine) samples were knitted on Hand propelled V-bed rib machine equipped with negative feed. Samples were produced with three different yarn counts at three different position of stitch cam. For dry relaxation, samples were left lying on a smooth flat surface in standard atmosphere for 24 hours.

Stitch lengths were tested on HATRA course length tester. Stitch lengths have been finding out by dividing the course length with total number of active needle and found 15mm, 18.5mm and 22.5mm. Fabric widths at grey state were checked at ten different places for each sample by measuring tape and mean values were noted. After that fabrics were washed on a domestic washing machine with detergent at 60^0C temperature and dried in line dry system. After conditioning the fabrics, finished width of the fabrics were measured and mean values were taken.

2.2.1 Statistical analysis:

The data thus obtained was analyzed statistically using two-way ANOVA analysis which was by MS Excel with the add-on named Data-analysis

3. RESULTS AND DISCUSSION

The values of grey and finished width of the samples in both dry and finished relaxed state are tabulated in Table- I.

Table 1: OBSERVATIONS of the effect of yarn count and stitch length on the grey and finished width.

Yarn Count (Ne)	S.L(mm)	Grey Width in cm	Finished Width in cm.
1.56	22.5	20	19.1
	18.5	19.5	18.7
	15	19.2	18.6
1.867	22.5	19.7	18.8
	18.5	19.2	18.4
	15	18.8	18.2
2.13	22.5	19	17.7
	18.5	18.2	17.4
	15	17.7	17.1

Table 1: Effect of Stitch length on Fabric widths at Yarn count 1.56 Ne

Yarn Count	S.L(mm)	Grey Width (cm)	Finished Width (cm)
1.56 Ne	22.5	20	19.1
	18.5	19.5	18.7
	15	19.2	18.6

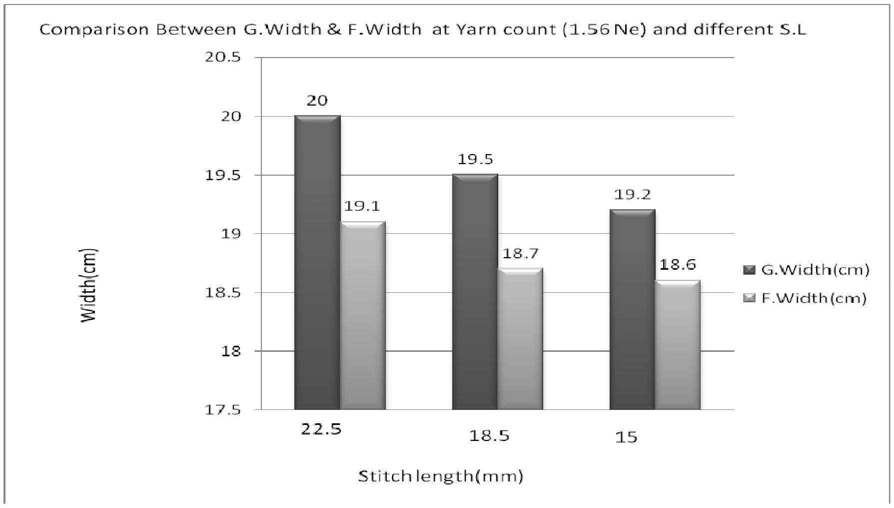

Figure 1: Stitch length Vs Width at yarn count, 1.56 Ne

Table- 2: Effect of Stitch length on Fabric widths at Yarn count 1.867 Ne

Yarn Count	S.L(mm)	Grey Width in cm	Finished Width in cm.
1.88 Ne	22.5	19.7	18.8
	18.5	19.2	18.4
	15	18.8	18.2

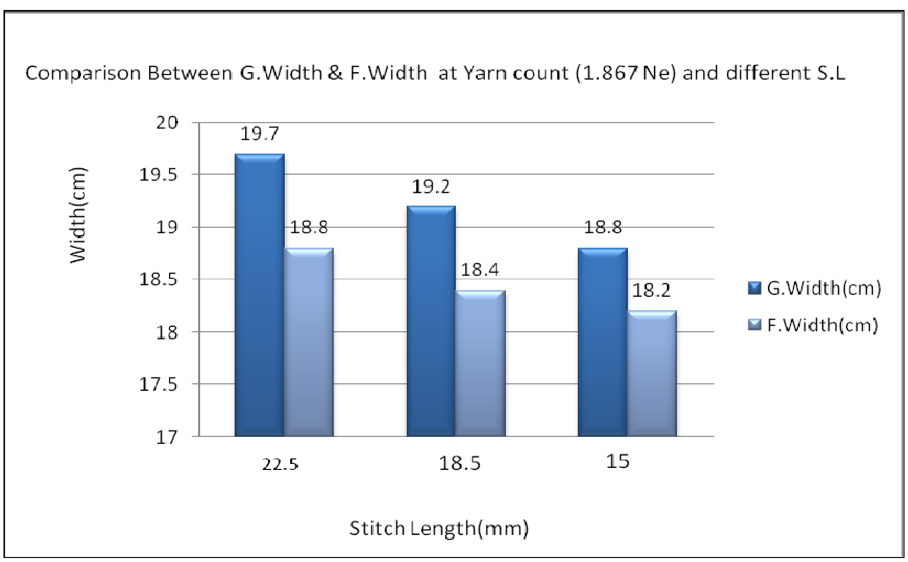

Figure 2: Stitch length Vs Width at yarn count, 1.867 Ne

Table 3: Effect of Stitch length on Fabric widths at Yarn count 2.13 Ne

Yarn Count	S.L(mm)	Grey Width in cm	Finished Width in cm.
2.13 Ne	22.5	19	17.7
	18.5	18.2	17.4
	15	17.7	17.1

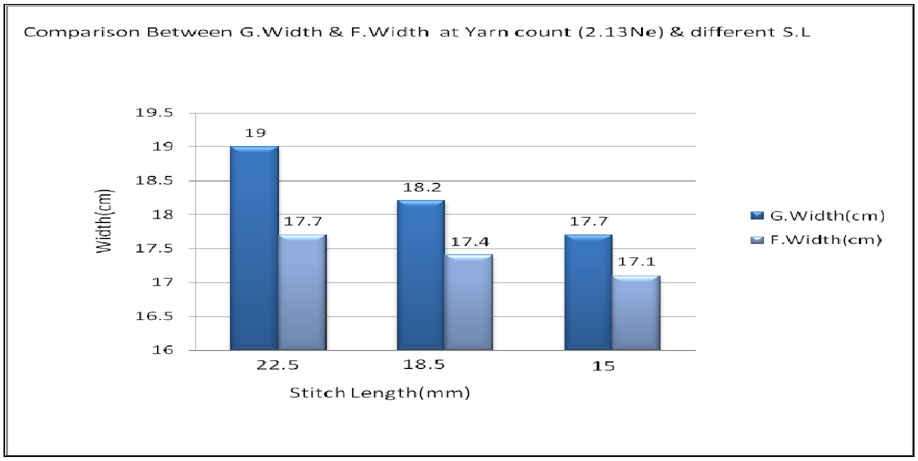

Figure 3: Stitch length Vs Width at yarn count, 2.13 Ne

Table 4: Effect of Yarn count on Fabric width at Stitch length 22.5 mm

Stitch length	Yarn count (Ne)	Grey Width in cm	Finished Width in cm.
22.5 mm	1.56	20	19.1
	1.88	19.7	18.8
	2.13	19	17.7

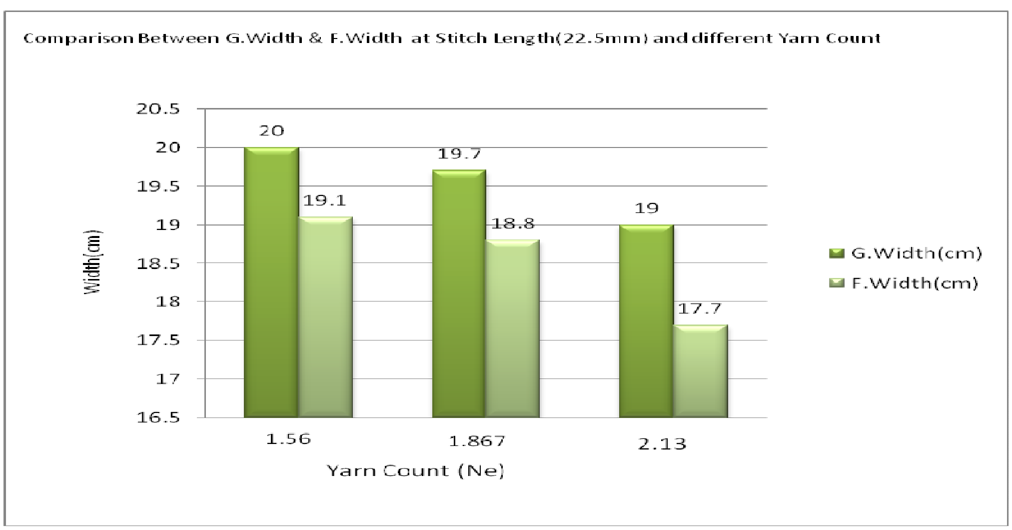

Figure 4: Yarn count Vs Fabric width at Stitch length, 22.5 mm

Table 5: Effect of Yarn count on Fabric widths at Stitch length 18.5 mm

Stitch length	Yarn count (Ne)	Grey Width in cm	Finished Width in cm
18.5 mm	1.56	19.5	18.7
	1.88	19.2	18.4
	2.13	18.8	17.4

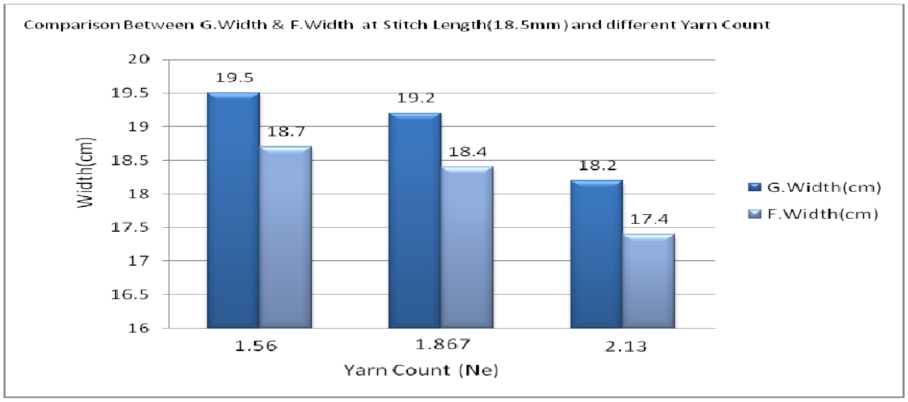

Figure 5: Yarn count Vs Fabric width at Stitch length, 18.5 mm

Table 6: Effect of Yarn count on Fabric widths at Stitch length 15 mm

Stitch length	Yarn count	Grey Width (cm)	Finished Width (cm)
15 mm	1.56	19.2	18.6
	1.88	18.8	18.2
	2.13	17.7	17.1

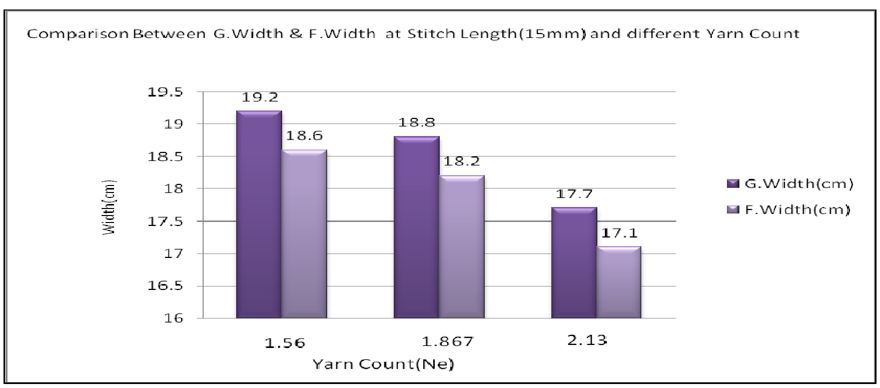

Figure 6: Yarn count Vs Fabric width at Stitch length, 15 mm

3. ANOVA FINDINGS:

Anova: Two-Factor Without Replication

Table-A: Two factor ANOVA without replication for Grey width

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
Stitch length 22.5 mm	3	58.7	19.56667	0.263333
Stitch length 18.5 mm	3	56.9	18.96667	0.463333
Stitch length 15 mm	3	55.7	18.56667	0.603333
Yarn count 1.56 Ne	3	58.7	19.56667	0.163333
Yarn count 1.88 Ne	3	57.7	19.23333	0.203333
Yarn count 2.13 Ne	3	54.9	18.3	0.43

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Stitch length	1.52	2	0.76	41.45455	0.002118	6.944272
Yarn counts	2.586667	2	1.293333	70.54545	0.00076	6.944272
Error	0.073333	4	0.018333			
Total	4.18	8				

Table B: Two factor ANOVA without replication for finished width

Stitch Length ↓	**Yarn count**			
	1.56	**1.88**	**2.13**	
22.5	19.1	18.8	17.7	
18.5	18.9	18.4	17.4	
15	18.8	18.2	17.1	

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
Stitch length 22.5 mm	3	55.6	18.53333	0.543333
Stitch length 18.5 mm	3	54.7	18.23333	0.583333
Stitch length 15 mm	3	54.1	18.03333	0.743333
Yarn count 1.56 Ne	3	56.8	18.93333	0.023333
Yarn count 1.88 Ne	3	55.4	18.46667	0.093333
Yarn count 2.13 Ne	3	52.2	17.4	0.09

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Stitch length	0.38	2	0.19	22.8	0.006504	6.944272
Yarn counts	3.706667	2	1.853333	222.4	7.94E-05	6.944272
Error	0.033333	4	0.008333			
Total	4.12	8				

5. DISCUSSION

The influence of stitch length on fabric width is evident from the data presented in fig (1-3), where the other structural factors are kept control. It has been seen in fig (4-6) that fabric width decreases with the finer yarn. It has been found in table (A & B) by ANOVA that both the stitch length and yarn counts affect the fabric width but yarn count has more impact on fabric width than stitch length.

6. CONCLUSION

The interest of this study was to identify the effect of stitch length and yarn count on fabric width of flat knit fabrics. The results of this research show that fabric widths are directly related to the stitch length and yarn count. Among the results, it has been found that the maximum fabric width can be obtained by using coarser yarn at maximum stitch length and vice versa.

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STUDY REGARDING THE CREASING BEHAVIOR OF FABRICS MADE FROM COMBED YARNS TYPE WOOL

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Abstract: The behavior to creasing of woven materials made from yarns type wool used in ready-made clothes has been analysed in this paper. Factors like fibrous composition, properties of constituent fibers, wovens' structure parameters, mechanical properties of yarns that influenced the recovery capacity from crease were investigated through several tests which revealed their importance in the process.
Key words: creasing, flotation the recovery angle and recovery coefficient from folding.

1. INTRODUCTION

The creasing of woven materials made from combed yarns type wool used for ready-clothes is an undesired deformation effect with temporary or permanent character, which is caused by a composed strain of bending and compression during utilization, processing or maintenance. It is manifested by the appearance of wrinkles, folds or stripes on the surface of wovens materials, thus diminishing their qualitative appearance and also their practical value.

Therefore, the woven materials used for garments manufacturing are classified in the following categories:

-reduced creasing, articles type wool;
-average creasing, articles made of synthetic yarns;
-pronounced creasing, articles made of cellulosic yarns that can be improved through superior finishing.

Creasing is the result of irreversible changes created through the reciprocal sliding of structural fiber components when exposed to a bending strain. Creasing is specific to oriented structures with high crystallinity (cellulosic fibers) [4,5]. The sliding appears because of hydrogen bond breaking which can, however, reform easy in other positions conferring a permanent character to creasing.

2. EXPERIMENTAL PART

The experimental trials have been performed on a series of woven materials made of 45%Wool+55%PES. Factors like fibrous composition, properties of constituent fibers, structural woven parameters, mechanical properties of warp and weft yarns and finishing treatments that influenced the recovery capacity from creasing/folding were investigated such as to assess their importance [2].

In order to reveal the influence of bonding on the surface characteristics of wovens we have expressed it through the mean flotation F_{warp} for warp yarns and mean flotation F_{weft} for weft yarns. The intersection between a warp yarn and weft yarn is called bonding point, thus the bonding contains all bonding points having a warp or weft effect along a longitudinal or transversal direction.

One or more bonding points having the same effect and forming one bonding segment can exist in longitudinal or transversal direction. The bonding segments with the same effect are called flotation (F). They can be warp flotation (F_{warp}) when the warp yarn passes over the weft yarn and weft flotation

(F_{weft}) when the weft yarns passes over the warp yarn. The flotation size, similar to the bonding segment, have the minimum value F=1 [1]. The following relations exist between the ration (R), number of passes (t) and mean flotation (F)

$$F_{warp} = \frac{R_{weft}}{t_{warp}} \quad (1)$$

$$F_{weft} = \frac{R_{warp}}{t_{weft}} \quad (2)$$

The measurements are done on woven samples having standard dimensions. These are folded at 180^o and pressed along the direction of one of the constituent fiber systems by applying over a defined time interval folding forces which are dependent on the unit surface mass [3]. After the removal of the folding forces, the sample is left to relax freely. The recovery angle is measured in the end of a determined time interval.

The following indicators are for estimating the capacity of textile materials to maintain their initial shape and dimensions during the wearing time:

- the recovery angle after folding (α)- the angle between the sample sides folded after the removal of the folding force;
- recovery coefficient λ (%) calculated according to relation (3):

$$\lambda = \frac{\alpha_1}{180^o}100 \quad (3)$$

where the recovery coefficient λ can be determined:

-at t_1=1 minute after detension when either λ_1 (%) or the instantaneous recovery coefficient is determined;

-at t_2=10 minutes after detension when either λ_2 (%) or the slow recovery coefficient is determined. The latter is defined by relation (4):

$$\lambda_2 = \frac{\alpha_2 - \alpha_1}{180^o}100 \quad (4)$$

The total coefficient of recovery after folding is calculated according to relation (5):

$$\lambda = \lambda_1 + \lambda_2 \quad (5)$$

The recovery capacity from creasing depends on the fibrous composition and on the level of deformations. Additionally, also technological processing through mechanical, physical or chemical processes can influence positively or negatively the evolution of the indicator.

Several operations have been performed for each item from the woven materials considered in the study:

-evaluation of the recovery angle after folding (α) and of the recovery coefficient λ (%) along the direction of the two yarn systems, *i.e.* warp and weft. The experimental values are given in Table 1;

-Fig.1 and Fig. 2 are illustrating the plots of functions α(t) and λ(t) by considering the woven materials grouped based on their flotation size.

Following useful observations for the design of woven materials can be drawn based on the analysis of the values in Table 1 and on their graphical representation:

- the largest value of the recovery angle was recorded for the wovens having the average flotation F=2 trialed along the warp direction. These were followed by wovens with same flotation value but along the weft direction;
- by reducing the flotation the recovery angle decreases while the recovery coefficient increases;
- while the yarns diameter increases the recovery angle decreases;
- the amplitude of the recovery angle variation is 25,38% along the warp yarn direction and 25,8% along the weft yarn direction.

Table 1. Evaluation indicators for assessing the creasing behavior of the studied wovens

Code Art.	Bonding	Yarn count Nm		Flotation		Recovery angle from creasing, α		Recovery coefficient from creasing λ	
		Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
B1	P 6/6	64/2	64/2	6	6	178.8	176.4	0.7	2.0
B2	D2/1	64/2	64/2	1.5	1.5	156.8	154.2	12.9	14.3
B3	D2/2	60/2	60/2	2	2	165.2	163	8.2	9.4
B4	Plain	60/2	60/2	1	1	142.4	140.8	20.9	21.8
B5	D2/2/	52/2	52/2	2	2	164.9	163.7	8.4	9.1
B6	Crepe	52/2	52/2	1.5	1.5	155.4	154.6	13.7	14.1
B7	D2/1	52/2	30/1	1.5	1.5	154.6	156.4	14.1	13.1
B8	D2/2	52/2	52/2	2	2	165.8	163.4	7.9	9.2
B9	D 2/1 2/5	52/2	52/2	2.5	2.5	166	163.2	7.8	9.3
B10	D2/1	52/2	52/2	1.5	1.5	156.7	154.3	12.9	14.3
B11	D2/1	52/2	52/1	1.5	1.5	155.9	153.7	13.4	14.6
B12	Plain	52/2	52/2	1	1	141.3	140.2	21.5	22.1
B13	P 2/2	52/2	52/2	2	2	164.5	163.7	8.6	9.1
B14	D2/2	48/2	48/2	2	2	162.8	160.9	9.6	10.6
B15	Plain	64/2	37/1	1	1	142.8	144.6	20.7	19.7
B16	D2/1	60/2	60/2	1.5	1.5	156.9	154.6	12.8	14.1
B17	D2/1	56/2	37/1	1.5	1.5	154.2	156.8	14.3	12.9

For instance: a) item **Art. B1** in Table 1 has α_{weft}=176,4 ^{o} and α_{warp} =178,8 ^{o} with Nm_{warp}=Nm_{weft}=64/2, P_{warp}>P_{weft}, having bonding P $\frac{6}{6}\frac{6}{6}$, thus average flotation F=6; b) item **Art. B4** has α_{warp} =142,4 ^{o} and α_{weft} =140,8 ^{o}, Nm_{warp}=Nm_{weft}=60/2 , P_{warp}>P_{weft}, having plaine bonding, thus the average flotation F=1.

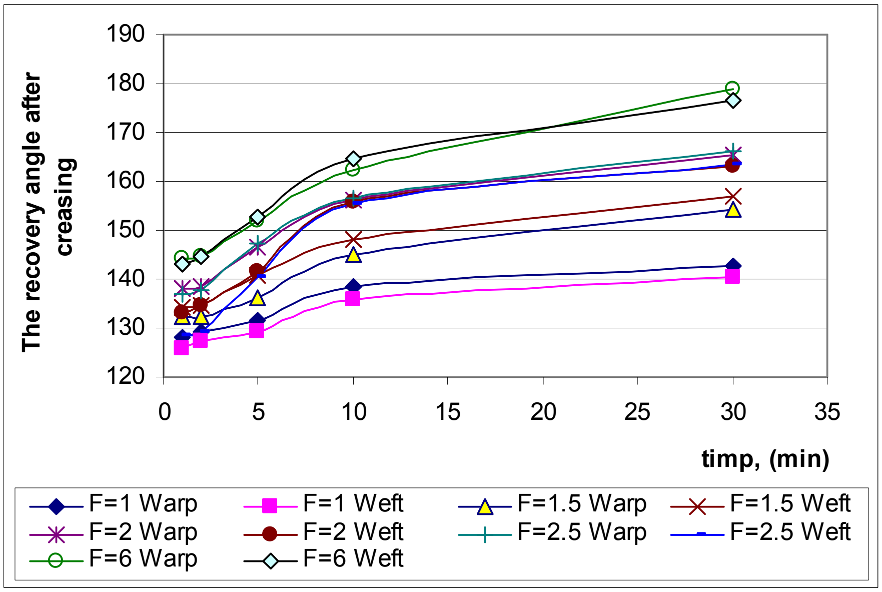

Figure.1. Variation of recovery angle after creasing for the studied wovens

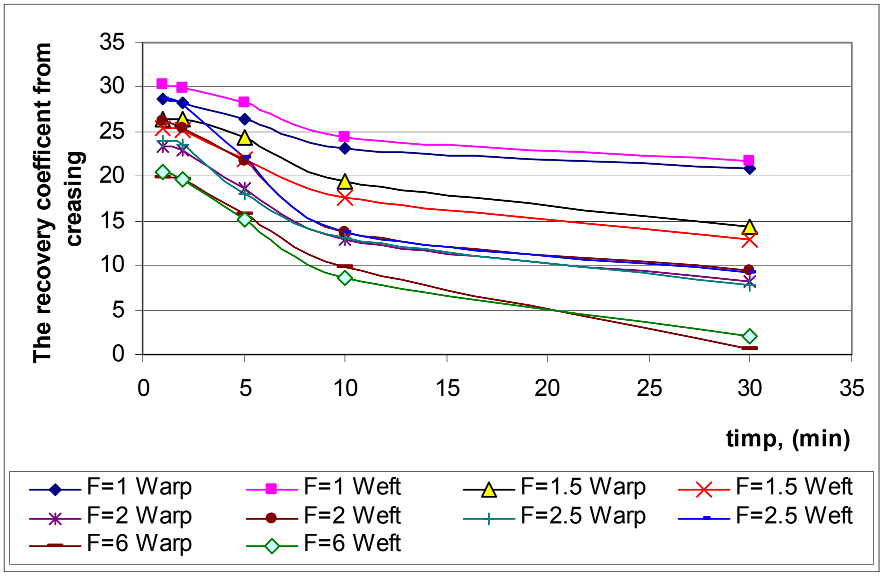

Figure.2. Variation of recovery coefficient from creasing for the studied wovens

3.CONCLUSIONS

The creasing of wovens is a complex process of deformation under the action of mechanical stretching, bending and compression strains, being influenced by the following factors:

1. **Fibrous composition and the constituent fiber characteristics**

The behavior to creasing is determined by the deformability of the constituent fibers with respect to the creasing conditions.

- The response at a certain strain level (strain speed, time, alternation of application direction, compression or stretching level) is evaluated depending whether the creasing is under or over the elasticity limit of the mentioned strain.
- The strain level through creasing determines the total deformation which in turn is determining the ratio between the elastic components of recovery and the remanent deformation value.
- Based on the data presented above one can observe that under the standard conditions the recovery angle is higher along the weft yarns direction, which could be because of the following reasons:

-warp yarns fatigue during the weaving process;
-density difference of the two yarn systems;
-different respons of the two yarn systems during the finishing process.

2. Structural parameters

- The yarns fineness, technological density and the type of bonding is signficantly influencing the creasing/folding behavior.
- The yarns fineness is influencing, at constant structure parameters, the woven thickness. Thus, increasing the thickness by increasing the linear density of the used yarns leads to a higher resistance to creasing.
- The yarns density is influencing the creasing behavior because the decrease of this parameter leads, independent of the used bonding type, to lower creasing tendency.
- The length of flotations has a positive influence on the recovery capacity from creasing.
- The simultaneous decrease of yarns density and flotations length parameters leads to a lower fiber tension state of the two yarns systems. This is reflected in the values of the recovery angle. For instance: for yarns with same composition and structure: $Nm_{warp}=Nm_{weft}=52/2$, Item B9 in Table 1, with $P_{warp}=295$ yarns/10cm, Pweft=280 yarns/10cm, $\alpha_{Warp}=166^{o}$,

α_{Weft}=163,2^o and λ_{Warp}=7,8%, λ_{Weft}=9,3%, diagonal bonding D$\frac{2\ \ 2}{1\ \ 3}$/ ; Item B12 in Table 1, with P_{warp}=210 yarns/10cm , P_{weft}=180 yarns/10cm, α_{Warp}=141,3^o ,α_{Weft} =140,2^o and λ_{Warp}=21,5%, λ_{Weft}=22,1% , plaine bonding .

- The plaine bonding presents a low recovery capacity from creasing, thus the flotation increase for both of warp yarns and weft yarns is favorable for reducing the creasing. The effect is compensated because the density in the two yarn systems is different.

3. Mechanical properties of warp and weft yarns

Warp yarns are more strained and worn during processing than weft yarns. Thus, even if the two yarns have identical structures, the elasticity module of warp yarns is higher, *i.e.* they become more rigid. This is reflected in lower values of the recovery angle for samples orientated along the warp direction.

- Creasing is influenced by increased stiffness during stretching, which is expressed through the elasticity module.
- The higher the elasticity module value, the lower is the recovery angle and the higher the creasing recovery coefficient.
- The interdependence between elasticity module and creasing recovery capacity is illustrated by the experimental data recorded, for instance: Item B15, with $Nm_{warp} \neq Nm_{weft}$, P_{warp}>P_{weft}, α_{warp}=142,8^o , α_{weft}=144,6^o and λ_{warp}=20,7%, λ_{weft}=19,7% , having the diagonal bonding plain , elasticity E_{warp}=167,82 cN/tex, E_{weft}=91,23 cN/tex; Item B17, with $Nm_{warp} \neq Nm_{weft}$, P_{warp}>P_{weft}, α_{warp}=154,2^o, α_{weft}=156,8^o and λ_{warp}=14,3%, λ_{weft}=12,9%, having diagonal bonding D$\frac{2}{2}$/ , elasticity module E_{warp}=145,63 cN/tex, E_{weft}=89,76 cN/tex.

The present study is also revealing the differentiation,in the frame of the same item, according to technological axis, the recovery angle from creasing along weft direction is higher than the recovery angle along warp direction. When the fineness Nm_{warp} = Nm_{weft}, the recovery angle is higher along warp direction and depends on the ration between technological densities and bonding type.

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ANALYSIS OF COTTON YARN COUNT VARIATION BY TWO WAY ANOVA

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Abstract: In a textile spinning factory yarn is produced according to buyer requirements. Achieving this target is depended on several factors. Spinning factory runs shift wise. Count variation is one of the major faults of spinning. Statistical approach should be established at every sphere of the textile industry to dominate the export world.The application of statistics to analyze is there any difference in mean number of yarn count differences due to shift and machine number. So, two ways ANOVA may be useful to do this analysis. In this paper count variations (yarn produced by different ring frames and different shifts) are analyzed by two factorial ANOVA. This type of work can find out gigantic problems and their simple solution.

Key words: *Yarn, count, machine, shift, ANOVA.*

1. INTRODUCTION

Textile industry is one of the largest sectors in Bangladesh. It is one of the fastest growing sectors of the country. The economy of Bangladesh now depends largely on it. Spinning is the sector to produce yarn which is used to prepare gray fabric as well as finished fabric. In a textile spinning factory yarn is produced according to buyer requirements. Achieving this target is depended on several factors. The quality of yarn is determined by different aspects. Yarn count variation is one of them. It should be maintained as much as lower variance in same count of yarn.

2. MATERIALS AND METHODS

Count variation is one of the major faults of spinning. The result of this fault is visually found in finished fabric called as uneven dyeing. So to get the yarn of particular count (yarn fineness), we set the required draft in ring frame by draft change pinion.

Two-Way ANOVA:
The *F* distribution is also used for testing whether two or more sample means came from the same or equal populations. This technique is called analysis of variance or ANOVA.

ANOVA requires the following conditions:
-The sampled populations follow the normal distribution.
-The samples are independent
-The populations have equal standard deviations.

Sometimes there are other causes of variation. For the two-factor ANOVA we test whether there is a significant difference between the *treatment effect* and whether there is a difference in the *blocking effect* (a second treatment variable).

$$SSB = r\ S\ (X_b - X_G)^2 \quad \textbf{(1)}$$

Where,

r = the number of blocks

X_b = the sample mean of block b

X_G = the overall or grand mean

The procedure is same like other hypothesis testing; the five step hypothesis testing is also done here, unlike the one way approach the error element is tried to reduce by defining it more precisely as blocks which is liable for the reason of variation. The data are arranged and if the fulfill the conditions of ANOVA testing they are calculated and arranged in the ANOVA table as stated as table-1. By calculating the F-value for treatment as well as blocks the critical values are tested with them to finalize the decision of accepting or rejecting the null hypothesis. The variation may be found for treatment or block or for the both.

Table-1

ANOVA Table				
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Treatments (k)	SST	k-1	SST/(k-1) =MST	$\frac{MST}{MSE}$
Blocks (b)	SSB	b-1	SSB/(b-1) =MSB	
Error	SSE (TSS – SST –SSB)	(k-1)(b-1)	SSE/(n-k) =MSE	$\frac{MSB}{MSE}$
Total	TSS	n-1		

Seven different ring frames were selected which were running with 30 KH (30 carded Hosiery) count of yarn. Then we got ten test results of each machine in each shift. Considering three shifts (shift A, Shift B and Shift C) per day. Seventy different results of per shift from seven different machines. So actually 210 test results obtained. Here average of ten results is shown. There are two types of variable, one is machines and another is shifts.

3. SIGNIFICANCE OF THE WORK

The analysis of variance of cotton yarn fineness is customer satisfaction with quality textile product. The purpose of this study is to minimize the faults of finished cotton fabric by maintaining actual yarn count during producing in ring frame. If the analysis shows the mean count difference due to shift and machine number then action should be taken to maintain required count of yarn. This action may be taken by setting of actual draft, uniform linear density of finisher draw frame sliver and maintaining proper atmospheric condition in ring and back section.

4. DATA ANALYSIS

The 210 data for yarn count of 30 KH (30 carded Hosiery) was summarized as follows:

Table-2

	Shift wise Yarn Fineness or Count Average (Ne)		
Machine No.	**Shift (A)**	**Shift (B)**	**Shift (C)**
1	29.52	30.91	30.14
2	29.58	29.33	30.00
3	28.62	29.32	29.98
4	30.50	30.04	28.99
5	29.03	30.33	29.82
6	29.75	30.91	29.85
7	31.28	29.95	30.05

Considering the data follow the normal distribution, it can be tested to measure the variation. The two-way ANOVA analysis was done by MS Excel with the add-on named Data-analysis, which gives the following output:

ANOVA Findings:
ANOVA: Two-Factor Without Replication

SUMMARY	*Count*	*Sum*	*Average*	*Variance*
Machine 1	3	90.57	30.19	0.4849
Machine 2	3	88.91	29.63667	0.114633
Machine 3	3	87.92	29.30667	0.462533
Machine 4	3	89.53	29.84333	0.599033
Machine 5	3	89.18	29.72667	0.429033
Machine 6	3	90.51	30.17	0.4132
Machine 7	3	91.28	30.42667	0.548633
Shift A	7	208.28	29.75429	0.796729
Shift B	7	210.79	30.11286	0.43189
Shift C	7	208.83	29.83286	0.150324

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Treatments (Shifts)	2.667067	6	0.444511	0.951404	0.495411	2.99612
Blocks (Machines)	0.497343	2	0.248671	0.532241	0.600529	3.885294
Error	5.60659	12	0.467216			
Total	8.771	20				

From the ANOVA table it can be stated that average number of yarn count is not depended upon the shifts and machine numbers as the test of hypothesis passed or null hypothesis is not rejected as the F-critical is greater than F-calculated. That means there is no difference in average number of count for different shifts and seven different machine numbers.

5. DISCUSSION

From the data analysis the ANOVA table indicates that there is no variation in the yarn count. So it is clear that seven different ring frames and three shifts are liable for having required count. If we found any variation due to shift or machine than should be taken necessary steps to overcome that problem.

6. CONCLUSION

ANOVA is one of the important statistical tools to measure different variations and their reasons in any industry. The outcome of this work is not so significance but it helps the use of statistic in a textile industry.

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BIDIMENSIONAL STATISTICAL PROCESSING OF THE MAIN ANTHROPOMETRIC PARAMETERS FOR MEN IN VIEW OF THE DISTRIBUTION ON SIZES AND WAIST LENGTHS

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Abstract: This paper presents a study of the correlation between two major anthropometric parameters, by the mathematical statistical applications corresponding to the bidimensional distributions for following pairs:
- Global dimensions of the human body (body height - bust perimeter),
- Body height - waist perimeter,
- Bust perimeter - waist perimeter,
a study that was carried out on a sample of 150 men aged between 20-29 years. Based on theoretical and experimental results shown in this paper can then properly structure the main stages of the manufacturing process. Combinations of sizes and weights of framing made rationally affect specific consumption and hence production costs.
Key words: anthropometry, anthropometric characteristics, statistical processing

1. INTRODUCTION

The shape of the human body is characterised by a large number of morphological parameters so that, if there would be analysed simultaneously the frequency of encountering several dimensions, the corresponding distributions would be called multidimensional distributions.

In the following there will be carried out a study of the correlation between two anthropometrical parameters, for each subject of a selection, the studied distributions being called bidimensional distributions.

The researches unfolded in this domain have proven that the simultaneous distribution of two anthropometrical parameters follows a normal bidimensional law, if each parameter taken independently observes the Gauss-Laplace normal distribution law.

There were studied the main anthropometrical parameters with longitudinal orientation (body height – $\hat{I}_c$), with transversal orientation (bust perimeter – P_B) and conformation-related (waist perimeter - P_T) for a sample of 150 male subjects, age group 20-29 years, for which in previous papers there have been carried out unidimensional statistical processing operations, which led to the conclusion that a Gauss-Laplace normal distribution law was observed.

2. GENERAL INFORMATION

Because the results of the statistical unidimensional distribution are known, this paper presents in the following the mathematical statistical applications corresponding to the statistical bidimensional dimensions for the same group of subjects, for following pairs of anthropometrical parameters:

- for the global dimensions of the human body – body height and bust perimeter ($\hat{I}_c$ – P_B);
- body height and waist perimeter ($\hat{I}_c$ – P_T);
- bust perimeter and waist perimeter (P_B – P_T).

The normal bidimensional distribution can be expressed as tables, analytically and graphically, as will result also from this paper.

2.1 Normal bidimensional distribution expressed as table

Within this paragraph there are presented the initial data needed for the later statistical processing for the mentioned pairs of dimensions, summarised in tables 1÷3.

Table 1

$\hat{I}_c$ (cm)	P_B (cm)								Total
	82,0	86,0	90,0	94,0	98,0	102,0	106,0	110,0	
167,0	2	2	3	-	-	-	-	-	7
171,0	-	1	4	5	3	-	-	-	13
175,0	-	1	9	11	11	3	-	1	36
179,0	-	1	2	9	15	10	3	-	40
183,0	-	-	2	2	8	14	8	-	34
187,0	-	-	-	2	3	4	5	-	14
191,0	-	-	-	1	-	1	1	1	4
195,0	-	-	-	-	-	-	1	1	2
Total	2	5	20	30	40	32	18	3	150

Table 2

$\hat{I}_c$ (cm)	P_T (cm)								Total
	79,0	82,0	85,0	88,0	91,0	94,0	97,0	101,0	
167,0	1	3	3	-	-	-	-	-	7
171,0	-	4	4	2	2	1	-	-	13
175,0	-	7	12	8	6	1	1	1	36
179,0	1	2	8	15	10	3	1	-	40
183,0	1	2	2	11	10	4	3	1	34
187,0	-	-	3	6	2	3	-	-	14
191,0	-	-	1	1	-	1	1	-	4
195,0	-	-	-	1	-	-	1	-	2
Total	3	18	33	44	30	13	7	2	150

Table 3

P_B (cm)	P_T (cm)								Total
	79,0	82,0	85,0	88,0	91,0	94,0	97,0	101,0	
82,0	1	-	1	-	-	-	-	-	2
86,0	1	2	2	-	-	-	-	-	5
90,0	1	10	9	-	-	-	-	-	20
94,0	-	6	12	8	4	-	-	-	30
98,0	-	-	9	13	14	3	1	-	40
102,0	-	-	-	15	7	7	3	-	32
106,0	-	-	-	8	5	2	2	1	18
110,0	-	-	-	-	-	1	1	1	3
Total	3	18	33	44	30	13	7	2	150

Based on these data, there were carried out calculations of the correlation coefficients and of the probability density, at the same time resulting such a distribution that even from the contents of the tables there can be estimated the ellipse shape of the base of the Gauss-Laplace bell. The orientation of the main axis of the ellipse for all variants indicates a direct correlation of linear shape, there being a positive connection between the two parameters in the pair, at the same time with the increasing in one parameter the other one increasing as well.

It should be noted, however, that the number of classes (in this case 8 classes for both parameters in the pair) was determined based on the indications from the speciality literature and was actually calculated within unidimensional statistical processings in previous papers by the same author.

2.2 Normal bidimensional distribution expressed analytically

The primary data presented above represent at the same time the elements needed for verifying the probability density by analytical means, applying the normal bidimensional distribution law written as:

$$F(x,y)=\frac{1}{2\pi s_x s_y\sqrt{1-r^2}}\times e^{-\frac{1}{2(1-r^2)}\left[\left(\frac{x_i-\bar{x}}{s_x}\right)^2-2r\frac{x_i-\bar{x}}{s_x}\bullet\frac{y_i-\bar{y}}{s_y}+\left(\frac{y_i-\bar{y}}{s_y}\right)^2\right]} \quad \textbf{(1)}$$

Where: F(x,y) = the function representing the number of subjects that fit within a certain typodimension;

x_i = the particular values of the parameters marked on rows in tables 1÷3;

y_i = the particular values of the parameters marked on columns 1÷3;

$\bar{x},\bar{y}$ = ponderated arithmetic means of the two variables;

s_x, s_y = mean square deviations of the two variables;

r = correlation coefficient between the two variables for the general collectivity;

$$r=\frac{\sum\left[\left(x_i-\bar{x}\right)\left(y_i-\bar{y}\right)\right]}{n_i s_x s_y} \quad \textbf{(2)}$$

The values of function F(x,y) calculated according to equation (1) constitute the base for determining the theoretical number of subjects, for this purpose there being set up the tables 4÷6.

Table 4

$\hat{I}_c$ (cm)	P_B (cm)								Theoretical no. of subjects, n_t
	82,0	86,0	90,0	94,0	98,0	102,0	106,0	110,0	
167,0	1	1	1	1	-	-	-	-	4
171,0	-	2	5	5	3	1	-	-	16
175,0	-	1	6	12	10	4	1	-	33
179,0	-	-	3	10	17	10	3	-	43
183,0	-	-	1	4	10	12	5	1	33
187,0	-	-	-	1	3	6	5	1	16
191,0	-	-	-	-		1	2	1	4
195,0	-	-	-	-	-	-	-	1	1
Theoretical no. of subjects, n_t	1	4	16	33	43	33	16	4	150

Table 5

$\hat{I}_c$ (cm)	P_T (cm)								Theoretical no. of subjects, n_t
	79,0	82,0	85,0	88,0	91,0	94,0	97,0	101,0	
167,0	-	1	2	-	1	-	-	-	4
171,0	1	4	5	3	2	1	-	-	16
175,0	2	5	9	11	3	2	1	-	33
179,0	1	4	10	14	11	3	-	-	43
183,0	-	2	5	10	9	5	2	-	33
187,0	-	-	2	4	5	4	1	-	16
191,0	-	-	-	1	2	1	-	-	4
195,0	-	-	-	-	-	-	-	1	1
Theoretical no. of subjects, n_t	4	16	33	43	33	16	4	1	150

Table 6

P_B (cm)	P_T (cm)								Theoretical no. of subjects, n_t
	79,0	82,0	85,0	88,0	91,0	94,0	97,0	101,0	
82,0	1	-	-	-	-	-	-	-	1
86,0	1	2	1	-	-	-	-	-	4
90,0	1	6	7	2			-	-	16
94,0	1	5	13	11	3	-	-	-	33
98,0	-	2	9	19	11	2	-	-	43
102,0	-	1	2	9	13	7	1	-	33
106,0	-	-	1	2	5	6	2	-	16
110,0	-	-	-	-	1	1	1	1	4

Theoretical no. of subjects, n_t	4	16	33	43	33	16	4	1	150

Since the subjects density is the same for all three variants and for any intersection within the tables, this confirms again the precision of the calculations, this being also a means to verify the applied methods. Also, it confirms the fact that the theoretical number of subjects determined at the bidimensional processing is the same as in the case of the unidimensional statistical processing (presented in previous papers by the same author).

2.3 Normal bidimensional distribution expressed graphically

Based on the values of the calculated function F(x,y) there have been drawn the graphical presentations from fig.1÷3, in all three cases obtaining a Gauss-Laplace bell shape, that represents also the bidimensional normal distribution surface. This confirms again, as stated earlier, that the base of the Gauss-Laplace bell is an ellipse, fact supported by the inequality $s_x \neq s_y$.

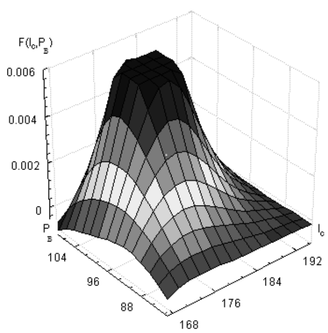

Figure 1: Gauss-Laplace bell (normal distribution surface) for the parameters $\hat{I}_c$-P_B

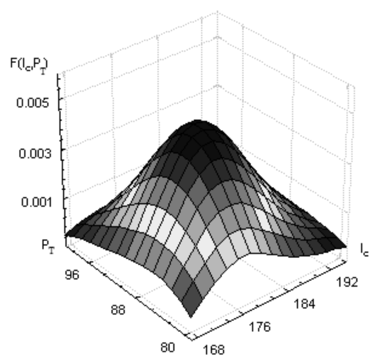

Figure 2: Gauss-Laplace bell (normal distribution surface) for the parameters $\hat{I}_c$-P_T

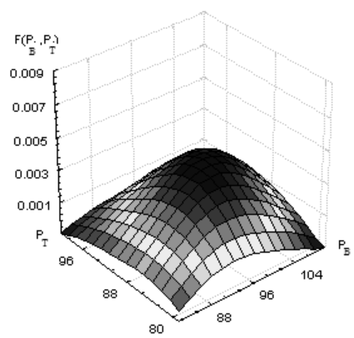

Figure 3: Gauss-Laplace bell (normal distribution surface) for the parameters P_B-P_T

3. CONCLUSIONS

Following the researches and the bidimensional statistical processings that were unfolded, there can be emphasised following conclusions:

- by analysing the 3D graphs, it can be noticed that arounf the mean value for the main dimensions, the probability density has a maximal value (property characteristic for normal distributions), while in normed deviations equally distanced from the mean value, its values decrease;
- the density of subjects with a certain height (corresponding to the body height), a certain size (corresponding to the bust perimeter) or a certain conformation (corresponding to the difference P_B-P_T), fits within an ellipse for each case, according to tables 1÷3, leading to the conclusion that the bidimensional statistical distribution corresponds, from tabular, analytical and graphical point of view, to the restrictions imposed by the Gauss-Laplace law and to the "Gauss-Laplace bell", respectively;
- the results obtained in the paper, materialised in this stage through the values of the function F(x,y), can be transformed also in percentage values for the subjects numbers, these, together with the numerical values indicated in the tables, grouped especially in the case of the correlation of the global dimensions $\hat{I}_c$-P_B, being suitable for the fundamenting of the repartition into a certain typodimension;
- these bidimensional distributions can be applied for the determining of the distribution by sizes and heights, for a certain model of a clothing product type, namely for the sizes that are close to the mean value there are made the largest number of products, after which the number decreases proportionally, for the extreme values there being realised only a small number of products;
- also based on the theoretical and experimental results emphasised in this paper, there can be realised a structuring of the main stages of the manufacturing process;

- the manner in which the combinations of sizes and heights were realised within the distributions dictates the obtaining of optimal specific.

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QUALITY EVALUATION OF THE KNITTED PRODUCTS USING THE G – F – ND METHOD

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Abstract: In a knitting factory, any activity orientated toward the evaluation, maintanence or improvement the products quality level is based on the measurement and analysis of product quality features, in order to establish the compliance to quality specifications and/or non-quality characteristics (evaluated and controled through defects and unconformities). It can be considered that non-quality is complentary to quality, although not always a clear delimitation can be made between the two cathegories or states.
This paper presents the way of evaluating the quality of the knitted produced on circular machines using a complex method of personal conception (G – F – Nd method), based on gravity – frequency – number of flaws criteria.
The idea which lies at the base of this method is: defects that affect significantly the quality are the ones of high frequency and gravity.
Key words: quality, analysis**,** defects, evaluation, metods.

1. INTRODUCTION

The evaluation of product quality level is based on measuring and examining the product quality characteristics, in order to establish conformity with the quality specifications and/or non-quality charateristics (evaluated and controled though defects and unconformities).
It can be considered that non-quality is complementary to quality although not always a clear delimitation between the two categories and states can be made.

Non-quality is evaluated with the help of defect control methods. If the method applied has a primary objective of tracking the location and defect emergence procedure, than this method can be considered analytical. On the contrary, when the method targets the evaluation of quality level of product or productive lines, than it presents a control character. Speciality literature [2, 3, 4, 5, 6, 7] proposes a series of defect control methods with the purpose of a more complete defect characterization, determination of perturbatory factors and establishment of preventive, diminutive or eventual curative solutions.

2. G-F-ND METHOD OBJECTIVES

This paper presents the way of evaluating the quality of the knitted produced on circular machines using a complex method of personal conception (G – F – Nd method), based on gravity – frequency – number of flaws criteria.

The G-F-Nd method takes into consideration the following aspects:

- Analysis of the technological process at pre-established time intervals and determination of the principal defect types;
- Assesement of defect generative causes by applying specific methods;
- Classification of defects considering their severity;
- Adoption of a penalization system for each type of defect;
- Enlistment of the quantity of quality verified knitted;
- Determination of noticed defect types frequency on verified knitted during a working day and booking the data in observation files;
- Decreasing ordering of registered frequencies;

- Compilation of a defect frequency histogram or Paretto diagram;
- Total number of recorded defects determination;
- Establishment of relative defect frequencies or cumulated defects number on the analyzed time frame;
- Determination through calculus of the Id defect index;
- Graphic representation of defect index evolution, syntetic complete indicator that offers informations not only on the number of defects per unity of product but also their gravity and frequency;
- Comparison of calculated defect index with the accepted defect index established conjunctivly by both the producer and the beneficiary.

2.1 Application of G-F-Nd for quality knitted analysis and evaluation

In the application of the G-F-Nd quality analysis and evaluation method for this paper, records from two profile economic units (generically called A and B) were used. Mentionable is the fact that in economic unit B all the knitting machines analysed were fitted with perfected auxilarry equipements as: conductive and protective yarn tubulature, yarn blowing system through tubes, surveilance and control devices for yarns, needles and knitted, Pulsonic type oiling appliance and ventilation equipements.

The determinations efectuated during a six month time frame are presented in table 1.

Table 1: Calculated indicators in economic units A and B

Defect types	Defect/ penaliza -tion	Calculated indicators							
		p_i/sem/ A	p_i/sem /B	p_i(%) /sem A	p_i(%) /sem B	pj med/ sem A	pj med/ sem B	pj (%) med/ sem A	pj (%) med/ sem B
Lost stitches	1 pct/stich	0,125	0,05	2,69	0,79	0,021	0,008	0,45	0,13
Stitch run on portions over 30 cm	1 pct/cm	9,87	5,27	243,26	75,65	1,645	0,878	40,54	12,60
Stripes caused by absence of one of 2 yarns the system fed (irregulary distributed stripes)	1 pct/cm	9,38	21,3	241,05	299,1	1,56	3,55	40,18	49,86
Stripes caused by system failure (uniformly distributed stripes)	0,5 pct/cm	0,026	1,79	0,76	25,28	0,004	0,29	0,13	4,22
Accidental loop acumulation (forming double stitches)	0,5 pct/cm	0,28	2,34	7,75	33,89	0,047	0,39	1,29	5,66
Holes	5 pct/ def	1,02	4,08	26,78	55,57	0,17	0,68	4,46	9,26
Oil smears	5 pct/pată	1,208	3,47	23,56	48,26	0,20	0,58	3,93	8,04
Oiled fly dusts hardened in the knitted	10 pct/def	2,12	4,47	54,15	61,39	0,35	0,745	9,025	10,23
	∑	24,029	24,029	600	600	4,005	7,12	100	100

Considering the determinations efectuated on the two economic units the following indicators were calculated:

- p_i – monthly defective fraction:
  p_i/defect = Σ Nr. of penalized points per defect/ Nr. of kg of verified knitted;
- p_i (%) – procentual defective fraction/month, defect;
  p_i (%) = Σ Nr. of penalized points per defect/ Nr. of penalized points per month;

- p_j – semestrial defective fraction for each type of defect: $p_j = \Sigma p_i$;
- $\overline{p_j}$ – average semestrial defective fraction for each type of defect:

$$\overline{p_j} = \frac{\sum_i p_i}{k} \tag{1}$$

where k = 6 (number of months in a semester);

- p_j (%)/sem. – procentual semestrial defective fraction for each type of defect: p_j (%)/sem. = Σp_i (%);
- $\overline{p_j}$ (%)/sem. – procentual average semestrial defective fraction for each type of defect:

$$\overline{p_j}(\%)/sem = \frac{\sum_i p_i(\%)}{k} \tag{2}$$

Defects noticed in knitted (clasified by four criteria) are presented in table 2:

Table 2: Defects scoring and encoding

Types of defects	Code	Points alloted	
		Code	Value
Critical defects(c) Stitch runs on portions over 30 cm	c_1	Pc	10 %
Holes	c_2		
Lost stitches	c_3		
Main defects(p) Stripes caused by absence of one of 2 yarns the system fed (irregulary distributed stripes)	p_1	Pp	5 %
Pete de ulei Oil smears	p_2		
Secundary defects (s) Oiled fly dusts hardened in the knitted	s_1	Ps	3 %
Accidental loop acumulation (forming double stitches)	s_2		
Stripes caused by system failure (evenly distributed stripes)	s_3		

By decreasing ordering of average defective fractions of noticed defects the Paretto diagrams, presented in comparison in figura 1, were built.

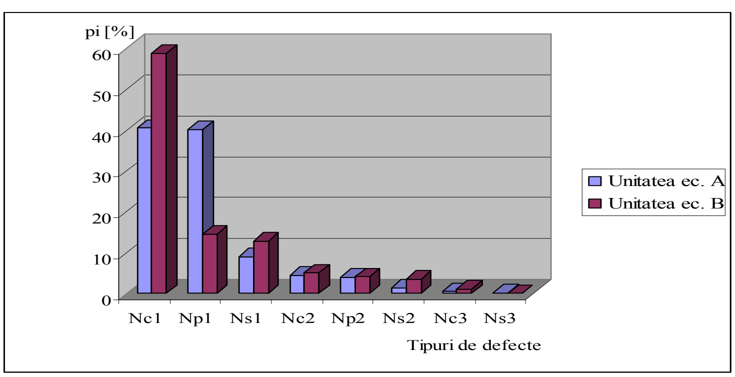

Figure 1: Paretto diagrams in comparison at the two economic units

Conclusions regarding aplication of Paretto analysis:

In economic unit A:

- greatest losses are due to lost columns (c_1) and stripping that appear following the break of one out of the two yarn of the feed system (p_1), summing approx. 81% of the total noticed defects;

- high frequency of lost columns reflects the inadequate quality of the needles, but also non-compliance with the maintanance plan that stipulates period changes of all knitting machine needles;
- high freaquency of unevenly distributed stripping demonstrated the usage of inadequate quality yarns and non-compliance of the technological regime by poor survelaince of the machines by the personnel; at the same time, lack of control devices leads to missing in due time the break of one of 2 yarns fed by the system and not stoping the machine to fix the defects.
- to these two types of defects is added the quite frequent appearence of oiled fly dusts hardened in the knitted (s_1), due on one hand to the lack of ventilation and fly dust absorbant equipements and performant lubricating devices in the machines and on the other hand to not cleaning the knitting machines by the working personnel;
- the 3 types of defects summing 90% of the total, lead to significant losses in knitted quality, necessary time for partial defect remedy and necessary time for re-tailoring the details containing defects in the tailoring room;
- the efforts of the operative personnel in the productive sections of economic unit A must be concentrated on elimination or significant reduction of causes favorizing the appearence of these defects, in order to substancially improve the knitted quality.

In economic unit B:

- greatest losses are due to uneven distributed stripping (p_1), by a break in one of the two yarns fed by the system, as well as runned stitches columns on segments bigger than 30 cm (c_1). The high freaquency of stripping (approx. 50%) and the average frequency of lost columns (approx. 13%) can be explained mainly though usage of inadequate quality yarns that either snap or cause deterioration or breaking of the needles.

From the comparative analysis of defects recorded at the two economic units results that the frequency of severe defects (critical and main) in unit B is much lower (approx. 62%) than in unit A (approx. 81%), explained by the equipement of knitting machines with perfected auxiliary devices that contribute to the substancial improvement of quality of the knitted produced.

The study of defects frequency allows the elaboration of some action plans oriented towards „the critical points" of the knitting proccess.

2.2. Calculus of average defect indicators for the analysed products

It has been designated N: the volume of the specimen, and Nc, Np and Ns: the number of defects critical, main and secondary observed in the ensemble of studied characteristics. The defect index of the batch containing the sampled specimen has been calculated using equation 3:

$$\overline{Id} = \frac{Nc \cdot Pc + Np \cdot Pp + Ns \cdot Ps}{N} = \frac{\sum Ni \cdot Pi}{N} \qquad \textbf{(3)}$$

$$Defects / kg[Ni] = \frac{penalization.pt./kg.}{penalization.pt./defect} \qquad \textbf{(4)}$$

where: Pi – points alloted to each type of defect (Pc = 10, Pp = 5, Ps = 3).

In figures 2, 3 it is comparatively presented, for the knitted realized in the 2 economic units, the variations of defect type frequencies (critical, main and secondary).

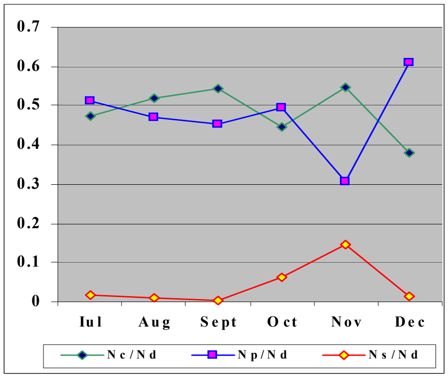

Figure 2: Variations of defect types frequencies in economic unit A

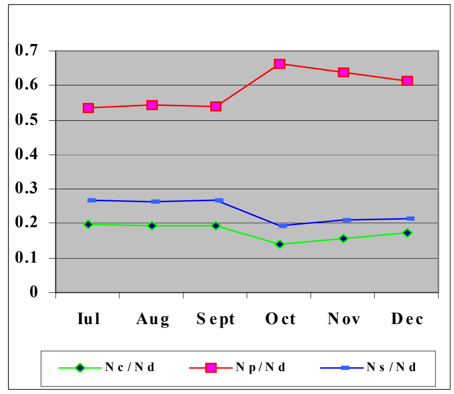

Figure 3: Variations of defect types frequencies in economic unit B

It can be observed that in the case of economical unit A the main and critical defects are prodominant (average frequency of these variating around 50%), while in economical unit B, only the main defects have a frequency above 50% , the critical defects being much fewer.
By processing the recordings made and applying the 3, 4 equations the centralized results have been obtained in table 3.

Table 3: Centralized results in the 2 economic units

Unit A	**Nd**	3,301	3,283	5,254	2,752	3,453	2,571
	Nc/Nd	0,472	0,519	0,542	0,445	0,547	0,379
	Np/Nd	0,511	0,470	0,453	0,494	0,307	0,608
	Ns/Nd	0,017	0,011	0,005	0,061	0,146	0,013
	Id	**7,33**	**7,58**	**7,70**	**7,10**	**7,44**	**6,87**
	Id/sem. = 7,34						
Unit B	**Nd**	6,546	6,03	5,026	6,894	6,454	6,212
	Nc/Nd	0,196	0,192	0,195	0,142	0,155	0,171
	Np/Nd	0,535	0,543	0,538	0,665	0,637	0,613
	Ns/Nd	0,267	0,265	0,267	0,193	0,208	0,216
	Id	**5,436**	**5,430**	**5,441**	**5,324**	**5,359**	**5,423**
	Id/sem. = 5,402						

By virtue of the results presented in table 3 it has been established the variation of monthly average defect index for the 2 economic units, prezented comparatively in figure 4.

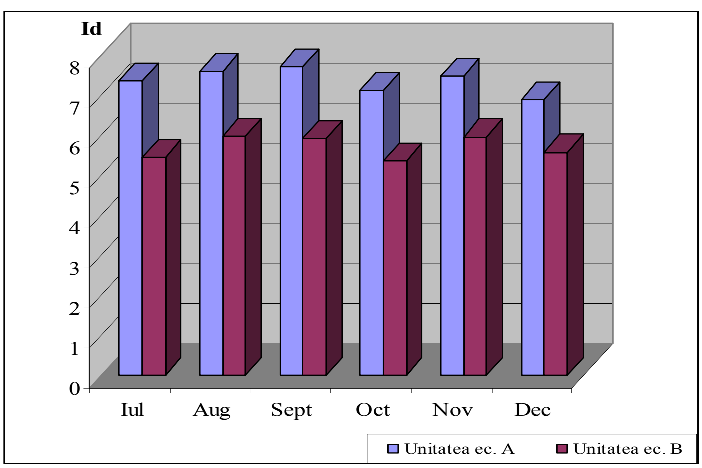

Figure 4: Comparison between the average indicators of defects realized by the 2 economic units

The significance of the value of average defect indicators translates in better quality or lower quality of the knitted. This fact can be also demonstrated by interpreting figure 5.

Figure 5: Correlation between the average defect indicator and quality level

Using the adopted penalizing points system (10 for critical defects, 5 for main defects and 3 for secondary defects) and representing this value system on an axis it can be concluded that:

- for low values of average defect indicators (between 1 and 3) corresponds a high quality knitted;
- for high values of average defect indicators (that come close or are equal to 10) corresponds a very low quality knitted;
- for medium values of defect indicators (equal to 5,5) corresponds medium quality knitted (good);
- **the lower the average defects indicators** (defect frequencies are low), **the closer to optimum quality the knitted is. If avergae defect indicators are above the medium value (5,5) and closer to the extreme (10), the quality of the knitted drops,** risking unacceptance by the beneficiary.

By comparing to this scale the average defect indicators obtained for the realized products by the 2 economic units, it can be affirmed that because the average index or defects/ semester on the products realized by unit B is inferior to the medium value (Id = 5), the quaity of the knitted is superior to the ones realized by unit A for which the average index of defects/semester is above 7. This fact can be explained though the usage of higher quality yarns in economic unit B, as well as equipement of the circular Metin machines in this unit with knitted quality protective mechanisms and devices.

Mentionable is the fact that in the knitting industry, the admitted average defect index must be negotiated in agreement by the producer and the beneficiary.

3. CONCLUSIONS

Evaluating the knitted quality with the G-F-Nd method presents the following advantages:

- The methos is an ample analysis of the productive proccess, that allows the accentuation of the quality realized during a certain period of time;
- The method offers informations on the total number of defects recorded in production and establishes the severity of the main types of defects, in close correlation with their generative causes, applying a certain system of rating;
- It allows the clasification of defects considering their severity, by summing the frequencies in a period of time;
- It offers a clear image on the defect distribution and identification of those that compose an important percentage of „total quality losses" (the first 2-3 high frequency defects);
- It grants the oportunity to establish a plan of measures for exclusion of fabrication deficiencies, as well as preventive or elimination methods for the main defects;
- Offers informations regarding the evolution of defect frequencies in time;
- The average defect index is a complete quality indicator, a mirror of the quality level of the products realized in a time frame;
- The calculus of the average defect index can be made in equal measure for both countable defects and atributive defects.

- The application of this method gives the posibility of negociating fully informed, the value of average defect index, accepted by the benficiary.

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PREDICTION OF DIMENSION AND PERFORMANCE OF FINISHED COTTON KNITTED FABRIC FROM KNITTING VARIABLES

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Abstract: For finished cotton knitted fabrics required areal density, width and lower shrinkage values are vital quality requirements in order to produce garments with satisfactory dimensional performance.So achieving required finished areal density (generally expressed as GSM i.e. Grams per Square Meter) and width with an acceptable shrinkage value is always the ultimate target of a finished fabric manufacturer.As there is no direct relation with grey knitting parameters to the finished fabric specification,knitters and finishers generally go for a number of sample trials to meet the target. But this practice is too much time consuming and expensive.In this work, with the help of simple weft knitted faric geometry, it has been shown that some mathematical relations may be established with finished fabric dimension to the stitch length (length of yarn in a knitted loop) in the fabric and the derived equations may be conveniently used for predicting GSM, width and ultimately shrinkage of a finished cotton knitted fabric.
Key words: Knitted Fabric, Single Jersey, Stitch Length, Stable State, C.P.I., W.P.I.,GSM,K-Factors, Regression

1. INTRODUCTION

The dimensional stability of knit fabrics is an important area of the knitting industry. There are various factors influencing the dimensional stability as well as the shrinkage of the knitted fabrics. Studies have been carried out over time and it was concluded that the geometry of knitted fabrics are based on two fundamental factors such as:

(1) The different dimensionally stable states (i.e. relaxation states) to which the knitted fabrics are imposed and
(2) The loop length i.e. the length of yarn in the knitted loop (stitch length).

By evaluation of the above two factors some geometrical constants (K-factors) can be achieved which may be used as effective tools for prediction of finished knit fabric dimensions and performance of a particular knit structure.[1]

2. OBJECTIVES

1. To know how to calculate finished fabric dimensions and performance like Width, Areal Density [generally expressed as grams per sq. metre (GSM)] for any target value like shrinkage from knitting parameters using fabric geometry.

2. To determine the stable state or fabric geometry constants, i.e.Kc and Kw for particular finished cotton weft knitted fabric (here Plain single jersey fabric) at fully relaxed state.

3. To check the accuracy of the derived Kc and Kw values with the help of statistical analysis.

3. REFERENCE DIMENSIONS AND REFERENCE STATE

Knitted fabric dimensions are difficult to measure consistently and reproducibly because they are always more or less distorted .The most useful and reliable way to properly characterize a knitted fabric is to measure it in relaxed condition-with all distortions removed .The most effective relaxation treatment is a vigorous wash followed by tumble drying .Such a procedure will bring out all the shrinkage that a fabric or garment is likely to exhibit during use. Through such a treatment a fabric sample will be converted into a stable state in which meaningful measurements of its construction and performance can be made.This stable configuration is called the reference state and the fabric dimensions at this state are known as reference dimensions.

A fabric in its reference state can be assumed to have essentially zero shrinkage and therefore if its characteristics (course per unit, wales per unit, areal density, width) are known, then it is a simple exercise to calculate the corresponding values for a fabric with a given shrinkage.Conversely, if target values are given for the final weight and width , then the consequent levels of length and width shrinkage can be calculated if these targets are achieved[3].

4. CALCULATION OF FINISHED KNITTED FABRIC DIMENSION AND PERFORMANCE FROM FABRIC GEOMETRY CONSTANTS

The results of researches into knitted-fabric geometry have enabled some important relations to be derived. Two of these are :

At relaxed or stable state

1. The number of courses per unit length is inversely proportional to the stitch length, i.e.

$$c \propto 1/l \text{ or } c = Kc/l$$

2. The number of wales per unit length is inversely proportional to the stitch length, i.e.

$$w \propto 1/l \text{ or } w = Kw/l$$

A knowledge of such constants enables the finisher to determine to what dimensions he should finish the fabric, e.g. the weight and width that correspond to a given level of shrinkage.[5]

From the concept of reference state the relationship among delivered (finished) state, reference state and shrinkage may be established as follows :

Delivered C.P.I. = Reference State C.P.I. × (100- Length Shrinkage) / 100
Or, Delivered C.P.I. = Kc/l × (100- Length Shrinkage) / 100 **(1)**

And

Delivered W.P.I. = Reference State W.P.I. × (100- Width Shrinkage) / 100
Or,Delivered W.P.I. = Kw/l × (100- Width Shrinkage) / 100 **(2)**

Knowing the values of delivered or finished C.P.I. and W.P.I. one can easily calculate finished width and GSM of the fabric at a target shrinkage value from the following formula

Delivered Width in inch (Open) = No. of needles/ Delivered W.P.I **(3)**
Delivered GSM = [Delivered Courses/ cm× Delivered Wales/cm × Stitch Length(cm) × 59]/Yarn Count (Ne) [3] **(4)**

So determining the values of stable state constants, i.e.Kc and Kw builds the basis for the prediction of fabric performance from knitting variables.

5. EXPERIMENTAL PROCEDURE:

1. Knitting 10 samples of plain jersey fabrics each of 1 meter in length with 10 different stitch lengths. The knitting machine was of 24 gauge and 23 inch dia. and of PAI LUNG origin, the selected yarn count was 30/1 Ne.
2. Dyeing and finishing these samples with a batch of bulk production. The wet processing route was like below:
   Dyeing→ De-watering→ Dryer→ Compactor.
3. Applying a Reference Relaxation Procedure (Three wash Tumble dry cycle) so that the fabric reached the fully relaxed state.
4. Measuring values of relaxed C.P.I. and W.P.I. of these samples at standard atmospheric condition,i.e.20^0 C and 65% R.H.(Relative Humidity).
5. Constructing graphs by plotting the values of C.P.I and W.P.I Against 1/stitch length. Here least-square curve fitting method was applied with the help of Microsoft Excel Software.

6. Determining the values of Kc and Kw from the obtained graphs through regression statistics.

6. RESULTS

Table 1 and Table 2 show the summarized results obtained through the experimental procedure.

Table 1: Values of relaxed state C.P.I. of Plain Single Jersey fabric for different stitch length

Observation No.	1/stitch length(in inch)	Courses per inch (C.P.I.)
1	8.14	45
2	8.20	47
3	8.52	50
4	8.79	52
5	8.98	54
6	9.24	55
7	9.51	57
8	9.58	60
9	9.77	62
10	9.96	62

Table 2: Values of relaxed state W.P.I. of Plain Single Jersey fabric for different stitch length

Observation No.	1/stitch length(in inch)	Wales per Inch(W.P.I)
1	8.14	39
2	8.20	39
3	8.52	40
4	8.79	40
5	8.98	41
6	9.24	41
7	9.51	42
8	9.58	42
9	9.77	42
10	9.96	43

7. GRAPHICAL REPRESENTATION OF RESULTS WITH STATISTICAL ANALYSIS

The obtained results were analyzed with the help of Microsoft Excel advanced features (Chart wizard and Data analysis toolpack). Following figures with statistical analysis were obtained.

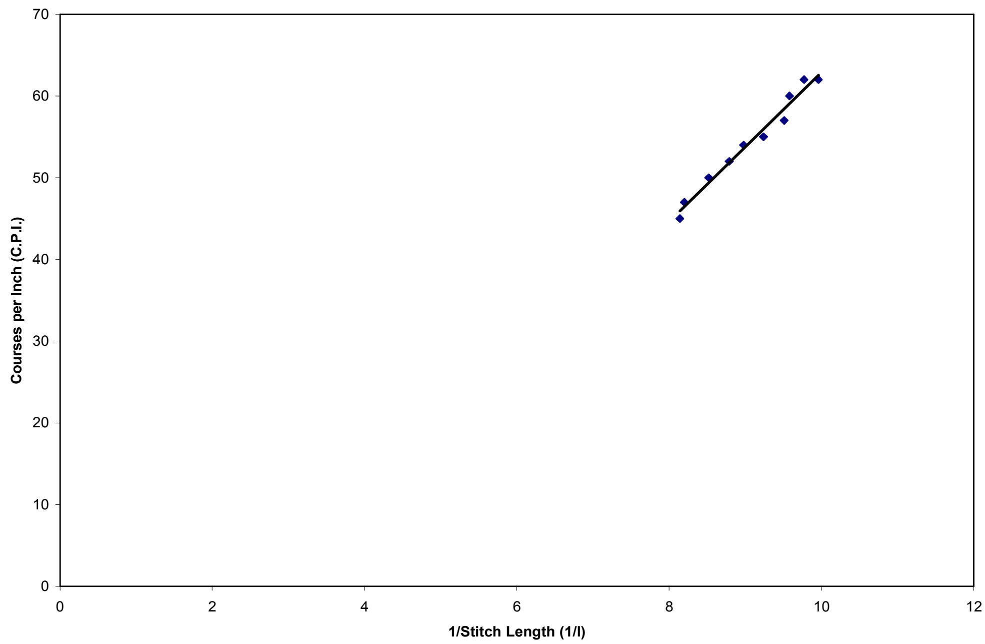

Figure 1: 1/Stitch Length (1/l) vs. Courses per Inch (C.P.I.) with trend line

Table 3: Statistical analysis for figure 1

Regression Statistics	
Multiple R	0.988688267
R Square	0.977504489
Adjusted R Square	0.97469255
Standard Error	0.952139213
Observations	10

Intercept	-28.45708239
X-Variable	9.13629754

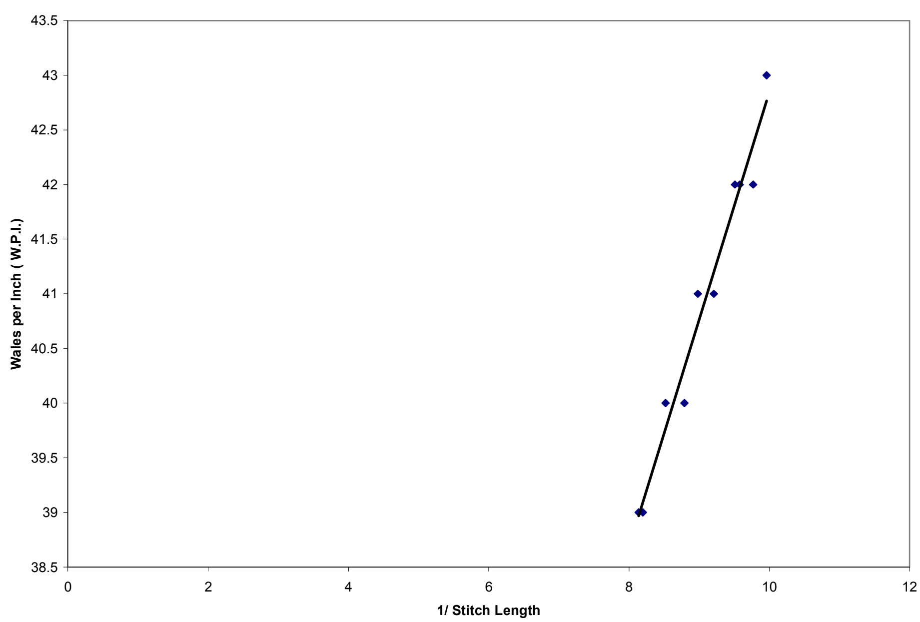

Figure 2: 1/Stitch Length (1/l) vs. Wales per Inch (W.P.I.) with trend line

Table 4: Statistical analysis for figure 2

Regression Statistics	
Multiple R	0.984726575
R Square	0.969686427
Adjusted R Square	0.96589723
Standard Error	0.253056168
Observations	10

Intercept	21.98822636
X-Variable	2.08601077

8. DISCUSSION ON RESULTS:

1. "R- square" value is a "goodness of fit" measure[4]. R^2=0.977504489 (For fig.1), means approximately 97.75% of the variation in relaxed state C.P.I. and R^2= 0.969686427 (For fig.2) means approximately 96.97% of the variation in relaxed state W.P.I.values can be explained by the knitting variable stitch length (l).

2. X-variables from Table 3 and Table 4 indicate the slopes of the trend lines in Fig.1 and Fig.2.These are the values of stable state constants (i.e. Kc=9.14 and Kw=2.09) which may be used for predicting finished fabric width and GSM at a target shrinkage value.

9. CONCLUSION:

The work was a scientific approach to establish a relation with knitting variables to finished fabric specification. The research was carried over plain single jersey fabric but similar procedure may be applied for other knit structures. There is also scope for careful study over the influence of yarn count though it was found non-significant in early studies of fabric geometry.Knitter and finisher may apply such procedure confidently to determine their own K-Factors and use these to predict finished fabric dimensions and performance for their processing routes. [2]

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DEVELOPMENT OF AN INTERACTIVE FASHION ACCESSORY FOR VISUALLY IMPAIRED PEOPLE

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Abstract: There are about 148,000 blind people in Brazil and approximately 2.4 million people who claim to have great difficulty to see. This large population might benefit from usage of assistive technologies that allow greater mobility and greater accessibility to public facilities, promoting this way social inclusion and improving quality of life. This paper presents the development of a fashion accessory – a cap – that alerts for shock of the head and upper part of the body with frontal obstacles. Such high obstacles are not detected by the touch of the stick that is typically used by visually impaired people. The developed product is a micro controlled cap with built-in circuit, optical obstacle detector and acoustic/tactile alarm. The caps were tested by 22 volunteers who also answered a questionnaire about the most important characteristics of the cap. Preliminary results show that most of the volunteers have easily learned how to operate the cap. Moreover, the possibility to independently turn on and of each one of the actuators (vibration motor and buzzer) has been considered of must importance.
Key words: Obstacles sensor, visually impaired, assistive technology, urban mobility.

1. INTRODUCTION

Data from the 2000 census show that in Brazil, about 14.5% of the population carries some form of disability. The Northeast is the region with the highest percentage of people with disabilities: 16.8%. Thus, there are about 148,000 blind people in Brazil and approximately 2.4 million people who claim to have great difficulty seeing. The Northeast region concentrate around 57,400 people who declared themselves blind [1].

This large group of citizens needs assistive technologies to allow an autonomous mobility in urban environments and an autonomous access to public facilities. According to the Technical Assistance Committee of the Special Secretariat for Human Rights (Presidency of Brazil), assistive technology includes products, resources, methodologies, strategies, practices and services that aim to promote functionality related to the activity and participation of persons with disabilities or reduced mobility, promoting their autonomy, independence, quality of life and social inclusion [2].

The most common assistive technology product among visually impaired people is the cane, which allows detection of lower obstacles, helping this way an independent walk. For a very short minority, it is complemented by a guiding dog. Nowadays, there exist several smart canes that include electronic de-vices for helping and guiding mobility. For instance the NaVi-Cane [3], developed by Sungbae Jo, that integrates sensor and GPS is one of the models al-ready available on the market. However, the canes don´t detect higher obstacles that are the cause of several accidents. Moreover, such canes are not affordable by the majority of the Brazilian population who needs.

In this context, fashion products, as for instance smart clothes or smart accessories, that integrate electronic components such as microcontrollers, tiny sensors and actuators, might be considered as assis-tive technology products. These smart fashion products may complement the function of a regular cane, helping the detection of obstacles in a very discrete and non stigmatizing way. The work of Leonardo Gontijo, consisting on the development of sensors to be hold in different parts of the body, has been re-ported in social media [4] as a promising assistive technology solution.

However, these type of products still remain unaffordable to the majority of the Brazilian visually impaired population.

This paper presents the development of a cap that integrates a sensor of obstacles and an alert system. It is made of Brazilian sustainable materials and may be produced and commercialized at an affordable price. Some preliminary studies of its functionality are presented.

2. DEVELOPMENT OF THE SMART ACCESSORY - SENSOR CAP

The cap is a fashion accessory universally used. It is very common among the population of the North-east Brazilian region to protect users from strong sunshine. Therefore, it appears to be a good accessory to be transformed integrating sensors that will al-low the detection of frontal and high obstacles.

The main desirable features of this cap are:

- the ability to detect frontal obstacles;
- the low constraint on the user;
- the weightless;
- the low cost;
- the easy learning and usage in daily routines;
- the autonomy (low battery consumption);
- the robustness;
- the aesthetic;
- the easy maintenance.

2.1 The electronic components

In order to be able to achieve the functional features, the cap should integrate a sensor, to detect obstacles, and should also integrate actuators, to inform the user about the risk of impact. The electronic devices should be as small, thin and light as possible in order to be embedded in the cap without constraining the user.

In the cap here presented, the chosen sensor is an optical one, instead of the larger sound sensor that has been used in the smart canes above referred. The optical sensor used is the model GP2Y0A02YK0F, produced by Sharp. It senses object from 20 to 150 cm distance.

Two devices are used to alert for existing frontal obstacles: a standard buzzer and a standard mechanical vibrator. They are positioned in both lateral sides of the cap. They can be used together or separately to alert the user for the risk of impact. Therefore, the user can choose the alert system he prefers or the one that is more perceptible according to the ambience. For instance in noisy ambiences the vibrator is preferred as it might be more perceptible.

In order to connect the sensor to the actuators, the electronic platform named Arduino Lillypad is used. In plus to it, two extra plaques are used to activate each actuator: the buzzer and the vibrator.

The following figure presents the scheme of the cap, integrating the electronic devices, including the batteries.

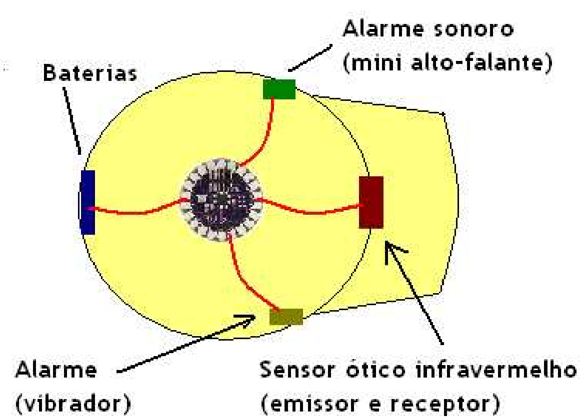

Figure 1: Scheme of the sensor cap.

A specific software allows to correspond the sensed distance to the frequency of the actuators. Therefore, the sound and vibrations are slowly repeated at 150 cm distance, faster repeated at 100cm and even faster repeated at 50 cm distance from the obstacle.

2.2 The smart fashion accessory – sensor cap

The cap should incorporate the electronic devices in fixed positions that must be accessible, to allow future maintenance of the electronic circuit, battery replacement and so on.

Preliminary prototypes were made by adapting standard caps in order to integrate on them the elec-tronic devices. Further, several specific models of the caps have been drawn to minimize the intrusive inte-gration of the devices and to facilitate the usage of the cap. Therefore, all drawn models of the caps have internal pockets that accommodate the electronic devices. Moreover, in all models the interior is easily acceded by opening a zipper or a Velcro tape.

Several materials were considered, most of all Brazilian materials, aiming to strength sustainable local productions. Figure 2 shows the interior of one of the models produced with goat's leather, in which the positioning of the several electronic devices are pointed:

- 1- frontal pocket for optical sensor;
- 2 – left pocket for the vibration motor drive;
- 3 – right pocket for the acoustic transducer drive;
- 4 – back pocket for rechargeable batteries module;
- 5 - zipper to close and protect the devices.

Figure 2: The interior of a cap made of goat leather.

Figure 3 shows the tested model that is made of goat leather, tilapia fish leather and dourada fish leather.

Figure 3: The tested sensor cap.

3. FIELD TESTS

The developed caps were tested among a population of 100 visually disabled persons, who attend the Association *Fundação de Apoio aos Deficientes – FUNAD*, at João Pessoa, Paraíba, Brazil. The sample consists in 22 volunteers, disabled persons at ages in similar proportion to the population, being 50% of men and 50% of women. It was not considered the origin or cause of the disability. It was not considered the education level neither was religious or social aspects.

The ergonomic aspects of the sensor cap were easily measured [5] with field tests that comprise two set of tests:

- 1- the training tests, with the aim of learning how to use the cap;
- 2- the verification tests, with the aim of testing the efficiency of the sensor cap.

For the training tests, the volunteers, using the cap, were sitting and were asked to identify some obstacles that were placed at determined distances: 50, 100 and 150 cm. This training was repeated 10 times.

For the verification tests, the volunteers, using the cap, were moving inside a pavilion were five obstacles were previously prepared. The volunteers were asked to detect the obstacles and to identify their distance from it. This test was repeated 5 times.

Moreover, a questionnaire was filled in order to inquiry volunteers' opinions about some important features of the cap. And interviews were made to collect personal experiences of usage.

4. RESULTS

Considering the 10 attempts of the training tests, volunteers were on average able to identify:

- 94,1 % of the obstacles placed at 50 cm;
- 95,0% of the obstacles placed at 100 cm;
- 92,3% of the obstacles placed at 150 cm.

Considering the 5 repetitions of the verification tests by each 22 volunteers:

- obstacle I was identified on 96,4% of attempts;
- obstacle II was identified on 86,4% of attempts;
- obstacle III was identified on 93,6% of attempts;
- obstacle IV was identified on 93,6% of attempts;
- obstacle V was identified on 93,6% of attempts.

Therefore, results show that most of the volunteers have easily learned how to operate the sensor cap.

The answers to the questionnaire have shown that 18 of the 22 volunteers preferred to have both actua-tors (vibration motor and buzzer). For 4 volunteers the noise of the buzzer was uncomfortable and dis-tressed. Moreover, in open questions the majority of volunteers revealed they appreciate the possibility to independently switch on and off each of the two actuators.

The interviews allow confirm the idea that the sensor cap is efficient and helpful when used in com-plement of the cane. Some interviewers loved the cap and would like to use it daily. Some would prefer more discrete caps than the ones tested or even more discrete products than the cap is.

5. CONCLUSIONS

One may conclude the optical sensor is efficient to detect frontal obstacles at 50, 100 or 150 cm distance. Moreover, the differentiation of the alarm signal for obstacles at 50, 100 or 150 cm distance are clear and helpful.

The large majority of volunteers have easily and quickly learned how to use the sensor cap. They ap-preciate the possibility to independently activate each of the two actuators. Most of volunteers use both actuators.

The sensor cap might have a lower price than other similar products of assistive technology. This makes the sensor cap more affordable which might enhance its dissemination among the visual disabled people. By this way, the sensor cap might facilitate urban mobility, improve autonomy and help social inclusion of a large number of citizens.

This work shows how design might promote social inclusion and might reduce stigmas, helping visual disabled people to live better.

6. ACKNOWLEDGMENTS

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ASPECTS REGARDING THE DESIGN OF THE CEREMONY ROBES OF THE "LUCIAN BLAGA" UNIVERSITY IN SIBIU (ROMANIA)

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Abstract: The paper presents the design of the robes of the "Lucian Blaga" University in Sibiu, continuing with the presentation of some aspects regarding the technological design. The robes are designed for specific University ceremonies (receiving delegates from other universities, opening the academic year, festive courses, offering "Doctor", "Doctor Honoris Causa" or "Senator of Honor" titles). They are for persons receiving the titles mentioned above, professors from the university management (president, rector, pro-rectors, deans, scientific secretary, and senators of the university) and graduates. The components of the robes are described, with particularizations by their user. Also, for the technological design phase, the main operations of mechanical and manual sewing are given. It is mentioned that for each manufacturing sheet, a technological sheet is made. Because the number of technological sheets is high, this parer presents only one sheet for one of the most complex manufacturing operations.
Key words: textile technologies, design, robe, fabric, clothing comfort

I. INTRODUCTION

Because the students have spontaneously adopted costumes of medieval university tradition, with the degree ceremony, University "Lucian Blaga" of Sibiu was seen obliged to design a garment diversified in categories of wearers. In medieval tradition, academics have the right to wear broad vestment, long to the ankles, like clergy, nobles and crown magistrates. Most garments include an emblematic piece, "scarf", which is long like the Roman toga, a sign of belonging to civilization.

The outfits develop starting from the one for the Doctor title which corresponds to the academic dress of the XIIIth century. The robe is wide and long, being made of black silk, with linings and trimmings of black velvet.

Senators are distinguished by the doctor red hat cap, trimmings and lining of red velvet which is visible at the high folding of the sleeves.

Doctor Honoris Causa special dress is that of Doctors, but with violet trimmings and lining, colour corresponding to the condition of Excelence.

Predoctoral academics condition as well as students are different by the colour blue with blue-indigo trimmings.

The designed clothing does not copy the ones of other universities, conforming though to European medieval clothing.

2. CONSTRUCTION CHARACTERISTICS

The designed robes, graphically presented in figure 1, present the following construction characteristics [1, 2, 3, 4]:

Figure 1. The look of ceremonial robes designed for use within the "Lucian Blaga" University of Sibiu

- The front of the robe consists of three elements (insets, front slits and the front side itself). The insets are lined on the inside and together with the slits are reinforced with woven material. The front of the robe is provided with pleats sewn longitudinally along a length of 3 cm.
- The back of the robe is made of two parts: the inset (lined on the inside and reinforced with a woven material) and the back itself, which is also provided with pleats sewn longitudinally along a length of 3 cm.
- The sleeves are provided at the top with pleats sewn longitudinally along a length of 3 cm.
- The collar which is a "band" type is reinforced with a woven material.
- The side seams between the front and back are made differently:
    - On the right side a pocket is placed without a pocket bag.
    - On the left side, the front is superimposed over the back, maintained in this way through items such as velcro. This design is made to ensure a light robe dressing/undressing by its wearer.
- The shoulder pads are covered with lining.

The distinct characteristics, depending on the wearer of the robe, are given below:

- The robes for the Rector and Senate president (figure 1a), Prorector and scientific secretary (figure 1b), Dean (figure 1c), Senator (figure 1d) and Doctor Honoris Causa (figure 1e) are supplemented by scarf.
- The ceremony dress for doctors (figure 1f), doctoral candidates and graduates (figure 1g) and students (figure 1h) is not supplemented by scarf.

Respecting heraldic coding, clothing for Rector and President of Senate is red with ermine trimmings, these representing the sovereign authority. According to the academic rank, the robes are long, lined with velvet and having ermine sleeve cuffs.

The distinct characteristics, depending on the wearer of the robe, are given below:

- The scarves for the president and rector are made of silk velvet type (inner side) and white fur (on the outside).
- The scarves for the prorector and scientific secretary are made of velvet, but on the outside

they have rectangular elements of fur.

- All the scarves (besides the one for the rector and senate president) have the university logo embroidered embroidered on the left. The university has adopted as a symbol the metamorphosis of a green rooted tree, which becomes an eagle soaring high, according to the motto “Mens agitat molem”. In the herald formula, the sign is framed in a shield with round base, the red colour as herald symbol of university authonomy, completed with the metamorphosis described above, represented in black. The emblem is the symbol of university autonomy as provided in the Charter and Constitution of Romania.

Figure 2. The logo of the “Lucian Blaga” University of Sibiu

- The sleeves have on the lower part a cuff of fur (for rector and president), fur and velvet (for deans), velvet (for prorector, scientific secretaries, senators). For other categories of wearers the sleeves are made entirely of velvet.
- Wearer’s head covering is made with hat brim or hood, depending on the wearer, but this part of the project is not part of this paper.

The robe for the rector is complemented by a heraldic-style collar (figure 3), evidence of the function. It consists of 11 medallions, each marked with the initial of one of the traditional medieval faculties which together make up a university. Medallions are connected by links in the form of “S”, which converge on the central medallion. This has gold parts and is made of solid fine silver with a diameter of 120 mm and thickness of 5 mm. The collar symbolizes the university, its autonomous status and authority put on the rector, being a heraldic ceremonial piece.

Figure 3. Collar for the rector of the “Lucian Blaga” University of Sibiu

3. USED MATERIALS

The base materials are different depending on the type, composition, colour and processing mode. For all the types of robes the lining matches the colour of the base material insets.

White fur trimmings are used for the sleeves cuffs, scarf and hat brims, on these being applied decorations of black fur [1, 2, 3, 4].

Trimmings of base material are used, in contrasting colour from the colour of the robe (robes for prorector, dean, scrientific secretary, senator of the university, senate student).

4. METHOS OF ACHIEVING THE FOLDS

In figure 3, graphics are made of folds in cross section, for front side (3a), back side (3b) and the robes sleeves [5, 6]. The representations are done for half the width of the front and, respectively of the back side of the robe.

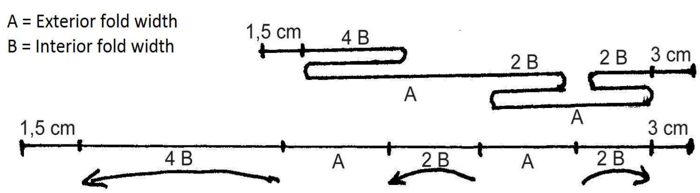


Figure 3a. The distribution of folds at the front

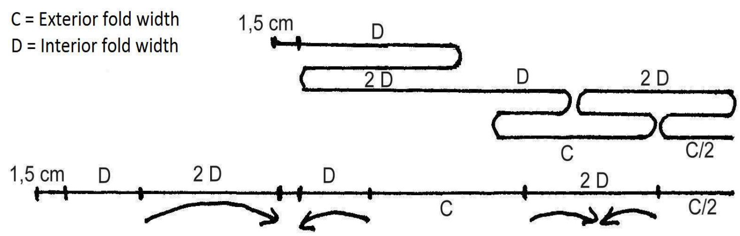


Figure 3b. The distribution of folds at the back

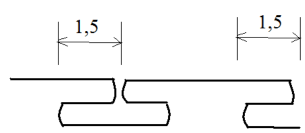
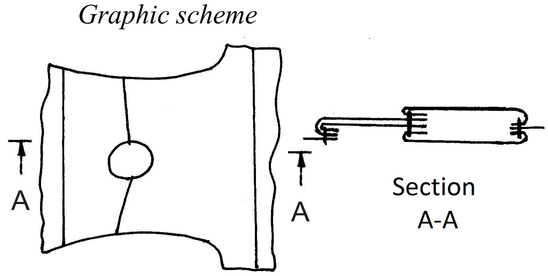


Figure 3c. The design of the folds at the sleeves

For all phases of sewing and finishing of the robes, technological sheets were developed, here being presented an example of such a sheet.

Technological sheet of operation 44

"Lucian Blaga" University of Sibiu	*Product*: University robe
Assembly of the chest with the back on the shoulders lines	
Graphic scheme 	*Equipment*: simple sewing machine or chain sewing machine *Devices*: - *Parameters*: Stitch density 4 steps/cm

Complexity: 1 *Standard time:* 5 *Salary:*	
<u>*Content of the operation*</u> - On the left side of the robe, the back inset details are overlapped, in the interior being introduced the inset of the front of the robe. - The details overlapped through the neckline are taken out and assembled, the sewing reserve having to be 1 cm. - The same is applied to the right side of the robe.	<u>*Quality requirements*</u> - Details should be perfectly overlapped at the sewings extremities. - Extremities stitches are reinforced.

5. CONCLUSIONS

Compared to the model used during the 2000s, the models designed have the following new elements:

* By using different materials, distinctions on academic functions are made.
* Being ample, thermophysiological comfort, dimensional and aesthetics are much improved.
* By making the slit on the side sewing and by the use of "velcro", it is ensured an improved convenience to the dressing-undressing.
* Using shoulder pads, these products can be worn even without jacket or costume.
* By adopting the range of sizes 42, 46, 50, 54, 58, a better distribution of the robes can be made, in function of the dimensional particularities of the population for which the robes are designed. Also, the design can be done in function of the anthropometric dimensions of the wearers.

The presented design method has the following particularities:

* By using the standard for measuring the human body, the design is more accurate.
* The base pattern design is made mainly in function on the dimension of the "distance between the shoulders", in comparison with the classic methods for which the design is made in function of the bust line.
* For a more accurate matching on the body, the robes are designed with insets made of two layers and in the shoulders zone, shoulder pads are assembled.
* Easy-fitting supplement is adopted on transversal direction (on the shoulders line) and in longitudinal direction (in the under-arm zone).
* The scarf is paired with the robe and the head covering object in order to have color matching, in these conditions the general esthetic aspect being improved.

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METHOD AND ALGORITHM FOR MASS CALCULUS OF THE FINISHED FABRIC WITH CHECK PATTERN FROM WEAVE. YARN COUNT 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 check effect at these fabrics is produced by simultaneously associating on cross and longitudinal stripes, the weaves with significantly different mean float, resulting in a contrasting appearance that can be outlined by using, at the same time, different colors. The algorithm for the mass calculus for the check pattern fabric from weave through the method of yarns number is presented as a flow chart, where the sequence of calculi is based on the logics of the dependence of data processing, in order to obtain the mass value per yarn systems and per the whole fabric. The flow chart has been conceived such that it can also be used as the basis for the development of a logical diagram meant to serve at the realization 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 (number of picks and/or yarn count) on the both yarn systems have an important place in the assortment of fabrics for both garments industry and other destinations, among which we must mention the sized fabrics: handcherchives, table cloths, napkins, etc.

The check effect at these fabrics is obtained through the simultaneous association on longitudinal and cross stripes, of weaves with significantly different mean floats, which gives contrasting aspects that can be accentuated by using also different colors.

In order to obtain an obvious contrast between subsequent stripes with different weaves, one of the weaves is of hessian type with mean float F= 1, but one can also use shadow twill weave $D\frac{1}{2}$ or $D\frac{2}{2}$.

The stripes with plain weave make in these cases the basic or the ground weave to which the other associating weaves are referred, resulting in a check pattern effect.

The check pattern fabrics produced through the association of weaves with different mean floats have a non-uniform yarn structure within the two systems. As a first consequence, the yarns positional stability on stripes with different weaves is not uniform, which has a negative influence on the fabric aspect and generally, their quality.

In order to produce a check pattern fabric from a weave with its internal structure as uniform as possible on all the stripes, irrespective of weave, it is necessary that the fabric has the compactness degree equal or close to equal in all its zones.

In order to produce a check pattern fabric from a weave with its internal structure as uniform as possible on all the stripes, irrespective of weave, it is necessary that the fabric has the compactness degree equal or close to equal in all its zones.

The mass of the finite fabric represents the basic parameter of the fabric, specified in all the Normatives and Standards which establish the main structural components that characterize the fabric, and constitute the „identity certificate" of the fabric.

The method and algorithm for mass calculation, based on the yarn count per unit length (m) or unit surface (m^2) represent the second possibility to measure the fabric mass, which can also be used as a mean to check-up the values of the established characteristics through the yarn set method.

At the same time, the necessity to develop an algorithm for mass calculation by means of the yarn count method is also motivated by the fact that the yarn count is specified as a basic fabric characteristic in Standards and Normatives.

The mass calculus through the yarn count method will be performed by taking into account the same fabric characteristics considered in mass calculus through the yarn sett (number of picks) method [5].

2. THEORETICAL CONSIDERATIONS

The algorithm of mass calculation for check pattern fabrics from weave through the yarn count method contains a calculus sequence based on the logics of determination of the data necessary to obtain the values of the basic and auxiliary parameters which represent the components that determine the fabric mass for both, yarn systems (warp and weft) and the fabric as a whole.
The algorithm used to compute the mass of the finished check pattern fabric from weave through the method of yarn count is synthetically presented in the flow chart 1.

Flow chart 1

Input data	Symbol	MU
Total width of:		
- Stripes with weave (i)		
- warp	Lu_i	cm
- weft	Lb_i	cm
- selvages	l_m	cm
Yarn set (number of picks) on:		
- Stripes with weave (i)		
- warp	Pu_i	fire/10cm
- weft	Pb_i	fire/10cm
- selvages	Pu_m	fire/10cm
Yarn shrinkage at		
- weaving:		
• warp	Cu_{ti}	%
• weft	Cb_{ti}	%
- finish:		
• warp	Cu_f	%
• weft	Cb_f	%
Mass loss or gain at finish	$\pm p_f$	%

↓

1. Calculus of total yarn shrinkage at weaving and finish

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

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

↓
①

①
↓

2. Calculus of mean shrinkage of yarns with weave 1 (Fmin)

$$a_{u1med} = \frac{\sum_{i=1}^{m} Lb_i \cdot a_{ui}}{\sum Lb_i}; \qquad a_{b1med} = \frac{\sum_{i=1}^{m} Lu_i \cdot a_{bi}}{\sum Lu_i}$$

↓

3. Calculus of warp yarn count on width l'_f l'_f

$$Nf_{u1} = (Lu_i) \cdot \frac{Pu_i}{10}$$

↓

4. Calculus of yarn count from selvages

$$N_m = l_m \cdot \frac{Pu_m}{10}$$

↓

5. Calculus of yarn count with weave (1)

$$f_{u1} = (Lu_1 + l_m) \cdot \frac{Pu_1}{10}$$

↓

6. Calculus of total warp yarn count

$$Nf_u = Nf_{u1} + \sum_{i=2}^{m} Lu_i \cdot \frac{Pu_i}{10}$$

↓

7. Calculus of mass of warp count across the width l'_f l'_f

$$M'u_f = \left[\sum_{i=1}^{m} \frac{Nf_{ui} \cdot Tt_{ui}}{10 \cdot (100 - a_{ui})}\right] \cdot \frac{100 \pm p_f}{100}$$

$$M'u_f = \left[\frac{Nf_{u1} \cdot Tt_{u1}}{10 \cdot (100 - a_{u1md})} + \sum_{i=2}^{m} \frac{Nf_{ui} \cdot Tt_{ui}}{10 \cdot (100 - a_{ui})}\right] \cdot \frac{100 \pm p_f}{100}$$

↓

8. Calculus of warp yarn mass for selvages

$$Mu_m = \frac{N_m \cdot Tt_{u1}}{10 \cdot (100 - a_{u1})} \cdot \frac{100 \pm p_f}{100}$$

↓

9. Calculus of total mass of warp yarns

$$Mu = \left[\frac{(Nf_{u1} + N_m) \cdot Tt_{u1}}{10 \cdot (100 - a_{u1md})} + \sum_{i=2}^{m} \frac{Nf_{ui} \cdot Tt_{ui}}{10 \cdot (100 - a_{ui})}\right] \cdot \frac{100 \pm p_f}{100}$$

sau

$$Mu = M'u_f + Mu_m$$

↓

10. Calculus of weft yarns mass

$$Mb = \left[\sum_{i=1}^{m} \frac{Nf_{bi} \cdot Tt_{bi}}{10 \cdot (100 - a_{bi})}\right] \cdot l_f \cdot \frac{100 \pm p_f}{100}$$

↓

11. Calculus of total fabric mass

$$Mt = \left[\frac{(Nf_{u1}+N_m)\cdot Tt_{u1}}{10(100-a_{u1md})} + \sum_{i=2}^{m}\frac{Nf_{ui}\cdot Tt_{ui}}{10(100-a_{ui})} + \left[\sum_{i=1}^{m}\frac{Nf_{bi}\cdot Tt_{bi}}{10(100-a_{bi})}\right]\cdot l_f\right]\frac{100\pm p_f}{100}$$

3. EXPERIMENTAL

The mass calculation algorithm for finite check pattern fabric from weave through the yarn count method was applied to a cotton-type fabric whose technical and structural characteristics are presented in Table 1.

Table 1:Technical and structural characteristics of the fabric

Input data	Symbol	Values	MU
Total width of stripes with weave (i)	L_i		
- in warp, on the width l'$_f$ l_f'	Lu_1	92	cm
	Lu_2	85	cm
	Lb_1	53	cm
- in weft, on l=1m	Lb_2	47	cm
	l_m	3	cm
- selvages			
Yarn set	P_i		
- warp	Pu_1	352	yarns/10cm
	Pu_2	440	yarns/10cm
	Pb_1	264	yarns/10cm
- weft	Pb_2	330	yarns/10cm
	Pu_m	352	yarns/10cm
- selvages			
Yarn shrinkage at weaving			
- warp	Cu_{t1}	10	yarns/10cm
	Cu_{t2}	5	yarns/10cm
	Cb_{t1}	10	yarns/10cm
- weft	Cb_{t2}	12	yarns/10cm
	Cu_{tm}	6	yarns/10cm
- selvages			
Yarn shrinkage at finish	C_{fi}		
- warp	C_{uf}	+4	%
- weft	C_{bf}	-8	%
Mass loss or gain at finish	$\pm p_f$	-4	%

4. RESULTS

By applying the algorithm from the flow chart 1 to a fabric with the technical and structural characteristics presented in Table 1, one obtains for the finite fabric mass the values presented in Tab2

Table 2: Experimental results

Name of the computed parameter	Symbol	Value	MU
1. Total shrinkage of yarns at weaving and finish			
- warp	a_{u1}	6,4	%
	a_{u2}	1,2	%
	a_{um}	6,4	%
- weft	a_{b1}	19	%
	a_{b2}	13,5	%
2. Mean shrinkage of yarns from the stripes with weave 1 (plain weave)			
- warp	a_{u1med}	4,0	%
- weft	a_{b1med}	16,3	%
3. Yarn count from ground on width l'$_f$			
- warp- plain weave (1)	Nf_{u1}	3240	yarns

atlas weave (2)	Nf_{u2}	3740	yarns
selvages	Nm	106	yarns
4. Weft yarn count on the length of 1m			
plain weave (1)	Nf_{b1}	1400	yarns
atlas weave (2)	Nf_{b2}	1550	yarns
5. Mass of warp yarns			
for ground on the width l'_f	$M'u_f$	114,5	g/m
for selvages	$M'u_m$	1,8	g/m
total	Mu	116,3	g/m
6. Mass of weft yarns on the length of 1 m	Mb	98	g/m
7. Total mass of finished fabric	Mt	214,3	g/m

5.CONCLUSIONS

Algorithm of finished fabric mass calculation concerns the fabrics manufactured on non-conventional Sulzer- Rutti and STB weaving machines, at which the shadow welt is executed by inserting the weft yarn ends with a length of lm/2 within the next lease, considering that the check weave repeat in only present in the ground zone across a width l'_f.

Irrespective of the fabric condition- grey or finished- the length of the yarns contained in the fabric does not change. That is why in the mass calculus for yarns, from warp or weft they must be considered at their initial value before the fabric transformation: Lu for warp and Lb for weft.

The method and algorithm for mass calculation based on yarn count per unit length (m) or unit surface (m^2) represents a second possibility for fabric mass measurement, which can also be used as an alternative to check up the characteristic values established through the yarn sett (number of picks) method, also motivated by the fact that in the Standard and Normative the yarn count is specified as a basic characteristic of the fabric.

The mass calculated through the both methods- yarn sett (number of picks) and yarn count- has identical values, therefore the proposed calculus algorithms are correct and they are recommended to be used in designing this family of fabrics.

Irrespective of the manufacturing location and the technical conditions, of the processing technological procedure or logistic characteristics available, the resulted fabric must satisfy the stipulated level for the basic and auxiliary characteristics from Standards and Normatives concerning the „finished” fabric.

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QUALITY ASSURANCE PROCESSES IN COMPANIES PRODUCING KNITWEAR GARMENTS

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Abstract: Manufacturing cycle of a producer of knitwear and clothing require compliance of certain criteria that can bring or not, performance in quality. The complexity of a product is higher and as the consignment is greater, the risks of manufacturing the product will increase, and therefore will grow also the costs of obtaining high quality products. A first step is to establish the elements to be pursued in particular[10].
Key words: *quality, assurance, garment companies, knitwear*

1. INTRODUCTION

1. **Quality assurance in constructive and technological design -** can be achieved through a series of actions, including[11]:
   - ✓ Performing analysis of existing technologies and products in terms of quality;
   - ✓ Ensuring appropriate information product design;
   - ✓ Providing financial means.
2. **Quality assurance of zero series -** zero series implementation and verification aims to detect possible defects in design and technology of the products prior to launch series production;
3. **Quality assurance at inspection of raw materials -** the main raw material reception and secondary feature shall be made on the control ramps. It can adjust the position of plan that runs the material, may change depending on the applied voltage of material structure, may adjust the speed of the material;
4. **Quality assurance of raw materials in stage storage -** storage of raw materials can exert a negative influence on quality when it is achieved under unfavorable conditions. For storage materials should to ensure standard conditions of temperature and humidity, each stored material to be packed, to make a periodic cleaning of storage facilities;
5. **Quality assurance in preparing lots for cutting -** is to establish correspondence between features and characteristics of raw materials orders;
6. **Quality assurance at swarfing -** includes:
   - ✓ stabilization of swarf so that sheets of swarf do not move to each other;
   - ✓ placing sheets of swarf so as not to be overstressed and not under pressure;
   - ✓ achieve perfect wall as by overlapping sheets of scrap that is placed on the operator.
7. **Quality assurance in glabrouse cutting and contour cutting -** a cutting lead to incorrect critical defects such as unpleasant aspect of assembly lines, incorrect size benchmarks, wrinkles or crooked seams. Textile materials cutting is done in two stages:
   - ✓ swarf sectioning;
   - ✓ cut from swarf marks;

   Sectioning of swarf is performed using mobile machines with circular cutter or vertically knife Cropping marks are executed with fixed blade continuous cutting machines.
8. **Quality assurance at thermo-bonding -** Product quality assurance by thermo-bonding is possible only in case of compatibility between base material and insertion of the following ways: dimensional changes after heat-bonding, flexibility and material thickness.

9. Quality assurance in stage of sewing - is an important step in ensuring product quality, at this stage are valued characteristics of textiles and new features are obtained as products:

a. technological aesthetic processing;
b. product appearance and dress;
c. dimensional correspondence;
d. ease of dressing – undressing;

Factors influencing quality of sewing operation are [1]:

- ✓ Type and characteristics of the fabric;
- ✓ Type and design of stitch;
- ✓ Characteristics of working bodies;
- ✓ Type and characteristics of sewing thread;
- ✓ Characteristics of technical documentation;
- ✓ Assembly features;
- ✓ Technological parameters of sewing;
- ✓ The human factor

10. Providing quality of products made by finishing

Finishing of products is made through: humido-thermal, finishing thermal treatments, labeling, sorting and packaging[14]:

- ✓ humido-thermal finishing aims to improve quality of manufactured products;
- ✓ humido-thermal finishing is achieved by pressing, steaming and pressing.

11. Quality assurance in the finished products sorting stage - sorting is a step in seeking the appropriate separation of defective products.

12. Quality assurance by labeling - made from washable or fixed materials, or just attached to the product labels contain some information on [7]:

- ✓ producing company (name, logo, address);
- ✓ product name;
- ✓ fiber composition;
- ✓ size (Size);
- ✓ conditions for maintenance of the product;
- ✓ price.

For better user information are used at least two types of labels, namely:

- • identification and characterization of labeled product;
- • maintenance label.

13. Quality assurance at product packaging

Quality assurance at this stage involves:

a. supply of all necessary materials for the packaging stage, the quantity and quality of desired level;
b. compliance with fidelity every time of the packaging instructions required by the beneficiaries of the order;
c. initial verification of necessary materials (bags, boxes, hangers, standers, adhesive tapes, cartons, labels to be affixed to the packaging);
d. increase of automation in the packaging operation.

2. CONCLUSIONS

To improve quality and ensure the knitwear garment companies should be taken the following steps:

- Quality assurance zero series[16];
- Quality assurance inspection of raw materials;
- Quality assurance of raw materials in storage stage;
- Quality assurance in preparing lots for cutting;
- Quality assurance to swarfing;
- Quality assurance of glabrous sectioning after contour cutting;
- Ensuring quality sewing stage;
- Providing quality products made by completing;
- Quality assurance by labeling;

- Quality assurance of packaging.

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THE INFLUENCE OF TENCEL FIBERS ON UNDERTAKING FABRICS DRAPE COEFFICIENT

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Abstract: The shape of a produced garment depends on the garment construction and the incorporated material . The end of the produced cloth depends on the qualities of the build material and its construction requirements. These can be estimated subjectively or objectively after the cloth is finished. The raw materials used to obtain clothing products, dictate the comfort of these products. The drape of the fabrics is one of the most significant properties which characterize the shape of produced cloths.
Cellulose fibers, have fine silk and gloss, the resistance of polyester, the comfort provided in wool and flaxen in different climatic conditions, the absorption capacity of cotton, dimensional stability, and pronounced cloth covering that facilitate an easy maintenance as acrylic. Characteristics of fibers such as Tencel/ Lyocell and Modal, improve the sensitive textile materials made from fibers blended with them. (Transport of moisture, heat conductibility, cough, permeability to air and vapor, structure, drape coefficient. etc.). Particularly, in this paper, the capacity of Tencel fiber has been analyzed to improve textile materials` drape, made from fibers blended with that by a visual method, comparing the drape coefficient and drape fold number.
Key words: Tencel, fiber, drape, drape coefficient, textile, cloth

1. TENCEL FIBER

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 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 adhere 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. 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 1 – Tencel Fiber – fibril and non-fibril appearance

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. [7]

2. EXPERIMENTAL METHODS FOR ASSESSING THE CAPACITY OF TENCEL FIBER FOR DRAPE IMPROVEMENT

The cloth drape capacity is defined by a textile`s tendency to take a certain position and shape. Fabrics are a complex mechanism of interwoven threads that are themselves mechanisms of twisted fibers. Drape is a property of fabrics associated with aesthetic appearance of garments and other textile structures. Fabric drape can be defined as a description of the deformation of the fabric produced by gravity, when only part of it is directly supported. This quality determines the construction of products and clothing and can be assessed by a visual method. The simulation of fabric drape is an interesting problem and there are many possibilities, including computer-aided design.

Cusick's Drape meter was recognized as a standard method for determining the cloth covering coefficient. [2], [4]

Draping capacity ,determined by visual methods, is defined by surfaces, shape and amplitude of folds and is influenced by the type of textile connection, which determines the fold length on the direction of fall. The draping evaluation of fabric can be subjective. In this case particularly, the expert designers need a great deal of experience in the textile area, because this is done using the senses of sight and touch. Another way of objective drape evaluation is based on experimentally measuring the variety of drape parameters - drape coefficient, depth of folds, number of folds, hang of folds and distribution of folds.

For visual analysis, Cusick's Drape meter has an attached camera and a computerized image analysis and data processing system. [2] Cloth covering capacity of Tencel fiber (T) was compared with the cloth covering ability of cotton (bbc) of viscose (VI), linen (In), a polyester material (PES) and mixtures of these.(table nr.1)

Table nr. 1

Crt. no.	Material composition	Specific mass (/m²)	Fiber no. /cm.-weft	Fiber no./cm.-warp	Link
1	100% T	195	28	42	serge
2	100% bbc.	176	28	52	serge
3	100% In	210	13	20	cloth
4	100% PES	194	30	35	serge
5	65% T + 35% PES	213	24	43	serge
6	65% T + 35% In	200	20	32	cloth
7	80% bbc. + 20% T	244	21	49	serge
8	84% bbc. + 16%PES	109	32	46	cloth
9	73% Vi + 27% PES	210	21	40	cloth
10	73% Vi + 27% bbc.	200	20	38	cloth

Drape coefficient describes any deformation between deformed and non-deformed fabric (Figure 2).

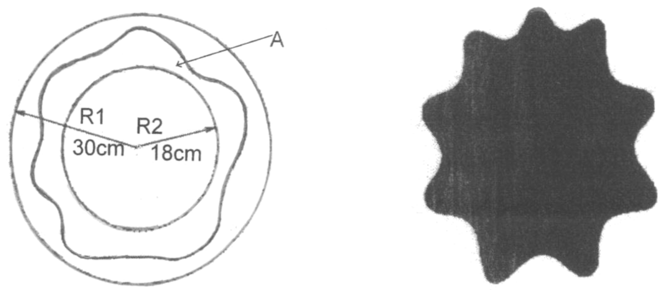

Figure 2 – Highlighting shadow cloth sample

Samples with radius of R1 = 30 cm have been used, from 100% Tencel, cotton, viscose and flax materials and mixtures of these materials with different fiber fineness [4]

They will be put on a disk with radius R2 = 18 cm. The disc is raised to a height of 17 cm. and a vertical light is projected, which will highlight the shadeof the cloth sample. (Fig.2)

Drape shadow images of samples are taken from the computerized system and converted into digital information. Drape coefficient is a given percentage of the ring area between radius R_1 of the fabric and radius R_2 of the disc holding the fabric witch is covered by the projected shadow.

Drape coefficient is obtained by the relationship [2], [3].

$$D = \frac{A - \pi R_2^2}{\pi R_1^2 - \pi R_2^2} \times 100 \quad (\%) \qquad [1] \qquad \textbf{(1)}$$

Where: D - drape coefficient (%)

R_1=30cm - radius of non-deformed sample (fig.2)

R_2=18cm - radius of horizontal disc (fig.2)

A - projection area of draped sample (cm²), including the part covered by horizontal disc.

$$D = \frac{A - 3{,}14 \times 18^2}{3{,}14 \times \left[30^2 - 18^2\right]} \times 100 = \frac{A - 1017{,}36}{1808{,}64} \times 100$$

The shadow area (A) will be between the sample surface in the plated state and the radius R1 = 30 cm and the disk surface with radius R2 = 18cm.

Non-deformed sample area $= \pi R_1^2 = 2826{,}00$ cm²
Disc area $= \pi R_2^2 = 1017{,}36$ cm²
Result 2826,00 cm² > A >1017,36cm²

If A = πR_1^2 (i.e. the sample does not distort)

Result $$D = \frac{\pi R_1^2 - \pi R_2^2}{\pi R_1^2 - \pi R_2^2} \times 100 = 100 \quad (\%) \qquad \textbf{(2)}$$

The interpretation of drape coefficient value is connected with the number, form, amplitude and distribution of folds and their positions according to weft and warp direction.

For the drape coefficient D = 100 %, the sample does not distort. Deduce that a large projected shadow area (A 2826.00 cm ²), will lead to a strong drape coefficient (D) and therefore, the material has a reduced drape capacity. A small value of the projected shadow area (A 1017.36 cm ²), leads to a low drape coefficient (D) i.e. the material has a high drape capacity.

The high value of drape coefficient means that fabric is stiff and could therefore be difficult to reform and a low value of drape coefficient means easier reform and at the same time better adaptation of the fabric to certain shapes.

There is an undeniable link between the drape ability (D) of materials, the number of folds (Nr.F.) and the length in warp direction (LFU) and weft direction (LFB), measured by projected shadows. This link is highlighted in Table. 2 and in Figure 3. [4]

Table no. 2

Crt. no.	Material composition	Specific mass (/m²)	Fiber no. /cm.-callosity	Fiber no./cm.-warp	D (%)	Nr.F.	LF Warp (mm)	LF Callosity (mm)
1	100% T	195	28	42	10	10	18,7	16,4
2	100% bbc.	280	30	48	30	8	22,5	19,2
3	100% In	210	13	20	49,5	4	37,5	27,6
4	100% PES	194	30	35	37	6	18,8	19,0
5	65% T + 35% PES	213	24	43	12	9	17,7	16,3
6	65% T + 35% In	200	20	32	32	6	28,2	25,7
7	80% bbc. + 20% T	244	21	49	16	7	19,7	16,9
8	84% bbc. + 16%PES	109	32	46	37	6	21,1	18,0
9	73% Vi + 27% PES	210	21	40	11	10	16,4	15,4
10	73% Vi + 27% bbc.	200	20	38	14	8	19,0	16,8

If the analyzed materials are ordered, depending on their cloth covering ability, we obtain the following figure chart. (Fig. 3).

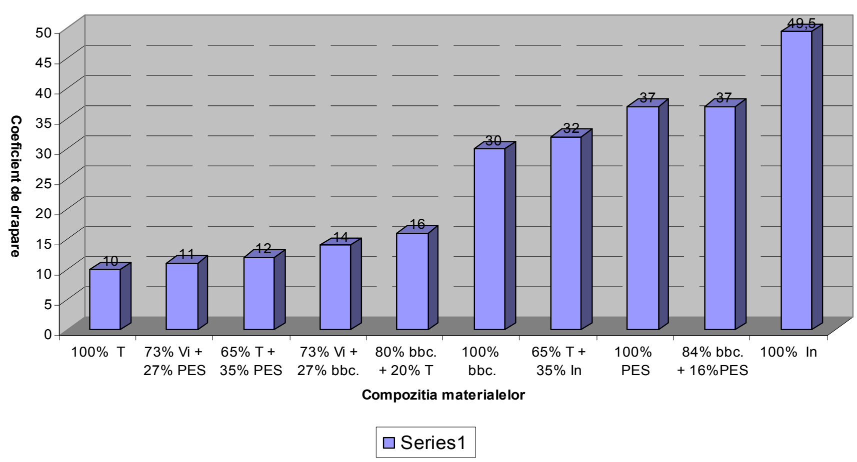

Figure 3 – Cloth covering coefficient (%) of the analyzed materials

The shape and number of folds are dependent on structure and fabric stiffness. A fabric with higher stiffness has larger and wider folds and less stiff fabrics have narrower folds.[5, 6]

With specialized software it is possible to determine these other parameters of drape of fabric. One of this is folding distribution G . It is calculated as a normalized variance of the maximum fold from the average maximum fold length. It indicates how balanced or even the folds are.[5, 6]

$$G_P = \sum_{i=1}^{n} \frac{\left(l_{G_{max}}(i) - \bar{l}_{G_{max}}\right)^2}{\bar{l}^2_{G_{max}}} \qquad \textbf{(3)}$$

$$\bar{l}_{G_{max}} = \sum_{i=1}^{n} \frac{l_{G_{max}}(i)}{n} \qquad \textbf{(4)}$$

$$\bar{l}_{G_{min}} = \sum_{i=1}^{n} \frac{l_{G_{min}}(i)}{n} \qquad \textbf{(5)}$$

Where:

G_p - folding distribution
$l_{G\,max}$ - the average of the maximum depth of the folds
l_{Gmin} - the average of the minimum depth of the folds
$l_{G\,max}(i)$ - the maximum depth of the fold
$l_{Gmin}(i)$ - the minimum depth of the fold

Collier R. and Collier B.J. were the first to use finite element method by modeling fabric drape.[5, 1] The fabric was described as a two-dimensional, orthotropic material with linear properties. They used Young's and modular shear modules values obtained from measurements performed with the use of the KES FB system for calculation in warp and weft direction, whereas the values of Poisson's ratio were based on literature data. The calculated drape coefficient was analyzed by experimental measurement using a Cusick's Drape meter.[5] Calculated data:

1. maximum hang of fabric sample

$$f_{max} = \sqrt{p^2 - \left(\bar{l}_{G_{min}}\right)^2} \qquad \textbf{(6)}$$

2. minimum hang of fabric sample

$$f_{min} = \sqrt{p^2 - \left(\bar{l}_{G_{max}}\right)^2} \qquad \textbf{(7)}$$

3. the depth of fold d_G

$$d_G = l_{G_{max}} - l_{G_{min}} \qquad \textbf{(8)}$$

All measurements were carried under standard testing conditions (20 ± 2^{0} C and 65 ± 2 Relative humidity).

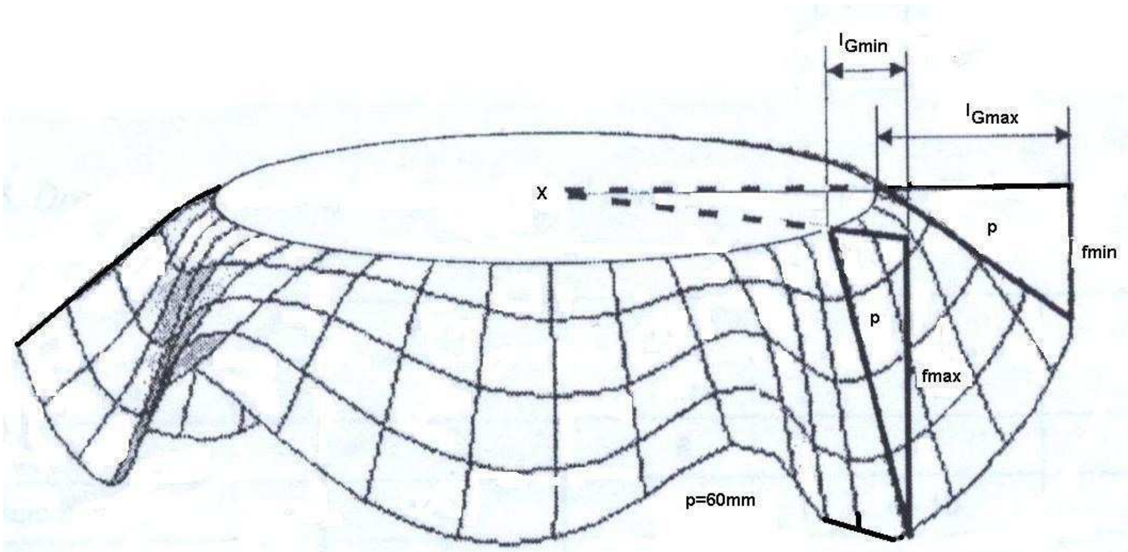

Figure 4 [5]

3. CONCLUSIONS

The bigger drape capacity of Tencel fiber helps to improve the quality for materials made with this mixture. Thus:

Table no. 3

Nr. crt.	Compoziția materialului	Masa specifică(/m²)	Nr. de fire/cm.- bătătură	Nr. de fire/cm.- urzeală	D (%)	Nr.F.	LF Urzeală (mm)	LF Bătătură (mm)
1	100% T	195	28	42	10	10	18,7	16,4
2	100% bbc.	280	30	48	30	8	22,5	19,2
7	80% bbc. + 20% T	244	21	49	16	7	19,7	16,9

The examined material, from 100% cotton, has a drape coefficient D = 30%, but blended with Tencel fiber, will be the coefficient D = 16%.

Table no. 4

Crt. no.	Material composition	Specific mass (/m²)	Fiber no. /cm.- weft	Fiber no./cm.- warp	D (%)	Nr.F.	LF Warp (mm)	LF weft (mm)
1	100% T	195	28	42	10	10	18,7	16,4
3	100% In	210	13	20	49,5	4	37,5	27,6
6	65% T + 35% In	200	20	32	32	6	28,2	25,7

100% Flax material has a drape coefficient D = 49.5%, while, mixed with Tencel fiber will have D = 32%. Similarly you can see the influence of Tencel fiber, blended with polyester.

Table no. 5

Crt. no.	Material composition	Specific mass (/m²)	Fiber no. /cm.- weft	Fiber no./cm.- warp	D (%)	Nr.F.	LF Warp (mm)	LF weft (mm)
1	100% T	195	28	42	10	10	18,7	16,4
4	100% PES	194	30	35	37	6	18,8	19,0
5	65% T + 35% PES	213	24	43	12	9	17,7	16,3

This is one of the Tencel fiber characteristics which is increasingly used in the textile industry.

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ALGORITHM AND METHOD FOR THE CALCULATION OF BREAKING FORCE OF WOOL AND WOOL –TYPE FABRICS

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Abstract: The breaking force as a cloth characteristics imposed itself as there was a demand for cloths having good performances concerning the tensile stress, especially when this characteristic represents the main component of the cloth quality.

The method and algorithm for the calculation of the cloth breaking force proposed in the specialized literature [1] is based on indirect structural elements, such as „breaking length" measured in kilometers, while for the determination of the breaking force on yarn systems, the concept of „conditioned breaking length" was proposed, calculated in terms of the weight of the masses of the two yarn systems in the cloth mass. Here comes the necessity to develop a method and an algorithm for the breaking force calculation, which can be practically used by cloth designers.

The algorithm for cloth breaking force calculation proposed in this work is based on its basic structural components, the yarns from the two systems, warp and weft, which, through their integration within the cloth, provide and determine the breaking force by means of the two basic characteristics: longitudinal density and yarn count.

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 fabric structural component which directly contributes and assures a certain level of the breaking force is represented by the yarns of the two systems (warp and weft) which, by their integration into the fabric, provide and influence the breaking force by means of their two basic characteristics: the lengthwise density and the set (number of picks and yarn count) They represents the two basic parameters in the structure of any fabric and directly determine the most important of the physico-mechanical characteristic of the fabric: the breaking force.

Therefore the fabric breaking force can be modified by: modifying the yarns system set, the lengthwise density (yarn count) and their structure (fibre nature, torsion, etc), or the both parameters: yarn set and lengthwise density (number of picks and yarn count).

Choosing one or the both possibilities, for one or both yarn systems depends on the necessities and the real available possibilities.

Practically, the simplest and most direct modifications can be brought to the weft yarns, through their both parameters: yarn set (number of picks) and structure.

In order to produce a fabric with a certain level of internal structure balance, it is necessary in most of the cases to modify the both yarn systems.

When the test results show that a fabric does not meet the imposed level of the breaking force or the beneficiary requires an improvement of these performances, one needs to intervene on the above mentioned factors by whose means the structural parameters of the fabric can be modified, which directly influences the breaking force.

2. ALGORITHM FOR CALCULUS OF FABRIC BREAKING FORCE THROUGH THE YARN SET (NUMBER OF PICKS) METHOD

2.1. Theoretical aspects

Taking into account that the warp set (number of picks) and weft sett directly influence the fabric breaking force, as well as the other previously studied factors of influence [1], we propose the following algorithm for the calculation of the fabric breaking force on the two yarn systems:
- fabric breaking force along the warp yarns direction:

$$Ru = \frac{f_u \times r_u \times Pu}{2000} \times I_{ru} \times C_{su}\text{, daN} \qquad (1)$$

- fabric breaking force along the weft yarns direction:

$$Rb = \frac{f_b \times r_b \times Pb}{2000} \times I_{rb} \times C_{sb}\text{, daN} \qquad (2)$$

where:

R_u, R_b is the fabric breaking force along the warp and weft yarns direction respectively, in N;
r_u, r_b - breaking force of the single warp or weft yarns respectively, in cN
Pu, Pb – warp and weft yarn set (number of picks) respectively, in yarns/10 cm;
f_u, f_b - coefficient of breaking force utilization for the single warp/weft yarn in the plied yarn;
I_{ru}, I_{rb} - index of breaking force utilization of the warp/weft yarn into the fabric;
C_{su}, C_{sb} – safety coefficient due to the influence of the finish processes on the fabric breaking force in the warp and weft direction respectively. Recommended values range between $0.8 \leq [C_{su}, C_{sb}] \leq 0.9$. In the case of grey fabrics, values equal to unit are adopted.

The value of the breaking force for single yarns is given by STAS's or company standards, being considered as one of the characteristics that define the yarns quality level.
Taking into account the fact that there is a direct connection between the breaking force and yarns lengthwise density (yarn count), if we know the yarns lengthwise density (yarn count) we can implicitly get to know their breaking force from normatives.
The algorithm for breaking force calculation proposed in this work contains components of the fabric structure which influences the level of the fabric breaking force for the two yarn systems. The influential factors which directly act on the fabric breaking force and have the largest contribution to the breaking force value are: yarn sett (number of picks) and breaking force of the component yarns.

3. ALGORITHM FOR CALCULUS OF FABRIC BREAKING FORCE THROUGH THE METHOD OF YARN LENGTHWISE DENSITY (YARN COUNT)

3.1. Theoretical aspects

The *tenacity* is the yarn property resulted from the association of the breaking force with the lengthwise density (yarn count) and it is defined by the relation:

$$r_s = \frac{r}{Tt}\text{, cN/tex} \qquad (3)$$

where:

$$r = r_s \times Tt\text{, cN} \qquad (4)$$

By applying this relation to the two yarn systems, it follows that:

$$r_u = r_{su} \times Tt_u\text{, cN} \qquad (5)$$

$$r_b = r_{sb} \times Tt_b\text{, cN} \qquad (6)$$

where:

r_u, r_b - breaking force of single warp and weft yarns respectively, in cN;

r_{su}, r_{sb} – tenacity of the warp and weft yarns respectively, in cN/tex;

T_{tu}, T_{tb} - lengthwise density (yarn count) of the warp and weft yarns respectively, tex.

By replacing (5) in (1) and (6) in (2) we obtain the fabric breaking force along the two directions: warp and weft, which can be calculated with the relations:

$$Ru = \frac{Tt_u \times f_u \times r_{su} \times l_{ru} \times C_{su} \times Pu}{2000}, \text{ daN} \qquad \textbf{(7)}$$

and

$$Rb = \frac{Tt_b \times f_b \times r_{sb} \times l_{rb} \times C_{sb} \times Pb}{2000}, \text{ daN} \qquad \textbf{(8)}$$

When the yarn fineness is expressed in Nm, by replacing $Tt_u = \frac{1000}{Nm_u}$ şi $Tt_b = \frac{1000}{Nm_b}$ in (7) and (8) we obtain the following relations for the calculation of the fabric breaking force on the two yarn systems:

$$Ru = \frac{Pu \times f_u \times r_{su} \times l_{ru} \times C_{su}}{2Nm_u} \qquad \textbf{(9)}$$

and

$$Rb = \frac{Pb \times f_b \times r_{sb} \times l_{rb} \times C_{sb}}{2Nm_b} \qquad \textbf{(10)}$$

The values obtained through calculus are compared with the STAS values or with those from company standards and the closest value of the fineness or lengthwise density is adopted.

4. EXPERIMENTAL

In order to verify and authentificate the quality of the algorithms for the calculation of the fabric breaking force, the algorithms from points (2) and (3) were applied on a fabric whose characteristics and other data necessary for the calculus are presented in Table 1.

Table 1: Characteristics of the studied fabrics

Name	Symbol	Value	MU
Lengthwise density (yarn count): Warp and weft	Ttu, Ttb Nmu, Nmb	19,23x2tex Nm 52/2	Tex Nm
Breaking force of yarns (Table 8.2)	ru, rb	210	cN
Yarn tenacity Safety coefficient	rsu, rsb Csu, Csb	10.92 0.9	cN/tex
Number of twists		600	twist/m
Coefficient of breaking force utilization for the single yarn in the plied yarn (Table 8.6)	fu, fb	2,06	
Coefficient of breaking force utilization for the fabric incorporated yarns (Table 8.11)	Isu, Isb	1.057	
Yarns sett (number of picks): warp weft	 Pu Pb	 250 200	 yarn/10 cm yarn/10 cm

4.1. Calculus of the breaking force through the method of yarn set (number of picks):

- along the warp direction:

$$Ru = \frac{Pu \times r_u \times f_u \times l_{ru} \times C_{su}}{2000} = \frac{250 \times 210 \times 2,06 \times 1,057 \times 0,9}{2000} = 51,44 \text{ daN}$$

- along the weft direction:

$$Rb = \frac{Pb \times r_b \times f_b \times I_{rb} \times C_{sb}}{2000} = \frac{200 \times 210 \times 2,06 \times 1,057 \times 0,9}{2000} = 41,15 \text{ daN}$$

4.2. Calculus of the breaking force through the method of lengthwise density (yarn count):

- along the warp direction:

$$Ru = \frac{Tt_u \times f_u \times r_{su} \times I_{ru} \times C_{su} \times Pu}{2000} = \frac{19,23 \times 2,06 \times 10,92 \times 1,057 \times 0,9 \times 250}{2000} = 51,44 \ daN$$

- along the weft direction:

$$Rb = \frac{Tt_b \times f_b \times r_{sb} \times I_{rb} \times C_{sb} \times Pb}{2000} = \frac{19,23 \times 2,06 \times 10,92 \times 1,057 \times 0,9 \times 200}{2000} = 41,15 \ daN$$

4.3. Calculus of the breaking force through the method of metric count:

- along the warp direction:

$$Ru = \frac{Pu \times f_u \times r_{su} \times I_{ru} \times C_{su}}{2 \times Nm} = \frac{250 \times 2,06 \times 10,92 \times 1,057 \times 0,9}{2 \times 52} = 51,44 \ daN$$

- along the weft direction:

$$Rb = \frac{Pb \times f_b \times r_{sb} \times I_{rb} \times C_{sb}}{2 \times Nm} = \frac{200 \times 2,06 \times 10,92 \times 1,057 \times 0,9}{2 \times 52} = 41,15 \ daN$$

From the analysis of the obtained results, one can find out that, irrespective of the utilized method, the values obtained for the breaking force are identical, which proves the accurate content of the calculus algorithm. At the same time, the correlation between the elements that characterize various components of the fabric structure, their condition and interdependence, are correctly described analytically, thus providing results which define the real condition of the fabric internal structure.

Taking into account the obtained results, as well as the simplicity of the calculus algorothm, we recommend their application for the determination of the breaking force of the fabric along the two yarn systems: warp and weft.

5. CONCLUSIONS

1. The breaking force is one of the quality characteristics stipulated in all the internal norms, company standards or Romanian standards for fabrics and it is defined as the maximum tensile force recorded during trials when the sample is stretched until it breaks, a characteristic required by both fabric manufacturers and users.
2. The structural component of the fabric which directly contributes and assures a certain level of the breaking force is represented by the yarns from the two systems (warp and weft) and it influences the breaking force by means of two basic characteristics: lengthwise density (yarn count) and yarn sett (number of picks).
3. The fabric breaking force can be modified by:
   - Modifying the yarn system set;
   - Modifying the lengthwise density, as well as their structure (fibre nature, torsion, etc);
   - Modifying the both parameters, yarn sett (number of picks) and lengthwise density (yarn count).
4. Calculus algorithm proposed for fabric breaking force through the yarn set density method is based on: breaking force of single yarns, yarn set (number of picks)), coefficient of breaking force utilization for single yarn in the plied yarn (if necessary), the index of breaking force utilization for the single yarn into the fabric, and a safety coefficient due to the influence of the finish processes on the fabric breaking force (ranging between 0.8-0.9)
5. Algorithm for the calculation of the fabric breaking force through the lengthwise density (yarn count) method is based on the coefficient of breaking force utilization for single yarns in the

plied yarns, tenacity of single yarns, index of breaking force utilization for the single yarn into the fabric, yarns set, and a safety coefficient due to the influence of the finish process on the fabrics.

6. Irrespective of the used method, the values obtained for the breaking force are identical, which proves the accurate content of the calculus algorithm. At the same time, the correlation between the elements that characterize certain components of the fabric structure, their condition and interdependence, is correctly described, which provides results defining the real condition of the fabric internal structure.

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DEVELOPMENT OF GOLD COATED THREADS AND IMPLEMENTATION INTO A WEARABLE SYSTEM

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Abstract: The paper presents the coating of commercially available textile threads with metals in order to provide it with electroconductive properties. This can be done in different ways such as metallization, electroless deposition, electrodeposition, chemical coating, carbon and metallic compound inclusion and application of electroconductive composites. However, by using the coating method (through depositing layers), high performance textile threads are made electroconductive without losing their other properties. Furthermore, using a coated instead of a solid metal fibre is more cost-effective especially if the desired metal is expensive such as gold, platinum or silver because the required amount of metal is considerably less.
The method was initially used for yarns and fabrics, but its application in threads' production offers further potential in wearable systems.
Key words: Conductive threads, electroless deposition, smart garment

1. INTRODUCTION

The aim of this research is to coat commercially available textile threads with metals in order to provide it with electroconductive properties. The conductive threads will be used to make connections instead of wires in a wearable electronic system.

Although there are many efforts from the authors to make conductive yarns and fabrics [2],[5] ,[8] there was no similar effort to make conductive threads for sewing. Conductive threads can make a simple electrical circuit easier than any woven or knitted structure.

The threads can become conductive with few different ways such as metallization, electroless deposition, electrodeposition, chemical coating, carbon and metallic compound inclusion and application of electroconductive composites.

Another possibility is the development of pure metallic or alloy threads. Also at the level of nanofibers, this trend is observed. However, by using the coating method (through depositing layers), textile threads are made electroconductive without losing their other properties. Previous research shows us that sewing using metallic threads is extremely difficult because the fibres are too rigid. Furthermore, using a coated instead of a solid metal fibre is more cost-effective especially if the desired metal is expensive such as gold, platinum or silver because the required amount of metal is considerably less.

These electrically conductive threads are produced by an electroless deposition method using a solution which contains a gold salt in combination with complexing agents. Finally after a three stage deposition process, the para-aramid threads which are used as base material are coated with metallic gold. The selection of gold as a sensing material is justified by excellent electrical conductivity, biocompatibility and corrosion resistance [8].

2. EXPERIMENTAL

2.1. Scope

In this research the metallisation of para-aramid threads is described, but the technology can be easily adapted to other substrates, for example polyamide and polyester threads. Para-aramid threads were selected as a substrate because of their excellent mechanical properties. Initially, an electroless deposition process of polypyrrole is performed, followed by a second coating with metallic compounds. Polypyrrole is of particular interest because it shows a relatively high electrical conductivity, it is stable enough for the development envisaged and described in this report, it possesses interesting redox properties and it has shown its suitability as substrate in the past, for example for coating with glucose oxidase or with metallophthalocyanine catalysts.

The authors during the last years have been developing prototype underwear with different sensors for various reasons [3,4]. The prototypes are equipped with textile electrodes [1,7] and the prototype wearable systems can continuously record various bio-potential signals from the body. Sets of textile gold coated electrode pads have been produced by the process of electro-less deposition [5]. For the wiring, the conventional wires were not appropriate for use, because they do not present "textile properties". When conventional wires are incorporated into the garment, the garment looses its comfort. For this reason electrically conductive threads have been designed. The electrically conductive thread is attached to the electrode pads with the use of a conductive adhesive compound which includes silver particles. This compound is applied on both the electrode pad terminal and the electronic module terminal of the thread. As well, the electrically conductive thread can be used for other interconnections with the electronic module of the wearable system.

2.2. Materials

Pure para-aramid threads were used for this research. Chemicals were obtained from Sigma-Aldrich and are of analytical grade. For the electroless deposition of polypyrrole and copper the chemicals used are pyrrole (98%), Iron(III)chloride hexahydrate, benzene sulphonic acid, tin(II)chloride dihydrate, palladium(II)chloride, hydrochloric acid (37%), copper(II)sulphate pentahydrate, Rochelle salt, formaldehyde (37%), sodium hydroxide (50%), citric acid and sodium hypophosphite. All solutions were freshly prepared with deionised water.

For the electroless deposition of gold the chemicals used are polypyrrole Sodium tetrachloroaurate(III) hydrate $NaAuCl^4$, Sodium sulphite Na^2SO^3, Sodium thiosulfate pentahydrate $Na^2S^2O^3$ H^2O, and Sodium phosphate dibasic Na^2HPO^4 all from Sigma-Aldrich.

2.3. Coatings

For the electroless deposition of copper a $SnCl^2$-$PdCl^2$ solution was used to activate the polypyrrole coated para-aramid surface. This solution is prepared by dissolving $PdCl^2$ in a 2.5% HCl solution, which takes about 2 hours. Then $SnCl^2$ is added to this solution. The color of this solution changes continuously over a period of 1 hour ending up with a dark brown color. This color indicates that the solution is ready for use.

For the Electroless deposition of the gold, the optimized composition and operating conditions are 0.06 mol L^{-1} $NaAuCl^4$ H2O, 0.42 mol L^{-1} Na^2SO^3, 0.42 mol L^{-1} $Na^2S^2O^3$ H^2O and 0.30 mol L^{-1} Na^2HPO^4. The pH was 9.0 and the temperature 90°C.

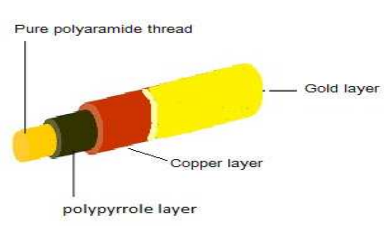

Figure 1: Schematic presentation of coated thread.

2.4. Inorporation of conductive threads into a wearable system.

In order to evaluate the overall performance of the conductive threads, the threads are sewn to a prototype wearable system, which would continuously record the bio-potential signals from the heart and monitor heart function through ECG.

A series of measurements has been implemented as follows:

Sets of textile gold coated electrode pads have been produced by the process of electroless deposition [5]. Electrically conductive thread has been attached to the electrode pads with the use of a special conductive adhesive compound applied on the electrode pads. The application of the adhesive compound followed a special geometry in order to retain pad's flexibility since the compound becomes rigid after its hardening process.

The electrode pads have been attached to a specially treated underwear T-shirt and the conductive thread was sewn on the T-shirt's fabric in an elastic surface stitch following a specific route in order to bypass the body's curves and also provide the best comfort level during wearing.

The leads of the ECG monitor were connected to the textile electrode pads and placed on the T-shirt in such a way that one textile electrode pad touched on each side, -right and left- of the person's chest, under clavicles and one textile electrode pad touched on the lower left side of the body.

The ECG monitor had three electrodes: the positive electrode, the negative electrode and the ground electrode. The monitor was set to view the heart in lead I, lead II or lead III.

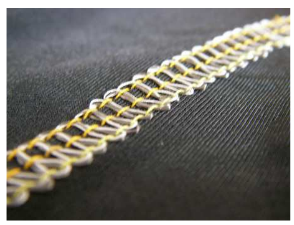

Figure 2: Elastic stitch of conductive threads

For the interconnection of the pads, gold coated threads were used. The threads connected the textile electrode pads with the ECG module. They were stitched with a special elastic zigzag stitch which followed a special route on the underwear T-shirt, in order to achieve flexibility and isolation from skin contact.

Five threads were used for the production of the elastic stitch: Three threads made of 100% nylon elanca, one thread made of cotton and the conductive gold coated for loop. The conductive thread runs on the outer surface of the T-shirt in order to avoid contact to the skin (fig. 2).

2.4.1. Electrodes

The electrodes are the ones which were used in order to capture the bio-potential signals of the heart function. The textile electrode pads were then sewn on the T-shirt's fabric with a zigzag stitch. Between the textile electrode pads and the T-shirt's fabric, circular pads made of foamy material have been inserted in order to act as pillows which would apply more pressure on the electrode pads to the person's skin. The shape of the electrode pads becomes convex, as much as to create a hump on the T-shirt that is not easily discernible and to improve functionality and contact pressure to the torso (fig. 3) [6].

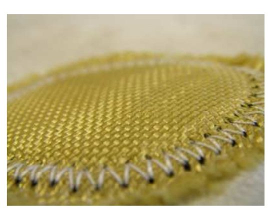

Figure 3: Gold coated para-aramid textile electrode pads

2.4.2. ECG module

A prototype ECG module using surface mount devices technology (SMD) has been developed, in order to capture and record the bio-potential signals. Two circuits based on Analog Devices AD 8236 high precision, ultra low power, instrumentation amplifier. No special signal preconditioning was needed with the use of the specific circuit. The results were recorded in a Tektronix Digital Phosphor Oscilloscope.

3. RESULTS AND DISCUSSION

3.1. Conductivity

For the conductivity of the treated samples the simple fundamentals of a division measurement over a known resistor and an unknown one, being the sample, are applied. A resistor of 1000 ohm was used in series with the unknown sample resistance. The applied potential was varied from 1 to 20V over both resistors from DC to AC and with a change in frequencies for the AC behavior.
The resulting unknown resistance is calculated with the following formula (eq. 1).

$$R_{unknown} = \frac{(V_{tot} - V_{known})}{V_{known}} \times R_{known} \qquad \textbf{(1)}$$

For the measurement of the resistance, a self-written program in Labview is used that is capable of measuring all values at once with a high accuracy and sample rate. The calculated resulting resistance was the same value every time, which shows the typical behavior of a passive component very similar to a normal resistance. It is also important to note that no capacitive or inductive effects were measured or seen through the whole chain of measurements.

3.2. Inteconnection using conductive threads

The measurements received with the use of the wearable monitoring system were satisfactory, but there were certain instances characterized by signal loss, due to less pressure at the desired contact points of the electrodes. The signal loss instances were attributed to the physics of the body and the whole measurement setup. They were not result of a supposed defect of the interconnection threads or the electrodes.

The resistance of the textile electrode pads including interconnection threads was measured in the class of 5 to 10 Ohms. The durability of the textile gold coated electrode pads and threads was quite good. They can go through many wash cycles with no significant decrease of conductivity.

The waveforms in figure 4 depict complexes recorded during the measurements which have stable and smooth baseline.

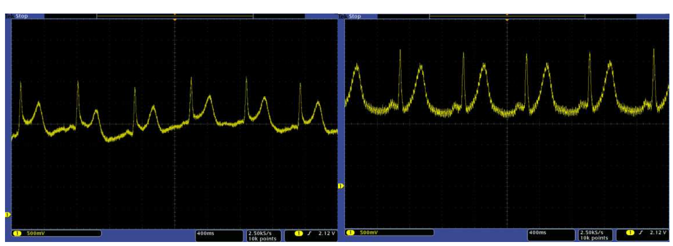

Figure 4: Recorded complexes

The electrically-conductive textile electrodes connected through conductive threads in mobile health monitoring systems is a matter of significant interest. Their properties allow them to be used as fabric sensors with critical advantage that solve significant problems: to continuously monitor bio-signals on the move in a transparent and imperceptible way. The textile sensors made of conductive yarns, in combination with the conductive threads instead of conventional wires, were found to be quite effective in measuring heart rate compared also to conventional pads. They produce clear signals, capable to represent cardiac function. The project was funded by FP7-PEOPLE-2009-IRSES PROCOTEX.

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IDENTIFICATION OF THE WAYS OF EVALUATING COMFORT AND PHYSICAL PROPERTIES OF TEXTILE MATERIALS

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Abstract: The state of physical comfort experienced by a wearer under a given environmental condition is greatly influenced by the tactile, thermal and moisture transport properties of the fabric. The aim of this study is to identify the evaluating ways of comfort and physical properties of textile materials. It also describes the value of the measurements made by advanced instrumented measurement systems when used as part of comprehensive research program designed to explain human response to the wear comfort of functional clothing and materials.
Key words: Clothing comfort, instrumented measures of clothing comfort, heat and moisture transport in *fabrics,* subjective evaluation of clothing comfort.

1. INTRODUCTION

Clothing is one of the fundamental needs of the human being. It serves various and diverse purposes. Clothing selection is based on the needs and desires of the people. It may be to satisfy some aesthetic needs or to fulfill any particular demand of human being. People's selection of clothing depends upon their perception and feeling about the clothing. In some cases it is recommended to wear certain clothing and selection is not possible, for example dress of a firefighter, military uniform, etc. However, it is very common that there is a dynamic and fundamental changes in the preferences of people with the change in the context; season, climate, age, type of activity, etc. It is highly linked with the core requirement why a person is wearing any particular clothing. Moreover, clothing requirements are rather different depending upon the type of activities of any person. However, comfort is a basic and introductory prerequisite of the people in all situations and is considered a threshold in selecting the clothing. Comfort is difficult to explain since it is a complex and interdependent combination of physical, psychological and sensorial perceptions and highly depends of subjective evaluation of the individuals. It is not possible that comfort level of every one sitting in an office could be same, even temperature, air velocity and other parameters, which they are experience are same and comparable, even then comfort sensation is quite diverse. However if more than 80% people feel comfort, then it can be said that such environment provides a comfort (ISO). Same is the case with clothing comfort.

2. HUMAN COMFORT:

- *Comfort* is freedom from pain, freedom from discomfort. It is a neutral state
- *Comfort* is a pleasant state of physiological, psychological and physical harmony between a human being and the environment.

Comfort is of the following types-

a. Relative comfort.
b. Subjective comfort.
c. Thermal comfort.

d. Sensorial comfort.
e. Mobile comfort.

3. COMFORT-RELATED PHYSICAL PROPERTIES OF TEXTILES

3.1 Thermo-physiological Comfort

- Thermal resistance
- Water vapor permeability (breathability)
- Wickability
- Sorption of water
- Water resistance, repellency and proofness
- Drying rate

3.2. Sensorial (Neuro-physiological) Comfort

- Prickliness, itchiness, inflammation
- Roughness
- Thermal character (warm/cool feeling)
- Electrostatic propensity

3.3. Body-Movement Comfort

- Stretch
- Weight
- Pressure/compression

4. PHYSICAL CHARACTERISTICS OF TEXTILE MATERIALS INFLUENCING THERMAL COMFORT

- Fabric Mass
- Fabric Thickness
- Fiber, Yarn, and Fabric Structures
- Porosity is the ratio of air space to the total volume of the fabric, expressed as a percentage
- Cover Factor is defined as the opacity or hiding power in textiles

5. TESTING, ANALYZING & PREDICTING THE COMFORT PROPERTIES OF TEXTILES

The word comfort refers to how the individual feels. Under the same environmental conditions and with the same type of clothing, one person may feel comfortable and another may not. Besides, those who feel comfortable may not be in the equal comfort level. This is because of the complex interaction between all of the parameters affecting the comfort of humans, e.g.,clothing parameters, environmental parameters, physiological factors, psychological factors, etc.

These factors typically interact in a very complex manner. Furthermore, there is a continuous change over time that leads to transitional effects.

- Neurophysiological comfort
- Tactile properties
- Thermophysiological comfort

6. CHARACTERIZATION OF COMFORT

Since Peirce's well-known study in 1930, 1 there have been numerous studies conducted with many experimental and analytical approaches, each providing an insight into the nature of the comfort phenomenon. However, a complete evaluation of the comfort phenomenon requires a substantial multidisciplinary approach. Kilinc et al.3, 28 groups comfort analysis into three main categories:

1. Objective analysis, in which quantitative measures characterizing comfort can be determined (tactile and thermal parameters).

2. Subjective analysis, in which psychological evaluation is made by surveys, ratings and scales.

3. Correspondence analysis, in which the subjective and objective analyses are combined to develop quantitative measures.

6.1 Neurophysiologic Comfort

Neurophysiological (tactile or sensory) comfort refers to the feel of fabric against the skin or interaction of the clothing with the skin. This feel is triggered by sensory receptors in the skin, which are connected to the brain by a network of nerve fibers. Overall comfort perception is a result of very complicated multi-step process, clothing, environment, body, and past experiences are some of the key factors affecting this complex process.

In regards to fabric and body, the skin/fabric interaction is one of the most important factors which impact the overall comfort status. The skin/fabric interaction is stimulated by many mechanically-related (bending rigidity, surface roughness, etc.) and thermally-related (warm/cool sensation, moisture transfer,etc.) factors.

In the following subsections, studies conducted in the area of fabric stiffness, fabric softness, fabric roughness, and fabric handle are summarized

6.2 Tactile properties

Many researchers have developed models to predict the tactile comfort or one of the constituents of fabric tactile behavior. Raychaudhuri and Das14 developed a mathematical model for the physical testing of fabric stiffness by the cantilever method in order to express the stiffness in terms of the physical parameters. Pandita and Verpoest8 compared different stiffness prediction models, including the Krenchel, Voigt, Reuss, and Inclusion models and Kregers' weight average model (WAM), and preferred the Inclusion model. In 2000, Peykamian and Rust15 used linear and non-linear models and yarn parameters such as CV%, hairiness and surface softness to classify the softness of knitted fabrics for comparison with subjective evaluations. They were able to classify 91% of the samples accurately based on the human data using surface response parameters and measured yarn properties to sort T-shirt softness into three classes, with tree modeling.

6.3 Thermo- Physiological Comfort

Numerous research conducted in this area resulted in many testing systems developed to evaluate one or more aspects of thermal comfort, including thermal insulation (resistance to dry heat loss from the body), thermal conductivity (the thermal transfer behavior of the heat flow through a fabric due to a combination of conduction and radiation),sweat evaporation, and water vapor permeability. Guarded sweating hot plate, togmeter, heat flowmeter, Gore cup, and sweating thermal manikin are a few examples of these testing systems.

Several testing standards including ASTM D1518 'Thermal Transmittance of Textile Materials', ASTM F1868 'Thermal and Evaporative Resistance of Clothing Materials Using a Sweating Hot Plate Test', and ISO 11092 'Textiles–Determination of Physiological Properties–Measurement of Thermal and Water-Vapour Resistance' require use of this method for determination of the thermal resistance value.

The American Society for Testing and Materials (ASTM) and the International Standards Organization (ISO). ASTM F1868 and ISO 11092 use this method for determination of evaporative resistance of fabrics. Many laboratory testing technologies have been developed to characterize the ability of fabrics to wick liquid moisture from sweating skin and one such test is the Gravimetric Absorbency Testing System (GATS). This test indicates the lateral wicking ability of the fabric, or the ability of the material to take up liquid in a direction perpendicular to the fabric surface. The GATS apparatus incorporates a special test cell and cover to assess absorption behavior in the presence of evaporation. Gore cup (Bekleidungs Physiologisches Institut E. V. HohensteinStandard Test Specification BPI 1.4 'Determination of Stationary Water Vapor

Resistance by Means of the Cup Method'), drop absorption (AATCC 79'Absorbency of Textiles'), contact angle, and drying rate tests are a few examplesof methods available for determining the water transport properties of fabrics.Very recently a new method and instrument developed by Li et al.,40 called the Moisture Management Tester, was introduced to quantitatively measure multidirectional liquid moisture transfer in a fabric. Air permeability is also a very important characteristic of fabrics which affect the thermal comfort in addition to thickness, and ASTM D737 'Standard Test Method for Air Permeability of TextileFabrics' has been widely used for determining air permeability of fabrics.

7. NAME OF SOME STANDARD TEST METHODS

Standard	Description
ASTM C518	Standard Test Method for Steady-state Thermal Transmission Properties by Means of the Heat Flow-meter Apparatus
ASTM E1530	Standard Test Method for Evaluating the Resistance to Thermal Transmission of Materials by the Guarded Heat Flow-meter Technique
ASTM F1868	Standard Test Method for Thermal and Evaporative Resistance of Clothing Materials Using a Sweating Hot Plate Test
ASTM F1291	Standard Test Method for Measuring the Thermal Insulation of Clothing Using a Heated Manikin
ASTM D737	Standard Test Method for Air Permeability of Textile Fabrics
ISO 8302	Thermal Insulation – Determination of Steady-state Thermal Resistance and Related Properties – Guarded Hot Plate Apparatus
ISO 11092	Textiles – Determination of Physiological Properties – Measurement of Thermal and Water-Vapour Resistance
ISO 7920	Estimation of the Thermal Characteristics of Clothing

8. LABORATORY MEASUREMENT OF THERMO-PHYSIOLOGICAL COMFORT OF CLOTHING

Clothing interposes a barrier between the body and the environment and therefore affects the person's wellbeing in terms of protection, skin sensations and heat and moisture management.

The heat and moisture balance between the body and the environment determines the thermo-physiological comfort of an individual.

8.1 Thermo-Physiological Comfort Parameter

Two most important parameters are concerned of thermo physiological comfort:-

- The movement of heat away from the body.
- The movement of sweat away from the body

8.2 Standard Tests for Thermal Resistance

The following Test Method are available for measuring of thermal resistant of cloth:-

1. The guarded hot plate- Togmeter
2. The two-plate method.
3. The single-plate method.

8.3 Water Vapour Transport

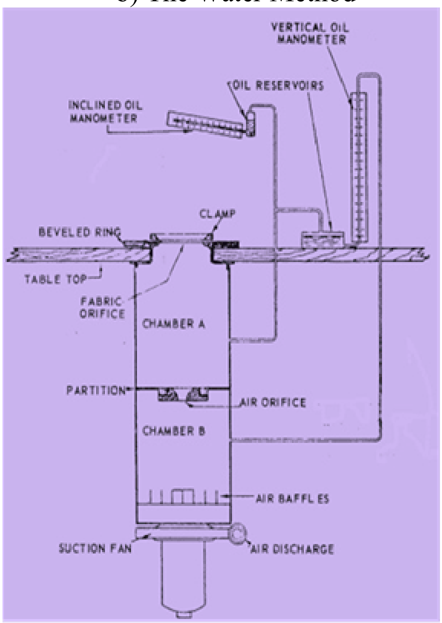
The water vapour transport properties of a textile are commonly expressed in three ways:

1. Water vapour permeability (WVP) or moisture vapour transmission rate (MVTR)
2. The water vapour resistance
3. The resistance to evaporative heat flow (Ret)

8.4 Water Vapour Permeability

The cup or dish method - there are two basic types, both based on weight change and are following:-

a) The Desiccant Method
b) The Water Method



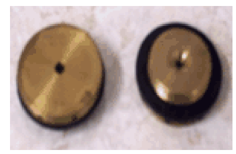



Figure 1: Water vapour permeability test methods

8.5 Water Vapour Resistance

The following test methods are available for measuring of water vapour resistance of textile:-

1. Control Dish method(Turl Dish Apparatus)
2. Farnworth and Dolhan's DND method.
3. Van Beest and Wittgen method.
4. The Gore Cup
5. The dynamic moisture permeation cell (DMPC).
6. The Permetest
7. Sweating guarded hot plate

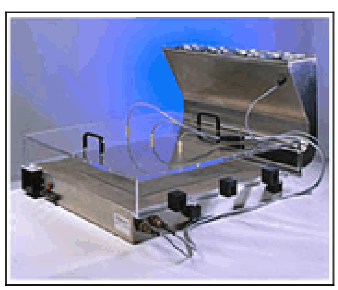
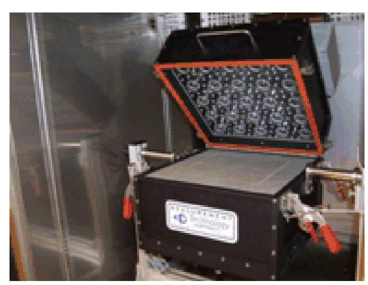




Figure 2: Sweating guarded hot plate

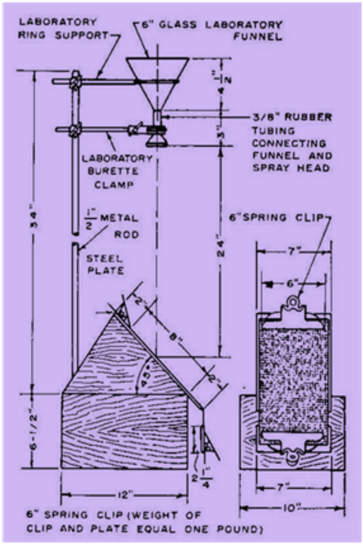


Figure 3: Impact penetration tester

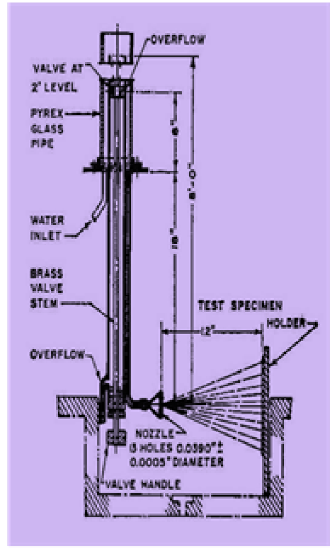


Figure 4: Rain tester

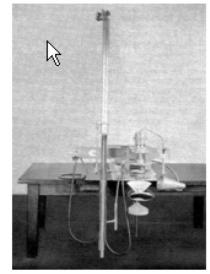


Figure 5: Hydrostaticpressure tester

8.6 Standard Tests for Water Vapour Resistance

1.**The cup or dish method**

a)The Desiccant Method

b)The Water Method

1. Control Dish method.
2. Farnworth and Dolhan's DND method.
3. Van Beest and Wittgen method.
4. The Gore Cup .
5. The dynamic moisture permeation cell (DMPC).
6. The Permetest

9. RELATION BETWEEN WATER VAPOUR RESISTANCE AND WATER VAPOUR PERMEABILITY

A relationship between water vapour permeability and water vapour resistance is derived from Fick's first law of diffusion which states that the flux in the X-direction, Fx, is proportional to the concentration gradient Dc/Dx (Glasstone 1960; Fourt and Harris 1947) such that:

$$R = \frac{1}{Q} D(\Delta C)At \qquad \textbf{(1)}$$

Where,
R = resistance of the system (cm)
Q = weight change of the test assembly during test period t (g)
t = test period (s)
A = area of the exposed test fabric (cm2)
D = the diffusion coefficient (cm2 s–1)
ΔC = difference in water vapour concentration across the test assembly
(g cm–3).
(Q/At, the water vapour permeability, can be measured directly.)

The water vapour resistance can be calculated from measurements of water vapour permeability under a known water vapour concentration gradient. This gradient is usually estimated from measurements of temperature and humidity away from the sample. Therefore, a resistance value obtained from the permeability value is a composite of the sample resistance and the resistances of the two air layers either side of the sample. The resistance may also be affected by local atmospheric conditions above the dish and the air velocity over the sample.

For multiple layers of clothing, such as likely in a complete clothing ensemble, the total resistance of the system is the arithmetic sum of the resistance of each component layer together with an assessed value for each air gap between layers.

10. AIR PERMEABILITY MEASUREMENT

The two principal methods for determining the air permeability of fabrics are both related to the air flow through a known area of the sample and the pressure drop across the sample. In one case, the pressure drop is constant and the flow rate measured, and in the other the flow rate is constant and the pressure drop measured.

The most commonly used method to determine a fabric's air permeability is by EN ISO 9237 (1995).

10.1 Wicking

Wicking can take place either around the body to allow a greater area for evaporation or through the fabric away from the skin. If the clothing becomes saturated from exertion then the wicking ability is limited.

Thewicking/buffering effect has been measured by Mecheels and Umbach (1976) on the sweating
guarded hot plate by allowing liquid water to be in contact with the fabric sample and looking at overall moisture loss or alternatively measuring the microclimate response to a short sweating burst

10.2 Absorbency

The two most commonly used parameters to characterize the properties of absorbent materials are the rate of absorbency and the total absorbent capacity.

The former determines the rapidity with which fluid is imbibed while the latter determines the total capacity of the material to absorb and retain fluid.

The Gravimetric Absorbency Testing System (GATS) is capable to measure these properties.

11. CONCLUSION

Literature provides a number of mathematical models to predict comfort but still final decision is made based on subjective findings by using clothing in real world. There is a continuous research to produce clothing which should be able to provide higher level of comfort. It is not possible to make clothing suitable for every situation. Industry is producing different designs, colors, and patterns to provided better look for wearers and at the same time functional clothing to fulfill certain demands. For example, water proof jackets, fire fighting suits, etc. This work is an effort to describe different faces and facts of clothing comfort. The core objective is to provide a summary of clothing comfort, which is science as well as an art.

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THE BLACK DRESS

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Abstract: In this paper we present a black dress. A black dress is no longer just a garment of mourning and becomes an attribute of elegance. A black dress, can be mini, midi or maxi, is the most elegant dress, and no one can challenge this.
Key words: dress, look, accessories, models, slim.

1. INTRODUCTION

In the term of clothing we understand the whole garment products made from different materials and are intended to cover the human body without making it impossible to move or move its own forces.

Depending on the era, cultures, civilization, the clothes may imply consistent status with the wearer, the ranking of social or public function which it occupies, the community, social class or blankets. In the past, wearing certain clothing products, or the use of textiles, was allowed only to certain social ranks.

The clothes means represent a condensed personality or a temperament by wearing them, can tell a lot about the wearer, sometimes expressing feelings, an attitude or dealing with certain events, proving of greater safety.

The person feels stronger or more entitled to undertake various actions and to have a certain attitude, but with a special interest in aesthetic motivation so that the person that will look good.

Clothing is an environment that can amplify the thinner, underline, to create the illusion of different bodily proportions, harmonious can hide some natural defects, suggesting the unsuspected qualities.

The appearance is very important whenever a great attire dress saves us in a horrible day, the colors and the shapes informs others about them lifestyle and they are transmitted to the subliminal as we see ourselves.

Today it is often the merges, current modes of speech with fashion design which is a combination of tastes, preferences and habits on clothing, dress and behavior that dominates, at one point, in a social environment is illustrated most pithy clothes, but when it ceased to be a purely useful and it was discovered that can express the idea of the beauty of a person, or collectivities.

Fashion is in continual transformation, therefore, when a new fashion becomes popular, a new standard of beauty and drain for a while until the audience accommodates and at one point she is bored and rejected, searching for something new. Change in fashion occurs when someone feel to get bored from her old wardrobe and wish to replace it with something new [1].

At first, when the clothing industry was developed not only the type of fashion garments realized by certain principles, although the idea of clothes ready goes back more time but the so-called the classical style and adding just some items from the fashion line.

A beautiful dress does not mean to be expensive or to dress up the last fashion, a nice dressed woman need to have the five keys that define her: to give her a pigmentation value, to improve lines, dimensions and proportions, to be appropriate, to match the style of her personality, and show the trend.

So when a women know that she look good, she is prepared to deal with this all, or any situation that requires a check and balance and evaluated, in general, by the way she is and how she is dressed.

If we often discover the personality of a garment, we will feel comfortable with any occasion in a *black dress* which we must -have companion to any women's wardrobe and that gets rid of any occasion where we want to go out either or do not know what we should wear to a certain event and what was introduced as a color for an everyday clothe. It ceases to be seen as the garment of mourning and is already attribute of elegance. Although in some states and not just the black and white color is considered, the color of cloths.

The widows how dressed up in black tried to weaken the momentum and to hide the beauty of men, and today has turned *the small black dress* in a provocative and sexy attire.

Black dress is that which is known as the *little black dress,* we always take it out of deadlock if is chosen with care.

If we remember the many images of American films, when the woman in black dress, molded, with decolletage and seduced with no toil any men especially from height cases - nail 10 cm.

A maxi dress or the midi dress is one of the most elegant dresses what cannot be challenged; sometimes it is a simple, classic piece. Black dress saves us from personal, professional or romance situations, first by its elegance, style, and an extension of the personality of each person, in any combination of colors, material, shape and attractiveness with minimal effort and even comfortable.

Any person, being part of any civilization and on some social wants to step forward and be understood by those around us, we need an appearance but also a place to try so we build models, and ideas about what is, how it is to be nice, to be dressed, to be arranged.

While fashion is not only a way of expression but it is also our way of being, a part of us, that is why it is said that man ends up as it wants to be.

Sometimes women should understand often things that may want and, by the way, how are covered with a short skirt, too much clothes, molded dresses that leaves everything in sight, can deceive even those of less victims of preconceptions and lighter by the individual in front of them analysis.

We must take care not to fail with simple cuts that flatter us, it is not important what we wear but what makes us feel good, what ultimately defines us.

Black dress will remain always a versatile piece in fashion, a delicate and elegant femininity which will be the benchmark of all time and a crucial watershed moments and being the most easily accessorized.

For a long time there have been many dilemmas between the little black dress and white dress, especially if it is look at the traditional black leads the woman to eternity, purity, simplicity and white representing a girl to become a woman.

Celebrities have always been and will be among the first people who handle masterly black dresses and if they need to make attire with such of dress, is not the most difficult thing; the hardest part is to choose the dress that defines them.

Figure 1. The black dress

A dress may could be from different materials, like: lace, satin, silk, velvet, taffeta tape, be natural on the body or wider, with sequins, rhinestones, beads, controls, using troll lines only Royal dress their footprint on them style.

If the highchair a dress which is molded on the body and accessorized with a simple jacket or a jacket for evening, for business or most appropriate is a chaplet, but without to forget the heels that always helps to have a sexy look.

If we want to put a little more delicate or midi dress, controls things are slightly more complicated, demanding, highchair a jacket longer during the day, and even a bolero application is best suited.

The black gowns could represent many styles: elegant, classic, business, office, Hall, gentle, sexy, compelling, but most women leave the dress to say something about them, minimizing the accessory.

It is known that each woman is unique in her own way, from the shape of the body until her inner beauty.

Whether a silhouette is robust or not, sleek case there is definitely a perfect evening dress for each of us according to the style that we like.

Classic style is a style where we like to be well clad, mature and extremely elegant, simple and tidy, all assorted from top to bottom, with a headdress and a person makeup. For people who adopt this simple black dress look no more cleavages with different type of dresses above the knee is more perfect for an exit with friends in town or at a romantic dinner.[5]

To look sexy

A black dress can be sexy without being provocative. The secret is in the details it contains. Choose a precious material such as silk or satin, and search pattern V-cleavage dress (not too bold), but have a straight, simple knee.

To retro look

Perfect black dress should contain details of this style. Mini dresses, baby doll in taffeta or chiffon are those that have a retro style. The *retro look* may be defined by the reexamination trends from the past being a style of fashion that is build with the help of vitage clothing. Always wearing high heels and platforms, even to wear bright colors, do not need a specific long hair style which is very nice bound to back with a scarf or Ribbon to be as natural as makeup to be more discreet. [5]

Black dresses for the occasion

Attract attention, making the look simply charming, evening dresses for occasions to be long, sleeveless, with some inlay stones or sequins. That's that perfect little black dress is the most brilliant. Also, a glamorous dress that does not contain elements in the material, can be electrifying assortment of accessories, so that to be feminine elegant. Of course the model can be chosen style taste of each, but keeping that little black dress short or long gown, sleeveless with a pronounced cleavage or closed neck and quietly with pearls, stones are brilliant to have any care to adapt to any silhouettes and age.

2. ACCESSORIZING THE BLACK DRESS

1. Black is definitely the classic color that defines the lightest that you can decor, if you want to wear it properly, just with care. However, black does not suit to anyone. For example, do not look good in black people with very white skin, simply, can make some people too bleak and tough.
2. If black suits, we could keep it as much as possible. If black does not suit us, sure we won't have such things in the wardrobe. In this way, we look pale or nor sober, but we could still enjoy the elegance, simplicity, if we wear other colors. Tights even in other colors than color to offer a finishing look. For evening dress we can wear black or gray, these colors are an excellent choice.
3. Chosen shoes are an important part of appearance because they can provide a contrast color or style dresses. For wear with black dress shoes must be of excellent quality, that can be characterized for proper footwear worn and human eyes will get to them after they will admire the black dress.
4. A simple black casual look is suitable for office or informal event. Strap shoes are also suitable for day wear a black dress. Evening shoes classics go well with a black dress has top round, with very high heels or sandals [2].
5. Using jewelry to brighten black dress. Black dress offers a magnificent setting for your jewelry can highlight. Accessories that match a black dress is a necklace which is fit to adopted style,

a fixed pin in a nice place or a pair of bold earrings. The list is endless in terms of accessories you can wear, so you just need to have imagination.

6.Improving style dress can be done with adding a belt, which can provide a very emphatic feature contrasting a black dress. Choose a belt by color, texture, style or model. Just make sure it fits well with the dress as a whole and check look in the mirror completely.

7.If you like to wear scarves, this can be a wonderful addition to a black dress. Choose a print or a model that matches the dress by matching scarf and the make sure of its quality is like a silk scarf.

8.If you do not mind wearing gloves, they really can "dress" black dress. White gloves during the day and evening gloves black can do wonders.

9.The bag will stand out as black serving as a background for any hold in your hand, so make sure the bag is treated as part of your overall appearance. The bag should not match the shoes or other accessories, but should mix well in the color scheme. A small bag looks great, discreet. For the evening try a dazzling color or foaming. A handbag should be of good quality and clean. A great bag can match when you dress casual, provided that it is in excellent condition.

10. Matching your nail polish, eye shadow and lipstick to color theme main issues arising from accessories, shoes and dress. Or, just make sure your makeup highlight the best features of the face and give life to the whole look.

11. Add accessories to cover the head and hair catching the list of possible items of the accessorized black dress. A well-placed hat may be suitable for special events such as weddings, baptisms, and in very hot days. We have to be aware from the colors will reflect shadows on the dark face. People with short neck will not wear hats with borders left while those with raised borders will uplift the face, if you face the square or rectangular beveled edges, you can wear hats with straight borders felt soft, round face wear rounded borders. Any type of hairstyle could be also sexy and charming, curls, a more sophisticated to show physical traits and qualities that we have [2].

2. DO WE KNOW WHAT KIND OF DRESS YOU MUST WEAR BLACK?

Whenever we asked this question what to wear? What does befitting? Some black dresses even if she is not really any black woman, an individual who is not adequate for your body.

When you choose the clothes, the most important goal is to create the illusion that you have line and hips, bust, highlighted waist, even with a slightly rounded belly and ass all round.

A golden rule I can tell you that you must follow and we always like to show how well it can not put never one thing that terminate in the widest part of the body.

An inappropriate bra cleavage may change the shape of the trunk if not as yours; we should have more that you can wear it in different situations. From a small bust we wear applications, controls, duplication of fabrics. A bust of a preeminent we will take a simple forming a V cleavage and a necklace.

Décolleté when we get to cleavages and collars should take into account the structure of clavicles, but also your mood to expose that part of the body.

The boat style id used for women who have neck and the head well proportioned, for women who have a line of delicate clavicle and dresses with such a wide cleavage are down, so are suitable for women with a pear figure.

3. THE FORMAL CLEAVAGES

These cleavages are more daring, but while maintaining a touch formal, being generally suitable for evening outfits.

The triangle style is formed by two pieces of material that flowed from the side and cling to each other behind the neck, is suitable for women with small or medium size bust, full or women with broad shoulders is better to avoid it.

The heart style compliments any figure and any size bust, lengthens face provide balance and great proportions, is found on most models for evening and wedding dresses.

The Empire style is a cleavage revealing much skin, so it indicated a medium or large bust is perfect for women with short neck, because lengthens face, is not recommended if you have small bust because it draws attention.

The Queen Anne style an excellent option for women with small shoulders and small bust, a small triangle of proportionality offers from middle of the breast, increasing it and be avoided by women with broad shoulders, because widens even more [6].

At the waist for a longer torso we wear products with lower waist and if is too short we choose those with waist high. Beginning of the tummy will hide under a pattern with waist high.

We define the hip line which is the widest part of the button will not prevent applications and will complement the waist line. Under skirt of crepe with asymmetric layers we hide the generous hips.

The legs are a big problem and removed many flaws unearthed if we do not know how to fix these short toes we wear clothes; we combine some shoes cut in front and a short dress to create the illusion of longer legs wearing the same solid color from the waist down.

For short woman we try to create an optical illusion to appear higher in the dress that I picked it up and we will be choosing a dress over the knee and a straight or with spades.

For the pear women look to the woman in need of dresses which should clearly show the upper part of the body, so the back blank or very cleavage to highlight the shoulder and bust and hip we care on line.

For the apple woman is slightly more difficult as there is no optical illusion and waistline will create a flat abdomen with floral top in elements.

For the hourglass woman is the perfect woman and is more advantageous for a dress that will mold and take out the beautiful all forms of the body and will show very well in it.

Hips too late will have to highlight size and to emphasize the neck line and forming a slightly hide defects, wearing a sleeveless dress to attract attention to the top and the length will be up to knees [3].

Silhouette, without any problem we can dress a stylish black dress and what is just perfect especially if choose for one up to knees and sleeveless only will be careful to choose a model that emphasizes the stature to have more faith.

Big shoulders a dress one shoulder we will work with a balance of a classic car an upper body and we might accessorize with a beautiful scarf.

The waist too thin trying to choose a dress that shall not be fitted at the waist to try to attract attention elsewhere, we could choose a dress to put the feet in evidence and do not need to pay attention in the upper part of the body through a very large cleavage [3].

I tried to give a few suggestions, but keep in mind that there is no perfect black dress, all have the role is to feel sexy, comfortable, confident and dressed after the last fashion, although it does not goes out of fashion.

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STUDY CONCERNING THE INFLUENCE OF THE RAW MATERIAL ON STRENGTH AND ELONGATION OF KNIT FOR SOCKS

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Abstract: The objective of the paper concerning the influence of the raw material on tensile strength and elongation at break for the knitted fabrics used to produce socks. The tests were performed according to SR EN ISO 13934-2:2002 with the Titan2 Strength Tester device. [3]. Were subjected to tensile the knitted samples made from different types of yarns such as cotton, viscose, bamboo, soy, Tencel.
Key words: socks, raw material, tensile strength, elongation at break

1. INTRODUCTION

In obtaining a good quality product, the focus is not only on its aesthetic, but also on the wear behavior. Product quality is strictly related to the possibility of using it without to modify his original characteristics. [2]

Properties of knitted fabrics are influenced by many factors: the nature of raw materials, knitted fabrics geometry and density, technological parameters of the knitting operation and finishing.

The objective of the paper concerning the influence of the raw material on tensile strength and elongation at break for the knitted fabrics used to produce socks.

The tests were performed according to SR EN ISO 13934-2:2002 with the Titan2 Strength Tester device. [3]

Were subjected to tensile the knitted samples made from different types of yarns such as cotton, viscose, bamboo, soy, Tencel.

2. SAMPLES

For test were used knitted samples made from different raw material: cotton, viscose, bamboo, soybean, Tencel® (Table 1).

Bamboo Fiber is a kind of regenerated cellulose fiber, which is produced from raw materials of bamboo pulp. What's notable of bamboo fiber is its unusual breathability and coolness. Because the cross-section of the bamboo fiber is filled with various micro-gaps and micro-holes, it has much better moisture absorption and ventilation. With this unparalleled micro-structure, bamboo fiber apparel can absorb and evaporate humans sweat in a split second. [5]

Soybean protein fibre (SPF) is liquefied soy protein that is extruded from soybean after the extraction of oil, and processed mechanically to produce fibres by using new bioengineering technology. A soybean protein fibre has not only the superiorities of natural fibres but also the physical properties of synthetic ones. [5]

Tencel® is the registered trade name for Lyocell, which is a biodegradable fabric made from wood pulp cellulose. The knitted fabric is environmentally friendly and a good choice for people with sensitive skin. [5]

3. EQUIPMENT

Samples were made using circular knitting machines with small diameter ($3^{3/4}$'') MATEC – Mono IV, 14 Ef, 144 needles.
The tests were performed with the Titan^2 – Universal Strength Tester, Model 710.

4. METHOD

In order to determine the tensile strength, samples were tested on dynamometer test Titan^2, applying the breaking force according to standard EN ISO 13934-2:2002 - Tensile properties of fabrics - Determination of maximum force using the grab method.[6]

The main advantage of the grab method is that no special preparation of the sample strip is required by removing the longitudinal yarns as in strip testing.[7]

The samples were tested only on the warp direction.

5. EXPERIMENTAL

Table 1: Results

Sample	Raw material (base yarn)	Fineness (base yarn)	Raw material (vanised yarn)	Fineness (vanised yarn)	Mean Force [N]	Mean Extension [%]
1	Cotton 100%	34/1 Nm	Polyamide 6	44/12x2 Den	263.91	71.38
2			Polyamide 6	78/20x2 Den	360.53	98.68
3	Cotton 100%	40/1 Nm	Polyamide 6	44/12x2 Den	213.48	65.51
4			Polyamide 6	78/20x2 Den	357.80	98.13
5	Cotton 100%	50/1 Nm	Polyamide 6	44/12x2 Den	201.13	61.51
6			Polyamide 6	78/20x2 Den	351.83	92.97
7	Bamboo + Viscose	34/1 Nm	Polyamide 6	44/12x2 Den	283.81	67.43
8			Polyamide 6	78/20x2 Den	350.26	94.87
9	Tencel	34/1 Nm	Polyamide 6	44/12x2 Den	286.63	72.98
10			Polyamide 6	78/20x2 Den	358.60	87.98
11	Cotton + Soy	34/1 Nm	Polyamide 6	44/12x2 Den	353.38	89.67
12			Polyamide 6	78/20x2 Den	420.99	110.34

The graphs of tensile test are presented in figures 1-12.

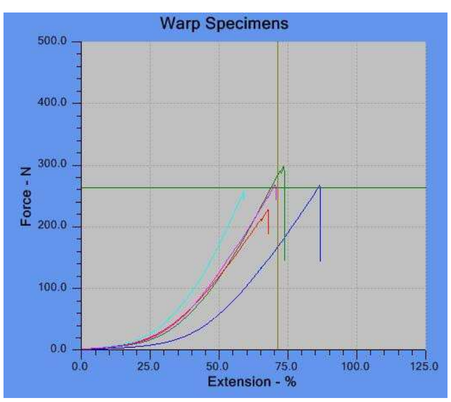

Figure 1: Cotton 100%, 34/1 Nm + Polyamide 6, 44/12x2 Den

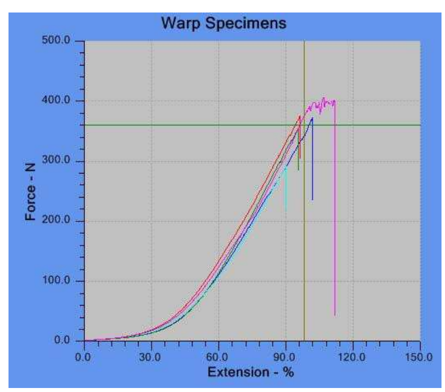

Figure 2: Cotton 100%, 34/1 Nm + Polyamide 6, 71/20x2 Den

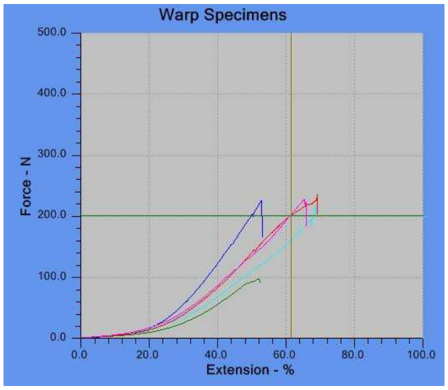

Figure 3: Cotton 100%, 40/1 Nm
+ Polyamide 6, 44/12x2 Den

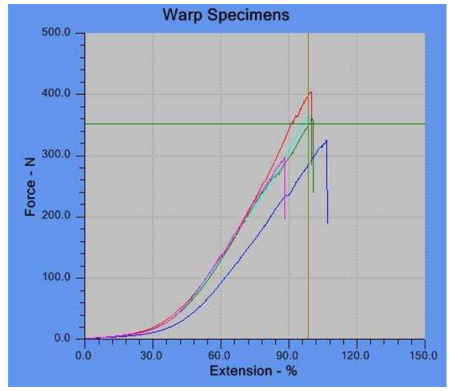

Figure 4: Cotton 100%, 40/1 Nm
+ Polyamide 6, 78/20x2 Den

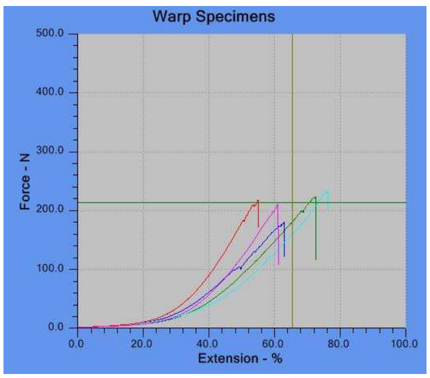

Figure 5: Cotton 100%, 50/1 Nm
+ Polyamide 6, 44/12x2 Den

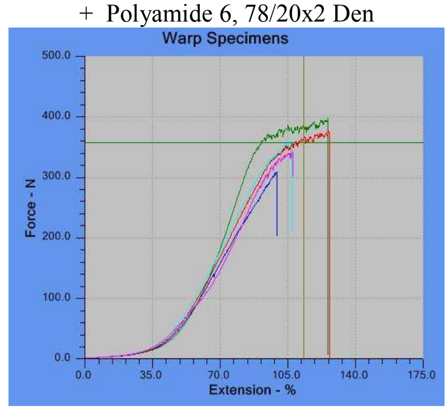

Figure 6: Cotton 100%, 50/1 Nm
+ Polyamide 6, 78/20x2 Den

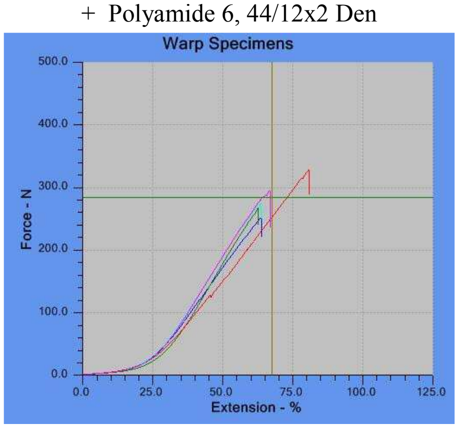

Figure 7: Bamboo+Viscose, 34/1 Nm
+ Polyamide 6, 44/12x2 Den

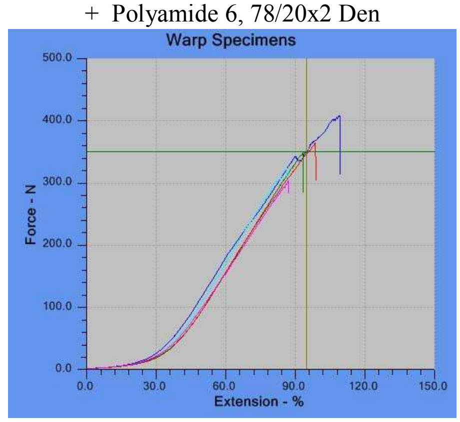

Figure 8: Bamboo+Viscose, 34/1 Nm
+ Polyamide 6, 78/20x2 Den

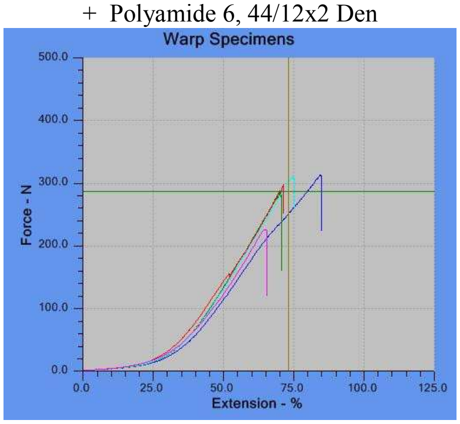

Figure 9: Tencel, 34/1 Nm
+ Polyamide 6, 44/12x2 Den

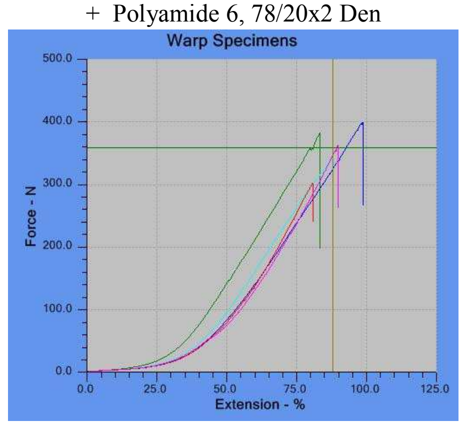

Figure 10: Tencel, 34/1 Nm
+ Polyamide 6, 78/20x2 Den

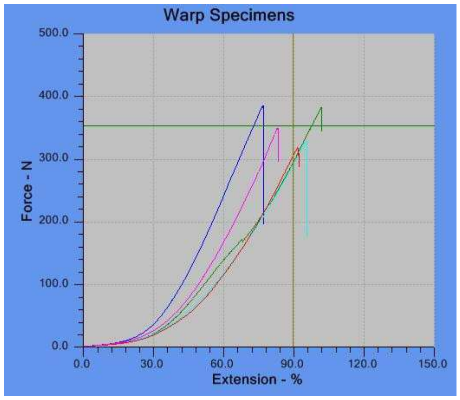

Figure 11: Cotton+Soybean, 34/1 Nm + Polyamide 6, 44/12x2 Den

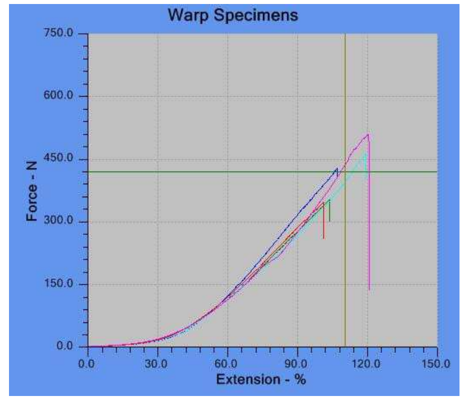

Figure 12: Cotton+Soybean, 34/1 Nm + Polyamide 6, 78/20x2 Den

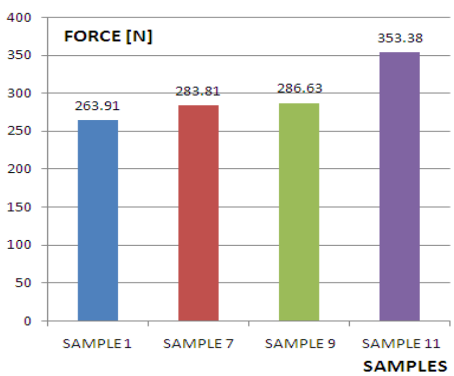

Figure 13: Strength graph for samples 1,7,9,11

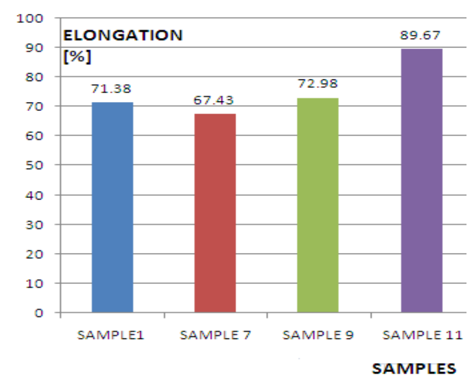

Figure 14: Elongation graph for samples 1,7,9,11

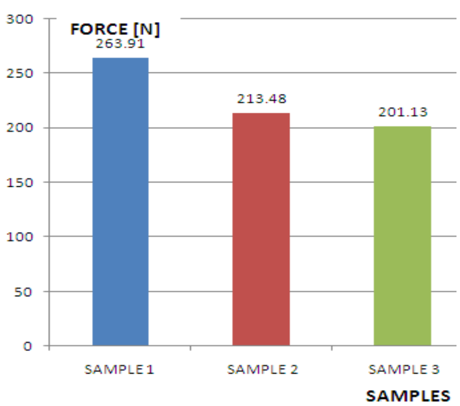

Figure 15: Strength graph for samples 1,2,3

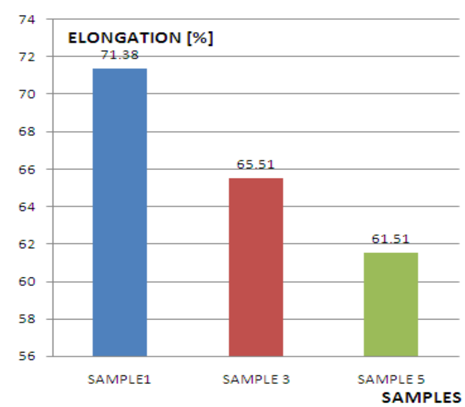

Figure 16: Elongation graph for samples 1,2,3

4. CONCLUSIONS

As a result of the performed analyses for testing the following conclusions may be drawn:

For the same raw material, cotton 100% + polyamide 44/12x2 den, (samples 1 and 3) the breaking resistance increase with 23,6%, figure 15 and the breaking elongation increase with 9% , figure 16, if fineness of base yarn increase with 18% .

For the same raw material, cotton 100% + polyamide 44/12x2 den, (samples 3 and 5) the breaking resistance increase with 6%, figure 15 and the breaking elongation increase with 6.5% , figure 16, if fineness of base yarn increase with 25% .

For the same raw material (cotton 100% + polyamide 78/20x2 den), samples 2 and 4, the breaking resistance increase with 0,8% and the breaking elongation increase with 0,4%, if fineness of base yarn increase with 18%.

For the same raw material (cotton 100% + polyamide 78/20x2 den), samples 4 and 6, the breaking resistance increase with 1,7% and the breaking elongation increase with 5,6%, if fineness of base yarn increase with 25%.

For the same yarn fineness (34 Nm + 44/12x2 Den), but different raw material, samples 1,7,9 and 11, knitted fabric made of cotton + soybean (sample 11), has the best tensile strength and elongation at break, figure 13 and 14.

For the same sample (cotton 100%), if we keep the same fineness for base yarn, 34Nm, but fineness of vanised (polyamide) yarn increase with 77%, the breaking resistance increase with 36% and the breaking elongation increase with 38%.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

SOLUTION FOR SYNTETHIC PRODUCTS NESTING BASED ON LEATHER PRODUCTS DESIGN

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Abstract: Research in general irregular-shape nesting can be used in confection industry for nesting leather and syntethic product parts. Today there are solutions for syntethic products, while solutions for leather products are still under development. Our research is oriented to improved footwear design efficency, while assister by computer. We treated almost each stage of footwear design, and we observed that our studies regarding economical efficency can be used also for nesting parts of syntethic products. However, the big goal is to create a professional nesting software for leather, but until then, nesting parts of syntethic products can be considered a small victory.
Key words: assited, material estimation, syntethic nesting

1. INTRODUCTION

A nesting solution is *relevant* if material waste is minimum while processing duration is instantenous. Relevant solutions are achieved by optimization, and so can be used in industry, where can't be afford times for delay. Generally, nesting solutions for industry should be less than 5-10 seconds.

Theory revealed nesting solutions for bought syntethic and leather products, but only syntethic solutions are relevant, their optimization is easier, because it requires less stages than leather solutions.

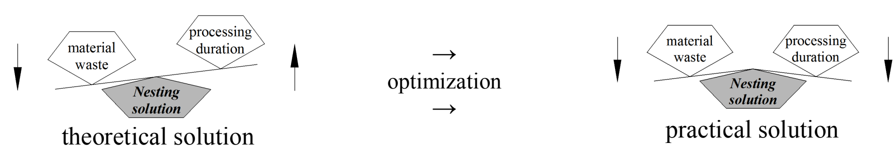


Figure 1: A n*esting solution* is a particular balance between *processing duration* and *material waste*

Generally, the big challenge is not to create the nesting algorithm, but to make it perform real faster, through optimization. This means relocating the behaviour of software while using resources, changing some internal arhitecture, and so on, there is required an approach using advanced programing tehnics.

● Computing ***leather products nesting*** consumes lot of processing time, because there is required to find *optimal combinations* between all product parts, and *optimal parts placement* over the leather surface.

● Computing ***syntethic products nesting*** consumes less time, because *combinations number is reduced*, and *parts placement requires a pattern that can be repeated.*

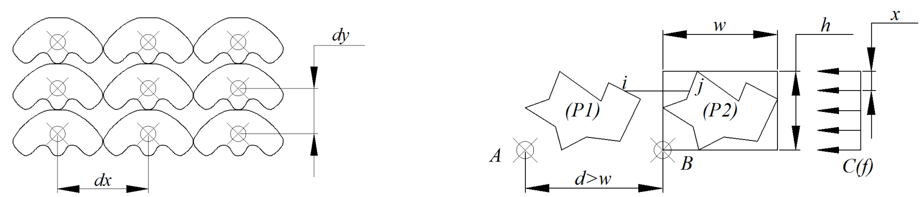
To convert a leather nesting to a syntethic one, is enough to consider the material shape regular (because leather nesting works with irregular material shape). In general, estimating consumption for the syntethic materials is a much easier process than estimating leather ammounts. Also, nesting on syntethic materials is subject to a wider tolleration than nesting on leather, because these materials are cheaper and also, in practice, not always the best nesting layout provides maximum usage for a syntethic material.

In our approch, we reconsidered the main stages of leather footwear development as : *digitizing, designing, grading, material estimation* and *nesting*; we have tried to develop faster methods to achieve all these stages, and for *material estimation* we have developed several methods. Actually, we transfered into our source code methods that allready exists in other software sollutions, but also an original one, so called the *sum of all rests*. This method is based on *same parts nesting*, so, we used this part to develop a solution for syntethic nesting. In the following chapter we explain the technique that we use to generate the nest layout.

2. TECHNIQUES USED TO GENERATE NESTING LAYOUTS

Next techniques were initially developed for material estimation of leather product, but their scope can also be used to generate nesting layouts for syntethic products.

Variant 1 : Parts are placed in vertical and horizontal rows; positions inside the final nesting layout resulting by translations (kΔx, kΔy) **(figure 2a)** . Associated parallelogram area is the product of ***dx*** and ***dy***.



a) Generall aspect b) Important dimensions used in algorithmics

Figure 2: Variant 1 used to generate nesting layouts

Considering a part represented by a polygon P_1,with ***w*h*** overall bounding area, is building a second polygon P_2 obtained by translating the first polygon horizontally by the amount ***d>w***, to avoid their premature intersection. If ***d-w = dw*** , (***dw*** is the added distance), the final distance for a proper contact of the two parts will be at most equal to ***dw***. To determine this value, the two polygons are intersected with a parallel beam of lines, whose height is at least equal to ***h,*** thus ensuring the beam fully intersects bought polygons **(figure 2b).**

Origin ***C(f)*** of this flow can be considered as a simetric point for ***A***, among origin ***B.*** Precision of the method is directly influenced by the distance ***x*** between two neighboring lines from the beam. It can be correlated distance ***x*** with height ***h*** of the part to distribute evenly all beam lines around part's surface. The condition is that ***x = [h / n],*** where ***[x]*** is the integer part of number ***x.***

Determination of contact distance ***dw,*** is performed by comparing segments determinated by the beam between the two poligons (parts). Each line from the beam intersects with the two polygons, retaining for the polygon P_1 the point with the higher abscissa, and for the polygon P_2 the point with the smallest abscissa. Thus, for each line, is given a pair of points ***(i, j).*** Finally, from all lengths of segments ***(i, j)*** the smallest distance is associated to ***dw.***

Considering the initial parts with zero rotation, ***dw=d x.*** Determination of ***dy*** is done similarly, except that the polygons are rotated with $90^{0,}$ in the preferential direction *(counterclockwise or clockwise).*

After determination for values ***dx, dy,*** parts nesting can be achieved by translating them with the values determined by the axes of the coordinate system.

Variant 2 : Parts are placed in vertical rows, with the observation that parts from neighboring rows are rotated by 180^0. These strings are intertwined to obtain a higher nesting factor **(figure 3a).**

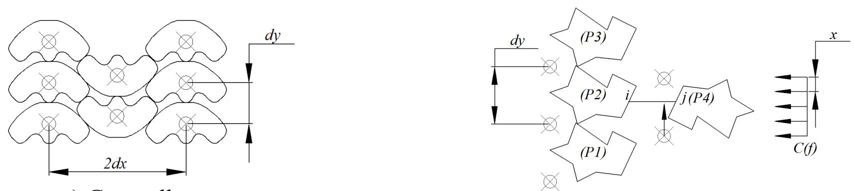
Associated parallelogram area is the product of ***dx*** and ***dy.***

Similar to the procedure described in variant 1, is build a vertical row of parts ***(P_1,P_2,P_3)***, distant from each other being ***dy*** (determined above).

It builds a fourth part, rotated by 180^0, positioned on the abscissa at a distance ***d>w*** from the vertical row, and on the ordinate midway between the center of parts P_1 and P_2. Analog to first nesting variant, is considered a beam of lines, with which is determinated the minimum distance ***dxi*** *(contact distqnce)* for this position. The process is repeated for each intermidiate position of polygon P_4, translated to the positive direction of axis OY; the increment of translation ***x,*** is equal to the distance between neighboring lines from the beam. Thus, for each intermediate position occupied by the polygon P_4 there is a contact distance ***(dxi)*** **(figure 3b).**

The final value ***dx*** *(the searched value)* will be the minimum of all ***dxi*** determined above.

Accuracy is directly influenced by the translation increment of poligon P_4 which is equal to the beam linear density ***(x).***



a) Generall aspect

b) Important dimensions used in algorithmics

Figure 3: Variant 2 used to generate nesting layouts

Variant 3 : This version is derived from the above, indicating that the evolution sequence of parts ***(P_1,P_2,P_3)***, is not vertical, but away from the vertical by an angle ***α*** (**figure 4**). ***dx*** and ***dy*** values determine methodology is the same as in variant 2, the difference in the number of different nesting layouts tested, which are corresponding to the angle ***α.*** Accuracy of these variant is influenced by same specifics as in variant 2, plus the increment of changing the angle ***α.***

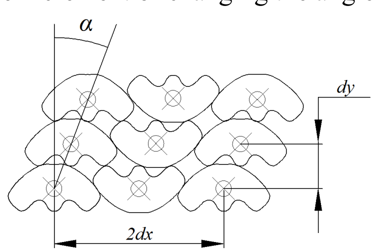


Figure 4: Generall aspect of variant 3 used to generate nesting layouts

3. CONCEVEING THE NESTING LAYOUT

A nesting layout is conceived by using a pattern, which is repetead over a surface (over the material) until it fills it. This pattern is based on the nesting variants previously exposed, and it contains the elementary cell. As ilustrated in figure 5, there is need to retain from the nesting variants only 1 or 2 parts, considered main parts, and to used dx and dy as base values for repeating this cell, to obtain the final pattern. Thus, *dx* and *dy* determined above are converted into perpendicular vectors *width* and *height*, which can be used to obtain the final nesting for a syntethic part. Further more, this elementary cell can be repeated, to obtain a nesting generall aspect (figure 6).

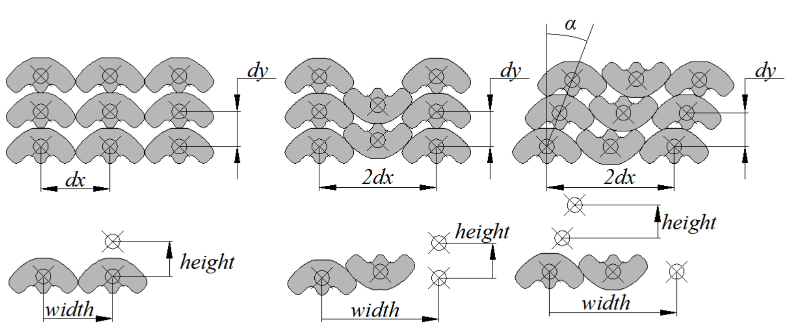


Figure 5: Extracting the elementary cel from all 3 nesting variants

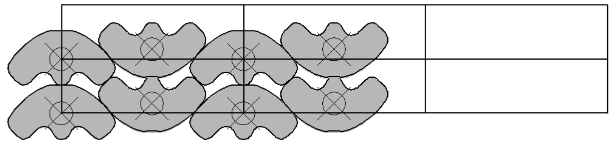


Figure 6: Nesting general aspect, obtained by repeating the elementary cell

To make this process relevant, is it important to position this row of elementary cells over the material surface. Thus, considering a nest general aspect, large enough to bound different position of the cutting material, this material is rotated (figura 7a) until it fits the optimal position, which has the most parts on it. Generally, best nesting result for $\alpha=0^0$ or $\alpha=90^0$, while using nesting variant 1 or 2, but there are also particular cases which trigger best result for different values for α, while using nesting variant 3.

This process can be done for several material dimensions and for several parts size, obtained after grading, in order to gain the optimal dimension for the syntethic material needed to manufacture one product (figure 7b).

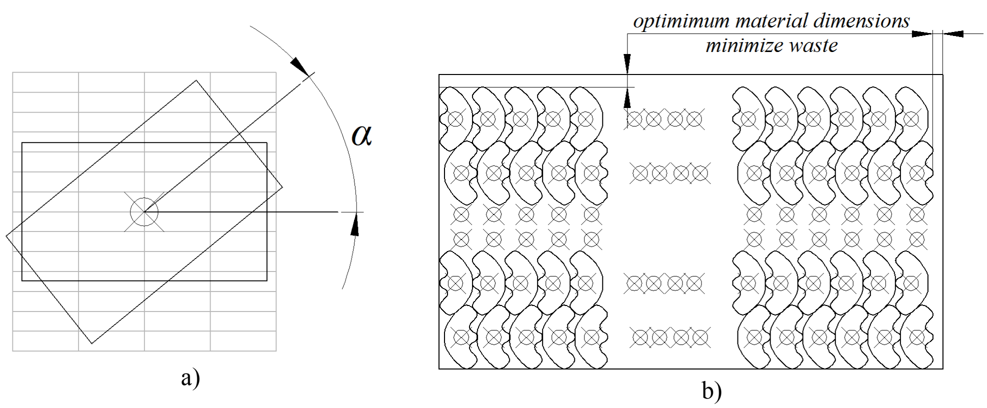


Figure 7: Testing different material positions over the row of elementary cells *a*, in order to retain the position with the highest material usage factor *b*

The best way to use this method, is to call it with different parts, required to be cut from the same material. Thus, not all parts of an article are to be manufactured from the same material, so, this method can be called only by groups of parts that are to be cutted from the same material. Also, further more, for best optimization, it is recomanded to call using all graded parts within the serie size.

In this way, it can be done a wise estimation for material usage, and a relevant recomandation for the optimal material surface that should be used inside manufacturing.

4. CONCLUSIONS

Nesting parts of leather articles is an actual issue, because leather tides and product parts have an irregular shape, which add complexity to the process of developing automatization solutions for cutting departments. On the other side, partial results can be used for synthetic cutting, where materials shape is rectangular, so not very complex, and parts placement over the material is easier.

Generally, when developing solutions for sintethic cutting, there are two cases :

• material manufacturers can deliver materials at a certain width/height, ordered by the customer; in this case, our software can be used to determine which are the dimensions; this case is very important when material costs are high;

• material manufacturers deliver materials at standard sizes; in this case, our software can recomand the best material size to be used, even if it is not the optimal one.

During our research, we considered bought cases and we built special software solution for them. Yet, our high goal is to develop relevant solutions for leather cutting.

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CHANGES DIMENSIONS OF THE SHOE LAST BY USING DELCAM CRISPIN 3D – LAST MAKER – FUNCTION GRADE

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Abstract: The paper presents a study regarding the changes dimensions of the shoe lasts, by using **Delcam CRISPIN** – **Last Maker function Grade**. The puprose is to obtain shoe lasts for inferior and superior sizes of the lasts from the database that were obtained width **ModelTracer** and **Last Make**r software.
Key words: shoe last, number size, system size, with, gender.

1. INTRODUCTION

One of the main activities in designing shoe lasts is to obtain similar lasts to the original one, for different sizes [2], [3]. This problem is solved for shoe maker using the methods for calbrating. For this is to obtain shoe lasts for inferior and superior sizes of the lasts from the shoe last creating using classical or computer methods.

2. ABOUT SHOE SIZE

A shoe size is an alphanumerical indication of the fitting size of a shoe for a person. Often it just consists of a number indicating the length because many shoemakers only provide a standard width for economic reasons. There are several different shoe-size systems that are used worldwide. These systems differ in what they measure, what unit of measurement they use, and where the size 0 (or 1) is positioned. Only a few systems also take the width of the feet into account. Some regions use different shoe-size systems for different types of shoes (e.g., men's, women's, children's, sport, or safety shoes).

2.1 Foot, Last, Shoe

There is several size systems used all over the world. Although there are general rules for comparison between the systems, these comparisons cannot be relied upon, due to a lack of coordination as to how each of these systems are applied in each country. There is also a lack of information as to how the manufacturers have defined the size and with of the last for the shoe [4], [5].

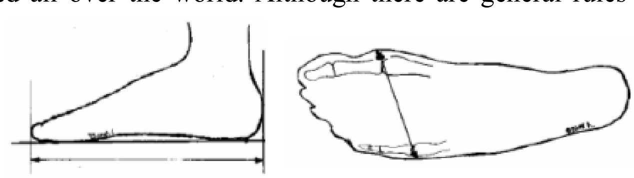

Figure 1, Length width of the foot

It is important to learn the difference between foot length and shoe size. Foot length in Europe (except UK) is always measured in millimetres (mm). The size of shoes is specified width different size terms depending upon which system is in use. There are also different opinions as to how long a shoe should be in proportion to the foot, but generally one can say that a shoe should be 12-15 mm longer than the foot depending of the shoe design (fig 1, fig.2) [4].

Most size systems will specify the shoe size based upon the nominal length of the last, which corresponds to the length of the inside of the shoe [5]. Therefore, all shoes designated width the same size will not necessarily be of the same length due to the shape of the last. A shoe width a low heel and wide toe shape is probably close to the specified shoe size in length if you measure the last. A shoe width a narrow toe shape will be longer then its specified shoe size (fig.2).

2.2 The length of the last

As indicated above there are significant differences, up to 16 mm, between shoes width the same size [4]. These length differences appear for shoes width the same size, in the same shoe system, if the lasts are measured differently. To be able to compare the length of shoes width the same size it is essential to know how the lasts have been measured [4]. The conclusion, after consultation width the manufacturers and suppliers, is that there are three different ways in which a last may be measured. In metric system the last is measured from the tip of the toe to base of the heel (fig. 2).

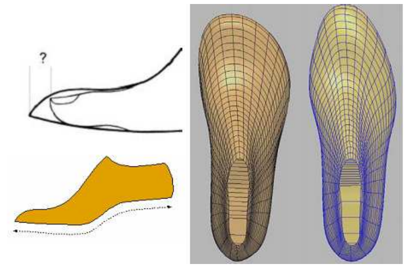

Figure 2, The length of the shoe last depending of the shoe design

2.3 Size System

There is several size systems used all over the world. Sweden and most of Europe, except UK and Ireland, use the system called Paris Point. In Sweden size 38 for women and size 43 for men are most common. The scale starts at zero and continues width length intervals of 6,66 mm per size. The Paris Point-system is sometimes called the Continental System. The difference between each system is that the length of the last is measured differently. English and American sizes are also used in Sweden, mainly for sportswear. In the illustration to the right, you can compare the differences between each of the shoe size systems. As can be seen, you may have the same shoe size but a different length, depending on which system you are utilizing [3], [4],[5].

In the illustration to the right, you can compare the differences between each of the shoe size systems [4]. As can be seen, you may have the same shoe size but a different length, depending on which system you are utilizing (fig. 3).

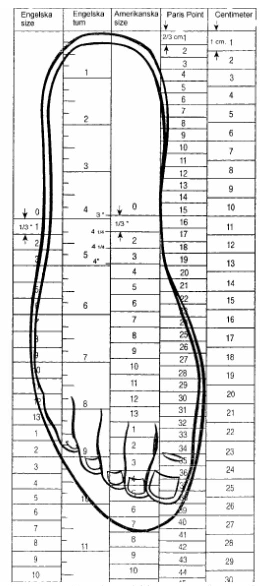

Figure 3. An illustration for compare the differences between each of the shoe size system

2.4 International Shoe Size Conversions Charts. Adults, Girl's and Boy's Shoe Size

For last and shoe these shoe size conversion table can help. Having studied many published shoe size tables on the net [4]. The best practice on recommend is to place orders in terms of inches, millimeters, or centimetes. Y on can at least measure you foot and mesure the shoe last and determine you ordered. The following tables demonstrate another aspect of globalizing products- shoe sizes are not measured in the same units around the world. E-Business applications need to provide users width appropriate units and be clear about which units are being referenced [4].

Table nr. 1: International Shoe Size Conversion

Girl's Shoe Sizes

Europe	26	26.5	27	27.5	28	28.5	29	30	30.5	31	31.5	32.2	33	33.5	34	35	Europe
Japan	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5	21	21.5	22	Japan
U.K.	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	1	1.5	2	2.5	U.K.
U.S. & Canada	9.5	10	10.5	11	11.5	12	12.5	13	13.5	1	1.5	2	2.5	3	3.5	4	U.S. & Canada

Boys Shoe Sizes

Europe	29	29.7	30.5	31	31.5	33	33.5	34	34.7	35	35.5	36	37	37.5	Europe
Japan	16.5	17	17.5	18	18.5	19	19.5	20	20.5	21	21.5	22	22.5	23	Japan
U.K.	11	11.5	12	12.5	13	13.5	1	1.5	2	2.5	3	3.5	4	4.5	U.K.
U.S. & Canada	11.5	12	12.5	13	13.5	1	1.5	2	2.5	3	3.5	4	4.5	5	U.S. & Canada

Adult Mens and Womens Shoe Size Conversion Table

M/W indicates Men's or Women's Sizes. Other systems are for either gender.

System		Sizes																System	
Europe		35	35½	36	37	37½	38	38½	39	40	41	42	43	44	45	46½	48½	Europe	
Mexico							4.5	5	5.5	6	6.5	7	7.5	9	10	11	12.5	Mexico	
Japan	M	21.5	22	22.5	23	23.5	24	24.5	25	25.5	26	26.5	27.5	28.5	29.5	30.5	31.5	Japan	M
	W	21	21.5	22	22.5	23	23.5	24	24.5	25	25.5	26	27	28	29	30	31	Japan	W
U.K.	M	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	10	11	12	13½	U.K.	M
	W	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	9½	10½	11½	13	U.K.	W
Australia	M	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	10	11	12	13½	Australia	M
	W	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10½	11½	12½	14	Australia	W
U.S. & Canada	M	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10½	11½	12½	14	U.S. & Canada	M
	W	5	5½	6	6½	7	7½	8	8½	9	9½	10	10.5	12	13	14	15.5	U.S. & Canada	W
Russia & Ukraine *	W	33½	34		35		36		37		38		39					Russia & Ukraine	W
Korea (mm.)		228	231	235	238	241	245	248	251	254	257	260	267	273	279	286	292	Korea	
Inches		9	91/8	9¼	93/8	9½	95/8	9¾	97/8	10	101/8	10¼	10½	10¾	11	11¼	11½	Inches	
Centimeters		22.8	23.1	23.5	23.8	24.1	24.5	24.8	25.1	25.4	25.7	26	26.7	27.3	27.9	28.6	29.2	Centimeters	
Mondopoint		228	231	235	238	241	245	248	251	254	257	260	267	273	279	286	292	Mondopoint	

3. GRADING OF THE SHOE LAST BY USING DELCAM CRISPIN 3D – LAST MAKER – FUNCTION GRADE

By classic methodology, designing shoe last is a very complex and laborious activity. That is because classic methodology requires many graphic executions using manual means, which consume lot of the producer's time. Moreover, the results of this classical methodology may contain many inaccuracies width the most unpleasant consequences for the footwear producer. Thus, the costumer that buys a footwear product by taking in consideration the characteristics written on the product (size, width) can notice after a period that the product has flaws because of the inadequate design. In order to avoid this kind of situations, the strictest scientific criteria must be followed when one designs a footwear product [2], [3], [5].

The decisive step in this way has been made some time ago, when, as a result of powerful technical development and massive implementation of electronically calculus systems and informatics, CAD (Computer Assisted Design) Systems were used in footwear industry. One of the most important uses of calculus systems in footwear design is interactive designing by using the CAD system.

These are the key issues - this is why CRISPIN *Dynamics* have developed a range of quality software products to give you the shoemaker a major advantage in shoemaking [5].

This paper presents the basic function for grading shoe last using the system Delcam CRISPIN *Dynamics* 3D . This is a system CAD/CAM for footwear. This offers new solutions for shoemakers.

3.1 About Delcam Crispin Last Maker

LastMaker - a program providing the means to design and modify lasts width outputs to various 3D file formats. This system offers new solutions for shoemakers. This application offer functions for creating new shoe last (fig. 4) using function **Last>Adjust**, and flatten for development in 2D. There are also facilities to re-centre front and back guide lines, change foot (no need to re-digitize). set the correct heel height and grading shoe last for obtain shoe lasts for inferior and superior sizes. The new shoe last on compare for a study using the function of this application [5].

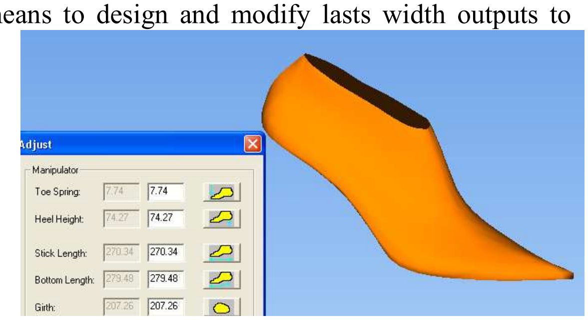

Figure 4, The dimensions of the shoe last with the option to reshape a last

3.2 Grading of the shoe last

Delcam Crispin Last Maker are functions for modification the dimensions of the shoe last for obtain shoe lasts for inferior and superior sizes. The steps for grading a shoe last are:

1. Modeling shoe last using **ModelTracer** - a program to digitise lasts in 3D using a Microscribe™ mechanical digitizer and imported in this application or select the last of the application data base you want to grade a shoe last [3], [5].

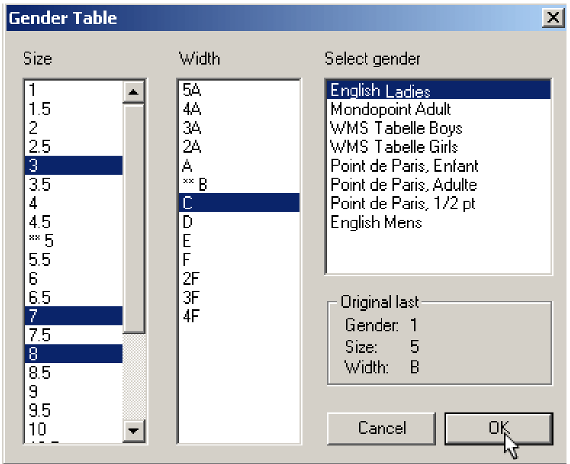

Figure 5, The window of the function Grade Proportional

2. Study the parameters of the shoe last using window of the function **Last Adjust** (fig 4).

3. Select the main menu Grade:

Grade > Proportional

and select the requested .grf file and seattle the number size. This number is market in the window of the function Grade – Gender Table, fig. 5.

Proportional grading option provides the facility to grade a last linearly by proportions/ increments defined by user.

Width the correct grade type selected and the model, gender, size and fitting set you can grade the last.

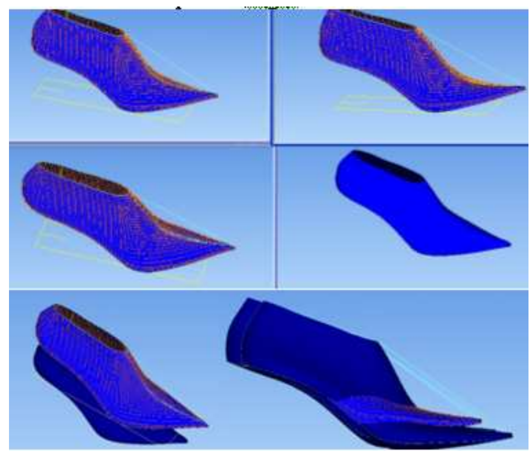

Figure 6, Illustration for last grading and comparing

Notes

The Grade Workspace (fig. 5) has the following tools:

- Selecting the measurement system - the Gender menu. The user can select one of the following measurement systems
- Selecting the width of the last. The application can modify the last's width, using the Width menu
- Selecting the size. The sizes are directly related to the option selected in the Gender menu

Once defined click OK and the system will prompts you to select the same .grf file once again. Now in similar box the parameters of the Original (current) last are already displayed width selected gender. In this dialog select **Gender, Size** and **Width** to be graded, fig. 5. The system will grade all the combinations of sizes and widths as defined.

All the graded lasts will be graded and place into separate files so they can be easily saved separately, (fig. 10, fig. 11). . For better control of the graded files use the **Window > Cascade** function or using function **Compare** (fig. 6)

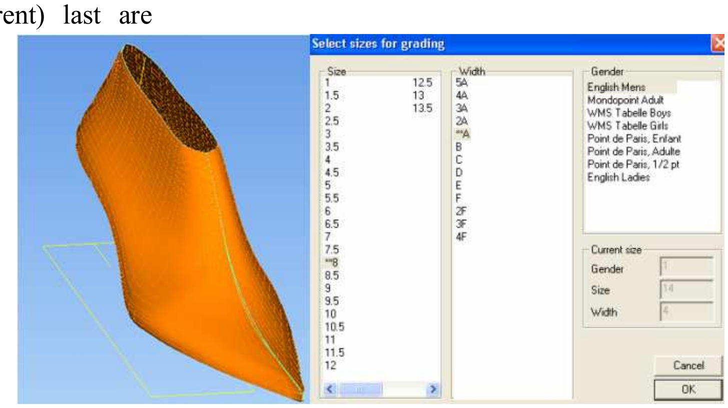

Figure 7, Window of the Last Maker for select size, Width, Gender for shoe last

4. STUDIES FOR GRADING THE SHOE LAST

We execute a studies using function Grade for a women last. The steps for this studies are:

1. We are modelling a shoe last for women using the methode of **Model Tracer** for digitise lasts in 3D with a Microscribe™ mechanical digitizer.
2. We imported in application **Last Maker** for study of the shoe last: views, geometrical parameters.
3. we execute the function: **Last>Adjust** to bring the parameters of this shoe last using for grading (fig 4).
4. We execute a studie for values of the parameters stick length – par1, bottom length- par2, girth-par3 for determination the number size.
5. We execute the function **Grade> Proportional**. In the window of this function we market: number size, width size, size system (fig. 5, fig. 7, fig.8).

5.RESULTS

The paper present the analysis of the variation of the basic geometrical parameters of the lasts during the grading process, as applied in Last maker.

To this respect, we use a women's shoe last and graded the last using two different methods.

- The size of the last was varied, while the width of the last of kept unchaged
- The width of the last was varied, while the size was left unchanged

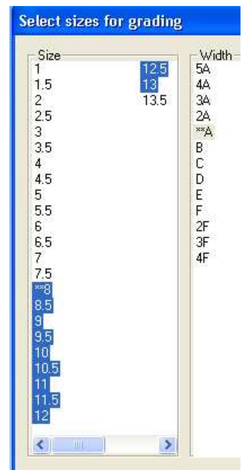

Figure 8: The window for select size for grading

5.1 The variation of the seize of the last while keeping the width unchanged

The study involved the following steps:

- A women's shoe last was selected, fig. 4.
- The measurements of the last were set using the **Last Adjust** tool in the menu, fig. 4.
- The last was modeled for size 8, width A in the English Ladies measurement system, fig.7.
- The last was scaled for sizes 8 to 13, while keeping the width unchanged, fig.8.
- Each file containing the new last was studied, fig. 10.
- The measurements was recorded in the database, fig.9 and table 2.

The measurements were recorded in a database and turned into graphics by using Excel (see table nr 2, the graphics of figure 9).

By looking at the values in the data table (see table nr. 2) , as well as the graphics themselves (see figure 9), one can see that the length of the last has varied, while the width remained stable.

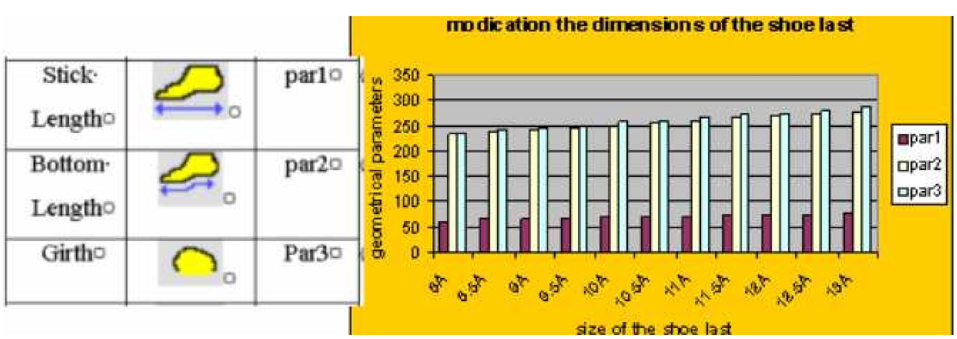

Figure 9: Modification the values of the of the parameters stick length – par1, bottom length- par2, girth-par3 for nr size 8 to 13 widt A

Table 2: Values for base parameters for number size of the last has varied

Number size	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13
Width	A	A	A	A	A	A	A	A	A	A	A
Stick Length-par1	234	239	243	247	253	257	261	266	270	274	280
Bottom Length-par2	237	243	247	252	258	262	266	273	277	281	288
Girth-par3	175	177	179	182	183	186	188	190	192	195	197

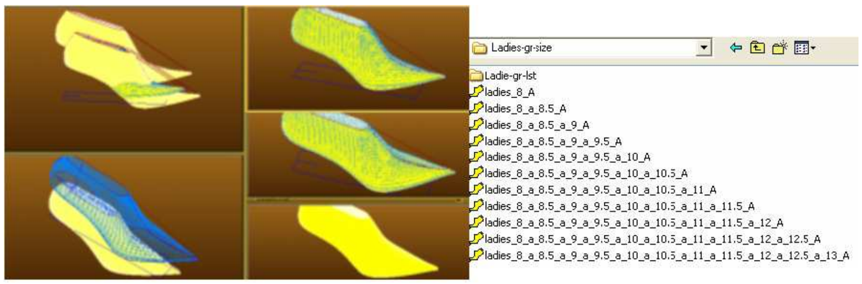

Figure 10: Results of the Last Maker for varation the paramers for several numbers size for this widths

5.2 The variation of the width of the last while keeping the size unchanged

To the purpose of this analysis, size 12 of the English Ladies measurement system was selected. The lasts were scaled on all the sizes allowed by the software, using the Last Adjust function. Just like in the previous study, each of the file containing the new lasts were analyzed. The data was recorded in a data table and graphically visualized by using **Excel** (see table nr. 3 and fig. 11).

By looking at the values in the data table (see fig. 11), as well as the graphics themselves, one can see that the width of the last has varied, while the length remained stable.

Table nr 3: Values for base parameters for width of the last has varied

Number size	12	12	12	12	12	12	12	12	12	12	12	12	12
Width	4F	3F	2F	F	E	D	C	B	A	2A	3A	4A	5A
stick length-par1	270	270	270	270	270	270	270	270	270	270	270	270	270
bottom length-par2	279	279	279	279	279	279	279	278	278	278	278	277	277
girth-par3	207	206	204	203	201	200	198	197	196	194	193	191	187

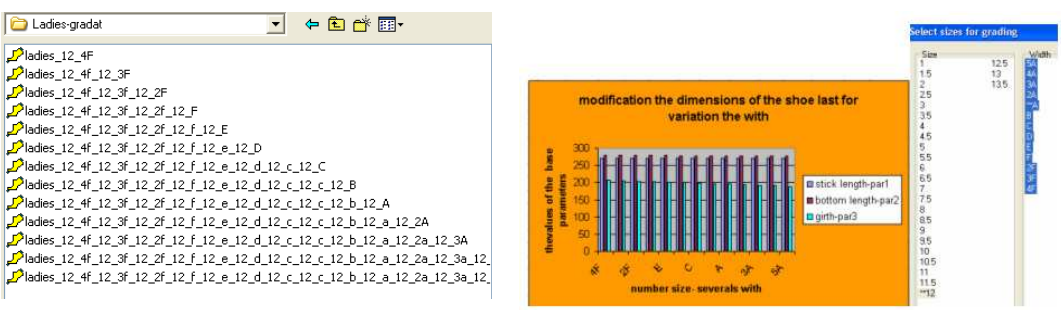

Figure 11: Results of the base paramers for several width and this size

6. CONCLUSIONS

The last is a central to shoe industry. Shoe design experts would always admit that a good last is a more important factor in the choice of a product in comparison to the price, because it assures a higher comfort. In this respect, computer aided modeling of the last can help increase the performance of the footwear producer. **Last Maker** gives the user the option to design the last according to the requirements and the standards of the clients. Automatic scaling can efficiently be used to produce lasts for all the sizes that are to be produced. The study represents a guarantee of the work precision and usefulness of the software for shoe producers.

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[5] *** DELCAM Crispin CAD Suite 3D

TECHNOLOGIES SPECIAL FOR THE LEATHER SOFA UPHOLSTERIES

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Abstract: In the processes of armchairs and sofas upholstering with leather covers, there are used many kinds of materials: leather, split hide, cloth, batting and some auxiliar materials such as: threat, zippers, backing bands, burr etc. Considering all these materials, the leather parts represent the most important starting material knowing its value but the specific technological conditions of its cutting-on and assembling, too. When the upholstering technological process is conceived, the operations specific for the leather parts are very important. The same importance is given to the operations of preparing and assembling of different materials parts, so that, in the end, the leather upholstery must give the impression that it was made of an entire leather roll which was uniform as structure and aspect. The paper presents some based operations used at the leather armchairs and sofas upholstering.

Key words: manufacturing, sofa and armchair upholsteries, leather, synthetic leather

1. INTRODUCTION

Each piece of furniture has interior arm, exterior arm, side rest frame, back rest frame, basement, seat frame, arm pillows, seat pillows and rest pillows [1,2]. The component parts used in these pieces upholstering are made of leather, split, cloth and batting. Each sample of upholstery needs the conceiving of the table of the component parts assembling [3]. Almost all assembling opperations of the parts are the same in the case of the armchairs upholstering but in the sofas (belonging to the same set) upholstering, too [4]. This is the reason because the assembling tables are conceived simultaneously for the armchairs but for the two and three seats sofas, too. The symbols used in the assembling tables [6] are: P- the leather parts; S – the parts made of covered split; C – the parts made of cloth; D - the parts made of batting; G- borders of the parts which 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 which are only of the armchair are symbolized begining with 100, the parts which are only of the two seats sofa are symbolized begining with 200, the parts which are only of the three seats sofa are symbolized begining with 300 and the parts which are common in all the three cases of the furniture pieces are symbolized begining with 001. This kind of assembling table is represented [9]in Fig. 1.

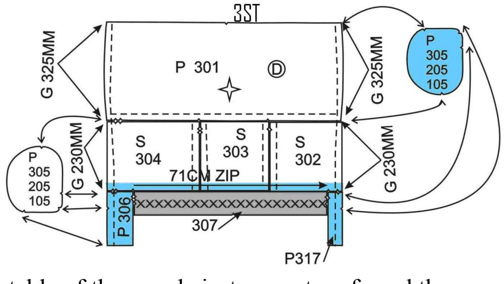


Figure 1: Assembling table of the armchair, two seats sofa and three seats sofa component parts

The assembling tables are the base of the conceiving of the technological process used in the manufacturing of the covers for the furniture pieces upholstering.

2. SOME TECHNOLOGICAL ASPECTS SPECIFIC FOR THE LEATHER UPHOLSTERIES

The cutting-on opperation is very important because the taylor has leathers from different qualities classes, with different useful areas and with differences of little colours [5]. Before the cutting-on begining, the worker must attentivelly analyze the leathers and he must addopt optimum solutions for the model setting on the leather, so that, in the end, he realizes the cutting-on of all the parts which are represented in the assembling tables and the material wastes are the smallest. Following all these desiderates, when the taylor cutts-on each part, he must abbey some rules [7]: the cutting-on of the parts, which are placed on the furniture pieces in visible and less stressed areas, must use the bend zones of the leathers; the cutting-on of the parts, which are placed on the furniture pieces in less visible or less stressed areas, must use the feet zones of the leathers; it will avoid, as possible as it can, the axillary zones of the leathers, because they may be elongated more easilly during the upholstering process, but during the using of the furniture pieces, too; the parts which must be used in visible zones and which must be jointed together, must have, as possible, the same drawing of the leather, so that they will create a continuity impression; the parts which have different drawings of the leather or the parts which have small surface damages will be placed in less visible zones of the furniture pieces; the leather parts which will be used at the furniture pieces of the same set, must be cutting-on using leathers which became from the same deliver.

Figure 2 presents different kinds of the parts dislacements on the surface of one leather with natural face and, respectively on the surface of one split hide [9].

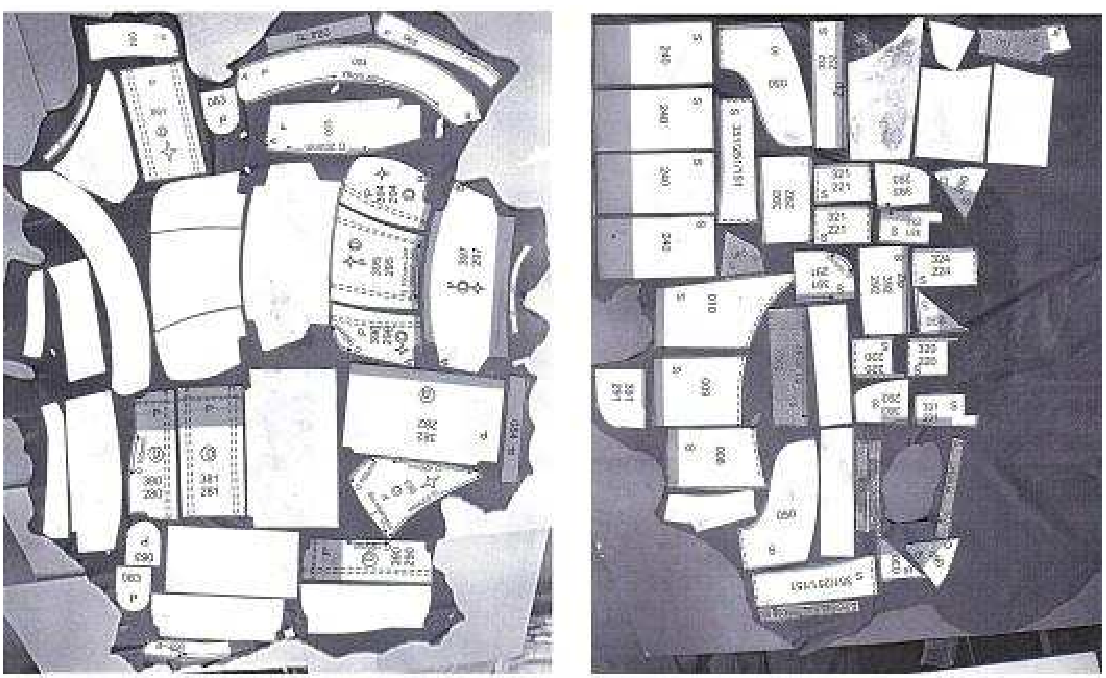
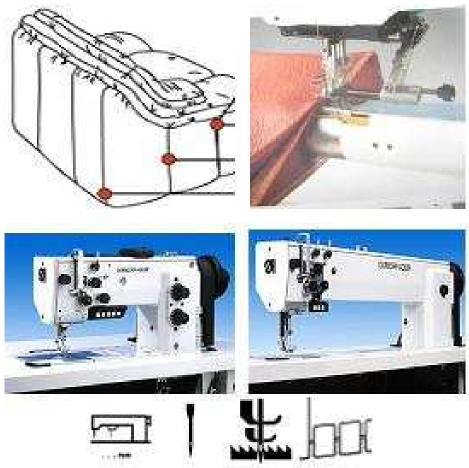
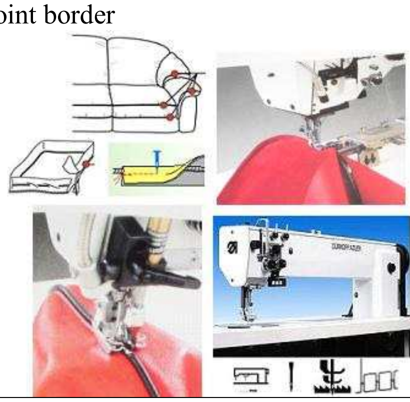
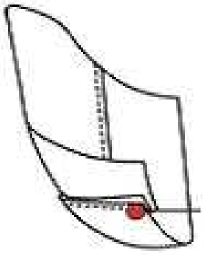
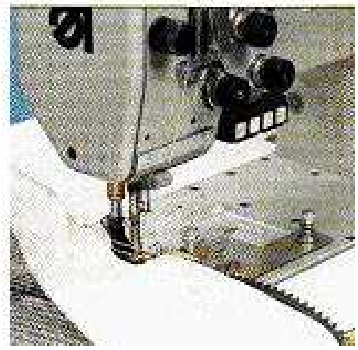
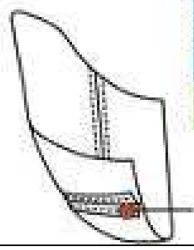
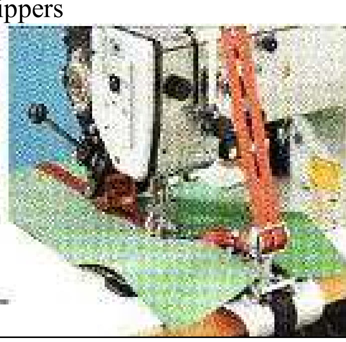
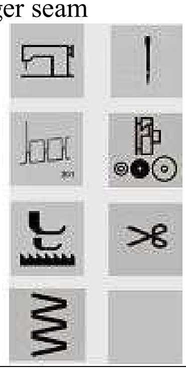
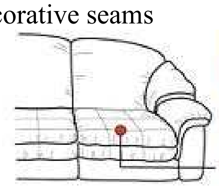
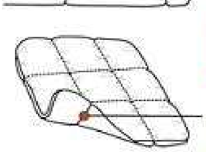
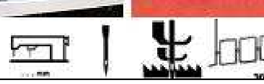


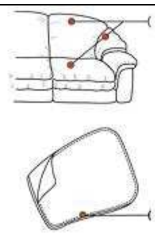
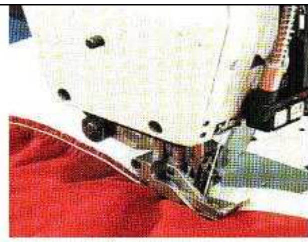
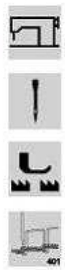
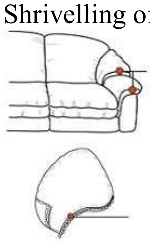
Figure 2: Displacements of the parts on leather and on split hides

The preparing, assembling and sewing of the leather parts and of the split hides need a series of specific opperations [8]. One of the preparing opperations, a very important one, is the attenuation of the borders of the parts which are jointed by sewing. Before the sewing, some parts are provisory fitted using a low resistance adhesive. Just before the fitting, it is very important to be tested the compatibility between the adhesive, the way of the leather finishing and the products for the leather conservation. If this compatibility is not realized, the adhesive might migrate to the leather surface and so, it can produce a colour change or less good proprieties of the leather. The opperation of parts joint by sewing is a very important stage of the furniture pieces upholstering process. Table 1 presents the main opperations which are used in the parts assembling during the technological process of the sofas upholstering [9,10].

Table 1: Sewing assembling specific for the upholstering of the leather sofas

No. crt.	Ppperations, different kinds of sewings	About the opperations
1.	Parts assembling by overlapping, realization of some border seams 	- The overlapping margin is 10 mm. - The overlapping margin is thinned in the entire width, through right thinning. - The joint takes place with one single skillet, with 3stitches/cm of seam-seam density, with thread PES-30/3 Nm finesse. - The border seams are realized using plane sewing machines for furniture upholsteries, with one normal or long needle carrier.
2.	Parts assembling by 180^0 turned seam 	- The parts are placed face to face, they are sewed with only one skillet, one sewing machine with one needle, with 3stitches/cm of seam-seam density, with thread PES-30/3 Nm finesse. - The joint seam is flanged and it is polished. - The seam is reinforced with a backing band which is sewed with two skillets. - The sewing is realized with a sewing machines for furniture upholsteries, with column and two needles, with thread PES-20/3 Nm finesse, with 2stitches/cm of seam-seam density.
3.	Parts assembling by la 360^0 turned seam and piping of the joint border 	-The assembling seams with piping is realized following the next steps: the parts are sewed with one single skillet, the sewed parts are turned with 360^0 and then, the piping and the reinforcing string are sewed on the sewed border. - The sewing will be realized using a sewing machines for furniture upholsteries, with one needle, with thread PES-30/3 Nm finesse, with 2stitches/cm of seam-seam density.
4.	Sewing of the permanent zippers	- The sewing of the prmanent zippers is realized on a 5mm margin of joint, with one single skillet, with 3stitches/cm of seam-seam density, with thread PES-30

	  Sewing of the band zippers  	Nm finesse. There are used plane sewing machines for furniture upholsteries, with one needle. -The band zippers are sewed using sewing machines for furniture upholsteries, with plane table and two needles. it is also used thread PES-20 Nm finesse, with 2stitches/cm of seam-seam density.
5.	Some parts assembling by stagger seam  	- The stagger seams are used in the joint of the parts which are placed in less stressed areas of the upholsteries; then, these seams are reinforced. The stagger seams may be used as decorations, too. - They are realized using plane stagger sewing machine for furniture upholsteries, with one needle. - The maximum stitch of the seam is 6mm and the maximum width of the stagger is 8mm, adjustable till 10mm.
6.	Redoubling of some part with batting by realizing of some decorative seams       	- The decorative seams on the parts redoubled with batting are made with one single skillete, with 2stitches/cm of seam-seam density, with thread pes which has a finesse stablished by the agreement. - The seams are realized with plane sewing machine used for the furniture upholsteries, with one needle, with long needle carrier.
7.	Scalloping of the parts borders	- The excedentary batting is cut and that parts which were redoubled with batting with decorative seams are spined over. - The scalloping is made with the

	   	scalloping and shrivelling machine, with one needle, with thread PES-50 Nm finesse, with 2stitches/cm of seam-seam density.
8.	Shrivelling of the parts borders  	- The shrivelling of the parts borders is made with the scalloping and shrivelling machine, with one needle, with thread PES-50 Nm finesse, with 3stitches/cm of seam-seam density.

3. CONCLUSIONS

• Following the realization of a good quality upholstery, each part which is cut on must be made knowing the place of the upholstering furniture where that part is emplaced. This is necessary so that, in the end, the leather upholstery must give the impression that it was made of an entire leather roll which was uniform as structure and aspect. On the other hand, some areas of the parts of the upholstering furniture are more visible and more stressed during their usage, but some areas are less visible and less stressed. This is the reason because, when a technological process is designed, first of all, it must conceive the assembling tables of all parts for each piece of furniture. Almost all the parts assembling operations are similarly in the care of the furniture pieces which belong at the same set of furniture. For an optimum efficiency design, the conceiving of the assembling tables, for the sets which have armchairs, two and three seats sofas, must be realized in the same time.

• In the assembling tables, all the parts are coded. The codes give information about the materials which will be used in the cutting-on operation and about the emplacement places on the furniture pieces. In this way, the workers may adopt optimum solutions for the models emplacement on the leather surfaces so that, the cut parts are qualitative and correspond to the normative.

• In the technological processes of the furniture pieces upholstering the cutting-on operation uses models and it takes place manually or mechanically. The operations of the parts assembling are realized with machines specific for the sewing of the thick materials. Depending on the seams types, there are used plane sewing machines with one or two needles for thick materials, plane sewing machines with long needle carrier with one or two needles for thick materials, sewing machines with column with one or two needles for thick materials, sewing machines with one needle for the stagger joints for thick materials, machines used for the scalloping and shrivelling of the parts borders with one or two needles for thick materials. The threads finesse and the seams density are correlated with the kinds of joints and with the materials thickness.

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ESTABLISH METHODS OF PRODUCING GLOVES

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Abstract: In recent decades, the leather industry (gloves) has grown considerably. Such a development was possible through diversification of raw materials, manufacturing technology modernization, improve working conditions. The stitches are used to assemble cut parts from various materials to create finished products. Currently known and used the following methods of producing gloves, ie, chain stitch, single stitch with two threads, cover stitch edge, stitching by hand. The present paper analyzes the methods of construction of the gloves. Methods presented in the paper manufacturing gloves serve to create original and interesting collections.
Key words: gloves, manufacturing methods, types of stitches, materials, parts, processes.

1. INTRODUCTION

The attire of all nations and civilizations has been presented more accessories (belts, handbags, gloves). Gloves, for example, in ancient times were used in cold climate countries to protect hands against the cold. In recent decades, the leather industry (gloves) has grown considerably. Such a development was possible through diversification of raw materials, manufacturing technology modernization, improve working conditions. By applying the new procedures has been made extending the use of synthetic materials, diversification of production, mechanization of operations and, consequently, improve the quality of products. Gloves, household or luxury, is an indispensable element of all modern human fashion.

2. HISTORY OF GLOVES

The first gloves had no fingers, being made in the form of bags, which were fixed by hand using strips that tied the wrist joint. Subsequently, there mitts and gloves with five fingers then. In ancient Rome these accessories are used to protect hands against dirt festive meals, and in ancient Persia were part of full dress. In the age of Justinian (sixth century) for making gloves are very expensive materials used. Consequently, the finished products became very heavy, adding embroidery, paintings, inlaid with precious stones or pearls. According to some sources, in sec. VIII (a 790) gloves were made and used by monks who used them during the celebration of certain religious rituals.

In the middle ages gloves were worn routinely. Hunters, craftsmen, even while working peasants used thick leather gloves with a finger. Leather gloves, fur or knitted, adjusted or large hand covering part of the forearm, were offered as a gift, having a symbolic meaning: a glove of the present lord was a tribute, someone throwing a glove was an act of provocation, and to bring your glove when you went to church or hand tightened when someone was a sign of respect. Kings wore leather gloves painted in purple and decorated with pearls and gems. Women of the imperial family begin to take these items from sec. IX. Gloves with separate fingers are appearing in sec. XII. The metallic twine or articulated plate armor is part of the knights and only wore thick leather gloves over.

The gloves were a Renaissance hallmark for lawyers and university professors, the candidates had to provide gloves, exam before graduation. Since sec. XV, gloves are mandatory in all the elegant clothing of a person: they were scented, being made of silk brocade woven with gold thread and sometimes without any fingers on the rings were worn to make visible jewelry. Already occurring and some rules of etiquette: so was not allowed to present yourself before the king, the princes and nobles of high rank with gloved hands or in the church ought not to go with the gloves. Remove gloves and during the dance, bereavement is not wearing gloves. To provide a frame of 12 pairs of gloves were a gift from the king.

In France, the gloves were made starting with sec. XV, which are cut and sewn by hand. French gloves were popular on the world market and exported to all countries. Besides gloves in the seventeenth century still wore about the waist and sleeves with ribbon. Long cuff gloves increases, reaching up over the side in sec. XVIII, but was missing and sleeve. Towards the end of the century already become mandatory gloves on the street.

In 30-40 years of sec. XIX in Moldova started to import various foreign merchants of luxury: thin gloves, leather shoes, leather gloves yellow and white [14].Wearing white gloves was seen as a measure of good taste and are also very expensive, affordable only representatives of socirtății strata considered.

In the early nineteenth century, Grenoble Jouvine master has made an important contribution to improving the manufacture of gloves [2; 5; 8-11; 13]. This study based on the size of hands, set 32 sizes and each size - five basic forms: very narrow, narrow, medium, large and very large. In 1844 the master made gloves with cutting dies. The next stage of development gloves are recorded in Europe in 1867, when the sewing machine was invented gloves.

3. LANDMARKS OF COMPONENTS OF GLOVES

The composition of the gloves meet the following guidelines [9]:

1. Clinic is the benchmark of the inside with fingers that combines the outside, has a rectangular or trapezoidal.
2. Edged flexible is the benchmark that is used for granting an appearance as pleasant glove. It is made of cloth, leather and leather substitutes.
3. Gusset cuff is the benchmark of increasing the role of cuff.
4. Gusset small is the benchmark for gussets for assembling two adjacent fingers.
5. Gusset strip is continuously combining benchmark of fingers the inside with the outside.
6. Large clinical marker is necessary to cover and protect the thumb of the hand.
7. The glove itself is the benchmark which is made from the outside and inside, separated by an axis of symmetry.
8. The inside / the palm is the benchmark that covers and protects the palm hand, is not ornaments. In the inside of the glove is slit and sew thumb hole.
9. The outside / the back is the benchmark that covers and protects the hand, usually have ornaments.
10. Thumb gusset is required thumb mark for better donning the glove on the hand and finger mobility.
11. Trim is added to an overall mark to beautify.

4. METHOD OF CONSTRUCTION GLOVES

Currently known and used the following methods of producing gloves, ie, chain stitch, single stitch with two threads, cover stitch edge, seam manual [1, 3, 6 - 8, 10, 11].

Chain stitch. Only for the leather gloves. All parts are assembled with two thread chain stitch class, namely 400, and 401 (also called seam step). Thumb will be assembled by applying two parallel stitches. By this method to obtain high quality gloves, but productivity is low.

Simple stitch with two threads. The type of stitch used is the class that is 300, 301. In the literature this is called seam stitching coward. The palmar and dorsal side gussets are assembled with one stitch and thumb parallel to assemble with two seams. Gloves are made by this method and followed by a return inside them.

Seam edge coverage. Landmarks are assembled using stitches ie class 500, 502 and 503 (also called French seam). Gloves can be combined on the face (no return) or inside (to return).

Hand stitch. Gloves are assembled using the 200 class, namely 201, 205, 209, 211, cross stitch or X-shaped, knotted stitch. Cross stitch or form of X is obtained by passing thread through each hole and reaching the second end of the line goes back via free holes. Seam with knots is given by: the top of the înoadă thread stitch and stitch the bottom of a step is performed by stitching.

Stitches listed can be done either manually or mechanically. Gloves can be combined on the face (no return) or inside (to return).

Table 1 presents the methods used to manufacture gloves feature [1, 3, 10, 11].

Table 1. Characteristic methods of producing gloves

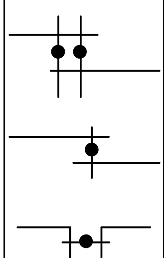
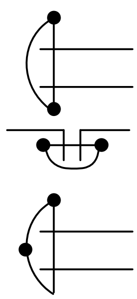
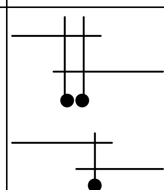
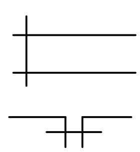
Method of construction gloves	Position of the needle puncture points	Class stitch	Stitch code	How to manufacture the glove	Presentation of the inside of the glove	Name of material for exterior parts
Simple stitch with two threads		300	301	On the upside, The front	Lined, unlined	Leather, imitation leather
Seam edge coverage		500	502, 503	On the upside, The front (leather)	Lined, unlined	Leather, imitation leather
Chain stitch		400	401	The front	Lined, unlined	Leather
Hand stitch		200	201, 205, 209, 211	On the upside, The front	Lined, unlined	Leather

Figure 1 shows the types of stitches used in making gloves manual [7].

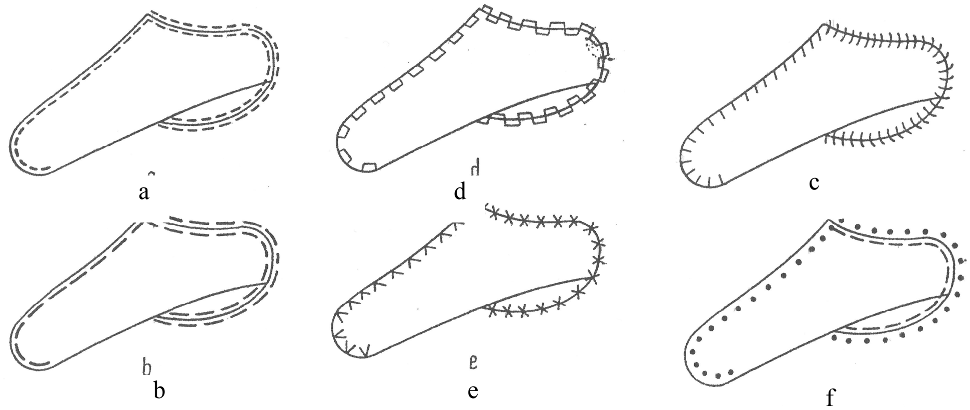
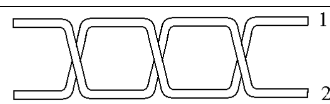
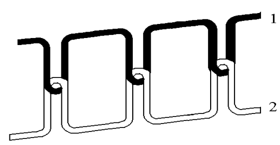
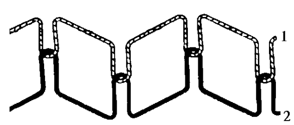
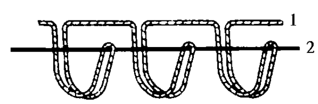
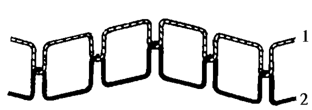
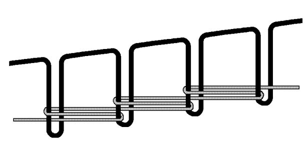
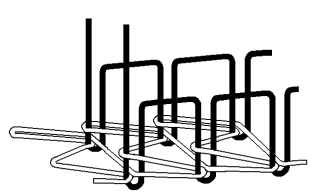
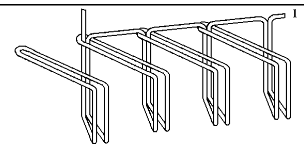
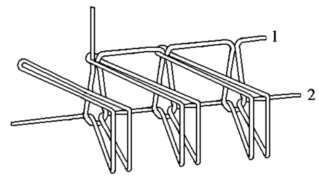
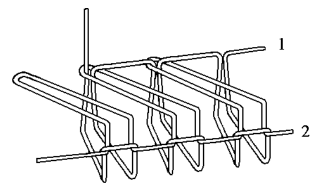


Figure 1. Hand stitch types, where: a is 205; b – 201; c – 211; d - 209;
e - cross or X; f - with knots.

Table 2 shows the appearance of stitch used in making gloves.

Table 2. Graphical representation of stitching

Class stitch	Stitch code	Form stitch	Application
200	201		Making gloves.
300	301		Making gloves.
	304		Decorative stitching on the outer parts.
	306		Processing margins rubber boots to gloves.
	308		Making decorative seams on the outer parts.
400	401		Making gloves.
	406		Thumb hole assembly in the pal mar side of the glove.
			Making the

500	501		inner linings of gloves.
	502		Making gloves.
	503		Inner lining making gloves

5. PROCESSES FOR OBTAINING LEATHER GLOVES

Manufacture of finished leather gloves requires completion of a complex technological process, which comprises several distinct stages, as follows [1-3, 6-8, 10, 11, 13]:

Workshop 1 for cutting flexible parts

1. Sort leather
2. Moistening leather
3. Sizing leather
4. Rest of leather
5. Cutting leather.

Processing Workshop 2 - assembly - finishing flexible parts

1. Making decorative stitches
2. Punching parts
3. Pinking edge cuff glove
4. Embroidering parts
5. Printing parts
6. Making and fixing applications
7. Ornamentation gloves
8. Sewing elastic glove on the palmar
9. Sewing cuff of the dorsal and the palmar
10. Making straps, used to set manually on hand
11. Sewing thumb (consists of 2 parts)
12. Sewing thumb in the recess on the palmar
13. Sewing cloned into them (2 each 2)
14. Sewing gussets in the back of the glove
15. Sewing clinical palmar side of the glove
16. Sewing palm with the back side
17. Return gloves face
18. Breaking gloves
19. Introduction lining in glove
20. Processing of the glove cuff edge
21. Treatment umidotermic gloves
22. Fixing gloves in pairs

6. CONCLUSIONS

1. Development of manufacturing technologies increase the number of satisfied customers.
2. Gloves are used in making the following classes and subclasses seams, namely, 200 (201, 205, 209, 211, etc.), 300 (301) 400 (401), 500 (501, 502,503).
3. Regardless of the method of manufacturing process technology for a cutting workshop landmarks flexible leather gloves are the same.
4. If manufacturing methods (simple two-thread stitching, stitching and seam edge coverage manual) process technology for the workshop 2 processing - assembly - finishing leather gloves flexible parts is identical and contains 22 operations. Whereas for the manufacturing method (chain stitch) technological process 2 will contain 21 studio operations will exclude the operation 17.
5. Methods presented in the paper manufacturing gloves serve to create original and interesting collections.

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FACTORS APPARITION FOOTWEAR AND METHOD OF DEFECTS REMEDIAL

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Abstract: Footwear is found in ancient times, is related to socio-economic life, the level of culture and civilization of the society. It is a defense of the foot from humidity, cold, stones, sun. Footwear consists of vamp classic, quarters, language and piping. Depending on the model and other items still to be found, for example, the bellows boots, straps on sandals or basic parts can be broken into two parts (the top vamp, quarters with bask quarten). During the exploration of product parts are subjected to complex (repeated bending tests, the action of moisture, dust and radiation from the outside, the action inside sweat during use, wear through each), all this leading to the appearance of defects that feel the comfort in wearing. The paper analyzes the defects that occur during wear (eg. frame breaking, breaking shank, biting foot, broken seams, biting a pen cap) and propose ways to remedy them.

Key words: Footwear, defects, repair, request items, range.

1. INTRODUCTION

Footwear covering the legs terminal segment, is a defense to the action of the leg agents. At the same time preserve the natural shape shoes to the foot, helping to fulfill this role is as an organ of support and movement of the body [4].

Depending on the coverage of lower tonque, meeting the following types of products footwear: boots, shoes, sandals, etc. [1-5].

Boots - footwear that covers pulp quarters entirely or sometimes rises above the knee.

Boots quarters short - shoes quarters height reach up to half a leg.

Shoes - shoes that are below quarters malleolus, covers all higher whole dorsal surface of the foot. If shoes women shoes can partially cover the dorsal surface of the foot.

2. STRUCTURE OF FOOTWEAR

Any footwear designed construction, has a structure that reflects the composition of 2 sets - all upper (dorsal is up under the block) and all lower (is established by planting block party area) [5].

In turn, the two ensembles, each consisting of three subassemblies: the outer, middle and inner. The composition of each of the subassemblies can identify any number of specific items, dependent on: the type of footwear product, model shoes, apparel and alternative system has been applied.

2.1. Marks all higher

a) Landmarks external subassembly

Subassembly outer shoe upper assembly is the most diversified in terms of numbers and configuration component parts, which are elements that make the features of a model for a variety of footwear.

Vamp is the benchmark that covers the dorsal surface of the foot region of the metatarsus and phalanges.

Top - mark covering the dorsal surface of the foot phalanges foot region.

Leggings **-** mark partly covering the dorsal surface of leg tarsus and heel region, in some cases, ankle, boot covers to a greater or lesser leg foot (depending on height leggings). Leggings take different forms depending on the type of footwear (boots, shoes, etc.) and construction model of footwear.

Comet **-** the top of the boot top with extended wings.

Bask quarten **-** outer marker covering the heel region.

Piping **-** part that serves to strengthen the posterior seam leggings.

Lug **-** part that acts as advocate in shoe (usually occurs in sports shoes and footwear for children).

Language **-** the part that is designed to protect the foot from pressure by staples, hooks, laces and action to protect the foot of dust and dirt from outside.

Strap **-** shaped strip marker found most often in sandals, is used for fastening shoes on foot, if you sew it banda "velkro".

Belt **-** shaped strip landmark that is designed to fit shoes on his feet, with a buckle closure.

Apron front **-** part of the vamp that corresponds its middle part, is assembled by joining by sewing the vamp.

Outer sleeve **-** part that can have a role to decrease the elongation and distortion of leggings at the top or decorative, the width of which does not exceed 1/3 of total length leggings.

Stronghold outside staple **-** leggings milestone for strengthening the region of fixing staples or hooks.

b) Landmarks intermediate subassembly

The intermediate subassembly refers landmarks that are located between the face and the lining inner parts of the shoe. They are designed to strengthen the sides and maintaining footwear outside the assembly. From the composition of this unit are both parts of flexible materials - intermediate coating certain parts and face which are named after it doubles mark, reinforcements of eyelets, reinforcement strips, and the rigid materials – counter and bombs.

Toe cap **-** rigid landmark that serves to maintain the peak shape of footwear.

Counter **-** rigid part which is designed to maintain the shape of the heel region.

c) Benchmarking interior subassembly

Inner lining is designed to protect the dorsal surface of the foot against the action of erosion and pressure from the outside seams of subassembly parts and the rigid parts of the assembly intermediate (counter and bombs). For the vamp and inner lining leggings lend their name: the lining inside the vamp, lining inside the leggings.

Counter room **-** part made of mostly of natural leather or abrasion-resistant material that covers the region inside the shoe heel.

Label inside **-** part that serves to strengthen the top of leggings in order to reduce elongation and deformation of the shoe upper contour.

Roof of zipper **-** part that is designed to protect the foot from direct contact of the zipper and footwear to prevent entry into the unfavorable external agents (humidity, dirt).

Stronghold staple **-** leggings milestone for strengthening the region inside the shoe fixing staples.

Piping inside **-** stitch marker designed to strengthen back.

2.2. Landmarks all lower

a) Landmarks external subassembly

This unit consists of parts that made contact with the bearing plane footwear.

Sole **-** mark placed over the plantar surface of the foot, which comes in direct contact with soil. Depending on the system structure confection used footwear soles can be presented in alternative outer sole and insole, the latter part of the subassembly intermediate composition.

Carrying Case **-** landmark located on the surface of plantar heel lift for a certain height from the ground surface. Frame with height up to 4 cm has functional role of proper body weight distribution on the plantar surface of the foot.

Cover the frame **-** which is shape of the lower part of the frame and the role of protecting its destructive action upon the support surface contact.

Outsole - part of the form and length of the peak corresponding to base and shank, pasted over it in order to extend the life of the shoe sole.

Frame - mark as flexible strip of leather or imitation leather sewn on the assembly line assembly with lower education, decorative or fixing of the two ensembles, in some systems confection.

Lift - part made of leather or rubber compound heel shape and size (more lift up frame).

b) Landmarks intermediate subassembly

Intermediate subassembly sub assembly includes landmarks located between inner and outer.

Reinforcement of sock - sock milestone reinforces the heel region and shank.

Shank - part of the shoe with the role of building and maintaining the shape of the foot arch region, which is made of metal, plastic or wood.

Filling - landmark role filling the gap formed by the reserve drawn in order to obtain a uniform surface finished shoe sole.

c) Benchmarking interior subassembly

The assembly includes inner sock, sock roof, inserts etc.

Insole - the inner part of the shoe and is shaped inner surface of the shoe sole.

Roof insole - form part of the main sock, the role of interior design and property improvement of hygienic footwear.

3. FACTORS APPARITION DEFECTS FOOTWEAR

Legs are subject to the greatest mechanical stress, while performing the basic function, namely, that of support and movement of body mass and possibly additional burden carried in the actions undertaken by man. Man through the daily average of about 5 km away, performing, about 6500 steps, a body mass of 70kg each foot of distance that the mature man carrying nearly 270 tons [4].

In the orthostatic position, the bearing surface is determined by the size of the human plantar surface of both feet in contact with the bearing plane. Maintaining balance in support orthostatic position for a period of time makes the muscles located on the back of the calf, staple, back and neck tension is strong, causing installation cee fatigue. Foot during walking, passing briefly through the stages of leg swing leg supported and given the weight load passes alternately from one foot to another. Is known around the time the foot is supported during the impact is7%, during the entire bearing plantar surface is equal to 43% and duration of support on the front foot is about 50% [4]. Hence, the duration of support while walking the entire plantar surface is below 50%. Table 1 shows the time on one foot bearing on the length of a double step depending on heel height [4].

Table 1. During a double-step depending on heel height

Heel height, mm	0	30	70
The bearing length / time step double	0,60	0,63	0,73

Table 1 shows that with increasing heel height increases during leg support. Atthe heel lift heel, repair the bearing pressure in orthostatic support, change and transfer on the front. In human movement under the forces generated pressures appear vertical to horizontal forces, acting on that part and another in longitudinal direction transverse to the direction of travel, much smaller size compared to the vertical force transmitted to the bearing: under action of these forces can cause foot slippage in shoes without shoe slips compared with prop. Because foot slippage inside the shoe below the horizontal forces that are damaged, for example: breaking quarters lining and vamp lining; breaking the seam joining the top and vamp; deformation in the toe vamp five.

In walking, the separation plan bearing leg, bending occurs in the joint metatorso-phalanges (the finger), the joint the tibio-astragalian and astragalo-scaphoid. Man shoes, when walking, bending it consumes additional energy, consumption may increase 2-3 times for a shoe with high rigidity, resulting in an overburdened system of muscle [4]. Highest stress a higher supports all located onmetatorso-phalanx joints. Bending multiple uppers faced resistance lead to significant changes in time tearing. Therefore these guidelines should necessarily couple with inner and outer linings of textile.

Landmarks footwear covering tibio-astragalian joint are also subject to repeated bending tests requests, leading to the appearance of wrinkles on this area quarters boots, affecting the appearance of the product while tensile strength. Depending on the physico-mechanical construction and the material base of its bending radius is 4-8 cm [4]. So the base is part subjected to high abrasion applications and repeated bending. Foot wear rate depends on: the nature of the material of the damping capacity, features bearer walking, nature of soil, climate conditions etc.

Shank acts as a spring which supports a load went beyond 2-2,5 times those of bilateral orthostatic support [4]. Using a low resistance shank determines deformation of the effort, the frame shift and peeling back of the shoe.

Analyzing factors of occurrence of defects of shoes is recommended that materials used in manufacturing products have: good flexibility; resistance to repeated kinks; elasto-plastic properties in order to shape space; hygienic properties; resistance to abrasion.

4. CASE STUDY

Study was carried out in the cold for a month when wearing shoes and boots, meet repair shop shoe in Chisinau. Table 2 shows the defects studied, how to fix them and required supporting materials.

Table 2: Damage occurring while wearing shoes it

Defects studied	Module trouble-shooting	Aids, equipment used	Meeting frequency of defects
Breaking shank	Changing shank	Shank, nails, glue pot, brush, cardboard, hammer, leather finished	10
Detachment foot faces	Bonds again followed ar ound a sewing	Vase with glue, brush, sewing thread, needle	28
Dissolution seams, broken stitc hing	It applies a new stitch, sew a new landmark on the existing	Sewing machine, thread scissors, finished leather.	31
Breaking the frame	Replace frame, is fixed again	Targets, hammer, frame, glue pot, brush	21
Biting the heel cap	Replace the lid of case	Cover the frame, glue pot, nails, hammer, brush	33
Biting foot in front	Place outsoles	Vase with glue, brush, hammer, outsole	60
Zipper breaking, breaking drawer, leaving the cursor or break it	Replacing the zipper, slider	Sewing machine, scissors, zipper, thread	32

The most common defects that occur while wearing footwear are: peel off top layer of the part; cracking the part; deformation of the upper shoe; breaking seams; biting cover the frame or frame; detachment sole or cracking sole.

5. CONCLUSIONS

Most frequently encountered defect is biting foot in front, followed by biting the heel cap. It is recommended that producers carefully choose the material for the sole, heel, heel cap, all superior, products to be used in making shoes, the consumer be given a pen caps, soles, heels, lace up.

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RESEARCH ON THE USE OF MARGINAL WASTE RESULTING FROM CUTTING PARTS OF THE SURFACE OF FLEXIBLE LEATHER SUBSTITUTES

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Abstract: Experimental research aim to optimize the rational use of leather substitutes cutting flexible parts that are part of footwear products using parts of belt used in the production of leather goods type belt for women.
Key words: belt, leather substitutes, shoes, design .

1. INTRODUCTION

Flexible leather substitutes are used frequently to obtain footwear upper parts and linings, clothing and leather goods.

Flexible leather substitutes are characterized by uniformity of thickness, color, look all over the surface and with few defects, so that they can be cut simultaneously in several layers. They are also characterized by precise width and length dimensions, width size is standardized.

Placing the component marks of a shoe model on the surface of flexible leather substitutes, the basic rule of cutting will apply according to which the direction of maximum solicitation of the mark corresponds to the direction of the minimum stretch of the substitute, respectively to the substitute length[4].

When tailoring identical marks from a model composition on the leather substitutes surface we encounter the following types of waste:

- normal waste: we have them between marks of the same type;
- marginal waste on width and length direction at the beginning of tailoring, equal to 4-5mm, due to tailoring in several layers;
- marginal waste on width and length direction at the end of tailoring;
- waste by decks: is due to distant tailoring of the marks so that their contours are not crushed by the blade.
- waste by decalage, D_d, which appear by inserting patterns in order to minimize normal waste

Marginal waste, at the end of cutting the material, on the width direction must be smaller than the width of the mark placed and on the length direction smaller than the length of the mark.

For turning these marginal wastes to good use, marks from other footwear models or component marks of some leather goods can be used.

In this respect the present paper presents the recovery of marginal waste by using some component marks of belts.

2. ESTIMATING THE SIZE OF MARGINAL WASTE FOR LEATHER SUBSTITUTES USE

To estimate the marginal waste by placing mark by make over the substitute surface, the number of marks that can be tailored to the width and length is calculated, with relations [2]:

$$\mathbf{n_B - 1 = \frac{B - (b + \Delta B_1)}{b \pm \Delta b}} \quad (1)$$

$$\mathbf{n_L - 1 = \frac{L - (l + \Delta L_1)}{l \pm \Delta l}} \quad (2)$$

where:

n_B- number of marks place on the width;
n_L- number of marks place on the length;
B – substitute width, in mm;
L – substitute length, in mm;
ΔL_1 şi ΔB_1- marginal losses at the beginning of tailoring, equal to 4-5mm;
l – mark length, in mm;
b- mark width, in mm;
Δb - interpenetration (sign "-") and distance (sign "+") mark the width direction;
Δl - interpenetration, respectively distance marks on the length direction;

Final marginal losses sizes on the length and width direction, ΔB_2 şi ΔL_2, is determined by the relations:

$$\mathbf{\Delta B_2 = B - \Delta B_1 - n_B \cdot b \mp (n_B - 1) \cdot \Delta b} \quad (3)$$

$$\mathbf{\Delta L_2 = L - \Delta L_1 - n_L \cdot l \mp (n_L - 1) \cdot \Delta l} \quad (4)$$

These losses, the end of tailoring, must be smaller than the length and width of o mark; the minimum permitted value for ΔL_2 and ΔB_2 is 4-5mm.

When adopting the layering system mark by mark on the substitute surface, usage index (Iu) is calculated by the following formula[2]:

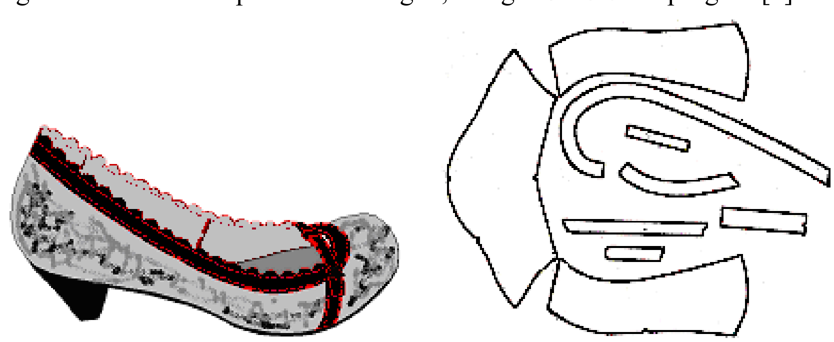
$$Iu = \frac{n_T \cdot A_r}{B \cdot L} .100, \qquad \text{in } \% \quad \mathbf{(5)}$$

where:

n_T- total number of possible marks placed on the susbstitute surface
A_r- a mark area, dm^2
B, L- substitute width and length, in dm

3.CASE STUDY

To highlight the size of marginal waste for substitutes surface tailoring, the marks were layered constituting a footwear model presented in Fig. 1, using **AUTOCAD** program[1].



a. model *b. Component marks: instep, interior top, exterior,* ***,*** *bolster 1,2si strap1,2*

Figure 1: Model with component marks

For example in Fig. 2 is shown instep layering[5].

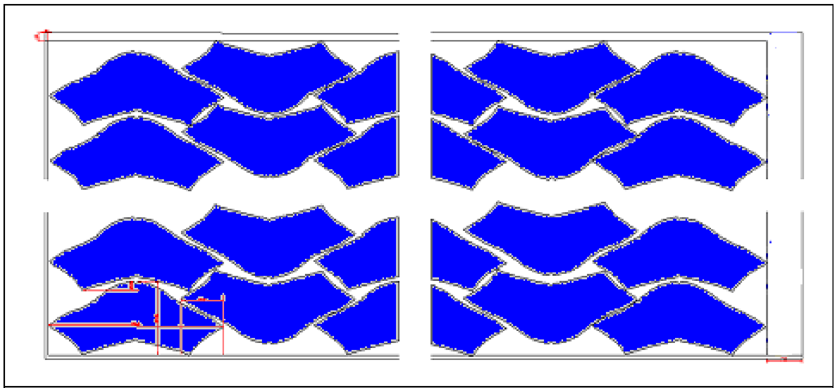


Figure 2 : Layering model for instep

Placing mark by mark has lead to the following values of marginal waste Table 1, with the help of which the use index of material for tailoring marks was calculated.

Table 1:marginal waste and usage pointer

No.	Marks name	DB_2 [mm]	DL_2 [mm]	I_U, %
1	Instep	51	11	81,76
2	Strap 1	11	4	79,66
3	Strap 2	12	48	62,40
4	Interior top	67	46	81,76
5	Exterior top	13	97	80,28
6	Braid	7	38	82,14
7	Bolster 1	4	42	32,74
8	Bolster 2	4	18	81,88

Turning into good use marginal waste resulted when adopting the layering system mark by mark on the substitute surface is possible by using some component marks of belt for women [2,3].

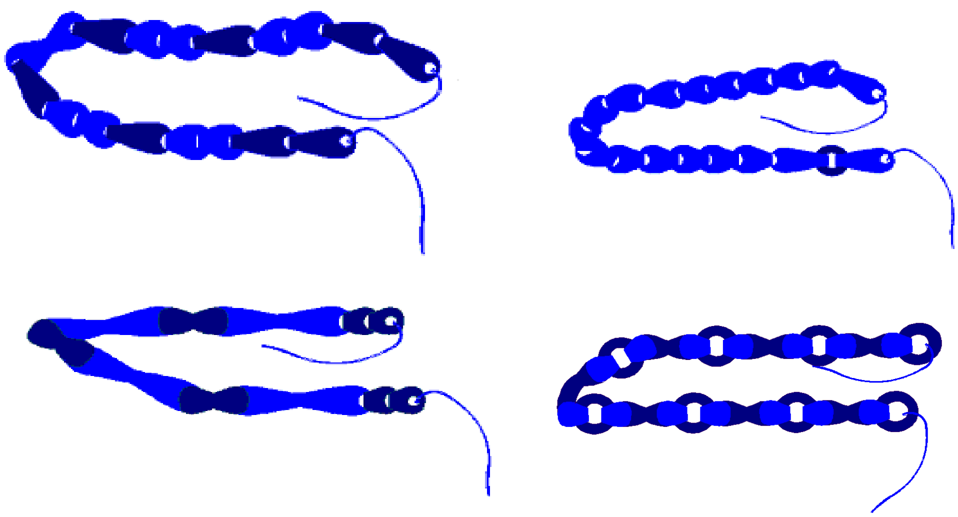


Figure 3: Belt patterns

The recovery of marginal waste by using component marks of the belts is illustrated in the figures below:

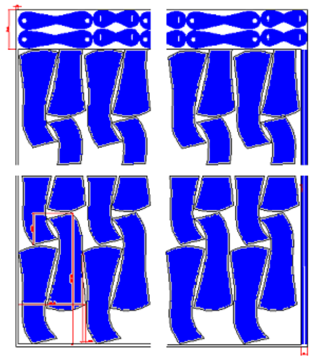


Figure 4: Practical layering for exterior top

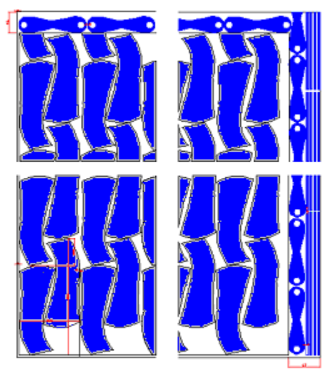


Figure5: *Practical layering for interior top*

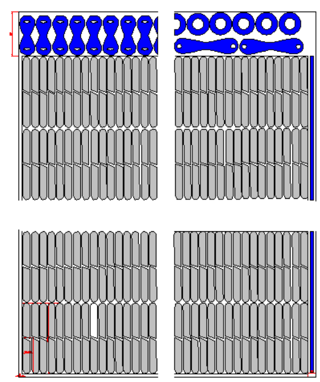


Figure 6: *Practical layering for strap 2*

By placing belt marks on the surface of marginal waste, the use indexes of substitute surface improve, resulting values above 80% for instep, top of the shoe and braid.

4.CONCLUSIONS:

- The use of belt-type marks for rational use of waste material has lead to optimizing the theoretical layering models to those products, for which consumption norm obtained has minimum value and material use index will be superior.
- After placing belt-type marks we get practical layering patterns, in which marginal waste is recovered.
- Waste resulting during leather and leather substitutes tailoring process can be used to obtain smaller details that can enetr into the componence of footwear, handbags, etc. products.

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DESIGN OF GARMENTS WITH THREE-DIMENSIONAL ELEMENTS

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Abstract: The work provide theoretical and technical-applied solutions for the use of creative methods in the design of garments using the innovational constructive approach with spatial-volumetric elements. The experimental researches were centered on the obtaining of garments with new shapes, lines with complex three-dimensional elements owing to the use of innovational procedures and creative design techniques. For this purpose the ”Balloon” technique has been elaborated, allowing to insert structural volumes into the three-dimensional designs without resorting to reunions or perfect entries. Another technique is the ”Whirl” named after the three-dimensional shape conferred to the fabric following a process of torsion and contouring into a voluminous protuberance or inversed cyclone. The draping technique applied in the experimental research differs from the traditional one by the direct decoration of a plain fabric piece adapted to the model.
Key words: three-dimensional elements, complex shapes, creative methods.

1. INTRODUCTION

Obtaining of complex three-dimensional shapes as products of individual creativity of a garment designer is possible based on the creative design methods treating the initial shape as a primary element to be developed, completed, personalized by various techniques. In this context the non-traditional creative methods – combinatory method, decostructive method, modular method – provide practically perpetuous space for the development of product shapes of various destinations.

The harmonic combination of creative design methods has facilitated the appearance of an entire series of product implementation techniques with complex threedimensional elements. These are based on the intuitive experimentation models in the creation of garments with new shapes, without constraints imposed by the traditional design techniques.

The techniques of elaborating garments with complex three-dimensional elements are based on the principle of transformation reconstruction. So, on the plane elements of the product one may obtain three-dimensional elements by using the styling lines generating volumetric elements, as well as inserted geometric shapes that in their turn may be diversified by fabric and color. The three-dimensional elements obtained by the complex techniques are presented as a planned surplus of materials and a certain shape, with a specific volume, adding plenitude, decorative and dynamic elements in the whole external appearance of the product. The three-dimensional elements confer a higher degreee of constructive-technological complexity to the product and an irrepeatable external appearance.

The process of creating garments with complex shapes implies the search of sources of inspiration that the designers fiind in nature, geometric shapes, in the streets, etc. and use them to create special products. By applying the design techniques to the volumetric elements the designer transforms the plane fabric into a three-dimensional sculpture. The products are made by cutting, transfer, transformation and re-assembly of reference elements of the product, just like puzzles.

2. METHODS OF CHANGING THE INITIAL SHAPE OF PRODUCT

The product shape is described as a complex spatial figure, with the shape determined, to the biggest extent, by the natural body. In the process of designing garments the designer resolves a complex engineering problem of transcending from a plane surface to the spatial-volumetric composition of the future product.

The product shape is determined depending on the geometric type of the shape as a whole, its components and silhouette that represents a conventional plane image of the shape.

The tools providing for the spatial product shape are the tucks and the constructive-decorative lines. Their assembly on the product surface is conditioned by the presence of prominences on the surface of human body. The constructive tucks provide for the spatial shape of the product. To this category are included:

The bust tuck that starts from the shoulder line, sleeve or the symmetry line, providing for the spatial shape of the front side in the bust zone;

The shoulder tuck providing for the spatial shape of the back in the scapular zone;

The waist tuck that includes the surplus of material at the level of waist line, providing for the product shape at the hipline level and providing additional volume in the bust zone;

The elbow tuck, providing for the spatial shape in the elbow area.

Any transfer of constructive tucks results in the appearance of an additional function – decorative one. In the case of presence of vertical and horizontal division lines on the product surface the tucks are superimposed with these lines.

The division lines may be located in the construction in different ways. Owing to this fact the products of the same silhouette may be conferred different shapes.

The shape may be obtained also by a positioning insert, invisible in the product owing to the technological processing. This technique allows toobtain plane shapes by partial transfer of tucks.

In order to develop the initial shapes for the subsequent elaboration of three-dimensional complex shapes one may use the creative non-traditional methods, such as combinatory method, deconstruction or the modular method.

The combinatory method in the design of garments has for the first time been applied in 1920 by the soviet designers Rodchenko, Popova, Stepanova [1]. This method combines the *combinbatory, transformation and dimensionless product creation techniques from an invisible piece of fabric*. The essence of this method consists in the randomized combination of various shapes and elements or in the search for original solutions by the application of various product shape development techniques.

The deconstruction method was proposed by the Japanese designer Yamamoto in the beginning of 80ths of the XXth century. This method has been taken-over and applied by the representatives of the belgian design school, such as the famous designers Gaultier and Galliano. The deconstructive method is a new approacj to the process of modeling, implying certain manipulations with the product shape by application of three-dimensional elements on the product body or inversion of elements. This method uses various deconstruction techniques, *such as fragmentation and inversion of shape* (randomized change of elements' position).

The modular method uses the module as initial unit. As a rule, the modules are of the same dimension with the simple geometric shapes. The modular method is based on the derivation of complex shapes from the simple ones, allowing to extend the applicability domain of the product and develop a suitable assortment of products. The development of product shape based on the modular unit is done in the presence of verified initial constructions, using the advanced processing technology with preservation of functionality of the manufactured product.

All the complex product shape spatial modeling techniques are based on the transformational reconstruction.

3. SPATIAL MODELING TECHNIQUES USED IN THE DESIGN OF COMPLEX THREE-DIMENSIONAL PRODUCTS

The experimental studies considered the application of various spatial modeling techniques in the view of elaboration of new models of garments. At the stage of initial design common for all techniques one has to obtain the initial pure shape of the product based on the shaping elements present in the initial construction of the product. The modeling process begins with the tracing of styling lines directly on the product body. These lines are drawn in accordance with the creator's idea, compulsorily they must pass via the prominent points of human body. The presence of styling lines on the product body allows to create original and irrepeatable models. The results of application of the following techniqques are considered in this work:

1) **The „Balloon" technique** (figure 1) – implies the insertion of various structural volumetric elements on the product body in the initial shape [2, 3, 4, 5]. The following stages are necessary in order to obtain the „Balloon" effect:
   1.1) Identification of points of location of volumetric elements on the product, fitting into a simple geometric shape, for instance, a square;
   1.2) The geometric shape is separated and then divided into two equal halves, rectangles in our case. Every rectangle is disposed in radial projection, thus generating the constituent reference points of the volumetric element, that upon assembly make a strongly ondulated surface;
   1.3) The obtained spatial element is repositioned on the chosen area of the product and is affixed to it by seaming. The initially designed square is removed from the back side of the element to which the „balloon" is affixed;
   1.4) The styling lines are traced depending on the model, crossing the initial element of the product and the spatially modified zone. It is recommended to use the styling lines in direction perpendicular to the folds of the „Balloon", in order not to interfere with the general visual effect;
   1.5) Strips are cut following the contour of the styling lines;
   1.6) Following the assembly of resulting references points of the product one obtains the three-dimensional effect of the „Balloon" technique.

Figure 1: Application of "Baloon" technique on the frontal side of the product with the oblique tracing of styling lines

In the process of work the authors have identified and applied several ways of optimizing this technique, specifically:

1. Division of initial shape of product instead of separate design of spatial element. The authors have pursued the positioning of prominent points of the surface by tracing the style lines.
2. Marking of location area of the spatial element.

3. Detachment of reference points by styling lines.
4. Radial and radial-parallel displacement procedure for the formation of folds of the spatial element.

The „Balloon" technique may be applied in place of the product, resulting in complex three-dimensional shapes. The visual effects obtained following the application of „Balloon" technique depend on the correct location of styling lines.

2) **The „whirl" technique** (figure 2) has been named so owing to the three-dimensional shape conferred to the fabric following the procedure of whirling and contouring the fabric into a voluminous or inversed cyclone [2, 3, 4, 5]. In order to obtain the „whirl" effect the following stages are necessary:
   2.1) The work starts with a piece of fabric, of rectangular form. The initial cutting line is marked on it; gradually the fabric is arranged in the form of a „whirl";
   2.2) The „whirl" element is applied on the product's reference point depending on the model. I tis affixed by sewing to the main reference point, forming proeminences and marking the position of the reference points on the basis of the „whirl";
   2.3) Styling lines are traced so as to include the „whirl" element into the concept of the product;
   2.4) The reference element as an integrated spatial component is detached according to the traced styling lines;
   2.5) The product's reference point is reconstructed and the integrated three-dimensional „whirl" shape is obtained.

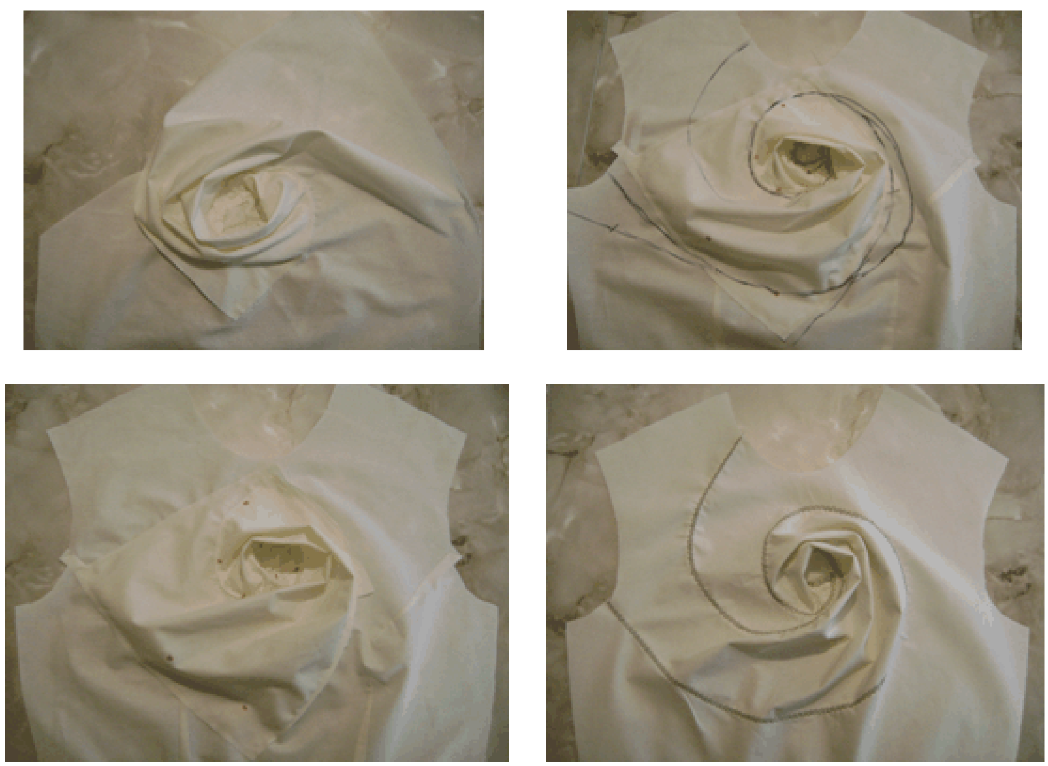

Figure 2: Application of the "Whirl" technique on the facade of the product in the bust area

1) **The draping technique** (figure 3) applied during the experimental studies differs from the traditional one by the fact that instead of the usual draping the material is arranged by draping directly from a puece of plane fabric adapted to the model, without the immediate application of constructive modeling techniques. This type of draping generates three-dimensional elements, unlike the traditional draping techniques. This technique of spatial modeling is especially suitable for the elaboration of unique creations, owing to the difficulty of duplication. Although, the algorithm is accessible and associated with a unique creative

process, being based on multiple sources of inspiration, the three-dimensional shape is conferred to the fabric following the operations of buckling and folding. Unlike in the case of the techniques described above, special attention here must be paid to the shape of the initial reference elements that are used as a basis for the draping [2, 3, 4, 5]. Modeling of garments with the use of this technique implies the following stages:

3.1) Tracing of styling lines on the product element, bearing in mind the positioning of points of prominence on the human body – bust, shoulders;

3.2) The product element is detached on the contour of styling lines and the plane outlays of reference elements are obtained for subsequent cutout of supporting layer;

3.3) The supporting reference elements are used as basis for the design of draped contours by their randomized variation in the zones to be draped;

3.4) The designed surplus of material se is draped by folding or buckling and fixed to the supporting reference element, and then the elements of the product are assembled together.

By applying the draping technique one may vary the aesthetic value of various types of products and diversify the traditional assortments of products.

In the opinion of the authors, the described technique allows to obtain good results, the surplus of draped material being used for the draping by the application of radial displacement procedures in the corresponding areas. In this case one may predict the location area and the volume of draping.

Figure 3: Application of draping technique on the façade of products

4. CONCLUSIONS

The spatial modeling techniques considered and applied during the experimental studies have been conceived as intuitive techniques implying creative thinking and original solutions. In multiple attempts they allow to generate complex constructive-technological solutions. These are followed by successful "errors" of designing complex three-dimensional elements, resulting in randomized and unforeseen creative solutions. Thus, the prototypes achieved by the techniques of transformational reconstruction become very promising solutions and potential sources of inspiration for the garments manufactured on industrial scale.

Some space for optimization has been identified in the process of application of the said techniques, so as to make it possible to use the resulting spatial elements in the garments produced in the industrial system. Moreover, the experiments have demonstrated that the application of spatial modeling techniques combined with the traditional constructive modeling procedures creates the premises for the diversification of models and assortments of garments, including the ones manufactured on the industrial scale.

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COLOR–THE ROLE OF COLOR IN PRODUCTS DESIGN PART II

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Abstract: The paper is analyzing the colors from sensorial-perceptive point of view point. The color, as one of the most important visual instruments can became a characteristic element of products, brands or company identification by using its special capabilities conveyed through technique. In trade, the color has a major role for advertising, packaging, and can and must communicate information about the quality and other characteristics of products. The principles that underlie the use and the functionality of color for the industrial products have been investigated.

Key words: color, aesthetic value, design, functionality of color

1. INTRODUCTION

Leonardo da Vinci wrote the first treaty of painting about light and color which was going beyond the simple practical recepies of previous painting manuals. The outlined theories were adopted and then further detailed and developed with the beginning of the XIX century.

However, in practice pigment based paints are utilized by all from creative painting artist to the trainman painters. Unlike spectral colors that are radiations whose combination is an ephemeral experience, through the combination of paints one can obtain colors that do not exist in the white light spectrum, like for e.g. black, brown, gray, ochre and also additional tones. These are called natural colors. The color sensation given by objects is due by their absorbtion and refraction properties. At one extreme of these phenomena is the opaque white body which reflects all incident radiation and at the other extreme is the opaque black body which that absorbs all radiations. A whole range of grays, all of which are considered noncolors, exist between these two extremes.

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 [1].

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".

The aesthetic value of color

From a sensorial – perceptive point of view, each color is characterized by three basic properties which determine the aesthetic value of color [2].

1. *Chromatic Tone* – given by wavelength.

The color sensation is generated by reflected the wavelength radiations. Body that reflect all wavelengths are perceived as white while those that absorb all wavelenghts as black. A multitude of achromatic shades exist being between white and black, *i.e.* gray, determined by the absorbtion and reflection in different proportions of all wavelengths. However, effort is put into differentiation between tone and chromatic shade (nuance) terms. Currently, a tendency exists to use chromatic tone as a term for saturated colors and chromatic nuance for colors modified by the addition of white and black.From this point of view, the difference in wavelength between extreme colors is 370 μm (dark red – 760 μm; violet – 390 μm). Over this wavelength range 130 to 200 chromatic tones can be distinguished which form the color families. So, red represents approximately 57 distinct tones, orange 12, yellow 24, green 12, blue 29 and violet 16 chromatic tones. By the combination of different saturation degrees and these 200 tones we can individualize approximately 1700 chromatic nuances. The human eye can distinguished over 10 milions of nuances.

2. *The intensity or energy load* of electromagnetic waves determines the luminosity or the degree of color brightness, which makes a color to appear to a higher or lesser degree alive. The highest luminosity is possessed by colors from the middle spectrum (mostly by yellow) while the lowest by colors in the extreme segments (mostly by violet and blue).

3. *Purity or saturation* is a colors' feature to be more concentrated, more saturated or paler and it is given by the distance of a chromatic color with respect to achromatic color- white.

Spectral colors are called pure or saturate if are they not mixed with other colors and have a purity degree equal to unity. The saturation of any color can be reduced by mixing it with white color.

The use of color in design

Beside general studies on colors and their potential influence on humans, consumer preferences relative to colors have been also investigated. As it turned out, any solution which ignores various features like the end-use of a product, the geographic area, traditions, age, manufacturing material, etc. is generating loss and damage for both manufacturers and consumers [3].

A less expected application of colors has been initiated by some U.S. companies which accelerates the moral wear of some products through the utilization of colors. In practice, some U.S. manufacturers of home articles associates a certain color of products to a certain manufacturing year. The housekeepers who give up under this pressure buy the product having the current year color in order to not be outdated and out of fashion (in this sense, those who have used for the first time this system proved to be very good psychologists triggering precisely the sensitive and sensible point of housekeepers. In fact, the color of the year in fashion proves its viability for more than a century. These exaggerations demonstrate the depth of color influence on an object.

Colors can and must communicate information about the quality and other characteristics of products. For expensive products, superior quality, other colors have to be used than for large-scale consumer products. The washing powder can be packed in living colors, garish, but these kinds of colors are not used for cosmetics articles.

Also, the product characteristics can be highlighted by using colors. For durable products and wear resistant we can use the bronze color. For toothpaste, the white and blue suggests cleaning and hygiene. Cosmetic products are packed in rose, light blue tones or other pastel colors. Brown or black packages are used for pipe tobacco or cigars. The packages for toxic articles are yellow and black for drawing attention and signaling of danger.

The principles that underlie the use of a color in industrial products are the following [4]:

- blind glow elimination;
- elimination of excessive contrasts from the visual field;
- improving of vision condition;
- avoidance of eye stain and increased product aesthetics;
- color psychology and preference for colors;
- presentation of products and their value.

The *functionality* of color for industrial products can be highlight through:

- the product color can aid productivity growth by improving working conditions (the creation of a better working environment, elimination of glow blind or tiring colors);
- color can help in work security by risk signaling;
- color has a protection role of packed products against light and humidity;
- color can be used in selling products for drawing the attention of buyers;
- color can be employed ad an integrative part of goods aesthetic;
- color can have an informative function that facilitates communication relations between humans and their environment.

A long lasting dispute is the one between the coloristic supporters and those of text advertising [5]. The former support the idea of advertising text minimization in which the communication is done through colors, symbols and packages shape. Letters must to be only an addition to the graphic design. Of highest importance is the color pattern that ensures not only visibility but also the power of suggestive information.

The conclusion is that you can not give a ready-made recipes.

The colourist place, products design, shape and packaging must be established for each individual object and the contribution of each of these characteristics for attaining a high quality product is difficult to determine beforehand. Shape, color and design must be harmonized in a rational way.

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HUMANIZATION OF HIGHER TECHNICAL EDUCATION AN ACTUAL SCIENTIFIC DIRECTION FOR FUTURE ENGINEERS TRAINING

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Abstract: The main objective of this paper is to develop professional skills and to train the general human values of future engineers.
Therefore the upper school shall be responsible for forming engineers, able to handle any changes in the world.
In this paper we have made the following: we defined the concept of humanization; we presented the humanization functions, it has been argued the need for humanization, we have established the humanization directions for the technical university and finally have been presented a model for training future engineers based on humanization.
In the context of development and resolution of data load we took into account the two categories of subjects involved in the educational process the students / graduates and academic staff.
Therefore the humanization process grows progressively within the formal of high school, by means of teachers and the individual efforts of study and reflection, through self-education, self - development.
Key words: future engineers, humanizing education, personality development, training.

1. CONCEPT - HUMANIZATION

According pedagogical dictionary, humanizing education - is a system of priority measures aimed at developing cultural components in the content and technology education, focused on improving personality, which is central in the structure of social relations.

Therefore the problem humanizing acting as a general problem of the universal values of civilization, as a condition for solving global problems of modern human society. Thus, in this sense involves the formation of a new humanistic vision, thinking, consciousness, personality, and creating new relationships between individuals, social groups and society.
It is evident that the technical universities resolve the problem of humanizing is solved by penetrating social sciences and in engineering disciplines and humanities enrich with the science basic components.

In other words, a concept humanizing engineering education involves a return to human integrity and training of students, giving them the subject of the educational function. Personality formation and overcoming stereotypes of learners thought occurs to include multidisciplinarity.

Referring to the humanization of technical higher education, we must consider the fact that engineering education in this century, we must consider a new relationship with environmental engineering activities, company, and individual, namely, the engineer must be humanistic activity.

Given that the technical universities special attention should be given technical philosophy, because it differs significantly from science philosophy. While science is the philosophy that revolves around the question: how to evaluate scientific truth and what is the meaning of this truth, Technical philosophy revolves around the nature of the artifact problem, namely, the man-made.

Therefore, humanizing education is seen as an important principle socio-pedagogical reflecting of the edification the current education system.

2. HUMANIZATION FUNCTIONS HIGHER TECHNICAL EDUCATION

Humanization of higher education aims to fulfill several important functions, including: worldview, axiological, cognitive, personal self-identification, intellectual and cultural development. Data functions note that any higher education institution to survive, must prepare their members to be productive and fulfill their respective roles.

For clarity, below we made a brief description of each function:

• Worldview, is the source of realization of human potential, and is considered cognitive stage of humanization. Knowing the basics of humanity, man recognizes himself as a person and acquired the ability to enter into the essence of its existence by knowing the ideals and norms of humanity and personal appreciation of their importance. So, takes place future engineer training free, creative, and responsible and creator of the self.

Is held forming the personality, development specialist with multicultural, social, creative anthropocentric character may correspond century XXI century.

• Axiological humanizing function of higher education is on the one hand, the basic concept of individual attachment to general human values, and on the other hand - is to demonstrate that one of these values is the full development of the creative personality.

• Cognitive function is performed by higher education as a humanizing process that aims to change society, "humanizing them," the release of individual creative potential. So really, on the one hand, humanization can not succeed without a thorough study of human and conditions of its existence, but on the other hand - analysis of education in the context of the principles of humanism can find problems in it that can identify the cause-effect relationship, and at the same time and to highlight which are the common methods of addressing it effectively. In this context, this function has a predictive component.

• Intellectual and cultural development function is achieved by forming a people-oriented culture based on truth, goodness. An indication of the culture of thinking is the ability to exceed the subject of cognitive conflict, not avoid, but the seek to address with dignity, to show independence, nonstandard approaches.

• So therefore humanization of higher education is one of important directions to create conditions for the formation of a man with all his best qualities, the discovery and development of individual creative potential, understanding its place in the universe, and in this respect, function personal identification is realized, the realization of human potential. Humanization of educational activities, serves as a mechanism to identify the student, and sometimes the teacher, personal intellectual and moral capacity and training valorico - rational relationship of this potential but also the need to achieve its possibilities.

3. ARGUMENT "PRO" HUMANIZATION

The need to humanize higher education is supported for various reasons. Shepel V.M. sees that the actuality of this problem:

a) Humane education\ contributes to emotional polyphony of people, and therefore make them more open to diverse information, intensify the activities of their intelligence;

b) Humane education focuses people's spirituality, features, great thoughts, desires, motives and noble deeds;

c) Humanistic education, in the words of FM Dostoevsky, facilitates the development of any profession. It is important for those who have an occupation and especially for those who have connections with people, communicate with them.

In a brief presentation of what proposing and means humanizing education is shown schematically in Figure 1.

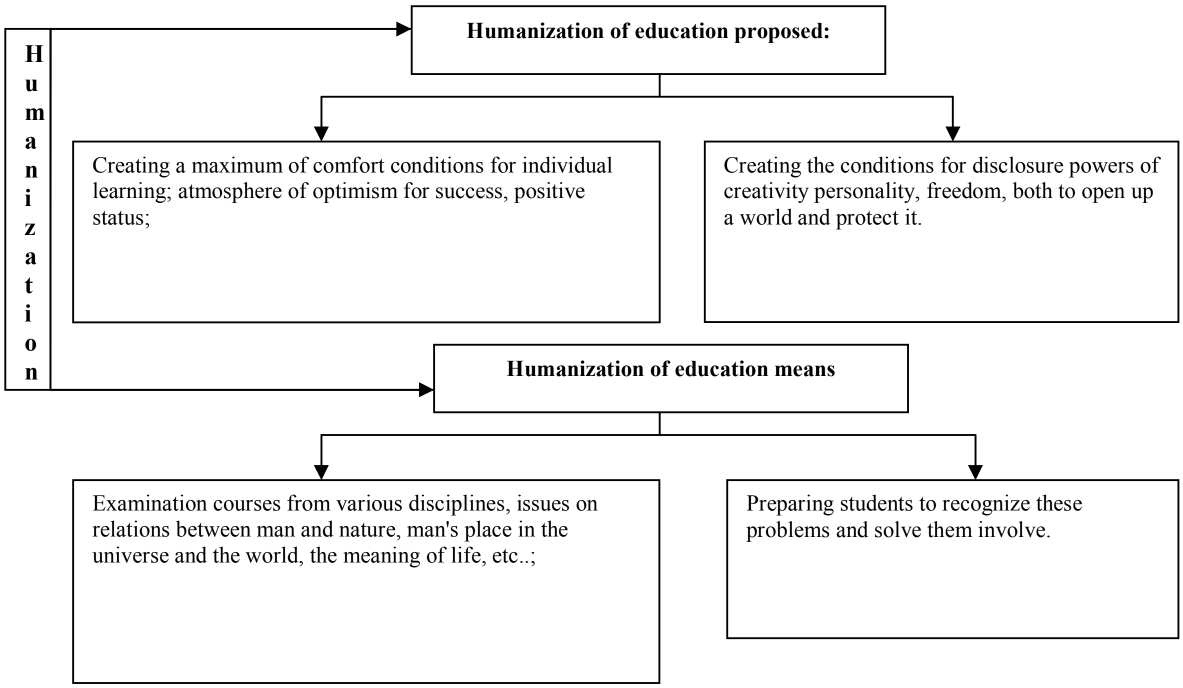

Figure1. Humanizing education concise presentation

4. SOLVING THE PROBLEM ADDRESSED

Solving the problem of humanization of education in technical universities should be made in the following areas: broadening the range of disciplines in the humanities module, ensuring the interpenetration humanities disciplines with engineering disciplines, development of general human values; knowing how many remarkable personalities of the areas scientific, cultural, technical, social, economic, etc.; interdisciplinarity in education; solving border problems arising technical and humanitarian areas; enabling students learn with technical profile the two specialties humanitarian or social profile -economic; consolidation engineers training in law, language, areas of environmental, economic and ergonomic, creating the environment within the university humanitarian orientation of education on student personality formation.

5. TRAINING MODEL FUTURE ENGINEERS

Basic purpose of education is personal development. And that means changing tasks which are put by the teacher. Previously, he had to transfer students' knowledge, after, humanization highlights another problem - contribute in every way possible to promote the development of the child / student [3].

Humanization requires a change in the relationship between "teacher-student", - by establishing cooperative ties. Such a change implies a change in teaching cycle (means the contents of the organizational learning process, that retains its essential characteristics [1]) in teaching methods and techniques.

By humanizing education is suggested individual professional development. This pedagogical principle should review the objectives, content and educational technology [2].

Following the synthesis bibliographic carried to the problem addressed, we developed a model of humanization structural-functional interaction relationship of student-teacher, shown in Figure 2.

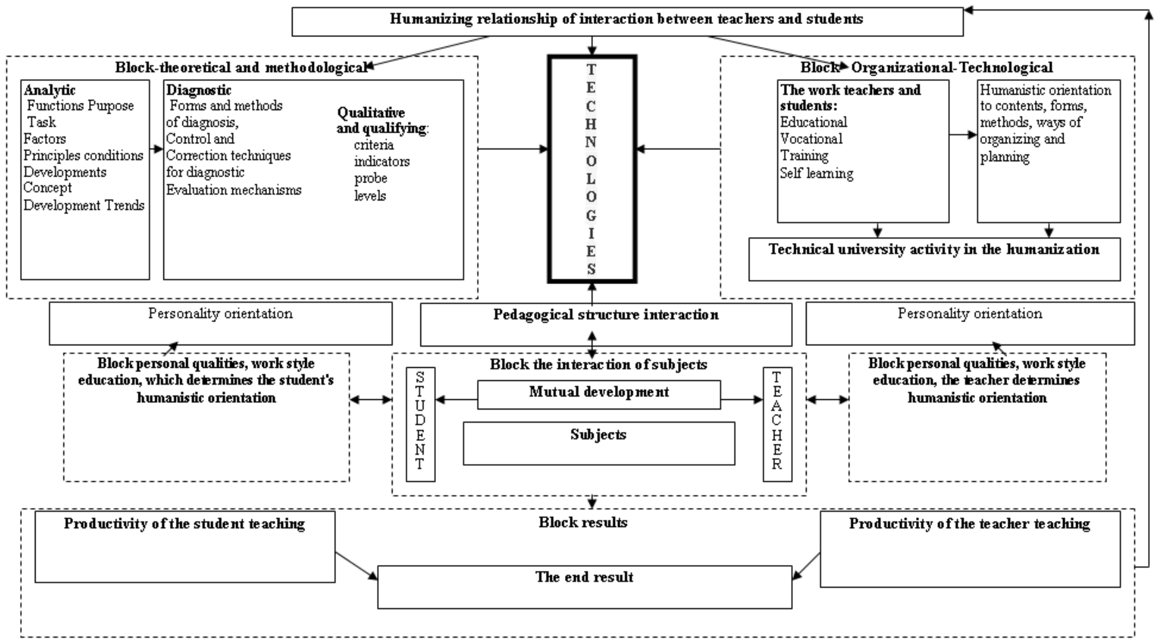

Figure 2. Structural-functional model of interaction relation humanization of a Professor (teaching) and students

6. CONCLUSIONS

Developing and implementing humanizing education in technical higher education, for a system the specialized in that areas are directly correlated with current requirements and dynamic employment market represent how universities can contribute to development engineers, specialists' future personality.

Preparation of a large variety of professionals in function the real needs of the labor market ensures on the one hand, an activity today after completing their studies and, on the other hand, coverage of jobs with competitive people and professional training.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

SOURCE OF INSPIRATION TIE BAGS COLLECTION TO ACHIEVE

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Abstract: Today leather products to meet the increasing demands of consumers both aesthetic and functional. To meet the increasing need for designers of leather goods industry to possess professional knowledge and artistic taste, imagination, creative initiative. Creators have to know the product manufacturing process, applied technology, types of equipment used in production, new materials, so that the created can be achieved. Fashion magazines, product catalogs, books about the creation of clothing and accessories and even their history studies can provide examples of how they were solved various requirements of the theme. This paper examines the creative process for the bag to use as inspiration tie. The paper also presents a brief temporal evolution of the tie, stating that Croatia is the country where it first appeared. Tie presents original reasons that glasses, lanterns, animals, umbrellas, etc., being present in wardrobe both men and women both. So the tie is an ideal tool in the hands of developers, helping them to make products that will remain in history.
Key words: ties, history, inspiration, purse, collection.

1. INTRODUCTION

Leather products to meet the increasing demands of consumers both aesthetic and functional. This together with items of clothing and footwear completes the attire, for which it should be modern, made in a variety of styles and colors, however beautiful or as leather products if they can not be matched with products. Footwear or clothing will lose value in the general appearance. To meet the increasing need for designers of leather goods industry to possess professional knowledge and artistic taste, imagination, creative initiative.

2. CREATIVE PROCESS OF PRODUCTS LEATHER

The site designer leather industry is beginning the manufacturing process. He must know the product manufacturing, technology used, types of equipment used in production, new materials, so that the created can be done smoothly. Fashion designers are the fashion line that emphasizes and stresses. When creating a model must take into account fashion line and harmony of colors, the possibilities for industrial scale and efficiency and economy. It also will follow the model to match the latest fashion trends, using new materials, and completion of draft and design patterns that ensure its aesthetic value [4].

Fashion magazines, product catalogs, books about the creation of clothing and accessories and even their history studies can provide examples of how they were solved various requirements of the theme. Creator is not about knowledge or copying a large number of achievements in the field, but takes issue date and the new solution gives existing achievements [8].

The creative process is preparing as follows:

- information on existing functional constructive solutions;
- critical analysis of existing information;
- emphasizing performance and current limits.

Before the move to creation itself is required information on existing constructive solutions, raw materials and existing technology. The creation of leather products previous design process is the same for all types and varieties, regardless of their destination.

In developing new models with greater economic efficiency creator must know the following:

- current and future trend of fashion in leather, in conjunction with fashion line of clothing and footwear;
- sources of raw materials and auxiliary materials;
- the rational methods of processing technology, existing equipment and technological possibilities of making leather products.

Development of new solutions is the first stage of creation. It will offer more options for development which can use several methods:

1. Analogy method.
2. Marketing method.
3. Method of structuring model components.

In the analogy method is based creator of the models on the market or in publications. Proposed new models take some elements of the existing products [5].

Marketing method is based on the buyer's taste intelligence consulting on an umber of shortcomings of similar products on the market and the requirement that the beneficiary. This information processed will enable the development of model variants that will take account of consumer requirements eliminating the shortcomings of existing products [5; 7].

Method of structuring elements model involves decomposition products components and finding the optimal solution [3; 8].

After we developed a series of models, these models are analyzed taking into account several criteria:

- Update to resolve the shape.
- Possibility to solve the future construction of solutions.
- Economy.
- The use of improved technology etc.

Once these requirements are analyzed prototype product development, step in establishing technology development and manufacturing and profit from new product sets.

Basic principles of creation:

1. Correlation model fashion line.
2. Appropriate choice of material for leather products with high and special features.
3. Appropriate choice of metal accessories.
4. Sizing rational products.
5.Choosing the right destination and type of product.
6. Ensuring the highest possible operating parameters.
7. Improving technology.

Also, with these basic principles, you should be taken into consideration trends such as:

- Unification, typing and standardization of product parts or elements.
- Increasing complexity of products quality and quantity.
- Introduction of high productivity processes.

3. HISTORY TIE

Tie was one of the few symbols of masculine elegance. Wear the neck and make life impossible (summer), when required in certain circumstances not to reject it. The obligation to wear a tie at work, clubs and restaurants was introduced in Western countries in the 60s. Not become an accessory to dislike and to enable men to customize through her dress, or a little monotonous, always just jacket and pants, designers have changed from season to season, size, texture and prints, which have evolved the dots, fruit and flowers to dinosaurs and elephants or other interesting or funny drawings [1]. Country in which first appeared Croatia tie is considered [10; 11].

In 1650 tie was launched in France, with success in England in the American colonies along with the return from exile of King Charles II. In the eighteenth century most had ties bat is form a band, or wrap the ends [10; 11]. Tie wrap once or twice around the neck, the in ode in front, so that both ends remain ulcer free. Who could not tie them already sewn law attorney and odorless, which had only to cling to the neck with a paper clip.

In England stock ties appear to be characterized by the absence extremities fallen ulcer, whose purpose was to mask open shirt. Also at that time was worn silk jabot, who wore the shirt set, replacing the tie.

In 1924 Jesse Lanngsdforf patent a new tie that does not wrinkle, no breaks, flexible, quality, since it is cut well and caught the three points. This invention made him rich. In 1940, Charvet tie adorns stamps, and in 1950 was top fashionable tie square [10; 11]. The twentieth century is characterized by hunting or sport reasons for women's pleasure, humorous atmosphere for relaxation, a pair of dice, a card game, pipes, clocks, lamps, glasses, banknotes, guns, pictures of Christmas, umbrellas, animals, etc. Today Claude Montana proposes as tie a piece of torn or burnt with iron and Ralph Marlin ties brought the fashion scene as fish [10; 11]. Tie that anything new has been banned at various times in countries like China, Soviet Union, Iran. The same tie was the first symbol of freedom proclaimed feminist movements. Adeptly this movement wore men's ties as evidenced brand of their emancipation [10; 11].

Classic tie length is 130-140 cm, width depends on tendițele fashion, ranging from 7 inches up to 9,5 cm. [12]. Ties are made of luxurious silk (100%) or cashmere. They can be braided leather, imitation leather and synthetic materials, but ties made from these materials form folds and unfold.

Now ties are various long / short, narrow / wide, can be worn on any garment or even naked body. Tie wardrobe is presented as both men and women. This is not necessarily to be ideal, may be wrinkled, dull, broken, etc. [12].

Currently feminine clothing slides easily to the male, from ancient times in wardrobe feminine men appeared specific elements such as: frame, rich ornamentation of shoes and handbags, trousers, tie.

Every year we think that the tie will eventually go out of style and will give it. In fact, tie not only to gain stability. These will complement the natural harmony and attire.

4. TIE SOURCE OF INSPIRATION

Ties can serve as inspiration to achieve collection of handbags, shoes, clothes. Ties form was developed using a collection of handbags, which is shown in figure 1 [6; 9; 10; 12].

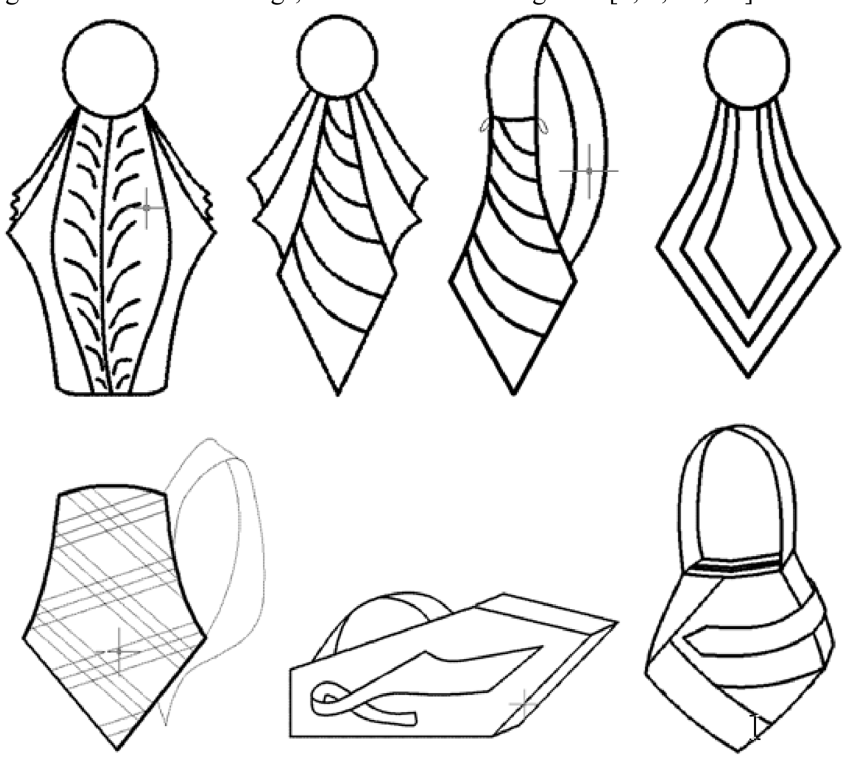

Figure 1. Handbags inspired by tie

5. CONCLUSIONS

To attract consumers, ideas must be original and interesting.

The idea and results in production until the application is a long way that once covered, give us success. Specifically how to address these issues depends on the experience designer, as well as its ability or willingness to follow a certain trend expressed in the fashion line or at a time. Regardless of the methods proposed the themes and sources of inspiration, bags beginning of this millennium can be characterized as, original, quality, beautiful. This requires flexibility, a permanent renewal and progressive collections. Thus, product designer task is to make products original and accurate and compositional style, which can add items such as quality of design and execution.

Currently the leather goods designers seek inspiration sources for various areas, but do not forget the past, keeping alive a certain style, then we recognize.

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DESIGN OF GARMENTS FOR THE CHILDREN AFFECTED BY METABOLIC SYNDROME

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Abstract: The theoretical researches and the conducted experiments allowed us to elaborate a series of new models of garments for girls. The dimensions of these products may be changed owing to the combination of materials with different extensibility properties (fabric and tricot), as well as by the use of proper principles of adjustment and fixation, superimposition and introduction. At the pre-design stage the anthropomorphological characteristics of wearers and their conformation particularities, functions and specific requirements, constructive and technological design properties of garments have been identified. The experimental researches were aimed at elaborating a series of new models of garments with shapes and dimensions adequate for the psycho-physiological and anthropomorphological characteristics of children with metabolic syndrome. This work addresses the problem of designing garments for the specific target groups of wearers – children affected by metabolic syndrome.
Key words: metabolic syndrome, garments for children, design techniques.

1. INTRODUCTION

Nowadays every fourth person on the planet is overweighed or suffering of obesity. In all countries there is a growing trend of obesity patients, both among adults and children. Obesity is regarded as a pathological condition from among the group of nutrition of physiological diseases with a high pathological potential for the overweight patients (based on the body weight to body height ratio). The World Health Organization has assigned to obesity the status of epidemic in the XXIst century.

During the recent years the scientists and doctors have been carefully examining various metabolic diseases and disturbances associated with obesity and in the result of conducted studies the Metabolic Syndrome has been defined. Another point of concern is the growing incidence of obesity among children, as obesity is a manifestation of primary stages of metabolic syndrome.

Numerous studies of manifestation of metabolic syndrome at children and adolescents are being conducted in Russia. [1] The growing incidence of obesity at children and the high number of metabolic disorders on the background of obesity make the studies of metabolic syndrome of children very actual.

The importance of studying namely this pathology is owed to the fact that the metabolic syndrome includes a series of anomalies leading to the appearance and progress of cardiovascular diseases and sugar diabetes of type II. The number of patients with Metabolic Syndrome is twice as high as the number of patients with sugar diabetes and in the next 20 years the incidence of this disease is expected to grow by around 50%. The rapid spreading of this disease is explained by easy access to foodstuffs (the cheapest ones being at the same time the richest in fat and carbohydrates content) in the condition of lower physical activity. The scientists from the University of Chicago have discovered that the ability to tolerate the cold climate is owed to the frequent incidence of metabolic syndrome, when the metabolism of body is affected by obesity, hypertension and sugar diabetes.

Bearing in mind the definition of metabolic syndrome as a pathology with a growing incidence among children and adolescents, as well as the data provided by the World Health Organization, stating that around 155 million children all over the world are either overweighed or obese, the problem of providing them with clothing of adequate shapes and dimensions becomes very actual.

2. THEORETIC RESEARCH

The conformation of body is determined by a combination of factors characterizing the body dimensions, the skeleton development degree, muscular development, subcutaneous adipose tissues, shape of back, extremities and abdomen. Numerous specialists consider the diagnostic scheme of Ştefco-Ostrovschii to be the most successful classification of body conformation for children, as it provides for the separation of pure, intermediate and undetermined conformation types. The pure types are divided into asthenic, thoracic, muscular and digestive. The brief characteristics of pure conformation types is provided in the table 1 below.

Table 1: Characteristics of pure conformation types of children by Ştefco-Ostrovschii

Indicators	Conformation type			
	asthenic	thoracic	muscular	digestive
Skeleton development degree (points)	1	1…1,5	2…3	2,5…3
Muscular development degree (points)	1	1,5…2	2…3	2…3
Adipose tissues development degree (points)	1	1…1,5	1,5…2,5	2…3
Shape of back	Coiled	Straight	Straight	Tensioned
Shape of thorax	Flat	Cylindrical	Cylindrical	Conic
Shape of abdomen	scaphoid, flat	Flat	Flat	Prominent
Shape of lower extremities	„O”	Normal	„O” or „X”	„X”

The intermediate types, as a rule, combine the characteristics of the two neighboring conformation types (muscular-digestive, digestive-muscular, etc. depending on the domination of the pure type parameters). However, in practice the intermediary types are referred to the category of pure types with dominating particularities. The undetermined type is mixed and includes the characteristics of several pure types.

The most representative indicators, expressed as % of body height, characterize the body shape of children with diverse conformation types in frontal and sagittal projections, as provided in the table 2.

Table 2: Values of dimensional indicators by conformation types at children, small school age

Dimensional indicators	Conformation type		
	asthenic	thoracic-muscular	Digestive
Transversal ratios, % of T1			
Width of shoulders	22,54	23,01	23,62
Width of bust	15,42	15,98	17,86
Width of waist	13,94	14,67	16,50
Width of hips	16,81	17,59	19,07
Longitudinal dimensions, % din T1			
Height of the throat base point	82,58	83,06	83,47
Height of the shoulder point	79,37	79,5	78,3
Height of waist line	61,12	61,79	63,50
Length of back to waist	22,27	22,11	21,23
Length of upper extremity	39,8	43,2	45,6
Height of sciatic fold	45	48	49,5
Characteristics of proportions in sagittal plane, % din T1			
Bust diameter	12,25	12,49	13,91
Waist diameter	10,80	11,29	13,53
Hip diameter	14,14	14,48	17,36

This analysis allowed to establish the particularities specific for each conformation type. So, the bodies of children of asthenic conformation are characterized by minimum values of transversal and anterior-posterior parameters, while the ones of digestive conformation are characterized by maximum values of these parameters. The bodies referred to the thoracic-muscular conformation type have mean values.

It has been determined that despite of the diagnostic criteria provided in the Ştefco-Ostrovschii scheme, the bodies of digestive conformation type have longer upper and lower extremities.

In order to be able to plan the production of clothing at industrial scale it is necessary to establish the incidence of each conformation type among the potential wearers. So, the children of asthenic conformation type have the lowest distribution incidence of around 7%, the ones of digestive type occupy around 30%, while the biggest share is represented by the thoracic-muscular type (around 60%).

Presently more and more children give up physical activity and dedicate almost all of their leisure time to television and computers. The static style of life with no physical efforts provokes substantial body weight gains. In the specialty literature one may find the recommended body weight values for the children of different ages (table 3).

Table 3: Normal body weight values for the children of different age groups

Body height (cm)	75 – 79	80 – 84	85 – 89	90 – 94	95 – 99	100 – 104	105 – 109	110 – 114	115 – 119	120 – 124	125 – 129	130 – 134	135 – 139	140 – 144	145 – 149	150 – 155
Body weight (кg)	9,0 – 11,5	10,0 – 12,5	10,7 – 13,0	12,1 – 14,4	13,3 – 15,7	14,2 – 17,2	15,8 – 18,6	17,2 – 20,1	18,8 – 21,8	20,4 – 24,2	22,3 – 27,0	24,5 – 30,0	27,0 – 32,8	29,5 – 36,2	32,5 – 40,4	36,0 – 45,6

The metabolic syndrome is diagnosed at children in accordance with the criteria proposed by the International Federation of Diabetes in 2007 [1]. The main criterion used for setting the diagnose of metabolic syndrome is the central obesity determined by the waist circumference [1]. The waist circumference is also one of the major dimensional indicators determining the dimensions of the clothing to be worn in that area, being used not only in the process of design of garments for children but also determining the body conformation group. The comparative analysis of values suggested by the dimensional typology elaborated for the children's bodies based on the waist circumference denotes that the obese children have higher waist circumference values:

- for girls the first conformation group is in the interval of 63, 66, 69 cm and the second group is in the interval of 69, 72, 75 cm;
- for boys the first conformation group is in the interval of 66-75 cm and the second is in the interval of 72-83cm;

Based on these assumptions one may properly formulate the problem of providing these children with adequately dimensioned products. The commercial networks provide clothing for the body types that either tightly fit the body and disturb the blood circulation or do not correspond to the age group. As a rule, the children are offered garments of bigger sizes for the following age groups in order to provide for the necessary degree of freedom.

The children affected by the metabolic syndrome are predisposed to overheating. This imposes the choice of adequate products that must be light, free cut, with transformable constructive elements. These are capable of providing natural ventilation and eliminating metabolic products.

Disturbance of blood circulation, as a rule, results in exanthemas on the skin. In order to prevent them from appearing, the garments shall not cause discomfort by friction or displacement on the body surface, nor should they exert any pressure. The garments of adequate size to suit the body shapes of the children must provide for freedom of physical activity, normal development and healthy lifestyle.

The constituent materials of the rational package must be chosen based on the well-defined quality indicators, providing for the observation of imposed requirements. Fabric with higher content of natural fibers is strongly recommended.

The most important requirements to the materials used for the manufacturing of clothing for children with metabolic syndrome are the hygienic and reliability–related ones. The hygienic requirements determine the basic function of clothing, providing for a stable and durable sub-clothing environment owing to the isolation of body from the effects of climate changes, pollution and lesions. These properties are especially important for the children, as their thermal regulation mechanisms are not perfect. The comfort is assured by the selection of materials with necessary elasticity, plasticity, light weight and easy maintenance.

3. EXPERIMENTAL STUDIES

The experimental studies included the elaboration and analysis of basic constructions of product – dress of semi-adjusted silhouette for girls of small school age for all conformation groups defined by the applicable dimensional typology.

The results obtained from the analysis of basic constructions and the resulting constructive parameters have been used as a platform for the elaboration of a system of new models of dress-type products for girls. The main scope was to obtain flexible constructions with possibilities of adaptation of product sizes to the values of dimensional indicators characteristic for the body types of the three conformation groups.

In order to provide for the necessary flexibility of models the authors have pursued the constructive-technological solutions providing for the possibility to modify the dimensions imposed by the variable shapes of wearers' bodies. These solutions have been pursued in the context of morphological transformations specific for the garments for children. The morphological transformation tools have bee studied and proposed for implementation by a group of Russian specialists. However, the said morphological transformation tools were specifically aimed at changing the thermal regime in the product strata or at extending the lifetime of the products subjected to quick wear due to the changes of dimensional characteristics of children's bodies.

In this work the authors propose some alternatives of using the morphological transformation tools for the satisfaction of wearers of the small school age and providing them with adequately dimensioned garments without affecting the dimensional range of products manufactured at the industrial scale in an attempt to raise the consumers' satisfaction degree without affecting the technical-economic indicators of garments.

The conducted theoretical and experimental studies allowed the elaboration of a system of six dresses, with varying dimensions owing to the combination of materials with different extensibility properties (fabric and tricot), as well as by application of adjustment-fixation principles and overlaying-introduction.

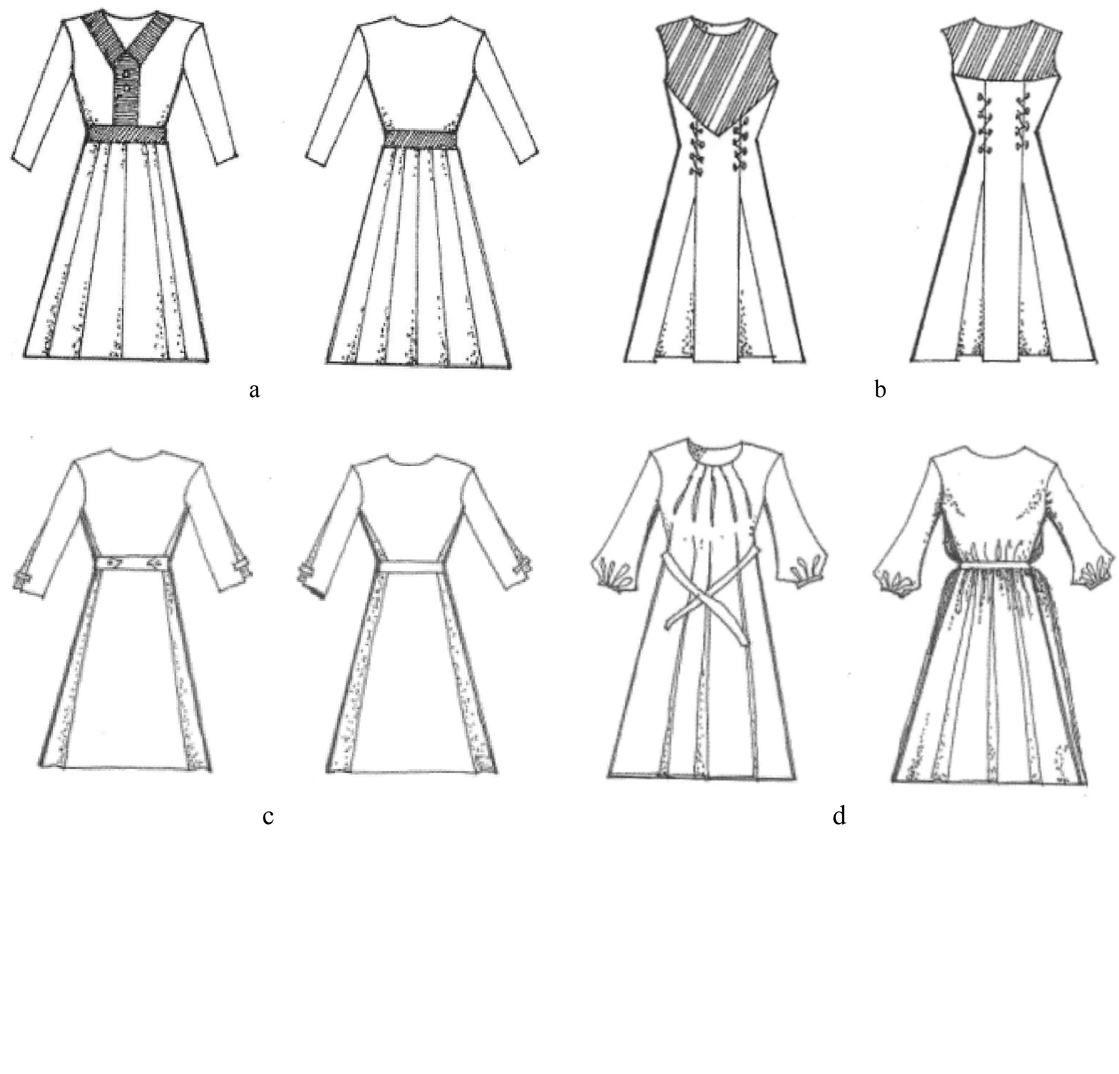
Below one may consider the description of the external appearance of newly elaborated models.

On the figure 1 one may consider the sketches of dress models for girls of small school age.

Model 1 (figure 1,a). Dress with semi-adjusted silhouette made of fabric combined with tricot for girls of small school age. The façade of product is symmetric, composed of two reference elements of the corsage, skirt, belt and a vertical cut. The closing system is of central type with vertical cut, the closing elements are buttons and buttonholes located at three levels. The skirt has curls at the level of upper contour. The posterior side is composed of three main elements: back, belt and skirt with curls at the level of upper contour. Classic sleeve applied with sew, of middle volume, smooth by shape, ¾ long. The belt on the front and back of the product and the vertical cut are made of tricot of second degree of extensibility, together with the curls on the upper contour of the skirt represent the elements providing for the necessary morphological transformation.

Model 2 (figure 1,b). Dress with semi-adjusted silhouette made of fabric combined with tricot for girls of small school age. The façade of product is symmetric, composed of upper element in the center and two lateral wedges. There are bidirectional folds between the central zone and the lateral wedges, their volume is adjusted and fixed by lacing. The closing system is placed on the lateral line as a recessed zipper. The back side is also made of upper element, central reference element and two lateral wedges. There are bidirectional folds between the central zone and the lateral wedges, their volume is adjusted and fixed by lacing. The product is of classic applied cut and does not have sleeves. The frontal and back upper elements are made of tricot of second extensibility degree, together with the bidirectional folds they constitute the elements providing for the necessary morphological transformation.

Model 3 (figure 1,c). Dress with semi-adjusted silhouette made of fabric combined with tricot for girls of small school age. The façade of product is symmetric, composed of upper element in the center and two lateral wedges. The back side is made of three reference elements: central element of back and two lateral wedges. The closing system is symmetric, partial, located at the level of back's symmetry line. The classic applied sleeve with two seams of middle-size volume, smooth shape has a length of ¾. In the upper side of the sleeve at the termination level a bidirectional fold is provided, with the internal piece made of tricot. The fold volume is fixed with a buckle. The lateral wedges are made of tricot of second extensibility degree- two bi-directional folds with descending depth – elements providing the necessary morphological transformation. The product is supplemented with a belt adjusted with buttons and buttonholes.



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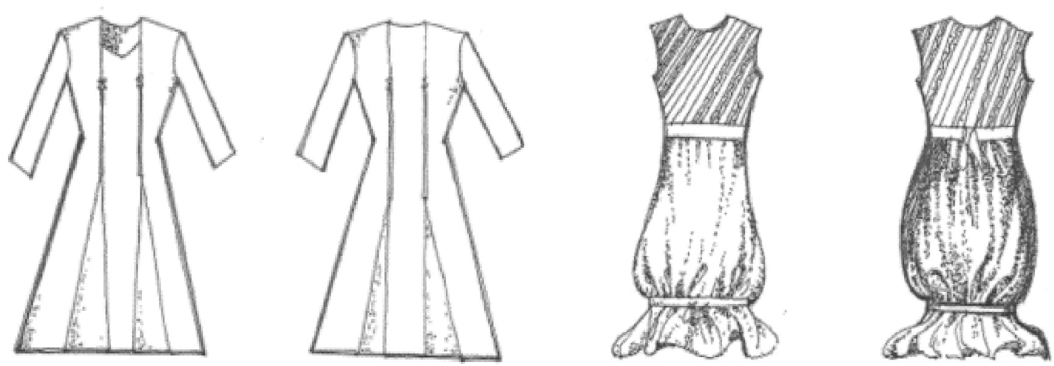

e f

Figure 1: Series of new models of garments for girls

Model 4 (figure 1,d). Dress of trapezoid silhouette, made of fabric, for the girls of small school age. The product façade is symmetric, made of a single reference element. The closing system is symmetric, partial, located at the level of back symmetry line. The classic applied sleeve is of average volume. The sleeve is narrowed to ends and provided with cuffs. The product is supplemented with a belt fixing the volume at the waist level by tying up. The elements providing for the necessary morphological transformation are the silhouette and the folds on the facade.

Model 5 (figure 1, e). The dress with semi-adjusted silhouette, made of fabric, for girls of small school age. The product façade is symmetric, composed of central reference element and two lateral wedges. Bidirectional folds are provided between the central zone and lateral wedges for adjustment of volume, fixed with zippers. The closing system – a recessed zipper - is located on the lateral line. The back side is made up of three reference elements: the central element of back and two lateral wedges. There are bidirectional folds between the central zone and the lateral wedges, their volume being adjusted and fixed by zippers. Classic applied sleeve with two seams of middle-size volume, smooth shape. The bidirectional folds on the façade and back with adjustable volume are fixed with zippers provide the necessary morphological transformation.

Model 6 (figure 1,f). The dress with semi-adjusted silhouette, made of fabric, for girls of small school age. The product façade is symmetric, made of upper element and skirt. The skirt has curls at the level of upper contour and can change shape at termination owing to a channel with lace. The back side is made of upper element and skirt. The skirt has curls at the level of upper contour and can change shape at termination owing to a channel with lace. The product is of classic applied cut, without sleeves. The upper elements of façade and back are made of tricot of second degree of extensibility and together with the curls and lacing channel constitute the elements providing for the necessary morphological transformation.

4. CONCLUSIONS

The theoretical research of the problem of designing garments for the children affected by the metabolic syndrome has outlined the need to improve the technology of designing adequate garments for the children with obesity pathology. The adequacy of garments may be assured by a more detailed study of dimensional typologies, specific constructive particularities of products, analysis of properties of materials, study of lifestyles and thermal regulation mechanisms of children.

The results of the said experimental researches have contoured a series of new models of garments of adequate shapes and dimensions for the psycho-physiological and anthropomorphological characteristics of children affected by the metabolic syndrome. In order to provide for the necessary degree of flexibility of models the authors have identified constructive-technological solutions capable of providing the dimensional changes imposed by the variable shapes of wearers' bodies, owing to the application of morphological transformation solutions specific for children's garments.

The conducted studies and the obtained experimental results may be transferred to the garments for overweighed children who are now disfavored by the lack of products of adequate dimensions for their age.

The elaboration of a rational wardrobe for various activities and age groups of children affected by the metabolic syndrome has been identified as a direction of development for the scientific research in designing garments for children.

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NEW PRETANNING AGENTS BASED ON VALORIZATION OF INDUSTRIAL WASTES

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Abstract: Leather industry has to cope nowadays with major environmental problems because of the polluting processes (a World Bank report has placed the leather industry in the ninth place when considering the environmental impact).Therefore, increasing the environmental efficiency in the leather sector is the major aim of leather, auxiliary materials and equipment manufacturers. The development of new tanning agents is required to cope with the increasingly higher environmental pressure on the current tanning materials and processes such as tanning with chromium salts.

This work deals with the preparation of tanning solutions based on Titanium (by processing solid wastes resulting from the process of obtaining highly pure titanium and that cannot be recycled in the industry yielding them), Zirconium, Aluminum.

Key words: free of chrome leather, eco-friendly product, Titanium tanning agents, Aluminum tanning agents, clean technologies.

1. INTRODUCTION

Leather is perhaps the first material being processed chemically by the man (as yearly as 8000 years B.C. – leather was obtained by fat tannage).

Leather belongs to our life; daily we are coming into contact with leather objects making our life more comfortable. Art, traditions, culture, and science have been employing over time leather and parchment.

Leather manufacture involves the processing of hides (byproducts of meat industry) into finished leather (a steady material) that can be used in making a large range of products.

Because of the specific tannery processes (use a raw material of organic nature and a large range of chemicals known to be noxious, and not the last, large water consumption and energy expenditure), they are currently facing up to major environmental problems.

The environment protection into the quality concept is a priority objective of the hide processing field because of the need of reducing water consumption and energy expenditure, and pollution under the general economic context, limited and varying resources at the economic operators' disposal, and a new regulation on chemicals - REACH (Registration, Evaluation and Authorization of Chemicals) to be adopted by the EU [6] .One of main ways of pollution prevention is the implementation of so-called 'clean' or 'environmentally friendly' processes developed onto three directions:

♦ reduced offer of chemical auxiliaries simultaneously with the application of hide support activation treatment;

♦ high bath exhaustion;

♦ replacing the 'classic' chemical auxiliaries of high toxicity and adverse environmental impact with others ones of low or no toxicity.

The development of new tanning agents is required to cope with the increasingly higher environmental pressure on the current tanning materials and processes such as tanning with chromium salts.

2. EXPERIMENTAL

Chromium is the major heavy metal polluting source in the leather sector. Basic Cr^{3+} salts are found currently in the effluents from tanning and wet finishing, and solid wastes from mechanical processing of leather and sludge resulting from the waste water treatment, all these falling within the class of hazardous wastes.

When dealing with the total or part removal of chromium in hide tanning and its replacement with other tanning compounds, even though some new product and processes have been developed, such a problem is kept on opened because of some drawbacks regarding the profitability and productivity while the environmental benefits are obvious.

There have been a variety approaches in obtaining new tanning materials in the last time, such as complicated syntheses, direct processing from ores, charging the chemicals directly into the (pre)tanning baths for in situ synthesis.

2.1. Obtaining of new tanning agents

This work deals with the preparation of tanning solutions based on titanium by processing solid wastes resulting from the process of obtaining highly pure titanium and that cannot be recycled in the industry yielding them.

The main classification criterion for titanium wastes was their contaminant level. The highest contaminant level in titanium wastes and titanium alloys is in cuttings resulting from the mechanical processing of ingots and cast articles (Figure 1).

a) Titanium ingot b) Cutting and shaping the ingots c) Unrecyclable cuttings

Figure 1. Aspects durring mechanical processing of wet white leathers

Therefore, a part of the above wastes cannot be recycled in the remelting process as this is not profitable. Chemical compositions of the titanium wastes placed at our disposal by SC ZIROM SA – Giurgiu, Romania is shown in Table 1.

Table 1. Titanium waste classification based on their chemical composition

Ref. No.	Alloy type	Ti [%]	Al [%]	V [%]	Nb [%]	Contaminants [%] (Al, V, Nb, Fe, Ni, Cr, C, N, O, s.a.)	Remarks
1	Non-alloyed titanium	97	Cont.	Cont.	Cont.	3	Cont.- maximum level
2	Ti 6Al 4V	88	6	4	Cont.	2	Cont.- maximum level
3	Ti 6Al 7Nb	85	6	Cont.	7	2	Cont.- maximum level

Table 2. :Chemical composition of cuttings processed for trials

Element	Ti	Al	V	Fe
%	89.61	6.25	4.07	0.00695

Chemical composition of the cuttings was established by plasma optical emission spectrometry.

The first step in obtaining new tanning solutions based on recovered titanium (from recyclable solid wastes-cuttings) involved the design of a new process for obtaining water soluble salts.

The dissolution of titanium wastes was carried out based on the properties of metals contained in them (considering that there are low levels of Fe, V and Al in such wastes).

Titanium is dissolved by acids at high temperature, the hydrofluoric acid having the best action; nitric acid has no action on the titanium, hydrochloric acid only acts at high temperature, and sulphuric acid at a concentration > 10 % acts at the room temperature.

Vanadium is attacked by nitric acid, concentrated sulphuric acid, perchloric acid, hydrobromic acid.

Iron is attacked by sulphuric and hydrochloric acid.

Aluminum is not attacked by the nitric acid while the other oxygenated acids acts on it at high rates even when highly diluted.

Considering the above features, the sulphuric acid was selected to dissolve the unrecyclable titanium cuttings according to the following reaction:

$$Ti + H_2SO_4 + O_2 + H_2O \longrightarrow TiOSO_4 \cdot 2H_2O \quad \textbf{(1)}$$

Following a large number of dissolution trials with solid titanium wastes (cuttings), the process for the preparation of solutions based on titanium/titanyl sulphate (containing V, Al and Fe) was designed and tried.

The framework process for obtaining water soluble salts such as titanium/titanyl sulphates (containing V, Al and Fe) is shown in Figure 2.

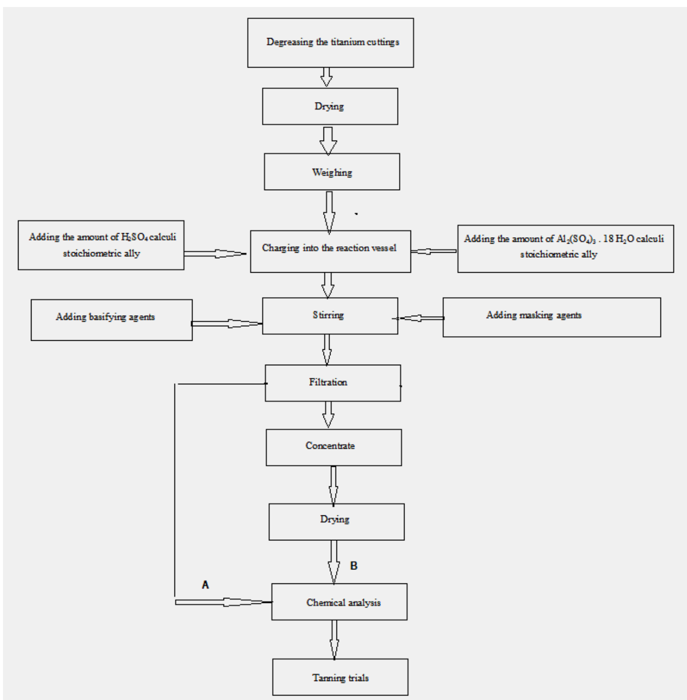

Figure 2. Chemical synthesis pathway for obtaining the new tanning agents based on Ti and Al

Considering the difficulty in obtaining tanning compounds from titanium salts (single) because of their instability in solution (hydrolysis at relatively low pH values), the stabilizing possibilities by masking, complexing, basification, and/or combining them with more stable (aluminum) compounds were investigated .

The results of chemical analysis carried for the novel tanning agents' solution are reported in Table 3.

Table 3: Chemical analysis of tanning agent solution

Parameter	
Density (g/cm^3)	1.25 – 1.45
pH	1.8 – 2.3
Total ash (g/dm^{-3})	75 – 140
Total metal oxides content (g/dm^{-3})	65-130

On the other hand, analyses carried out on dry Titanium-Aluminum tanning agent powders have given the results shown in Table 4.

Table 4: New Titanium-Aluminum tanning agents (powder form) metal content and pH

Parameter	
Total metal oxides, %	15 – 20
pH (1:10)	1.8 – 2.3

2.2. Tanning Trials.

Leather tanning trials were undertaken using pickled bovine pelts and a DOSEMAT laboratory-micro pilot DOSE MAT inox-drum. The tanning brine bath length varied from 200-400% on pickled weight and the initial float pH=3.1-to-3.2, before the administration of the tanning salts. The temperature of the tanning bath varied was ca. 25°C and the drum rotational speed was 15 rpm. At this point the Ti-Al tanning agent was added with offers ranging from 2-5% w/pickled weight. The pH measured five minutes after the addition of the tanning agents was reduced pH=2.2-2.3. The tanning bath had a characteristic purple color and the section of the pelt was fully penetrated («through») after 10-25 min (visual control). Basification was initiated using commercial MgO products for this purpose (2-3% w/pickled weight offer). After 30-60 minutes - with an optional heat induction (heating of float from 25-to-35°C) – a cationic fat liquor was added (2-3% w/pickled weight offer) and the drum run to reaction completion over a period of 1-to-6 hours with the tanning bath fully de-colored – end pH=3.4-3.7. Prototype wet white shrinkage temperatures ranged from 73-to-78°C.

Table 5: New Titanium-Aluminum tanning agents (powder form) metal contents (ICP-AES)

Element	
Ti-Al (%)	99.6
V (%)	0.13
Mg (%)	0.33
Fe (%)	0.03
Zr (%)	0.23

Most significant is the absence of Cr, Cd, Pb, Hg, Ni and As – non detectable.

Full thickness semi-processed tanned leathers resulting from application of the new Titanium-Aluminum tanning agents as described here is white, with a smooth grain full and supple, as shown with the photographic image in Figure 3.

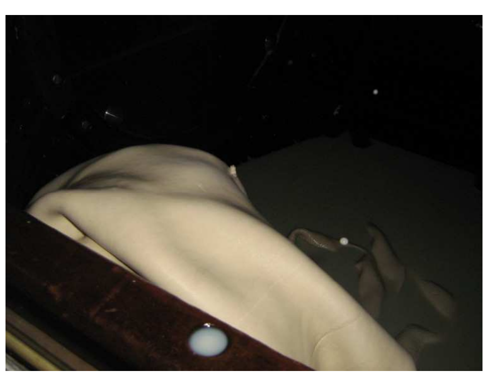

Figure 3.Wet-white leathers tanned with the new agent

3. RESULTS AND DISCUSSIONS

The tanning operation is difficult to be defined but it should to be based on o comparison of the raw hide with the tanned one by considering at least three criteria:

- storage and preservation characteristics obtained by tanning;
- changes resulting in the leather structure following the tannage;
- characteristics resulting from tanning treatment.

The protein structures in the dermis have changed their reactivity following the tannage while remaining unsaturated chemically (becoming inactive or stable), imparting leather a long time preservation ability.

Following the treatment known as “tanning”, leather shows such characteristics as follows:

4. increased physical-mechanical resistance because of the increased fibrous structure isotropy;
5. stability to the enzyme and bioenzyme attack;
6. increased hydrothermal resistance as a result of the increased shrinkage temperature of the dermis;
7. a porous character and acceptable wettability level in dermis after drying.

Considering the above features, the hydrothermal resistance values for the treated leather and characteristics of leather semi-finished products assessed by electron microscopy can be thought to provide the required information on the tanning characteristic of the environmentally friendly materials suggested in this work.

Shrinkage temperature was performed both by the common method of heating the sample immersed in water (Giuliany device-Italy) and DSC.
Shrinkage temperatures for leather samples tanned with the new tanning solutions are shown in Fig. 4.

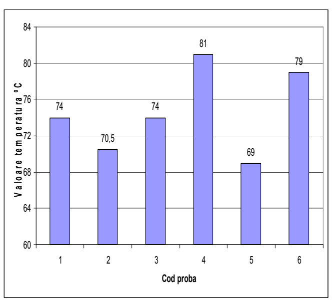

Figure 4. Shrinkage temperatures for leather samples tanned with the new tanning solutions

Figure 5. Leather tanned with the new tanning materials subsequently split

Hydrothermal resistance values for all the leather samples tanned with the new materials are not as higher as those tanned with chromium salts but provide a very good mechanical processing in the operations subsequent the tannage such as splitting and shaving (Fig. 5).
The results of thermal analysis (Figures 6 and 7) and electron microscopy (Figures 8 and 9 - 1500x magnification) have revealed the tanning characteristic of the suggested new materials.

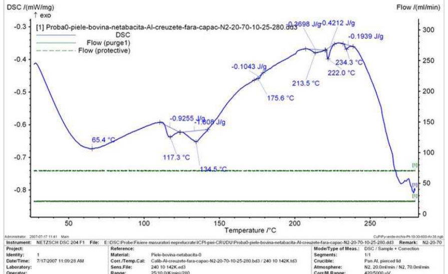

Figure 6. DSC curve (obtained in nitrogen flow) hides titanium tanning

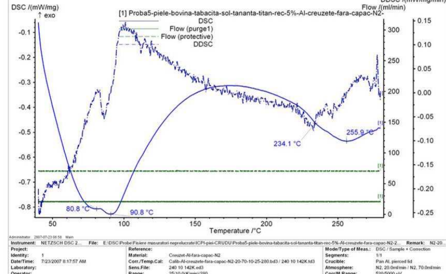

Figure 7. DSC curve for the leather tanned with the solutions containing

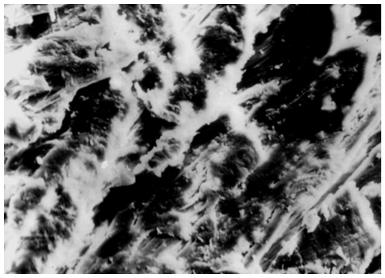

Figure 8. Electron microscopy (SEM) photos for pickled (untanned) bovine leather

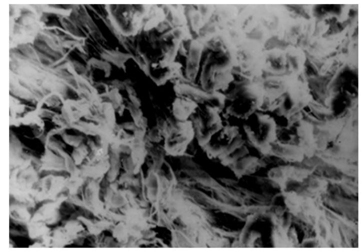

Figure 9. Electron microscopy (SEM) photos for bovine leather tanned with the Ti - Al

5. CONCLUSIONS

Exploring the valorization of solid Titanium metallurgic end wastes, as a low cost raw material has yielded new tanning agents for the replacement of Cr(III) tanning salts, a hitherto unthinkable or non technically feasible mission. In turn, as demonstrated here it is plausible to:

- increase of eco-efficiency in the leather manufacturing sector by making use of solid wastes, which cannot be recycled in the industry that generated them;
- total or partial replacement of chromium salts in the tanning process with cheap to produce and easy to apply in rapid full substance bovine leather manufacture, that, in turn required minimum process rationalization or modification; moreover, the new mineral tanning agents are free of restricted or regulated metals Cr, Pb, Cd, Hg and Ni;
- increase in articles diversity.

The experimental results obtained so far in pretanning trials, are a clear witness that it is now possible at pilot scale to produce full substance bovine wet white with the desired smooth grain, that possesses the minimum hydrothermal stability for subsequent mechanical processing.

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NEW BIO-BASED MATERIAL FOR FOOTWEAR

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Abstract: To date, the chemical industry has been using fossil resources to produce Thermoplastic Polyurethane (TPU). However, recently a bio-based alternative has been developed to produce TPU from renewable sources (plant oils). These environmentally-friendly TPUs can be used by different traditional industries (automotive, furniture, clothing, etc.) and the footwear industry is one of its potential consumers. Thus, the project titled "Thermoplastic polyurethane from renewable sources applied in footwear (EcoTPU)" was launched, co-funded by the European Commission through the Eco-innovation Programme, and aims at the EU market uptake of an innovative and environmentally-friendly TPU that can be used to produce footwear components, such as soles, toe puffs and counters.
Key words: Thermoplastic polyurethane, TPU, footwear, environment, bio-based.

1. INTRODUCTION

Thermoplastic polyurethanes (TPUs) are lineal polymers formed by the polymerization reaction of three basic components: diisocyanate, a short-chain diol (so-called chain extender) and a long-chain diol (see figure 1).

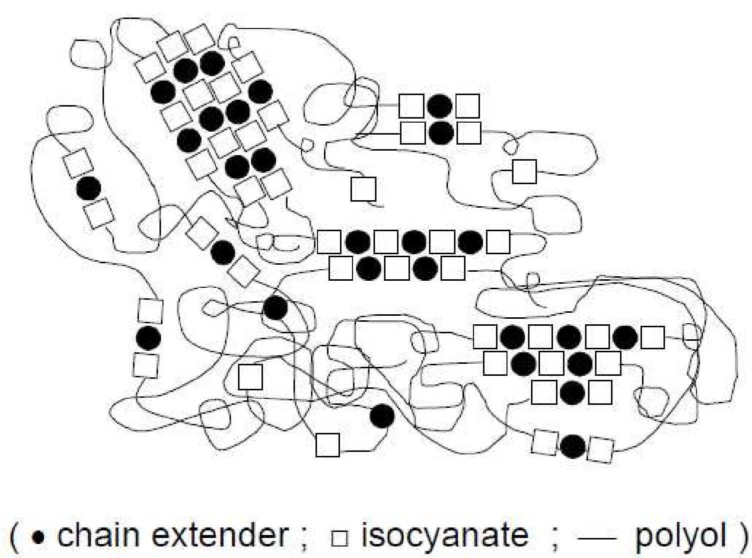

Figure 1: Micro-structure of a polyurethane block copolymer

Nowadays, the TPU market in the EU is estimated at 80,000 tons/year compared with 400,000 tons/year worldwide [1]. However, over the last years the European TPU market share has been reduced by 5% per year [2] due to the market irruption of low-wage competitors from third countries (mainly from Asian countries) with low labour costs. Moreover, the supplies of fossil resources (main raw material for the plastic industry) are limited and subject to steady increases associated with the resource scarcity we are witnessing. So during the first quarter of 2011, the raw material cost increased by 17.7% with regard to the same period in 2010, while the price of processed plastic products only increased by 4.6% in the same period [3].

Faced with this situation, the implementation of technology innovations in production processes aimed to obtain value-added products is seen as a solution for companies to boost their competitiveness and this way ensure their sustainability.

Formerly, the chemical industry has been using "old" carbon taken from fossil resources, especially oil, to produce TPUs. However, recently a new process has been successfully developed through which it is possible to achieve polyol synthesis from plant oils used as a raw material [4, 5]. This way, it is possible to obtain TPUs with a bio-based content [6] ranging from 20% to 90% (see figure 2), thus improving the environmental performance of such products.

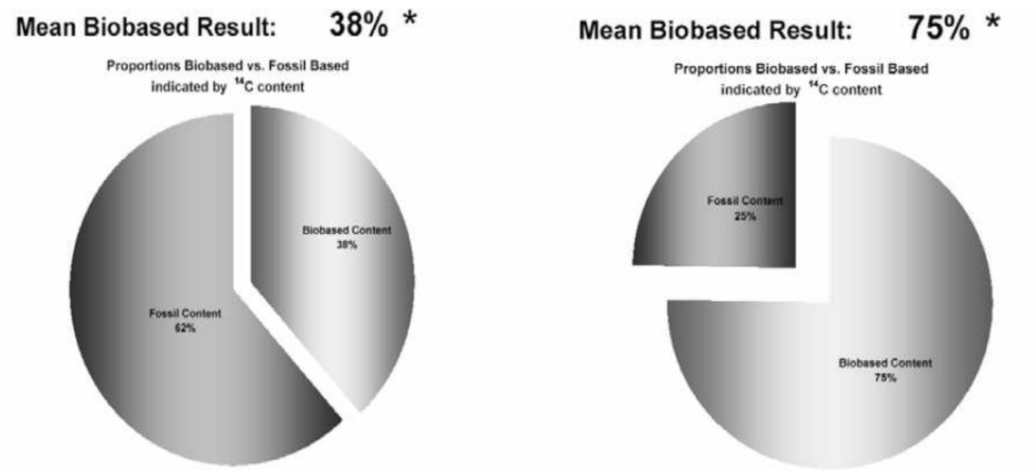

Figure 2: Report of Bio-based content analysis using ASTM-D6866

So, INESCOP, with the partial support of the EU through the Eco-innovation programme, coordinates the project titled "Thermoplastic polyurethane from renewable sources applied in footwear (EcoTPU)", aiming to introduce an environmentally-friendly TPU into the footwear European market to produce some components (soles, toe puffs and counters).

This paper presents the results obtained so far to check the products manufactured in the framework of the EcoTPU project meet the quality standards required for footwear manufacturing.

2. GENERAL INFORMATION

2.1. Production and check of raw BioTPU for soles, toe puffs and counters

Throughout the project different types of ecological TPUs were developed (marketed under the brand name Bio TPU®) according to the needs of the producers of soles, toe puffs and stiffeners. Table 1 shows the products developed.

Table 1: Bio TPU products

Bio TPU	Application in footwear	Hardness Shore	Biobased (%)
Pearlthane ECO D12 T55	Soles	55.0 Sh D	29
Pearlthane ECO D12 T95		95.6 Sh A	33.5
Pearlthane ECO D12 T90		91.5 Sh A	37
Pearlthane ECO D12 T90E		91.9 Sh A	37
Pearlthane ECO D12 T85		85.3 Sh A	48
Pearlthane ECO D12 T80		82.1 Sh A	62
Pearlbond ECO D900	Stiffeners	52.0 Sh D	75
Pearlbond ECO D590		52.0 Sh D	75

In the particular case of Bio TPU for soles (Pearlthane), the product PEARLTHANE ECO D12T85, of 85º Sh A hardness was finally chosen. Table 2 shows the results obtained in the physical-chemical tests carried out by INESCOP to perform their characterization, as well as their comparison to its non-eco counterpart (average values).

Table 2: Quality control test for Bio TPU material

Physical/Chemical test			Bio TPU	TPU	Recommended values *[1]
Test	Methodology	Unit	ECO D12T85	11T85	
Hardness Shore	UNE-EN ISO 619:2011	Sh A	87	88	-
Density (20ºC)	UNE 535326:2001	g/cm^3	1.16	1.19	-
Tensile strength	UNE-EN 12803:2001	MPa	Direction A: 48.0	Direction A: 39.7	> 7.0
			Direction B: 58.7	Direction B: 53.1	
Elongation & break		%	Direction A: 460	Direction A: 430	> 300
			Direction B: 530	Direction B: 525	
Abrasion loss	UNE-EN 12770:2000	mm^3	25	28	< 200
Phthalates (DEHP, BBP, DBP)	UNE-CEN ISO/TS 16181:2011	ppm	< 10	-	Not detected*[2]

*[1] Value recommended by INESCOP for men's and women's town footwear
*[2] D.L. 0.0001%

The results demonstrate that the physical properties of Bio TPU are comparable to those of conventional TPUs. Moreover, density, a very important property for this type of material, is enhanced given that its value decreases, which will allow reducing the weight of the products made from this new material without compromising its quality.

2.2. Production and check of BioTPU soles, toe puffs and counters

Different footwear components (soles, toe puffs and counters), were manufactured from the Bio TPU developed in the framework of the EcoTPU project (see figure 3).

Figure 3: Bio TPU toe puffs, counters and soles

In all cases the corresponding quality control tests were carried out to check their applicability to the manufacture of footwear (see figure 4). Tables 3, 4 5, 6 and 7 contain the results of the physical characterisation of the Bio TPU soles and stiffeners (average values). In the particular case of stiffeners, the tests were carried out on stiffeners made of Bio TPU (Biostick stiffeners) and on their non-eco counterparts (Forstick stiffeners) in order to compare the behaviour of both materials.

Table 3: Results of test on soles

Test	Methodology	Recommended value *[1]	Result
Hardness (º Sh A)	UNE-ISO 7619-1:2011	-	86
Density (g/cm^3)	UNE 53526:2001	-	1.13
Abrasion loss (mm^3)	UNE-EN 12770:2000	< 180	30

Tensile strength (MPa)	UNE-EN 12803:2001	> 7	40.2
Elongation at brealk (%)		> 400	560
Tear resistance (N/mm)	UNE-EN 12771:2000	> 8	43.6
Flex resistance (mm)	UNE-EN ISO 17707:2005	< 10	0
Phthalates (DBP) (ppm)	UNE-CEN ISO/TS 16181:2011	-	32.7
Phthalates (BBP) (ppm)		-	34.9

*[1] Recommended values are those established by INESCOP for women's and men's town footwear.

The results obtained for soles are good for the intended use of the footwear (women's town footwear).

Table 4: Results of deformation resistance and recuperation capacity tests on stiffeners

Sample	Variation	Force (N)					Recuperation (%)
		Cycles					
		1	2	3	4	5	
Biostick 0.6 mm thick material (toe puff)	Dry	35	32	3	30	30	86
	Wet	24	22	21	21	20	82
Forstick 0.6 mm thick material (toe puff)	Dry	20	19	18	18	18	86
	Wet	14	13	12	12	12	83
Biostick 1.0 mm thick material (counter)	Dry	61	58	57	55	55	84
	Wet	51	48	47	46	45	83
Forstick 1.0 mm thick material (counter)	Dry	48	44	42	41	41	85
	Wet	37	34	32	32	31	83

*[1] The methodology used was UNE 59521:1997 and material moulding conditions were 130ºC, 5.0 kg/cm^2, 6 s.

In the case of the deformation resistance test the results obtained showed better values for the case of Bio materials. On the other hand, for the recuperation capacity test the results were of the same order of magnitude for the two types of materials so it can be stated that their behaviour is similar.

Table 5: Results of fatigue deformation resistance and recuperation capacity tests on stiffeners

Sample	Variation	Force (N)			Recuperation (%)
		Cycles			
		1	2	50	
Biostick 0.6 mm thick material (toe puff)	Dry	4.7	4.4	3.9	86
	Wet	2.4	2.2	2.0	82
Forstick 0.6 mm thick material (toe puff)	Dry	3.3	2.9	2.6	88
	Wet	1.7	1.6	1.2	84
Biostick 1.0 mm thick material (counter)	Dry	11	11	9.8	84
	Wet	8.2	7.7	6.8	83
Forstick 1.0 mm thick material (counter)	Dry	11	10	8.7	90
	Wet	6.5	6.0	5.0	86

*[1] The methodology used was UNE 59521:1997 and material moulding conditions were 130ºC, 5.0 kg/cm^2, 6 s.

Again the stiffeners made of Bio TPU (Biostick stiffeners) showed better values for deformation resistance while they showed similar values for the recuperation capacity. After 50 test cycles there was no significant drop in the force values obtained in any of the materials tested so the behaviour of the materials is optimum.

Table 6: Results of tensile strength tests on stiffeners

Sample	Direction	Result (N/mm)
Bioestick 0.6 mm thick material (toe puff)	A	19.5
	B	6.5
Forstick 0.6 mm thick material (toe puff)	A	21.1
	B	8.3
Biostick 1.0 mm thick material (counter)	A	16.7
	B	9.7
Forstick 1.0 mm thick material (counter)	A	21.1
	B	9.6

*[1] The methodology used was UNE-EN 13522:2002

The values obtained are similar in both materials.

Table 7: Results of adhesion testson counters

Sample	Methodology	Result (N/mm)		Recommended value (N/mm)	
		Dry	Wet	Dry	Wet
Biostick 1.0 mm thick material	UNE-EN ISO 20863:2005	0.5	0.4	≥ 0.5	≤ 0.3
Forstick 1.0 mm thick material		0.6	0.5		

The results obtained for the bondability of the materials tested, both in dry and wet conditions, are considered suitable for using these materials in lined footwear.

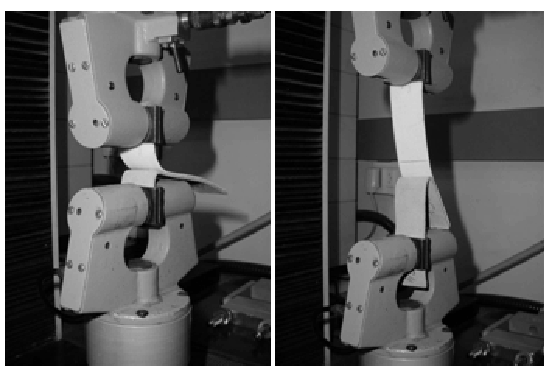

Figure 4: Example of quality control tests (adhesion)

2.3. Production and check of BioTPU footwear

A women's footwear model was manufactured using the soles, toe puffs and counters developed in the framework of the project (see figure 5). Dimensional stability and slip resistance tests were carried out to check the quality of final product, the footwear (see tables 8).

Table 8: Results of dimensional stability and slip resistance tests

Test	Methodology	Result	Recommended value
Dimensional stability (% shrinkage)	UNE-EN 12772:2000	0	< 3
Slip resistance (coefficient of friction) Ceramic tile + water+ detergent	UNE-EN ISO 13287:2008	0.20	> 0.30

Figure 5: Bio TPU footwear

The slip resistance test was carried only in the flat mode on the forepart of the shoe. Although the minimum recommended value was not reached, this material is suitable for use since there are other factors to be considered, like the tread pattern, which is what determines to a greater extent the value obtained and not the nature of the material.

2.4. Environmental advantages

A production capacity of 5,000 tons/year of Bio TPU is expected to be reached. When this level of production is attained the greenhouse gas emissions will have been reduced by 50,000 tons of CO_2 per year, due to the fact that Bio TPU shows a considerably lesser carbon footprint impact (15 kg CO_2/kg) in comparison to the conventional TPU (25kg CO_2/kg). Likewise, a reduction in non-renewable energy consumption of 480 tons/year is expected. Translated to footwear production, by using these new materials it will be possible to considerably reduce the carbon footprint of the final products, thus improving the competitiveness of European footwear companies.

3. CONCLUSIONS

It is feasible to obtain TPU from renewable sources, both from a technical and a financial point of view, with physical properties very similar to those of conventional TPU.

Eco TPUs partially obtained from renewable sources are currently available on the market, as well as different components for footwear manufacture (soles, toe puffs and counters) made from these materials. To manufacture the latter, it is not necessary to carry out changes in the production processes.

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USE OF GREENER CHEMICALS FOR ENVIRONMENTAL FRIENDLY TANNING PROCESSES

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Abstract: Originally, leather production is governed by an eco-friendly industrial process, because slaughter house waste such as the hides/skins discarded as waste material, is processed into useful materials such as leather goods, footwear and garments. During the leather making process, tanning is one of the most important operations, in which the tanning agents react with the collagen, stabilizing the triple helical structure of collagen matrix, thereby the leather acquiring resistance towards chemical, thermal and microbiological degradation. The currently employed commercial chrome tanning for leather processing requires re-examination in the light of growing concern regarding the ecological inacceptability of chromium in tannery effluents. It seems more meaningful to render chrome tanning more ecologically acceptable and complete by improving (a) exhaustion characteristics and (b) the filling mechanism of the tanning system. Improvements in tanning process can now be achieved by (a) use of exhaust aids, (b) reuse/recycle methods and (c) use of high exhaust chrome tanning salts. This paper highlights a chrome tanning process in conjunction with acidic amino acids (AAs) as well as aldehyde tanning assisted with D-Lysine (as alternative to chrome tanning) to achieve eco-efficiency as well as better quality of product.
Key words: Greener process; Cleaner process; Chromium(III); High exhaustion; Amino acids.

1. INTRODUCTION

1.1. Tanning- an ecologically sound industry

The tanning industry is ecologically sound and yet it has a notorious reputation for producing noxious wastes and smells but it is to be noted that the raw material for the leather is a by-product of the meat industry; if the tanner did not convert the hides & skins into leather, the slaughter houses would face a serious disposal problem that would far outweigh the alleged pollution by tanneries. Leather processing results in the emission of a huge amount of pollution load such as biochemical oxygen demand (BOD), chemical oxygen demand (COD) and total dissolved solids (TDS) apart from generation of solid wastes including sludge from tannery and chrome sludge from effluent treatment plant. In recent years, tanners in many countries have adopted cleaner or greener leather processing technologies.

1.2. Importance of cleaner or greener technologies

The tannery effluent contains considerable quantity of chemicals applied for processing. Wastage of chemicals is economic loss to the business community. Wastewater generated cannot be discharged as such due to pollution characteristics but need to be treated in effluent treatment plants. Also the treatment of effluent involves considerable cost. Hence the needs for going for cleaner or greener technologies in leather industry.

1.3. Recent research & developments of tanning process

The leather research in the first half of the 21st century centres on green chemistry approaches, green manufacturing practices, cleaner process, high exhaust tanning processes (chrome, vegetable and aldehyde tannins), sustainable process and biocatalytic tanning processes.

1.4. Solution to the problem of poor uptake of tannin

A true scientific solution to the problem of poor uptake of tannins involves avoiding the formation of low affinity tanning agent, converting low affinity into high affinity tanning agent, high affinity additives and auxiliaries for the tanning, modifying the chemical structure of tanning agent and developing a near zero waste tanning method.

1.5. Transition from conventional chrome tanning to high exhaust greener method

The conventional chrome tanning ensures a maximum of 55-65% exhaustion of chrome resulting in wastage as well as adding to pollution load. In this work, studies on the development of high exhaust chrome tanning process based on chrome tanning with presence of acidic AAs and as well as aldehyde tanning assisted with D-Lysine has been attempted. The high exhaust conditions, physical-chemical characteristics and the environment impact of this tanning have been compared with conventional method.

2. METHODS

In the present study, a greener approach to tanning process based on acidic AAs assisted chrome tanning and D-Lysine assisted aldehyde tanning repectively has been attempted. The mechanical and thermal properties of tanned leathers were analyzed using Thermomechanical Analysis (TMA, Instron series II Automated Materials Testing System) and Differential Scanning Calorimetric (DSC, TA-DSC Q 200) analysis. The organoleptic properties of tanned leathers were assessed. The % of chrome exhaustion from the effluent liquor was calculated. The chromium content in the spent liquor and wet blues obtained in each of the trials was estimated by the perchloric acid digestion method. The acidic AAs assisted tanned leather liquor from experimental processing was collected and analyzed for BOD and COD. Total solid (TS), Dissolved solid (DS) and suspended solid (SS) were calculated by according to the standard procedure.

3.RESULTS AND DICUSSION

The acidic AAs used are Glu and Asp that contain one amino and two carboxylic acid functional groups and have been used as crosslinking agents. The two carboxyl groups can react with active groups located in protein, such as amino (NH_2) or hydroxyl (OH) groups and interact with metal complexes. These groups are able to form ionic bonds with positively charged AAs or metals and it can also form ion dipole interactions with water [Scholnick et al. 1992; Pu et al. 2008]. The effect of the acidic AAs used as high exhaustion of chrome tanning on enhancing the ability of uptake tanning agent and reduction of tanning in waste were documented.

The shrinkage temperatures (T_s) and denaturation temperature (T_d) of leathers obtained by chrome tanning with addition of acidic AAs are similar to the values of leathers obtained by chrome tanning alone. The Ts of final leather reach 100, 102 and 104, respectively (Table I). The acidic AAs assisted tanned leathers were found to be soft, full and possessed tight grain; these leathers, having better hydrothermal stability. There are a number of ways in which the tanning action could take place, and although an ionic compound may be formed initially, it seems certain that the main chemical action is by means of coordination complexes or covalent bonds. Tensile strength (TS), % Elongation (% E) of acidic AAs assisted tanned leather were determined and compared to chrome alone (Table I). The acidic AAs assisted tanned leathers are close to the BCS.

Table 1: Thermal and mechanical properties

Process	Ts (^oC)	T_D (^oC)	TS (MPa)	% E	% Exhaustion
BCS (Control)	100±3	103±2	18	56±3	64±5
BCS+Glu	102±4	102±3	19	66±3	95±2
BCS+Asp	104±2	105±3	19	67±3	96±3
Ald (Control)	96±5	93±3	15	72±6	-
Ald+D-Lysine	120±5	108±7	18	56±6	-

The reaction of acidic AAs involves two-step reaction. Initially acidic AAs react with Cr(III) present in BCS. In the second stage, collagen in the leather reacts both with free Cr(III) and Cr(III)–acidic AAs complex. Fixation of acidic AAs in leather enhances further uptake of Cr(III) resulting in enhanced uptake of Cr(III) by leather. It is seen that the exhaustion of chromium in each trial (experimental group) is above 95 %. Also, the % fixation of Cr_2O_3 in the leather produced from the tanning agent is more than control. Higher uptake of chrome is reflected in low discharge of chrome in the exhaust liquor. This is because of the improved uptake of BCS. Generally, the appearance and overall performance of the tanned leathers from acidic AAs assisted tanning process is good comparable to the BCS alone.

In comparison with chrome tanning, the BOD/COD value is greater in the new tanning systems reported which demonstrates that the effluent is easier biodegradable. The acidic AA could bring about the enhancement of chromium uptake, significant reduction in TS, DS and SS. The rate of chromium fixation may be increased using these acidic AAs compounds. Recent studies have demonstrated the possible role of acidic peptides and unnatural AAs to achieving ecofriendly tanning process and molecular crosslinking of collagen (Pu et al., 2008; Krishnamoorthy et al., 2011 and 2012).

Table 2: COD, BOD and TS, DS, SS analyses

Processes	pH	COD (ppm)	BOD (ppm)	TS (ppm)	DS (ppm)	SS (ppm)
BCS (Control)	2.5-3	1000-2500	400-1000	30,000-60,000	29,000-57,500	1000-2500
BCS+Glu	2-4	1200-3000	500-1200	20,000-52,000	16,000-45,500	800-2000
BCS+Asp	2-4	1100-2900	500-1200	15,500-44,000	15,000-42,500	700-1800
Ald (Control)	3.0-4.0	1200-3000	400-1000	20,000-40,000	25,000-48,500	800-1800
Ald+D-Lysine	3.0-4.0	1300-3300	300-700	12,000-28,000	17,000-38,000	400-1400

We see three possible reasons for the high exhaustion of chrome in our experiments. Tanned leather could crosslink with the added additional carboxyl groups of Glu and Asp and form stable metal complexes. Collagen has an ability to coordinate with chrome salts which is mostly determined by the amount of pendent carboxyl groups on the backbone of collagen. The fibre bundles seem to be less dispersed (separation of fibre) in the tanned sample compared to chrome alone. Since the tanned sample exhibits slightly dispersed (opened up) fibre structure, it would, in principle, exhibit an increased fullness and softness in the final leather.

The $T_{s,}$ T_d and TS of D-Lysine aldehyde tanned leather is more than that of aldehyde or equal to chrome tanned leather. It is observed that tanned leather exhibited good fullness, softness, smoothness, colour and general appearance compared to glutaraldehyde alone. EIA shows that the developed process benefits from significant reduction in TS, DS and SS and improves better biodegradability of organic compound present in the effluent compared to conventional tanning method.

According to chrome tanning mechanism, chromium predominantly coordinates with the carboxyl groups of collagen, form fixable crosslinking between collagen molecules, and make the skin into leather, so in the process of chrome tanning, carboxyl group of collagen has played a major role in improving the hydrothermal stability of collagen. Moreover, the coordinating reaction is affected by other factors such as spatial position, degree of ionization as well as coordination field, which means the combining sites between the collagen and the chromium are very limited, so the actual combination ratio of chromium is often lower than 70%. High exhaustion of chrome by introducing additional acidic AAs groups onto the tanning process is considered to be an efficient approach to enhance chromium exhaustion.

From the above results and discussion, it can be conducted that the added acidic AAs content is the key issue for chromium absorption, and this behavior can be enhanced by means of introducing the additional carboxyl groups. This process provides more than 95% exhaustion of chrome made possible with small molecular chelating and masking additives. The unique feature of the improved high exhaustion chrome tanning process lies in providing an economical as well as eco-friendly approach and improved properties of leather. The introduction of high exhaust chrome tanning process can not only efficiently enhance the tanning uptake but also significantly improve the mechanical strength, thermal stability and also highly improves the organoleptic properties of leather. This procedure is expected to yield a novel substitute process for conventional tanning in leather-making.

The introduction of acidic AAs can efficiently enhance the chromium absorption in chrome tanning. Also, addition of D-Lysine in aldehyde tanning is beneficial in improving the tanning characteristics.

4. WAY FORWARD

Expansion of leather industries spread across the globe in days ahead raises issues relating to sustainable development. Economical development, environmental protection and social development are the three pillars of sustainable development encompassing the structure of the industry, ecology and environment, technological dynamics, market forces and so on. Sustainable development is of great importance in present leather industry scenario. The ability to use these advanced techniques and technologies without causing damage to or attrition of resources is all the more important. The introduction of acidic and basic AAs can efficiently enhance the tanning properties at same time improving the exhaustion characteristics. Implementation of greener chemicals or green chemistry approaches to cleaner production and pollution prevention measures can provide both economic and environmental benefits.

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INDUSTRIAL ECOLOGY - AN INSTRUMENT FOR SUSTAINABLE DEVELOPMENT

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Abstract: This paper aims to contribute to understanding the role and importance of the concept of industrial ecology. Thus, are presented some notions about ecology, about the analogy between natural and industrial ecosystems, some points of view of specialists on industrial ecology, up to accepting the idea that industrial ecology is the science of sustainable development.
Key words: *ecology, ecosystem, industrial ecosystem, industrial ecology, sustainable development.*

1. INTODUCTION

After the publication of the Brundtland Report (1987) and before the United Nations Conference on Environment and Development in Rio de Janeiro (1992), Robert Frosch and Nicholas Gallopoulos (from General Motors Laboratories) said that the concept of industrial ecology should be known by officials, used by them, by executives from industry and media. The concept must be presented to all citizens, and provide guidance to governments and industry.

2. ECOLOGY

Appeared initially as a branch of biology, ecology, defined as "the science that deals with the study of interaction between organisms and their environment" [8] has evolved over the decades amid increasing evidence of the emergence of natural imbalances, up to breaking absolute essential ecological balances. Thus, gradually, ecological implications have multiplied, intensified and complicated, especially with the development of industrial companies, which have profoundly altered the planetary environment, but also due to population growth.

In the conception of Noica, from the perspective of the human - science relationship, ecology is at the border between natural sciences (sciences of knowledge) and human sciences (sciences of recognition).

In one of the many definitions is said that "ecology studies the laws that determine productivity, stability and evolution of ecosystems and the ecosphere as a whole and therefore studied the influence of human activity on these processes and their implications on the quality of human life" [3].

Today ecology is seen as a multidisciplinary science, with several subdivisions, defined in various ways, perspectives and modes of application, such as: plant ecology, animal ecology, terrestrial ecology, marine ecology, population ecology, communities ecology, human ecology, ecosystem ecology, theoretical ecology, fundamental ecology, applied ecology, industrial ecology.
Human ecology is "the study of relations between social phenomena and spaces in which they are included" [8].

3. ECOSYSTEM

English ecologist, C. Tansley in 1935, defined ecosystem as "an interactive system that is established between a biocenosis (a group of living organisms) and its biotope, the biocoenosis living environment".

Of the many classifications of ecosystems we mention:
- Natural ecosystem - ecosystem that arose spontaneously in the struggle for existence of plant and animal species in which man has no role in changing the density, abundance and diversity of organisms
- Anthropogenic ecosystem - ecosystem where human intervention is partial or total
- Human ecosystem - the whole planetary in interaction of the human populations with the environmental factors [10].

Also, is spoken of urban ecosystems, or agricultural ecosystems, even of industrial ecosystems, all of which can operate under the same laws specific of ecosystems.

The most important functions of an ecosystem are: energy function, the function of circulation of matter and the automatic adjustment function. Also, one of the basic principles in ecosystem functioning is that they do not produce pollution. As we know, in nature nothing is lost, nothing is gained, everything transforms.

4. INDUSTRIAL ECOSYSTEM

At the beginning of life on Earth, when resources were very numerous and their customers relatively few, the impact of the latter on the available resources was insignificant. Resources seemed unlimited, and waste could also be produced in unlimited quantities. By analogy, the same happens in a traditional industry, where each transformation operation, independent of the others, consume raw materials, providing products that are then sold, and wastes which are stored. This type of operation, reduced to the resource extraction and waste disposal, is the current source for the environmental problems. Braden Allenby, one of the first researchers who have explored the concept of industrial ecology, this type of operation called "ecosystem type I".

Later, amid awareness that resources are not unlimited, there was the so-called "ecosystem type II", in which between system components are interdependent and complex interactions with materials flows within the ecosystem. This type of ecosystem is clearly better than the first, especially in terms of resources, but is not sustainable in the long term, because the resources continue to diminish and the waste continues to grow very much.

A truly viable ecosystem in the long term is one that works cyclic, where the waste of a one component of the system is resource for another component and the only contribution from outside is the solar energy; such an ecosystem is called "ecosystem type III" [1].

Ideally, industrial society should approach as much as possible of an ecosystem type III. This transition is actually the stake of development and implementation of the industrial ecology concept.
The analogy between the concepts of industrial ecosystem and biological ecosystem is not perfect, but we have much to gain if the industrial systems should imitate the best aspects of biological systems.

An industrial ecosystem would function as a biological ecosystem, if it respects the following principles:
- judicious use of raw materials and energy
- maximizing recirculation in of industrial units
- reuse of materials and forms of energy besides the production units, such as using recycled materials and manufacturing waste, secondary energy (steam, hot water), wastewater, etc. for other processes
- minimization of emissions for each stage of manufacturing [4].

5. INDUSTRIAL ECOLOGY

There is no single official definition of industrial ecology, but this concept is recognized in the following items:
- is a holistic, integrated vision of all components of an industrial system and their interaction with nature
- its field of study and action consists of all stocks and flows of matter and energy
- aim is to foster the transition from current industrial systems to long-term sustainable industrial ecosystems, mainly through technological dynamics [2].

Concretely, industrial ecology aims at major reshaping the industrial system, to make it evolve into a viable long-term running, compatible with nature, this eco-restructuring being directed along four axes:

- valorization systematic waste
- minimization of losses by dissipation
- dematerialisation of the economy
- decarbonisation of the energy.

The establishment, in 2001, of the International Society for Industrial Ecology, was the recognition at the institutional level, increasingly higher interest for this concept, both in academic environment as well as in political and economics.

From appearance until now, have been imposed several trends and stakes of industrial ecology [6].

During 1990 - 2000, four main trends have been imposed in connection with industrial ecology:

- eco-industrial parks
- symbioses and intersectoral synergies
- economy of functionality
- metabolism of economic activities.

After 2000, revealed many research directions and strategies for implementation of industrial ecology, from which most important are:

- legislative context
- innovation, risk
- responsibility, investment, government
- territorial politics, the construction
- information society (knowledge economy).

There are also some trends late, left the early stages of industrial ecology, such as:

- economic thinking
- business models, management
- scientific ecology
- epistemology, philosophy
- dynamic technological
- convergence of nano-bio-information-knowledge
- scientific policies
- A sophisticated waste treatment?
- A luxury for rich countries?
- A green smokescreen?
- A vision of pure technician?

Industrial ecology has methodologies such as: life cycle analysis, material flow and energy analysis, cooperation of many actors who usually are ignore or are compete. All these tools help to diagnose the possibilities to minimize environmental impacts, inside an enterprise, inside an industrial park or inside a given territory, thus allowing decision makers to achieve a sustainable development.

Industrial ecology, based on a very large and rigorous conceptual framework (scientific ecology, natural sciences and engineering sciences) aimed at reducing environmental impacts, including through improved technological performance, while being realistic in economically and legally responsible social, so we can say, rightly, that industrial ecology is closely related to integrated environmental management and sustainable development, up to accepting the idea that industrial ecology is the science of sustainable development. The following are some points of view that led to the previous assertion.

* Industrial ecology is a recent concept and practice of environmental management, which aims to limit the impact of the industry on the environment, in view of achieving a sustainable development [10].

* Industrial ecology is a set of emerging concepts from the research and practical fields of sustainable development; it is necessary to be integrated in all design models and strategic approach to sustainable development. If would not take into account the application of industrial ecology in addressing such models would be a number of risks and difficulties, which would lead to many problems and not just optimal solutions [7].

* Industrial ecology is a key tool in policy, rigorously scientific, of the sustainability [5].

6. CONCLUSIONS

In conclusion, we agree the idea that industrial ecology is an instrument for sustainable development, even that it is the science of sustainable development. As saying Erkman [6], industrial ecology not propose us a return to nature, but offers ways to help us live in harmony with nature, giving us the ability to keep account the limits that are imposed us, the imperfections of all existence and entire society, opening the way for human and spiritual dimensions of sustainable development worthy of this name.

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