ANNALS
OF THE
UNIVERSITY OF ORADEA

FASCICLE OF TEXTILES, LEATHERWORK

VOLUME XII, 2011

No. 1

ISSN 1843 – 813X

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OF THE
UNIVERSITY OF ORADEA

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VOLUME XII, 2011

No. 1

This volume includes papers presented at International Scientific Conference "Innovative solutions for sustainable development of textiles industry", 27-28 May 2011, Oradea, Romania

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Published by
Editura Universităţii din Oradea
Universitatea din Oradea, Str. Universităţii Nr. 1, 410087, Oradea, Bihor, Romania
ISSN 1843 – 813X

Indexed in: Ulrich's Update - Periodicals Directory

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E-COMMERCE AREA FOR TEXTILE INDUSTRY

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Abstract: This paper presents some management aspects concerning the e-commerce area for textile industry. Here it can have database management – customers, products and brand visualisation management. The database management can be doing by using a database management system. For database management it was use the relational model based on first-order predicate logic [1]. In this paper is was analyzed the relational database model. The e-commerce area is born from need to simplify the buying and selling garment product, the virtual store have the advantage that is require low cost and is more accessible in different regions and at any hour. The e - store can simple addressing to different population by respecting their cultural specific tradition.
Key words: e-commerce, textile, management, database, design, website.

1. INTRODUCTION

For the e-commerce the site design is a very important step. The website must be a copy of a real store. The customer must do not feel a wrong difference between real and virtual store.
Like in the real world the e-store must have a friendly interface and to have a good promotion. This promotion can be doing by using the search engine optimization.

A good sales management can be obtained by linking the website objectives to the customer needs and expectations, communicating customer needs and expectations throughout forum or email, measuring customer satisfaction by using the questionnaires and acting on the results, systematically managing customer relationships and by having a balanced approach between satisfying customers and other interested parties (such as owners, employees) [2].

The e-shop provides lower costs for product sales and promote, marketing. The website owners can have consistent and predictable results and must be oriented to the improvement opportunities. The relationship between customers, e-shop and owners must be based on transparency, easy communication and must have a positive feedback [2].

2. E-COMMERCE MANAGEMENT REQUIREMENT

The e-commerce area improves the time and product management. The updating of the virtual product sales takes time to implement, gain acceptance and stabilize as accepted practice. The website updating must allow pauses between implementing new changes so that the change is like a real improvement, before the next improvement is made.

By choosing the e-commerce area for product promotion, it can be developed a website very quickly. The aspects of the virtual e-shop and the items can be fast modified and updated. The buyers can have access to the virtual e-shop 24/24 hours [2].

If we have the website developed – the web design and database released it is required to follow some steps. The first step is to defining the e-commerce management tasks:
- updating the database new textile products: descriptions, prices, images;
- backing up the database;

- optimising the site.

For database management there are 3 models:

- relational model;
- hierarchical model;
- Network model.

The hierarchical and the network model represent old architecture and are used for high data volume. The relational model was the first database model to be described in formal mathematical terms.

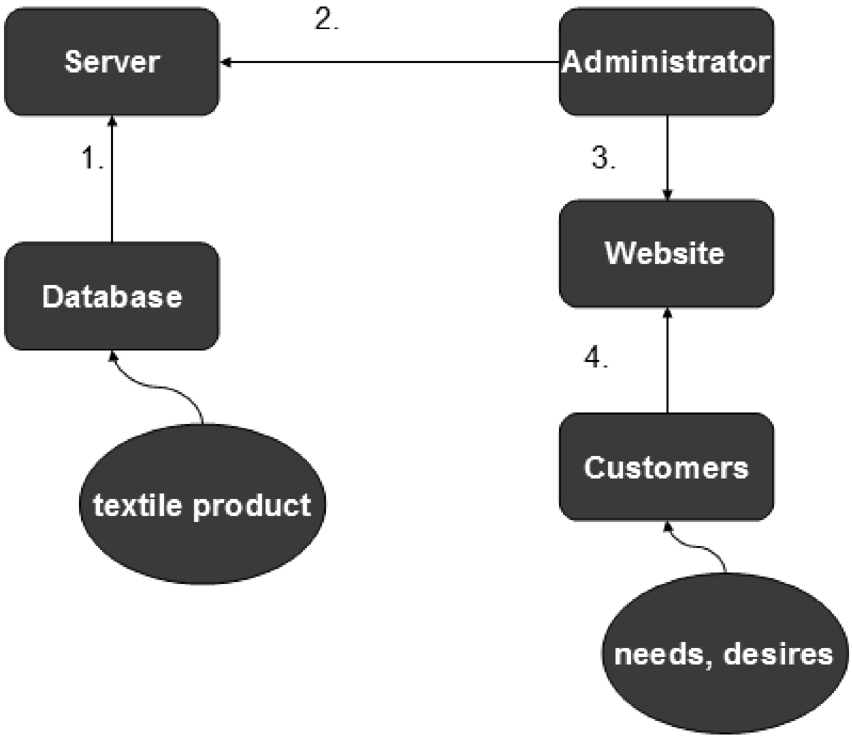

Fig. 1: Website requirement

The website administrator the duties to administrate the server, to update the website by updating the webdesign, to optimize the website in search engines and to design, modify, create, update and backup the database.

The relational databases used in the e-commerce area presents security. A relational database supports access permissions for the database administrator. It is need to implement permissions to the access of the data in database tables.

The website administrator can have the control of the products stocks and of the customers that order the products from the website.

It is possible to obtain the statistical data and to capt the consumer profile, habits and products that they and they would like to buy.

By using this simple e-commerce store can have access to the customization, administration, and management tools that can be running to the website.

The e-shop is based on client server model (figure 2).

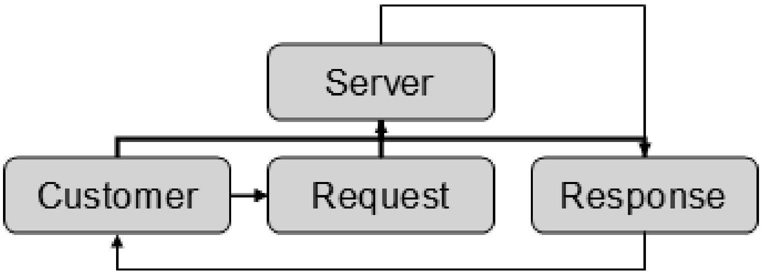

Fig. 2: Client – Server model

3. VIRTUAL E-SHOP IMPLEMENTATION

In this case we will analize the virtual e-shop for 3D garment product. The customer has the possibility to test the garment on virtual mannequin or on his 3D body captured from scanner.
The buyer must upload the file obtained from 3D scanning to obtain a simulation of a body (morfotype) with parameters close to his body.

3D simulation [5] process (figure 3) is necessary because the buyer chooses different colors and textures of fabric that drapes [4] in different ways.

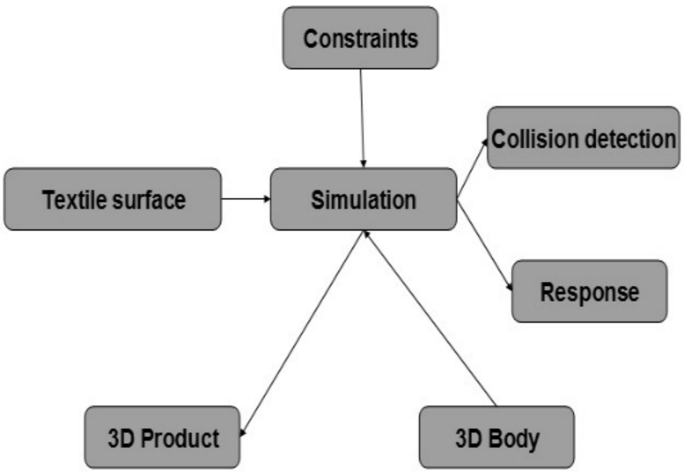

Fig. 3: Simulation process [3]

The virtual shop has five sections: home, garment, view, about us and contact (figure 4). The menu View is define for choose 2D or 3D view. When the client try the garment menu than it is showing the product characteristics (product type, color, size and fabric type). After the customer body uploading on the server, the perfect fit body morhotype is showing on the screen. For simulate the dress on the body it is necessary to press the simulate button.

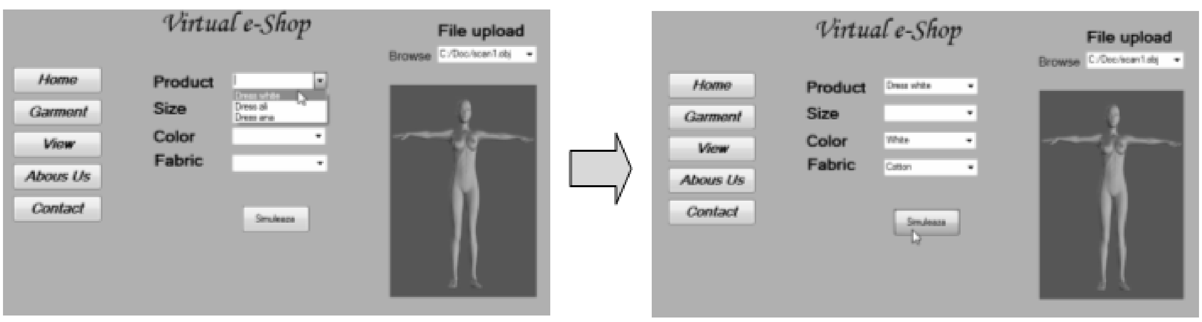

Fig. 4: Virtual shop –body uploading

When the customer uploads his body file, the size selection becomes disable. Atfer the simulation prcess the client can see on the screen the cloth simulated on the body (figure 5).

Fig. 5: Cloth simulated on the 3D body

In this way the customers, before buying, can try different product-color-fabric combinations for getting the best idea about garment product design.

4. CONCLUSIONS

By using the e-commerce in textile industry is possible to increase the quality management. The advantages of using the electronic commerce are:

- Choose the target customer;
- Possibility to choose the material, color or size for textile items;
- Posibility to update the e-shop permanently;
- Adaptation to the market changes;
- Posibility to see how looks an item by using different material type, color.
- Fast response to the market requirement;
- High volume of items that can be sold;
- Quality management in database optimization;
- Positive response from clients;
- Simultaneous execution of the transactions with different items;
- Structured information;
- Database security;
- Buyers have access to the site 24/24;
- Lower costs;
- Time economy;
- Stocks management and control.

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ANNALS OF THE UNIVERSITY OF ORADEA
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THE RESULTS'S USE OF PROCESSING THE ANTHROPOMETRICAL DATA FOR REALIZATION OF ART WORKS

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Abstract: The following essay presents the studies regarding the conceiving, the designing, the making and the placing of a sculpture in a public display , analyzing the geometrical composition and the proportions of the sculptural ensemble, as well as its framing into the ambient. During the essay it will be pointed out the various methods of the bust's construction , particular technics of modeling and moulding , as well as versions of projecting the socle, afferent to an interior or exterior display, with the only purpose, to distinguish the stylistic and the conceptual features of the monument . The study of the proportions presented as part of the essay underline the aesthetic function of the ensemble and its harmonious framing into the specific display.
Key words: : bust , sculpture , proportions , modelling ,aesthetics

1.GENERAL APSECTS

The study on human society, ever since its beginnings, has shown to us various artistic displays, which have declared the human passion for knowledge, as a part of a social setting, as well as of the whole universe.These manifestations have established the very first bricks of the culture and once the passing time , these displays have succeded to overcome the natural limits of an isolated artwork, shortly becoming a solid mean of knowledge and understanding , which has tryed to penetrate the entire existence.The artworks obtained specific features in accordance with the civilization and the historical time of which they have belonged to, totalizing the cultural evolution of the society's results.As follows, the emergence and the development, as well as the mechanization of social activities have grown significantly the diversity of artistic displays, which have acquired , in our time, a strong interdisciplinary character. Close to nature, the human body still remains a solid and wealth source of inspiration, as well as a mean of expression, through which ideas and concepts had always been transmited. The manner a human figure is being represented it usually causes the character of a civilization, it demarcates the stylistic features of a certain artistic period of time or it defines the originality of an artist. The characteristics which determines the difference between these representations are being often expressed, advanced by the concept of the artworks, by their purpose, as well as by the material used and the manner chosen for their representation.

Once with the evolution of artistic displays it can be observed an evolution of the study proportions, achieved from the junction of many sciences such as anthropology, geometry, aesthetics, anatomy.Although it can't be given a straight and arbitrary definition of an artwork, or upon the specific manner used to create it , it exists the possibility of recognizing it on the basis of certain criteria. Time, as well as history, can sustain such criteria. And that is the fact by which the human society preserves and passes on to the next generations various artistic creations, gathered in museums, libraries and other many more, this representing itself a selection criterion. Archaic cultures from various geographical areas are present along renaissance and neoclassical artworks set in a contemporary cultural space. All these have as a common denominator the collective awareness of true value, performed unequally and different inside the society.From an aesthetic point of vue , to identify the valid qualities of an artwork can be effectuated beginning from the study of proportions.

The right proportion of the details that merge into an assembly, points out to the eye in the same way the harmonious line of the sounds attracts the hearing. The study of a landscape, the bright colour of a bird can give the same conclusions, such like presence of proportional relations between the unit and its components.It is possible to try to identify the origins of these relations, as well as the aesthetic perceptions generated by them . The results of such a study are being presented , discussed in this paper work and were used in conceiving and the making of a sculpture, the main purpose was to identify evaluation criteria in understanding the concept of an artwork. The bust of Vasile Urseanu was realized by the author of this paper on the Romanian Fleet Commander's initiative.

The layout of the portrait was established in the interior of the Quarters in Constanta and the great event celebrated the personality of the Fleet's first commander. Conceiving this sculpture implyed the study of the location, the personality of the represented figure, the stylistic features of the building, as well as many possibilities of making the pedestal. It was necessary that the memorial would blend easily into the architectural assembly, to express the character of the commander, as well as the image and the aspirations of an institution, and to have, in the same time, a modern, contemporary fingerprint. The authour chose a neoclassical manner of realising the portrait, the modern side of the artwork lays into the geometrical composition of the bust.The sculpture, as well as its pedestal were grounded on the golden proportions,and the materials used for the sculpture , from a chromatic angle, learn the harmony into the surroundings.

1.1. Using the anthropometrical data in materializing a sculpture

The plastic art has always been oscillating about the representation of the human body and it has been, in most of the cases, the direct expression of a culture, of an artistic trend or ,of a civilisation, thereby establishing various stylistic features.The human being has known many manners of artistic representations, beginning from the abstract symbols, stylized shapes, till the realistic representations of Greco- Roman Art and the humanist trends that followed after that. The greek sculptors are the first who have given a truthful image of the human body, in various aspects, establishing canons and proportional systems of the ideal image . The sculptors used to apply in making of a sculpture , studies of an alive model, usually they chose figures of young athletes and women, the main purpose was to expose , to transpose the geometrical and the philosophical knowledge of that time into art.

These studies used to be applied in the making of clay models , made in the 1:1 scale, and on whom base it was realized the bronze castings or the marble sculptures. In the cases of larger statues, they realized two, or three versions of the model , in various sizes. Later, in the Renaissance period, the preparatory models were made from plaster, the casting technique soon spread in many workshops of sculpture and handicrafts. In the same time the renaissance period rediscovered the great values of ancient civilizations, mankind became very important inside the society, after the black time of middle ages, where all the aspirations were leaded towards a celestial universe, limited by the religious rules.

A realistic image of the human body becomes popular again as a study object for the artists, searching the most unusual forms of understanting the body and its representations. The proportional systems made by Durer and da Vinci sustains a fundamental base for the subsequent development of anthropometry.The study progress upon the human body and on its fiziological evolution can be followed in various canons established by authours like Kolmann, Fritsch, Liharzic Zeising and others. These data have participated in understanding better the human body, as well as, its truthful representation in artworks, used by sculptors in conceiving the composition and in realizing the technique of an artwork. Therefore, the plaster casting of a human body needs anthropometrical knowledge, the sculptor uses the anthropometrical dots in achieving the mould (of the negative). Some of Canova's sculptures from Passagno Museum, Italy (fig.1, 2) present on its surfaces marks of the figure's maximum dots,upon which can be drawn high lines , quite vital in the incipient moment of casting a mould . The making of the marks is effectuated in the instance in which the mould is intended for casting of more copies of the same model, thus the negative is made of many components.These components can be easily used, through a new constitution, therefore avoiding the degradation, the shading of the assembly. After hight leanating it is obtained a network of lines on the entire surface of the sculpture that divides it in many other surfaces –components.

Fig.1 Canova –"Napoleon"

Fig.2 Canova –"The three graces"

On each one of these surfaces a 2-3 cm(fig.3) plaster layer is poured on, obtaining a perfect coverage of the sculpture with isolated pieces between them so that it could be easily handled, each piece containing the corresponding negative fingerprint. After finishing this stage , the obtained form is divided in other 3-4 surfaces(depending on the size of the sculpture), these will constitute 3-4 covers, after the subsequent casting of a new plaster layer. The main pupose of these covers is to protect and to keep the right position of the pieces from the inferior layer.

The positive of the sculpture, which will become the corresponding copy of the original sculpture , will be cast only after unbinding the covers carefully and after the negative fingerprint pieces will be arranged in the right position for the casting .This casting method contributed in spreading truthful copies of many workarts from various museums of the world, as well as the production in series of ornamental sculptures used in decorating buildings. It's necessary to understand that to achieve adequate copies requires a solid knowledge about the casting methodsfact that lead to the development of many specialized workshops , separated by thoe of the artists themselves. Over the years, making a negative (the mould) has become easier to accomplish by substituding the plaster witht plastic and silicon materials, althought the last mentioned cannot be used in bronze castings or other alloys.

2. WORK METHOD

2.1 . The geometrical composition of the admiral Vasile Urseanu's bust. Conception and proportions

Using the proportion of the Quarter's building (fig.4,5,7), as well as the architectural style, it has been accomplished an absorption of the memorial into the wanted architectural frame , therefore the building and the memorial can easily turn to profit their positions. To represent the admiral's personality , the authour used a geometrical composition based on triangles and oblique, dynamic lines (fig.6). The lines are sustained by a ,,two squared,, quadrangle, its proportions underlied, helped the authour to discover the golden proportions.This quadrangle is marked by the decoration's square , also we can see a quadrangle sustained by the position of military distinctions.The horizontal edge of the collar sustains the base of ascendant and descendant series of triangles. The sides of the descendant triangles underlines, points out the tunic's dynamic and the direction of the figure's muscle , as well as the comb lines of the chin Alltogether with the descendant lines of the forehead's muscles , it point out focus spots like the base of the forehead, the line of the eyes, and the line of the lips.The distance that demarcates the top of the head and the base of the chin holds an account with the height of the square. Therefore, the Le Corbusier's rapport is expressed again , pointing out to the viewer the portrait.

Fig.4 – The golden proportions of the Quarters Fleet's building, Constanta

Fig.5 – The golden proportions of V.Urseanu's memorial, Constanta

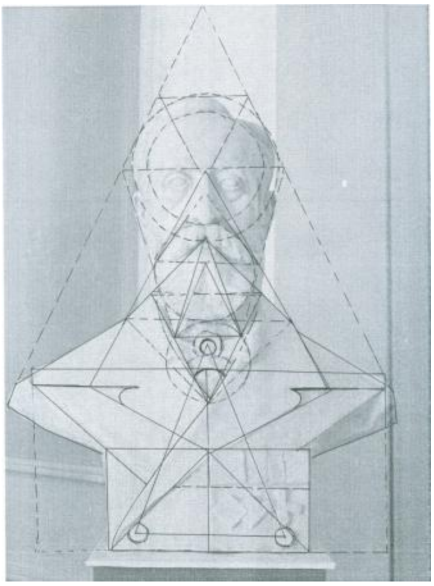

Fig.6- The geometrical composition of V Urseanu's bust

Fig.7- The golden proportions of V.Urseanu's bust (having a pedestal for interiors)

3. RESULTS AND INTERPRETATIONS

Vasile Urseanu's bust is made from composite material based on marble dust and casted after a clay model. After finishing the sketches(fig.7a) where the shape and the dimensions of the sculpture are itemized, the first level of work sustains the construction of a wood structure on which clay is applied(fig.8). After realising the portrait's composition , the sculptor starts to shape the clay , underlining the character's features, the materiality ant the expressivity of the forms(fig.9). For the casting , it is realised a plaster mould made from three covers binded with wood laths, to be more resistant(fig.10) In this mould, after what the clay is removed , the composite material is casted, this will be the positive, meaning the original sculpture. The negative is broken after the material dries, obtaining an identical shape the same as the clay model , but made from a hard material , resistant to the changes of the weather(fig.11).

Fig.8

Fig.9

Fig.10

Fig.11

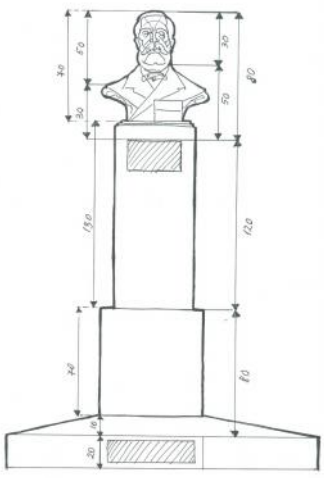

Fig.7a – The sketch of the memorial providing the dimensions and the proportions

3. CONCLUSIONS

The analysis upon the evolution of study proportion and anthropometric studies, determined the author to synthesize using his own practical results. The author enforced knowledge of constructive projection, esthetic canons and technicques of making a sculpture, having as a final result the creation, the accomplishment of a memorial naturally integrated into the ambiental space .

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ACHIEVEMENTS AND PROSPECTS IN SPINNING COTTON FIBERS AND COTTON TYPE

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Abstract: In this work are presented the latest achievements in the field of cotton spinning. All in preparation for spinning cotton equipment are aspects of automation, robotics and aggregatisation which led to increased quality of products and increasing labor productivity. This paper is a continuation of other works in which we presented the preparation of spinning machines. We present only this time spinning machines, namely the modernization of roving frame and ring spinning machine.
Keywords: cotton, spinning, equipment, modernization, roving frame, ring spinning machine

1. INTRODUCTION

For a long time, cotton was the most important raw material for textile industry, in terms of production volume, reaching in 1970, more than half of all textile products are made from cotton.

Due to population growth and increasing living standards, world production of textile fibers reached in 1970 about 21 million tons, compared to about 3.9 million tons as it was in 1900, the year 2000 having a production estimation of cotton fiber of 16.8 million tons and about 3 kg per consumer.

Due to the special characteristics of cotton fibers, they continue to be a raw material in textile industry.

Processing of cotton and cotton-like fibers impose the following conditions:

• - appropriate choice of raw materials according to the destination of textile products that will be made;

• - optimization of technological parameters for all facilities in the stream;

• - continuous control of processing.

Growing demands on the characteristics and quality of textiles have imposed changes in technology and in building machines that have led to increased labor productivity and economic efficiency.

2. ROVING FRAMES

To achieve roving flyers development trends roving frames followed mainly three directions [1, 2, 3, 4]:

a. Making use of equipment with high electronics and the use of special technical solutions that provide great precision of movement of subassemblies in terms of speed work and obtaining high-quality preforms.

This is accomplished through:

– robust mechanisms, but high precision speed control devices

– fork with an inverter;

– fork through training gear straps;

– replacement dimmer spinning leveler drive speed profile consists of hyperbolic or right with precision actuators (RMH Howa)

– improve lubrication systems;

– extending the use of needle bearings which are able to take large loads (660 Zinser)
– coils used for training handlers transmissions (Rieter, Toyota);
– commands using pneumatic tilt mechanism;
– rovings a constant voltage (-16 FL Toyota, Howa, CTMTC) using an optical sensor device for compensating (FL- 16 Toyota)
– generalized use of trains rolling by straps in the main area of rolling and capacitors in each area of rolling sequence;
– ability to set the pressure on superior train rolling cylinders (SKF PK 1500 and PK 1600), pressures that can also be achieved pneumatic way (F 4/1 Rieter);
– permanent cleaning of train rolling with absorption systems (MBK Zinser, F1/1, F 4/1 and F 4/ D Rieter) ;
– pretwist cylinders use or positioning of different diameters at different heights pretwist cylinders (660 Zinser) for uniform density and irregularity of its length on the two rows of spools;
– automatic shutdown of the machine when a sequence is broken (Luntenstop SKF)

b. Labour productivity growth and the degree of automation:
– shutdown of the winding rowing at the deposit of a predetermined lenght ;
– using mechanisms that ensure an easy maintenance;
– reducing occupied surface by introducing a train car rolled down (Clean Rover - Osaka Kiko)
– introduction of roving air arm work (Chemnitzer);
– increasing speed spindles up to 1500 rpm (RME and RMH Howa, Zinser 660, BCX-16 Marzoli) and even 1900 rpm (Chemnitzer) using suspension forks, made of alloys with lower volume density 10 - 30% than the classical generalization ;
– automatic change of tricks (Toyota, 25 s/6 coils, Howa, 3.5 min/trick, LABX Marzoli, Hollingsworth Rovematic 766) ;
– aggregating with ring spinning machines (Grossenhainer , Tac and Tab Electro - Jet);

c. Use of computers in production planning and follow through:
– extension of the monitoring and control of technical data and production systems (F 4/1 and F 4/1D Rieter);
– control scheme of the four engines (cylinder train rolling fork, coil and coil bank) (Grossenhainer) and data storage mode regarding working regime and characteristics of the roving obtained;
– online modification and optimization of process parameters (Grossenhainer);
– control coil geometry, the speed and their voltage winding (766 Rovematic Hollingsworth).

2. RING SPINNING MACHINE

The evolution of technology in the last couple of years showed us that the classic spinning maintain its supremacy in producing fibres compared to OE spinning because of the quality advantages offered by the classic fibres. Large engineering companies with spinning rings (Rieter, Zinser, Savio, Marzoli, Suessen, SCM, Platt, Toyota) have focused their efforts to improve these machines in the following directions [5, 6, 7]

Modernization of the train rolling with:
• training bilateral train rolling, using two systems of training modules, with their engines;
• use pneumatically operated pressure arm to ensure a more homogeneous distribution of tension in the entire mass of fibers;
• choosing the optimal angle of inclination of the train draft and decreasing the distance between the cylinder and the top cops debtors;
• borrowers lower cylinder, with a special surface treatment of fibers and not allow adhesion resistance to wear more;
• produce very large drafts (eg. Ri system - Q - Draft);

Increased speed spindles by:

• selecting the optimal geometry of the copse depending of the diameter of the ring and optimal choice of the ring ensemble, taking into account the following observations: - high-speed spindles are obtained using small diameter rings and an optimal ratio between the speed of cursor ring diameter - weight copse adaptation according to the diametre of the ring;

• spindles speed optimization: speed is variable depending on the spindles of yarn wound on cops, because the number of breaks is higher in certain parts of the PSC (eg. foot PSC). Using a speed inverter can provide an optimal balance between speed spindles and the number of breaks;

• using sliders and rings (for ex. Orbit) with appropriate forms, with special processed surfaces or from special materials;

• development of original technical solutions that include: - construction of spindles and mounting them (time HP S25 - Suessen ensure a speed of 18 000 - 25 000 rpm under a high spinning stability) - system design, operation and lubrication of bearings - how to move the bank rings - filing system of wire wound on cops - kinematics transmission in different areas of work.

Increasing the automation level by providing automated deives and systems of leading and control of the process wich led to reducing the human factor intervention. Ring spinning machines were equipped with a series of robots and automated management and control systems, which made possible the elimination of human intervention which is relatively subjective. The main achievements in the field of automation are:

• automatic change of tricks with a number of specialized systems: SCD (Stationary Cop Doffer), Robo-doff, CO-WE-MAT Laser, etc

• direct transport to the car winding through a system transport (eg. Servo - Disc)

• aggregating with flaierul (SMA-Spinning Mill Automation - Toyota) and / or drive winding (eg. Robo-load)

• Automatic power coils of rack;

• optical control of the presence of spinning yarn from each unit (a-Fil-mat);

• Auto power off to break the yarn spinning station (Roving - Guard)

• adjust speed depending on the frequency spindles break (Pro - spin)

• production quality control (Uster Ringdata)

Using computers to manage and control the process. Spinning machines are equipped with computers that serve for tracking and recording the technical data and selection of optimal parameters of adjustment and development of the spinning process (curve in the wire tension variation, choosing the optimal speed according to the number of spindles breaking the weight copse default geometry, etc..):

• recording the number of breaks (Date - Guard) and transmitting data to the central unit (Central - informant);

• record production data (speed spindles, cursor speed, production, yields, etc.) and display them on demand, on a monitor (Uster Ring View)

• using a change of speed spindles program, which are stored in five charts depending on the position of submitting the cops wire, to minimize the frequency of fracture;

• copse shape simulation depending on its mass

Shortening roving frame process flow by eliminating bandwidth and delivering with band to the ring spinning machine. It is the case of ring spinning machine RingCan [94] which can make both carded and combed fibres to a lenght density of 8.33 tex (Nm 120)

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THE PROFESSIONAL ORIENTATION ON THE LABOR MARKET OF YOUNGSTERS FROM BIHOR COUNTY

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Abstract: This paper aims at depicting some subjective aspects concerning the career orientation of pupils in the last high-school year. The research begins from the premises that any decision made by an individual is determined by more characteristics, some more obvious, others more difficult to observe directly in the complexity of social networks the individual is part of. We analyze the professional expectances and the socio-economical environment the individual comes from. Often there are modifications in the value system of the society in which the individuals live and this leads to modifications in their expectances, attitudes and behaviors.
Key words: professional aspiration, label market, educational level, income, youngsters from Bihor county.

1. INTRODUCTION

Education is an aspect that influences all the social spheres, it is the mechanism through which society can be developed; thus, we create the state support through which a great number of persons can benefit of this public good by equal access and support in order to obtain a much comprising level in the citizens' education.

When they are in the situation of professional orientation, many youngsters make choices, not always in their favor, maybe sometimes they orientate to professions in which the risk of not finding a job is reduced, other times they do wrong anticipations about the professions that will be appreciated when they graduate.

We can observe a tendency towards profession homogamy in case of parents and children, generally speaking (e.g. doctors' children tend to follow the doctor profession) maybe because they have information from their parents about a certain profession and there is a tendency for the children to socialize with special symbols related to a certain profession, thus being easier for them to follow the study of that specific profession (see at Bourdieu the concept of habitus).

The population subjected to analysis is formed of high school students in the twelfth grade. We started from the premises that they have already reached maturity age from a psycho-social point of view, having clear options under the influence of the social factors they have encountered.

The sample was formed of 851 pupils in the 12^{th} grade from Bihor County, which consisted of classes from both rural and urban environment, boys and girls; we also wanted to see if religion influences in any way the expectances concerning the new profession, so within the study there were also pupils who study in confessional high-schools.

2. THE PRESENTATION OF THE RESEARCH RESULTS

Table no. 1. The assessment of the characteristics of the future profession

(%)	Very important	Important	Less important	Not important	I don't know/No answer
1. To be well paid	73,2	21,2	2,5	0,5	1,2
2. To be easy	26,1	38,2	25,9	5,6	1,4
3. To be respected	62	30	3,6	0,4	1,2
4. To be interesting	60	30	5,4	0,6	1,2
5. To be clean	61,5	28,1	5,3	0,9	1,2
6. To allow a long career	65,8	25,3	4,1	0,7	1,3
7. To bring me into contact with new situations	45,1	37	12,6	1,3	1,4
8. To be an intellectual profession	36,3	38,8	16,2	2,8	2,8
9. To have the possibility of being promoted	61	26,6	4,8	1,9	2,5

(Missing up to 100%)

Taking into consideration these characteristics, we can say that pupils consider the most important aspect the material one (73,2%), followed by stability (65,8%), fact that might suggest a paradox – youngsters want stable professions, contrary to the hypothesis of professional flexibility in the case of young people.

Over half of the respondents consider that the future profession must be clean (61,5%), must ensure the possibility of being promoted (61%) and must be interesting (60%); thus, we can notice the importance of the environment in which they will work, the importance of promotion and of lack of monotony in profession.

The contact with people is also important (45,1%); the profession should be placed in the category of intellectual professions (38,8%) and it should be easy (38,2%).

Table no. 2. Factors which influence the choice of profession in the subjects' opinion.

(%)	Very much	Much	A little	Very little	I don't know/No answer
1. Family	22,7	24,6	22,8	17,4	4,7
2. Teachers	4,1	13,2	28,7	36,7	6,2
3. Friends	6,5	16	29,1	32	5,5
4. Mass-media	4,7	12,2	20,8	40,9	9,8

(Missing up to 100%

The pupils in the 12th grade consider that the most influential in the choice of a profession is the family (47,3%), followed by friends (22,5%), teachers and media.

Family is an important factor because parents ensure material support during faculty, but also because most respondents are used to make decisions together with their family.

Gary Becker believes that "parents have a strong influence on education, marital stability and on many other dimensions of their children's lives" [1, p. 23]. Boudon also considers that "the parents' socio-economic status exposes their children to certain life conditions and defines their social identity. (…) Thus, a father's chances to stick to a certain status or to improve it, his capacities to adapt himself and to learn new roles, as well as to conform himself to new norms, mainly influenced by his educational level, determine the level of intellectual flexibility and has consequences on the type of socialization to which he will subject his children" [3, p. 157].

Individual differences are explained by socialization because "from the perspective of cultural psychology it is logical to privilege the hypothesis of a social origin of individual differences. In other words, the differences and/or inequities among individuals are, first of all, differences of socialization" [4, p. 519].

At the item expectances concerning the level of studies, the answers are according to the values promoted by society regarding education; thus, 72,06% of the students in the survey want to continue their studies after they have graduated from high-school. In the same time, a considerable percent of the subjects haven't decided yet (25,03%), but the percent of the ones who intend to graduate only 12 grades is quite small, only 2,91%.

For a long period of time, sociologists and politicians started from the hypothesis that the development of education leads, in time, to social equality and economists believed that the development of education would lead to the reduction of salary inequity [2, p. 168]. On the other hand, Thurow states that "if we assume that the structure of professions is determined only in a small degree by the modification in time of education stock, the prolongation of the average schooling time leads not to a reduction, but to an increase of economical inequities" [2, pp. 168-169].

Table no. 3. Parents' educational and occupational status

	Up to 8 grades	9-12 grades, including baccalaureate and trade school	Technical school, post high-school studies	University studies	I don't have a mother/a father
What was the last school graduated by your mother?	7,5	48,6	15,5	15,9	1,3
What was the last school graduated by your father?	6,2	41,1	21,4	16	0,4

(Missing up to 100%)

In establishing the background socio-economic status, an important indicator is the parents' educational level as this influences the children's educational level, not only directly, but also through the parents' level of expectancies, the importance and the trust in education, the effectiveness of investing in education.

Most parents graduated 9-12 grades, including baccalaureate and trade school; it is understandable, if we think that the majority reached the compulsory schooling level (the percent might differ in the case of the elderly). If in mothers' case the percent of the ones in the 9-12 grades category is higher (48,6% in comparison to 41,1%), in fathers' case the percent of the ones who graduated from technical schools or post high-school studies is higher (21,4% in comparison to 15,5%).

The percents are close, in both cases, if we refer to the category of university studies (16% -father and 15,9%-mother) or to the category of up to 8 grades (6,2% -father and 7,5%-mother). It is expected that children should reach at least their parents' study level; we can say that some of them have already equated or even surpassed their parents in the case of the parents with only 8 grades.

The factors that determine parental investments in children's education are: gender (there are differences concerning the investment in the education of boys and girls); parents income (the ones with modest financial resources invest less in education); the number of siblings; parents' educational level; the child's abilities [6, pp.182-184].

Gender is associated with the expected level of studies, as one can notice that more girls want to go to university than boys.

The level of income is not associated with the expected level of studies; in this case, we can notice that the pupils who appreciate their families' income as modest have the tendency to aspire to a higher level of studies. Thus, in this case, we can disprove the hypothesis according to which the ones with a higher income usually continue their studies longer than the ones with a more modest income. The explanation resides in the fact that many parents, even if they have a modest economical status, support their children in the education system, hoping that by investing in the education of their children they can contribute to their ascendant social mobility.

Students from the 12th grade were asked what profession they would want to practice. There is in this case a significant number of non-answers, almost 28% didn't express their choice; the situation could be generated by many factors. Thus, even if they are confronted with the faculty examination admission, many students don't know exactly which profession they will choose (maybe some will orient according to opportunities; there are cases when many of those who graduate high-school don't register in faculty in the first session, waiting for the autumn to register in the vacant places).The majority of the respondents want to be economists; the next position is occupied by the profession of police officer. On the third place there is the profession of doctor that has always been socially valued, regarding the high reputation but also the income; this profession is also important because of its emotional side (it involves saving lives), because of the long period for its preparation (it is considered that a large luggage of practical and theoretical knowledge is needed) and because of the fact that it has an important social utility.

On the fourth place, surprisingly at a first glance, we meet the profession of teacher. Surprisingly because of the education problems in the last years (teacher strikes, protests) and also because of the modest salary and school conditions related with the stress at the working place.

The psychologist profession ends the top 5 professions; very fashionable in the last years, this profession is desirable mainly because of two reasons: the first would be the comparison with more developed countries than ours, where there is a large number of psychologists and so it is created an impression for the possibility of development of this niche; on the other hand, many youngsters consider that by learning this profession, they will be taught all the human beings' "secrets" and they will understand better themselves and the others. Moreover, as in the case of teachers, it is a profession desired especially by girls (we'll see if this hypothesis is true).The professions of lawyer, accountant, priest are known as social desirable professions and they appear in many profession tops; the large number of those who want to follow the priest profession is influenced also by the large number of students from confessional high-school. On the ninth place we meet the driver profession; we framed here all the drivers categories and we consider that it appears in the youngsters' profession preferences mainly from two reasons: the first regards the high accessibility (it is necessary to have a driving license) and the good income that this profession brings (especially in the recent years the drivers earn better than other professions and the offer in this area increased).

Generally, we find among students' professional options, a large range of preferences, fact which it is positive on the labor market. There are cases when professionals are trained for certain areas above the necessity of the market, which can bring a positive side because it can create competition, which leads to an improvement of the quality on the market. On the other hand, this can generate an increase of unemployment in those areas, determining those people to refocus on other jobs despite the fact they have invested a lot of resources. Another negative consequence could be the frustration of young people because of investing a lot of hope and having high expectations from these qualified trainings which proved to be pointless in the end.

The profession that high-school students think they will practice after they graduate is uncertain; over 80% haven't specified any profession; the non-answers may be explained because of the fact that many don't know for sure the area they will work in.

We can notice a difference between the job they desire to practice and the job they think they would practice, making them aware of the fact that they don't have the necessary qualification and the market's conditions won't offer them a lot of areas to practice in the beginning.

It is proven that students consider that there is a good relationship between the job and their qualification. We can notice that a lot of them think that in order to have a certain job you need to continue your studies. It is very important for them to realize that the jobs they want require a high education rate. We refer to the fact that they need to justify their option and not to study harder but to obtain a degree that would show they have qualifications to occupy a certain position.

The family's income does not influence the job students from the 12th grade decide to go for, this test showing us that the association is not significant and the option for a certain job is not balanced with the family's income.

But there's a significant association between the desired job and the job they think they will practice after high-school, for the specified scenario. This can be explained through the fact that the ones who expressed these choices are determined to follow them or there's the possibility that they thought their job after graduating would be the job they want to prepare for and they won't be activating in other areas besides the ones they are currently studying for. Another explanation could be the fact they have not analyzed the possibility of accessing other jobs, thus excluding from the start the fact they won't be able to integrate themselves in the area of the job they truly desire.

3. CONCLUSIONS:

- The population to which we referred throughout this analysis is represented by high school students in the twelfth grade, a category that will reach the labor market within a relatively short time and which will be influenced by the characteristics and attitudes they will build during the years of study ahead.
- High school students have considered the following characteristics as important in choosing a profession: 1. to be well-paid, 2. to be appreciated; 3. to allow a long career; 4. to be interesting; 5. to be clean

Therefore, the characteristics of a profession, particularly appreciated by students are not associated with novelty or compatibility with the new demands of the labor market, but rather with what their parents like, such as the gain implied by offering a prestigious social position or job safety.

- The family is the factor that mostly affects young people's career aspirations, followed by friends and only in third place, by school, by teachers.
- Students' educational aspirations for a long career is a characteristic of youth, given that 72% of the surveyed ones want to continue their studies, a quarter of them are still undecided, though they want to reach at least Bachelor's degree level, the share of those who are determined not to continue their studies is just 2.91%. The high aspirations are certainly induced by their families, as noted above, but also by the fact that education became once again a great value of the Romanian society, after a short period of confusion, installed immediately after 1990.
- Regarding parents' educational level and occupation, according to studies and statistical data at national level, most parents have graduated from high school, followed by those who attended technical schools, college or post-secondary education. Employment status is represented in the highest proportion of workers and service workers; we must keep in mind that the educational level of parents was influenced by the educational policy promoted before 1989, when higher education was an elitist one, characterized by a strong selection. The students' expectant level of education is associated with the parents' educational level (in the father's case the coefficients are slightly higher), the residence, and it is not associated with gender and income. Parents' financial situation does not affect children's educational and professional option; students compensate the scarcity of financial resources by engaging in certain types of activities during their studies. Therefore the wish to occupy important social positions in society transcends family of origin.
- The following professions meet the top professional preferences among students in the twelfth grade: 1. economist; 2. police officer; 3. doctor; 4. teacher; 5. psychologist; 6. lawyer; 7. accountant; 8. priest; 9. driver; 10. architect
- From this analysis we extract some important information, but we cannot take into account the large number of people undecided on the profession they will follow, and this says a lot about the current state of youth, many of them having no clear targets to follow. On this occasion, we identified a weakness that characterizes school vocational guidance, which would mostly be able to notice the new orientations in the labor market, thus pointing in these directions the choices which young people socialize in the formal framework. Counseling in schools should be geared more towards this type of objective. A proper educational guidance by which one can achieve compatibility between the abilities and inclinations of young people, on one hand, and labor market characteristics, on the other hand, would greatly reduce the "costs" associated with the options, which may later prove too high, after the onset of educational career (energy, time, money).

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COOLING PROPERTIES IN LAMINATED TEXTILES DEPENDING ON THE FIBRE

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Abstract: It is widely known that fibres posses different behaviour depending on the temperature. Moreover, it is know it is influence by the kind of structure (fabric, garment, etc.). In this work we studied nine fibres from different nature. They have been treated at high temperatures and cooling speed was studied by means of thermographic techniques. As a conclusion a relationship was established between cooling speed or heat storage and cross section or fibre nature.

Key words: Thermography, heat storage, fibre, temperature, cooling speed.

1. INTRODUCTION

Every material show different behavior to external agents they can be exposed to, textiles too. Some properties of the material can be changed. Those properties can influence in different aspects such as mechanics, optics, acoustics, electrical, thermal, physical, magnetic, etc. The present study is focused in thermal behaviour from textile fibres.

Thermal property is known as the answer of a material when it is exposed to a change in temperature. Temperature is an external characteristic which influence in many materials properties, it can induce some properties to change. When a solid body is treated with energy it can absorb it or transmit it or expand it. Those three actions depend on the calorific capacity, thermal conductivity or the expansion factor [1]. They will be developed below.

It can be considered important to know if a body is going to change when a shift of temperature occurs. Many industry fields need to know thermal behavior of every material in order to select some materials for the proper use. For example, building field needs to check every thermal behavior in materials. As a result, materials engineering takes importance. This scientific field studies every material physical characteristics so as to be used in architecture or devices, etc. But this is not only interesting for building field. Textiles can play an important role from the point of view of thermal behaviour as they can work like thermal insulating products or improving comfort properties to garments.

The study presented in this project is focused on the thermal conductivity of different textile fabrics. It will show different speeds and periods of time in cooling some samples. It will be measured by thermographic images when some changes in temperature occur. As a conclusion we can confirm which ones are the fibres which show higher heat conductivity and study in which fields they can they be useful for.

2. STATE OF ART

Different procedures can be used to control the thermal properties of materials. Textile products can be selected depending on the final use. Thermal properties can be modified by means of changing the nature of fibre, the kind of structure and its physical characteristics.

Infrared thermography is a method of measurement based on getting and analyzing thermal signs without direct contact with the sample. Thermographic cameras are devices which produce a visible image to the eye from the by converting the infrared radiation from an object into a standard code. Thus, allows to scientist to measure at a certain distance from objects with no need to get in touch with them. This method is capable to translate infrared radiation into temperature values. The analysis system is focused on converting the infrared radiation from the electromagnetic spectra into electric signs.

Many studies are focused on the measurement of thermal conductivity by the heat transfer across the material. Differences in temperature between both faces of the material show its thermal conductivity. This is the reason because studies show procedures with different devices composed of mirrors and thermographic cameras located in specific zones. Figure 1 shows the method designed by M.Michalak [5] when working in similar studies about thermal conductivity.

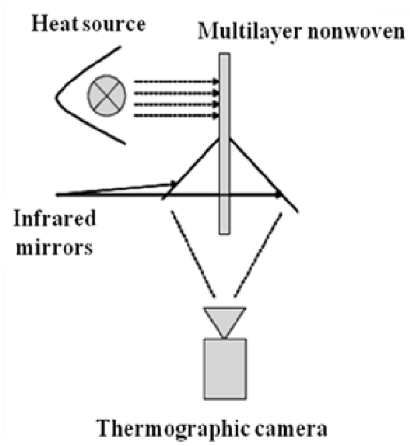


Fig. 1: Device to measure thermal conductivity.

Some other studies try to establish the influence between thermal and electrostatic properties of different materials used in garments. They want to observe the effect of clothes on the muscles. Moreover, some of them study the influence of the fibre related to its thermal properties in fibres such as Kevlar [3], ceramic ones [2] or composites made of glass fibre and polypropylene.

Thermography can be used in every study where a problem or measurement can be observed as a difference in temperature. It can be used in lots of fields taking advantage of the difference in temperature. One of the main advantages of that technique is to measure without touching the body, it is in a certain distance. As a result, non destructive analysis can be conducted. Some examples where thermograpy is used are fields such as conditioning rooms, aeronautics, fire protection [6], biology/medicine, building [4], energy, industrial, environmental, forest, military and art conservation.

3. EXPERIMENTAL

The study has been divided into five steps:

- Weaving fabrics: every sample is a weaving fabric. Different warp and weft densities have been used. Yarn count has been changed too. They have been changed in order to obtain the same cover factor for every sample.
- Experimental procedure: every sample was cutted at the same size and was studied in the same position. This was designed to obtain the same influence in each sample. When they are ready, the thermographical images were recorded.
- Thermal analysis: Thermal images were studied and they shown each fabric behavior.
- Cross section: They were studied by means of scanning electronic microscopy (SEM)

Has been developed with different fibres such as cotton, bamboo, ramie, wool, viscose, polylactic acid (PLA), acrylic, polyester and multi-groove polyester. All of them have been weaved. The warp of fabrics was a brown, tangled, polyester multifilament with 167 dtex in yarn count. Weft is based on the different nine fibres used in this study. The entire weft used has been selected with similar colours (white or beige) in order to minimise the colour effect.

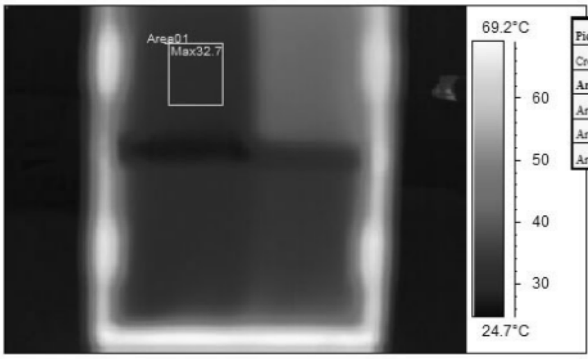
The rapport used is a composed one so as to analyse the most uniform samples. A two sided fabric by weft was weaved in order to obtain the maximum quantity of fibre in both fabric surfaces. This structure allows covering the polyester with the fibre we want to analyse.

Each fabric was exposed up to 110º C in an air heating for 15 minutes. Once the heating has finished they are taken of and located in analysis position. As soon as the fabric is in the right place, the camera begins to record images. The camera can get as many images as you want. Measurement time depends on the thermal behavior of fibres. When fibre gets speedily the environmental temperature time of recording will be low, and it will be large in the other way round.

Fig. 1: Test conditions

Measurements were performed with a CANTRONIC SYSTEMS INC. camera Model IR980. Information was processed with specific software CMView SE Reporter Version 1.2, de CANTRONIC SYSTEMS INC.

From the images, numeric information was extracted with the help of the software cited above. This software allows translating the colour in every point of the image into temperature values.



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Created time	20:20:50
Area analysis	**Value**
Area01Max	32.7°C
Area01Min	30.2°C
Area01Average	31.5°C

Fig. 2: Analysis of images with specific software.

Moreover, cross section of fibres was studied in order to establish a relationship between thermal treatment and cross section.

4. RESULTS

Once every sample has been tested and results have been translated into temperature, cooling tendency is represented for each sample.

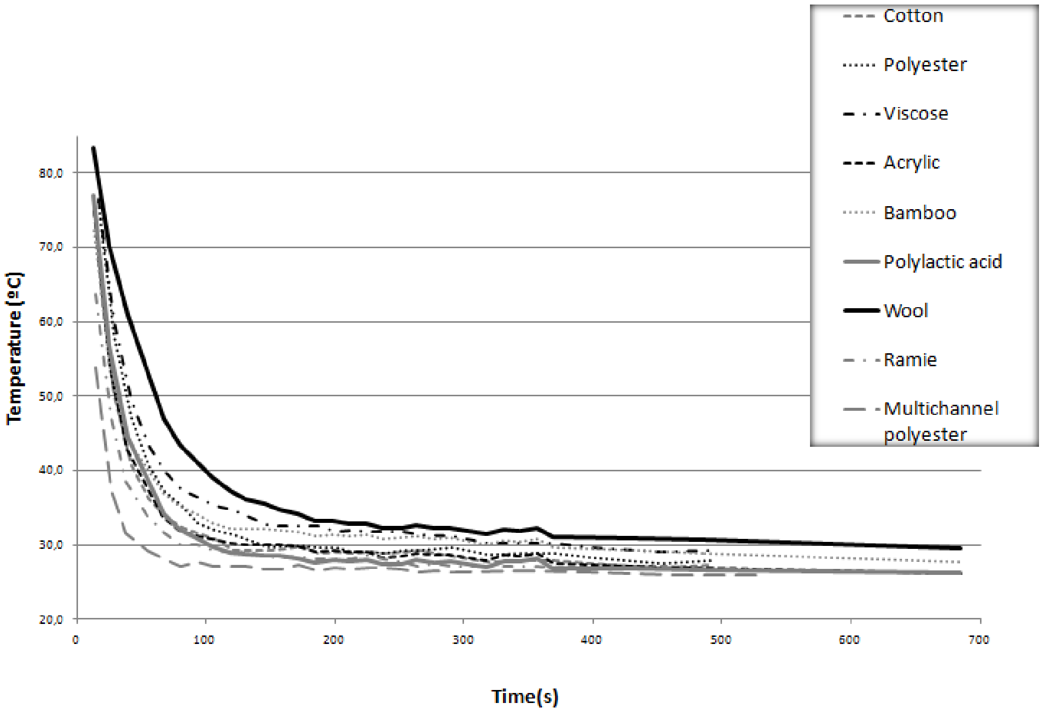

Fig. 3: Cooling tendency

It can be observed a different behaviour among fibres. All of them show the same behaviour, to cool themselves quickly. However, it can be noticed that although all the samples were treated at 110º C the initial temperature for every fibre is different. Moreover, the tendency or speed shows different behaviours. The most remarkably differences can be found between wool and multi-groove polyester.

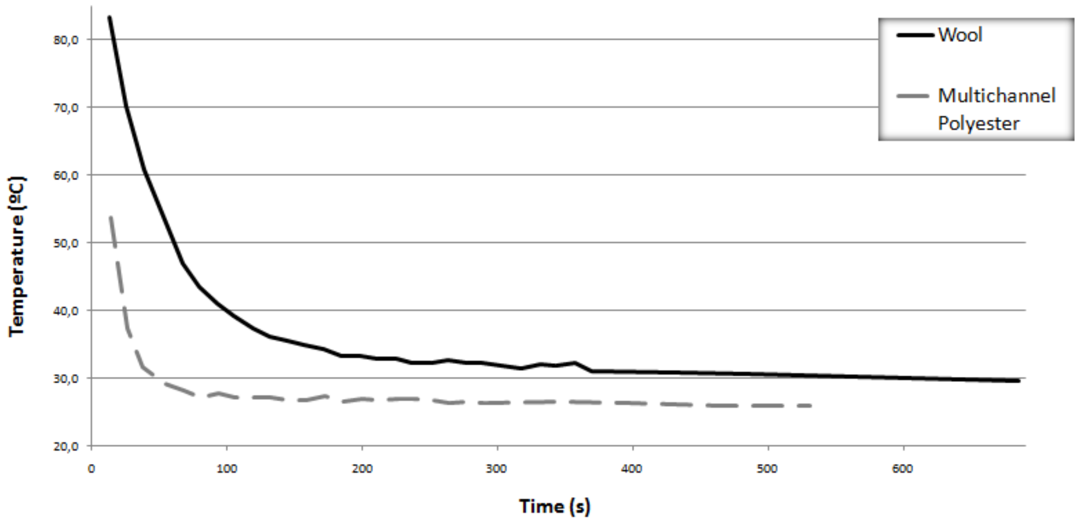

Fig. 5: Cooling in wool or multi-groove polyester

It can be observed that multi-groove fibre cools faster than wool one. Moreover, it is the fibre which shows the lowest initial temperature. Furthermore, the slope in the curve is higher and always show the lowest value in temperature in each moment including when temperature reaches a constant value. On the other hand wool shows a parallel behaviour but with higher temperature values. It keeps the heat longer and is the fibre which needs more time to reach a constant temperature value. The rest of the samples studied, show a similar behavior.

Figure 5 shows that any sample reaches the environmental temperature of 23,5°C. The hypothesis that we get from the project is that as the fabric was heated for a period of time at high temperatures, and temperature has been changed quickly to the environmental one, a special atmosphere has been created surrounding the samples. This remains when the cooling has finished and the total cooling time is higher than the one used in this study.

Some studies show that fibres shape can influence in the thermal behaviour. To check it cross section for every fibre has been reported. SEM images can be observed below.

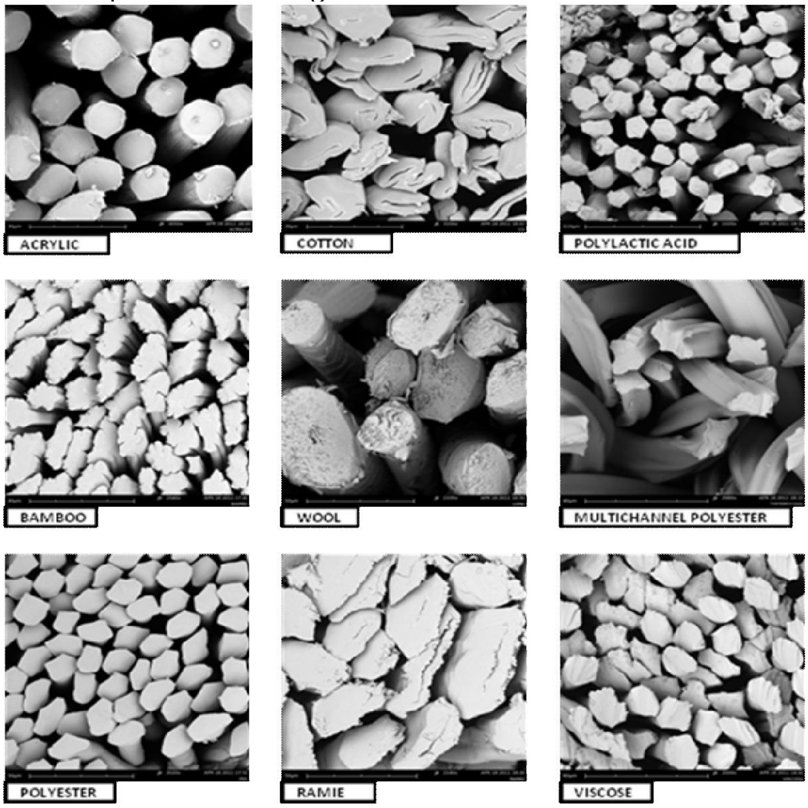

Fig. 4: Cross section for every tested sample.

5. CONCLUSIONS

In order to establish a relationship between thermal behavior and its cross section, fibres have been joined into groups depending on their nature. As a conclusion it can be stated that:

- Protein. Only wool has been studied and shows expected behaviors.
- Acrylic. Only one sample was studied and the behavior was similar to other fibres with round cross section.
- Polyester. Two samples were studied:
  - Conventional one with round cross section. The cooling speed is not as fast as other fibres with the same shape in cross section.
  - Tetralobal with long grooves. This is the one that shows the highest cooling speed.

When both polyester fibres are compared it is clearly noticeable that cross section has an influence in thermal behavior. Wide grooves on tetralobal fibre create a way to conduct the heat and allows the fibre cool itself quickly. On the other hand, round shapes get to little hollows between fibres and heat can not be conducted so easily.

- Cellulose. Four different fibres have been studied:
  - Viscose with round section. It shows the highest value for this group.

- Bamboo with multilobal section. It shows a multi-groove structure but when observed in figure 6 it can be appreciated that the size is shorter that the ones for polyester. That means that it can maintain better the heat and not cool so fast.
- Cotton and ramie. Both of them are naturals one and with kidney shaped what gives wide grooves to conduct the air across and cool faster.

The cellulosic group shows an intermediate value in cooling. It is remarkably that when cellulose is manufactured they have similar behaviour and can be considered as a sub-group and the ones from natural cellulose present a similar behavior too.
Despite the fact that all of them are cellulose the cross section presents an influence too. This should be considered in manufactured fibres.

To sum up, an important characteristic to control thermal behavior in fibres is their capacity to maintain the air into his structure. This can be modified by the cross section of the fibre and the fabric structure. Then, cross section plays an important role in heat retention, this parameter is really important in chemical fibres as it can be modified by the man. Moreover, yarn count and yarns density or rapport in a fabric are some parameters to be considered as they can change the air retention.

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LATEST PRODUCTS IN THE MONITORING OF WATER METERS

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Abstract: The purpose of this paper is to brief cold water meters, the last generation that can be read via radio waves. It is proposed to replace an existing system for data transmission cable, water meter reading to a new system for transmitting data through radio waves.

Key words: water meters; reliability;data transmission; wireless; cable; meter reading.

1. GENERAL INFORMATION

It is proposed that research topic monitoring system drinking water (cold) stairway in a block in Oradea, a system that works for about 8 years and has never been adapted to new technologies and methods in terms the collection and transmission of measured parameters. Below is a brief operation of the system, observations on the functioning and objectives to further improve data transmission mode.

1.1. Water meters equipped with data transmission

Multi-jetmeters with mechanical semi “protected roller” type 420 PC

Water meters 420PC type, DN15-40mm multi-jet meters are semi-dry with mechanical movement and direct transmission from the turbine shaft-pointer mechanisms. Applying the latest technology and continuous quality control in all manufacturing processes, ensure excellent metrological characteristics: high sensitivity and stable operation over time, a very good average life-span and a wide range of measurement. Roller mechanisms 420 PC version of the meter is sealed and immersed in a protective liquid (water + glycerin). This solution prevents condensation and provides a very good read, regardless of water circulated through the meter. Displaying 5 rollers consumption is made with large numbers (5 mm) favoring legibility at distances greater than one meter.

Fig 1. Multi-jet meter with a semi-dry mechanism

Fig. 2 Semi-dry with mechanical counter and remote transmission

420PC standard meter is pre-equipped for remote transmission modulator pulsed inductive. Transmission distance of consumption recorded by these meters can be done by means of different modules, such as radio, M-Bus or impulse. These modules can be easily mounted directly on the meter, without having to make any electrical connections or wall mounting. Being independent devices, the modules can be mounted quickly on the pipe after meter installation, without breaking the seal metrology .

Fig. 3 Modulator

Advantages of the principle of multi-jet meters from the jet:

• multi-jet type meters 420PC is no need reassurance sections upstream and downstream, an advantage that allows installation in tight spaces.
• Reliable time. If metering jet, water jet turbine each blade individually involve acting as an eccentric force. This creates an uneven load bearing, which can lead to premature wear.
• Low sensitivity to impurities driven by water, achieved through a dual filter, filter specific finger of all meters and multi-jet meters only specific filter basket.

Meters on the principle advantages compared to the semi-dry :

• semi-dry with mechanical meters are immune to the influences of magnetic nature, compared with dry-meters where the water springs (iron oxides, magnetite, ferrite) may in time lead to demagnetization magnetically coupled to spin, all these adversely affects the measurement - the measurement accuracy.

Fig. 4 Palette with water suspension deposition

• There is no counter magnet→ such measurements and data transmission can not be influenced by external magnetic fields.

Pulse modulator technology advantages versus REDD inductive (magnetic)

• It is very resistant to difficult working conditions, even submerged operating smoothly thanks to the degree of protection IP 68 construction.
• The induction detection with retransmission ensures 100% accuracy of the information measured volume of water, unlike mechanical contacts REED, where differences arise between totalizer index, and the electronic totalizer
• The HRI is possible referral of the water flow direction through the meter. This enables synchronization index of the meter and the electronic indicator. Not the same can be said about a Reed contact. In case of reverse flow, the contact will transmit pulses REED, it can not distinguish between direct flow and reverse flow. In this case, the index will not totalizer meter was equivalent to that of electronic totalizer -way radio
•420PC meter plant is perfectly adapted to the specific conditions of Romania, so it is ideal for household water can flood homes.

2. CONTOARE HIGH FLOW, WITH DATA TRANSMISSION WOLTMANN METERS HIGH FLOW TYPE MEISTREAM / MEISTREAM PLUS PLUS MEISTREAM METROLOGICĂ C CLASS

Fig.5. Meistream Count Plus Metrological class C

Meters Meistream family Woltmann Turbine meters are perfectly adapted to high flow applications: the supply or distribution networks in industrial measurements, the traders on the connections of social housing units and buildings, characterized by relatively constant flow. Meter have a sturdy construction which gives high reliability and extreme conditions of use. Meistream Plus is the only Class C Woltmann type meter, a new generation meter with DN 40 to 150mm, providing a reliable solution for customers who want the accurate measurement of flow variations.

Meistream Plus, a turbine is defined constructive hydrodynamic balanced "three dimensional" (patented solution), which confers susceptibility meter and hence a very stable flow metering very small, regardless of the flow profile. Its performance measurement exceeds the standards of class C.

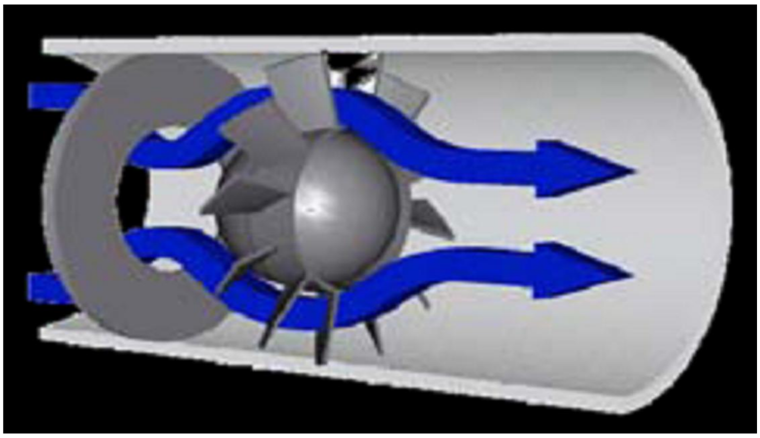

Fig. 6. Hydrodynamic balanced turbine

Advantages:

- Easy to install, read and maintain:
  To minimize installation costs Meistream meter range is available in all lengths and ISO DIN mounting;
  Easy to read in the harshest environments (such as basements flooded) is maintained by totalizatorul orientable hermetically sealed.

Fig.7. Mounting the meter

Fig. 8. Rotate the dial reading of the index

- The meter mechanical moving parts characterized by the lowest Pressure loss;
- Extended measuring range;
- Measuring mechanism is extractable and interchangeable;
- Support Easy and rapid fluctuations in flow without loss of measurement accuracy and damage;
- Does precision class B in any installation position and class C in a horizontal position;
- Standard pre-equipped for remote reading.

Fig. 9. Pre-equipped with an inductive meter

Totalizer is pre-fitted as standard for remote reading through an inductive system. This technology enables high reliability and accurate reproduction of clear distance increment of volume, it detects and measures the inverse of water run-offs and is not disturbed or influenced by magnetic fields, being immune to any attempt at deception magnetic.

3. CONCLUSIONS

To study the reliability of the proposed system is proposed to implement the new system to a limited group of blocks that are supplied with cold water from a pumping station, blocks were mounted on each water meter staircase.

It will replace the current system of data collection and transmission system for transmitting data through radio waves. It will test using several types of equipment, analyzing each type: the accuracy of data submitted, equipment reliability and price / specific technical characteristics. Data collected and transmitted by the new devices will be compared with data taken manually by direct reading of water meters fitted indexes connections.

This action will study parallel track size measurement errors and their development over time to determine whether this new way of data collection is efficient and introduces less error than the system data transmission cable.

Creating a safe and effective monitoring system is particularly important in a company supplying water to the exact water consumption can bill beneficiaries and also to protect them from the consequences of damage to internal networks, damage that would otherwise not be detected on time.

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A PROCEDURE TO EVALUATE MICROCAPSULES RESISTANCE

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Abstract: Microcapsules have been widely used in recent years. They have been studied at textile field in different aspects such as how to apply them, how to characterize fabrics with microcapsles, their behaviour towards laundry, rubbing and other parameters. However, no research can be found about the microcapsules composition and its influence on their mechanical properties. In this study, mechanical properties of microcapsules will be studied. In order to obtain objective information AFM technique has been used and results were analyzed. This paper shows how to prepeare samples to be analyzed. Results will show that microcapsules resistnace depends on the active ingrediente despite of what could be though, the shell composition.
Key words: Microcapsule, AFM, mechanical properties, resistance, textile.

1. INTRODUCTION.

Understanding the elastic behaviour, or deformation, of individual macromolecules is an essential issue in both biopolymer science and materials science [1]. One of the main charcteristics about AFM technique is surface topography which is obtained by keeping forces between the surface and the tip constant by means of a relatively soft cantilever. The possibility of characterizing local mechanical properties of polymers at sub-micrometrical and nanometrical scale is of fundamental importance in the framework of their use in scientific and technological applications, both as bulk materials, thin films, and nanostructured samples [7].

Microcapsules have been widely used in recent years, initially they were used in pharmacy field but since 1990´s some research has been conducted in order to stuy its influence on fabrics, garments or any textile surface. [2-6]. They have been studied at textile field in different aspects such as how to apply them, how to characterize fabrics with microcapsles, their behaviour towards laundry, rubbing and other parameters. [3-6] As they have a thin film of a polymeric product as a shell, characterise its mechanical properties recquires measurements at sub-micrometrical and nanometrical scale. Because of that, our study borns from the hypothesis that mechanical properties of shell can be measured by this method.

The aim of this work is to develop a procedure which allows to obtain different values useful to determine mechanical properties from measured surface. When values are obtained, some conclusions about the shell resistance will be done.

2. EXPERIMENTAL

2.1. Materials

Microcapsules samples were obtained by different procedures. Lavander, Mint, Red Fruits G and Red fruits P and Mint PUR, all of them are composed by the fragrance and the shell. The sample Mint pur was developed at GIITEX laboratories with polyurethane shell. For every sample except Mint PUR shell was composed of melamine formaldehyde and they are commercialy available samples. All of them have been referenced depending on the active ingredient. Their appearance is a white viscous liquid.

2.2. Atomic Force Microscopy (AFM)

The surface morphology of the samples was analyzed by an Atomic force Microscope (AFM) Digital Instruments NanoScope IIIa and Digital Instruments MultiMode made by Veeco metrology Group. Scanning was carried out in contact mode. All samples were scanned at room temperature in atmosphere. The scanning size was 10µm x 10 µm. The tip shape was square pyramidal (0,06 N/m). Ten measurements were performed for every sample.

3. RESULTS

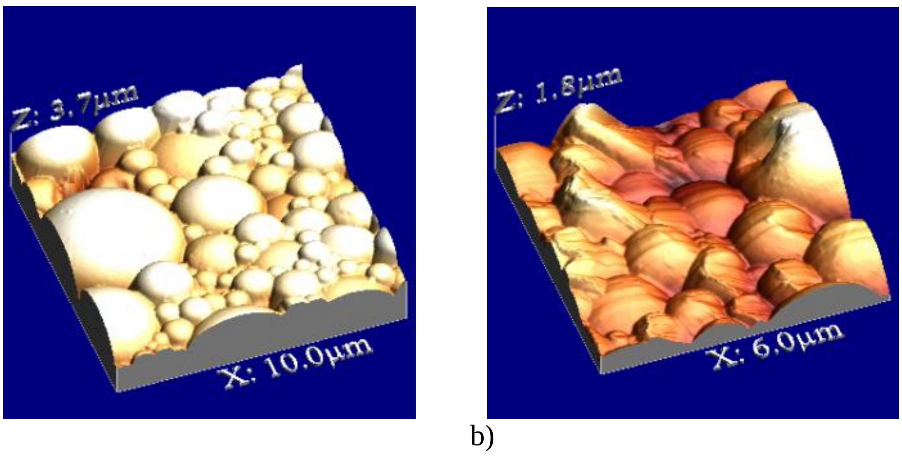
Considering the microcapsules have no rigid surface, and that are sold as a viscous liquid, the procedure to measure its resistance had to be performed. To begin with we tried to measure the microcapsule behaviour on the fabric surface, but we found some problems. Figure 1 shows microcapsules distribution on a textile fabric obtained in previous work. It can be clearly seen that microcapsules are not together whereas some distance is among them.

In order to have a high concentration of microcapsules in the same surface, we dropped every sample on a paper (110 g/m^2), result is shown in figure 2.

Fig. 1: Microcapsules on a fabric surface

Fig. 2: Drop of lavender microcapsule on paper.

Once the solid sample was prepared, it was measured by AFM method. Figure 3a shows 3D image of the measurement when the tip is displacen on a 10 x 10 µm surface. When indentation was conducted, we could observe some plasticity on the material as it is full of liquid. Obviously, when we press microcapsules at higher preasure, we could observe a similar behaviour to the one that occurs when you press a balloon. This effect can be seen in figure 3b.



a) b)

Fig. 3: AFM 3D image of microcapsules. a) at low preaure. b) high pressure

Figure 3b shows clearly that indentation has been performed and the tip shape can be clearly observed on some microcapsules.

Figure 4 shows the displacement a surface suffers when the AFM tip press on it. We tried to determine the plasticity of the shell because of the displacement the tip suffers when a microcapsule is broken by the tip. In order to obtain results that could be compared it is compulsory to work always at the same preasure (P).

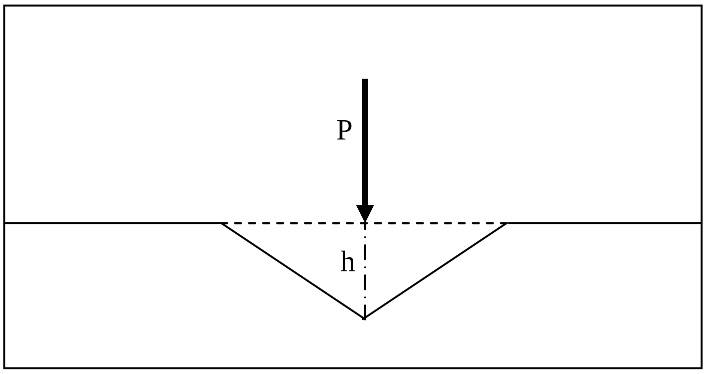


Fig. 4: Surface deformation. Parameters.

When the test has finished the NanoScopeSoftware allows obtaining some graphics like the one shown in fugure 5. Then it can be seen the tip penetration as the lowest value in Y axex (nm).

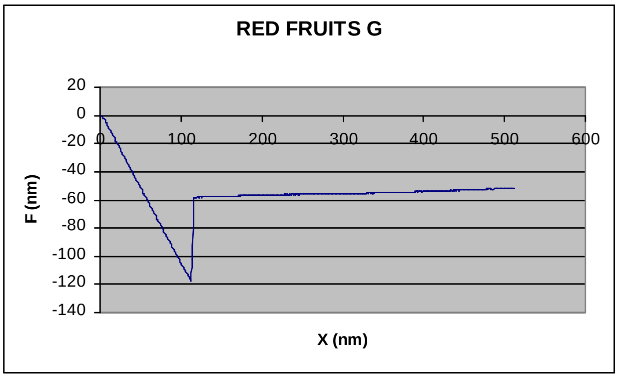


Fig. 5: Tip penetration on microcapsules.

When those results are analysed for every sample, it can be observed that every test reaches a minimum value, but it could be interesting to analyse the slope for every one. The analysis was done by the adjustment of a line, as figure 6 shows. As it fits with a line, the common mathematical expression is:

$$F = a X + b \tag{1}$$

Every sample has been analysed and results are shown in table 1, evidently the slope is represented by “a”. When table 1 is observed, values seem to be approximately the same. However, if we take into consideration that we are measuring at microscale, then they maight be considered. A surprising result is the fact that values can be considered similar because of the active ingredient and not because of the shell composition.

Table 1: Linear equation constants

SAMPLE	a	b	R^2
Red fruits G	-1.0730	2.63	0.9999
Red Fruits P	-1.0775	2.4025	0.9999
Lavander	-0.9546	-1.02	0.9995
Mint	-1.1696	5.5125	1
Mint PUR	-1.1691	6.6876	0.9996

Table 2: Tip displacement

SAMPLE	h (nm)
Red fruits G	-1.0730
Red Fruits P	-1.0775
Lavander	-0.9546
Mint	-1.1696
Mint PU	-1.1691

Table 2 shows the AFM tip displacement when microcapsule is broken at constant preasure (P) for every sample. A similar result to the one when slope is analyzed can be observed. The result shows similar behaviour depending on the same active ingredient and seems to be independent from the shell behaviour.

4. CONCLUSIONS

To sum up, this work has sown a procedure to measure microcapsule resistance and allows comparing results from different samples.

To begin with, it must be pointed out that measuring the microcapsules when they are on the fabric is more difficult. Thus implies that they should be prepeared in a way were the microcapsule concentration is high. In this study we put a drop on a paper with high density.

AFM nanoindentation has resulted as one of the procedures that allow comparing microcapsules resistance. Different shell compositions were studied in order to see if it can influence on the mechanical behaviour. Surprisingly results show a big influence on the active ingredient and not on the shell composition as it was spected.

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ABOUT ABRASION RESISTANCE OF FABRICS WITH STRATEGIC DESTINATION PART I

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Abstract: This paper is part of a research agreement between "Aurel Vlaicu" University and The National Research - Development Institute for Textile and Leather, Bucharest, about the relationship of interdependence between the yarns' characteristics and fabric's characteristics for the installation of ventilation and heating pipes of the military helicopter[5]. Fabrics for strategic areas must have certain characteristics such resistance at high temperatures, breaking and tearing strength, shock resistance and chemicals' resistance.
This paper presents a concrete case of mathematical modelling of the yarns characteristics and the fabric abrasion resistance for ventilation and heating ducts of a military helicopter.
Keywords: yarns, structure parameters, fabric, abrasion resistance, warp, weft, yarns density.

1. INTRODUCTION

The yarns for high performance fabrics used in aeronautic field, and the fabrics obtained by them were analysed in I.N.C.D.T.P. Bucharest physic-mechanical testing laboratories. The fabrics obtained were used at the installation of ventilation and heating pipes of an military helicopter. It was used Kevlar yarns, 220dtex/134fx1, with different yarn twist. The fabric's weave repeat is plain weave.The yarns were processed on weaving and finishing technologies that allowed the preservation of fabrics.

Special emphasis was placed on the analysis of interdependence relations between the yarns characteristics and the fabrics characteristics.

For the fabrics were used the following type of yarns:
- 100% para-amide yarn count 220 dtex by134 filaments with zero twists;
- 100% para-amide yarn count 220 dtex by134 filaments with 150 twists Z;
- 100% para-amide yarn count 220 dtex by134 filaments with 250 twists Z.

Were made two types of fabrics:
- Variant code K-250/0
  - ❖ warp 100% para-amide yarn count 220 dtex by134 filaments with 250 twists Z
  - ❖ 100% para-amide yarn count 220 dtex by134 filaments with zero twists
- Variant code K-250/150
  - ❖ warp 100% para-amide yarn count 220 dtex by134 filaments with 250 twists Z
  - ❖ 100% para-amide yarn count 220 dtex by134 filaments with 150 twists Z

2. EXPERIMENTAL PART

There were made some determination for yarns:
- the breaking strength and the breaking elongation for para - amide yarn 220 dtex, conditional status, table no. 1.

Table 1. Yarns' parameters

	Breaking strength, N			Breaking elongation, %		
	0 twists/m	150 twists/m	250 twists/m	0 twists/m	150 twists/m	250 twists/m
average	44,688	43,994	43,708	3,477	3,651	3,675
standard average	0,554	2,199	1,510	0,130	0,201	0,140
variation coefficient	1,239	4,999	3,454	3,749	5,502	3,805

- abrasion resistance (number of cycles) for para - amide yarn 220 dtex, conditional and wet status, table no. 2

Table 2. Yarns' parameters

	Abrasion resistance in conditional status			Abrasion resistance in wet status		
	0 twists/m	150 twists/m	250 twists/m	0 twists/m	150 twists/m	250 twists/m
average	724,76	1008,5	1349,16	673,06	972,1	1275
standard average	308,797	340,104	266,682	310,160	314,571	229,876
variation coefficient	42,607	33,724	19,767	46,082	32,360	18,030

The characteristics [1] determined for yarns were encode:

- $x_{1,}$ x_{11} – the breaking strength for weft yarn, N;
- x_2 – the breaking strength for warp yarn, N;
- $x_{3,}$ x_{31} – the breaking elongation for weft yarn, %;
- x_4 – the breaking elongation for warp yarn, %;
- $x_{5,}$ x_{51} – abrasion resistance in conditional status for the weft yarn, cycles;
- x_6 - abrasion resistance in conditional status for the warp yarn, cycles;
- $x_{7,}$ x_{71} – abrasion resistance in wet status for the weft yarn, cycles;
- x_8 - abrasion resistance in wet status for the warp yarn, cycles

There were made some determinations for raw fabric and for grey fabric. This paper is about abrasion resistance. The encode used:

- y_{101} - abrasion resistance for raw fabric, variant k250/0, cycles
- y_{102} – abrasion resistance for raw fabric, variant k250/150, cycles;

The regression and correlation analysis attend to the description and research of the dependence of two or more variables. The regression attends to the dependence between the variables and the correlation study the dependence degree. The correlation analysis shows the measure in which the mathematical function, named mathematical model, describe the system behaviour. A program made by research staff from Textile Department was use for experimental data processing. The results are presented [2], [3], [4].

The simple regression equations are obtained in this form:

$$y = a x^2 + b x + c \quad \textbf{(1)}$$

where: a - x^2 coefficient in regression equation;
b - x coefficient in regression equation;
c - constant term.

The correlation coefficients calculated with the program are presented in table no.3

Tabele. 3.The correlation coeficients

	The correlation coefficient	
	y_{101}	y_{102}
x_1	0,95	
x_2	0,92	0,92
x_3	0,93	
x_4	0,94	0,90
x_5	0,92	
x_6	0,93	0,92
x_7	0,91	
x_8	0,93	0,92
x_{11}		0,91
x_{31}		0,87
x_{51}		0,92
x_{71}		0,92

The correlation between the abrasion resistance of the row fabric and the yarns characteristics is presented in figures no 1-16.

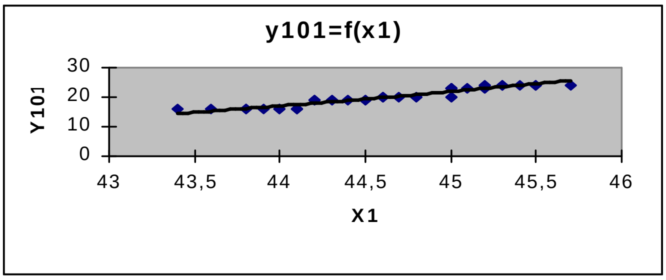

Fig. 1: The dependence between the fabric' abrasion resistance and the breaking strength of the weft yarn

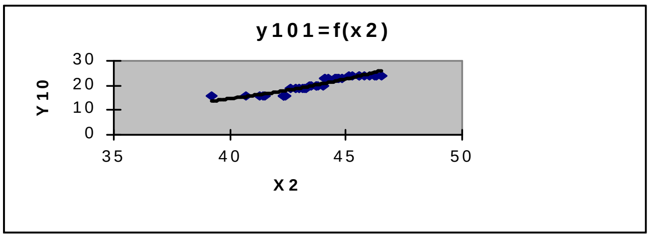

Fig. 2: The dependence between the fabric' abrasion resistance and the breaking strength of the warp yarn

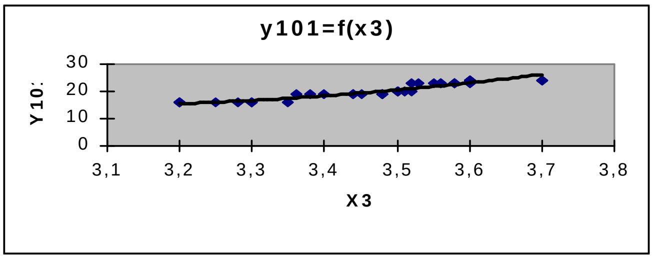

Fig. 3: The dependence between the fabric' abrasion resistance and the breaking elongation for weft yarn

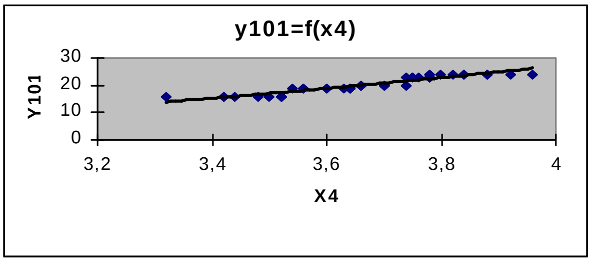

Fig.4: The dependence between the fabric' abrasion resistance and the breaking elongation for warp yarn

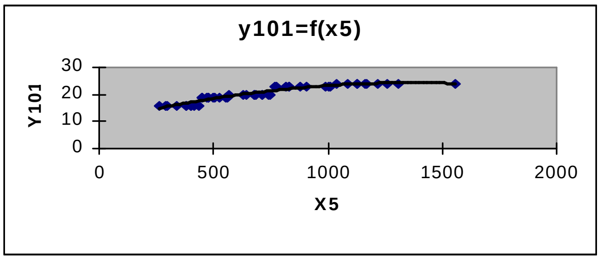

Fig. 5: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the weft yarn, cycles

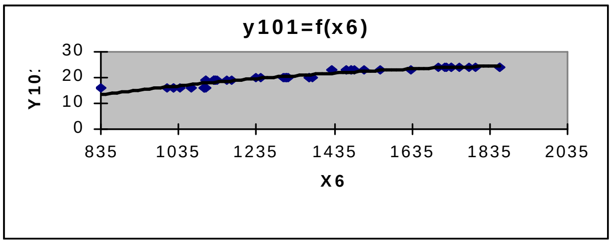

Fig. 6: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the waft yarn, cycles

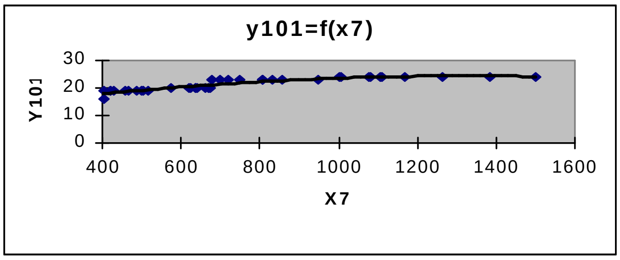

Fig. 7: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the weft yarn, cycles

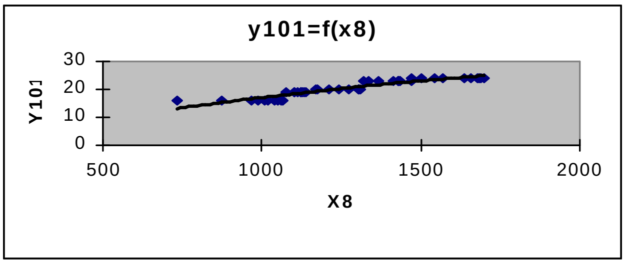

Fig. 8: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the warp yarn, cycles

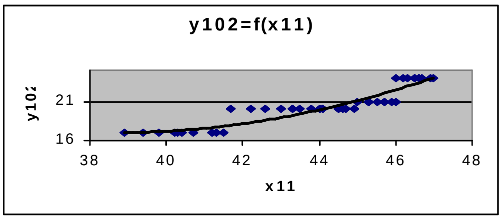

Fig. 9 : The dependence between the fabric' abrasion resistance and the breaking strength of the weft yarn

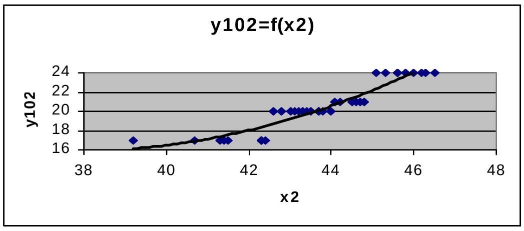

Fig. 10: The dependence between the fabric' abrasion resistance and the breaking strength of the warp yarn

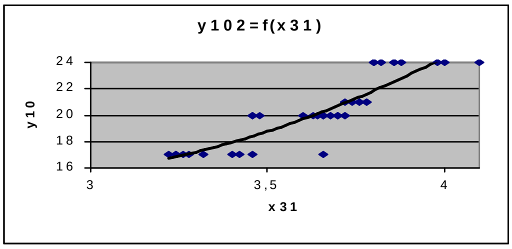

Fig. 11: The dependence between the fabric' abrasion resistance and the breaking elongation for weft yarn

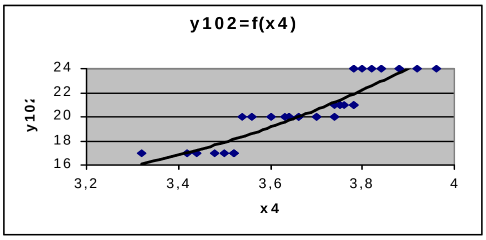

Fig. 12: The dependence between the fabric' abrasion resistance and the breaking elongation for warp yarn

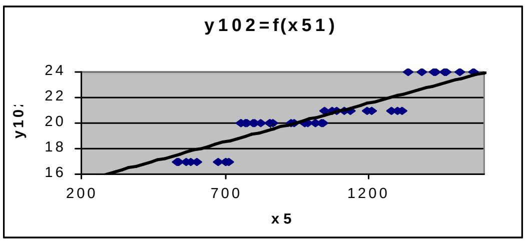

Fig. 13: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the weft yarn, cycles

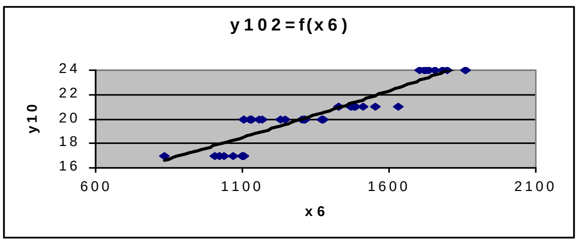

Fig. 14: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the waft yarn, cycles

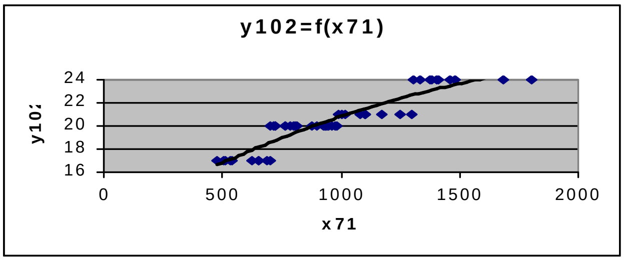

Fig. 15: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the weft yarn, cycles

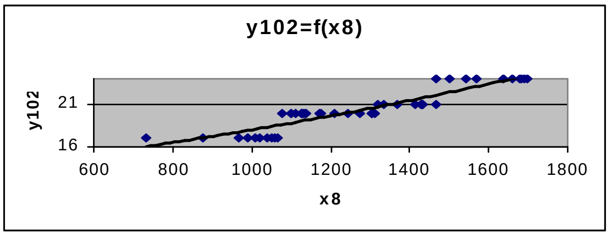

Fig. 16: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the warp yarn, cycles

3. CONCLUSIONS:

The regression equation obtained by rolling the program are:

$$y_{101} = 0{,}3319\, x_1^2 - 24{,}687\, x_1 + 460{,}68 \quad \textbf{(2)}$$
$$y_{101} = 0{,}0834\, x_2^2 - 5{,}4857\, x_2 + 100{,}63 \quad \textbf{(3)}$$
$$y_{101} = 23{,}149\, x_3^2 - 138{,}21\, x_3 + 220{,}7 \quad \textbf{(4)}$$
$$y_{101} = 4{,}4485\, x_4^2 - 13{,}219\, x_4 + 8{,}806 \quad \textbf{(5)}$$
$$y_{101} = -8E\text{-}06\, x_5^2 + 0{,}0212\, x_5 + 9{,}8375 \quad \textbf{(6)}$$
$$y_{101} = -7E\text{-}06\, x_6^2 + 0{,}0301\, x_6 - 6{,}6205 \quad \textbf{(7)}$$
$$y_{101} = -8E\text{-}06\, x_7^2 + 0{,}0202\, x_7 + 10{,}976 \quad \textbf{(8)}$$
$$y_{101} = -4E\text{-}06\, x_8^2 + 0{,}021\, x_8 - 0{,}277 \quad \textbf{(9)}$$
$$y_{102} = 0{,}0985\, x_{11}^2 - 7{,}5852x\, x_{11} + 163{,}07 \quad \textbf{(10)}$$
$$y_{102} = 0{,}1225\, x_2^2 - 9{,}2708\, x_2 + 191{,}32 \quad \textbf{(11)}$$
$$y_{102} = 5{,}0676\, x_3^2 - 26{,}775\, x_3 + 50{,}402 \quad \textbf{(12)}$$
$$y_{102} = 9{,}5916\, x_4^2 - 55{,}541\, x_4 + 94{,}78 \quad \textbf{(13)}$$
$$y_{102} = -9E\text{-}08\, x_5^2 + 0{,}0062\, x_5 + 14{,}212 \quad \textbf{(14)}$$
$$y_{102} = 9E\text{-}07\, x_6^2 + 0{,}0052\, x_6 + 11{,}684 \quad \textbf{(15)}$$
$$y_{102} = -2E\text{-}06\, x_7^2 + 0{,}0116\, x_7 + 11{,}615 \quad \textbf{(16)}$$
$$y_{102} = 2E\text{-}06\, x_8^2 + 0{,}0039\, x_8 + 12{,}129 \quad \textbf{(17)}$$

4. REFERENCES

[1]. Avram, D.. (2005). *Textile structures– Yarns*, Ed. Performantica Iassy
[2]. Bona, M.(1993).*Statistical methods for the textile industry*, Editura Textilia, Italy
[3]. Ciocoiu, M., Cascaval.,(1996) “*Program packages for mathematical modelling of textile processes*”, Iassy
[4].Mihail, R., “Introduction in the strategy of experimentation with application from chemical technology”, Scientific and Encyclopaedic Printing House, Bucharest
[5]. Research agreement, in PNCDI INVENT Program, no 79/2003, Textile product with high performance in aeronautic field, 2003-2005, National Research - Development Institute for Textile and Leather, Bucharest and "Aurel Vlaicu" University from Arad

ABOUT ABRASION RESISTANCE OF FABRICS WITH STRATEGIC DESTINATION PART II

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Abstract: This paper is part of a research agreement between "Aurel Vlaicu" University and The National Research - Development Institute for Textile and Leather, Bucharest, about the relationship of interdependence between the yarns' characteristics and fabric's characteristics for the installation of ventilation and heating pipes of the military helicopter[5]. Fabrics for strategic areas must have certain characteristics such resistance at high temperatures, breaking and tearing strength, shock resistance and chemicals' resistance.
This paper presents a concrete case of mathematical modelling of the yarns characteristics and the fabric abrasion resistance for ventilation and heating ducts of a military helicopter.
Keywords: yarns, structure parameters, fabric, abrasion resistance, warp, weft, yarns density.finished fabric

1. INTRODUCTION

The paper is an analysis in 2D systems of the influence of yarn's characteristics about the abrasion resistance of the finished fabric in two variants of weft yarn: 0 twists and 150 Z twists .

2. EXPERIMENTAL PART:

There were made some analysis term for yarns:

- $x_{1,}$ x_{11} – the breaking strength for weft yarn, N;
- x_2 – the breaking strength for warp yarn, N;
- $x_{3,}$ x_{31} – the breaking elongation for weft yarn, %;
- x_4 – the breaking elongation for warp yarn, %;
- $x_{5,}$ x_{51} – abrasion resistance in conditional status for the weft yarn, cycles;
- x_6 - abrasion resistance in conditional status for the warp yarn, cycles;
- $x_{7,}$ x_{71} – abrasion resistance in wet status for the weft yarn, cycles;
- x_8 - abrasion resistance in wet status for the warp yarn, cycles

There were made some determination for yarns [1]:

- the breaking strength and the breaking elongation for para - amide yarn 220 dtex, conditional status, table no. 1

Table 1.Yarns' parameters

	Breaking strength, N			Breaking elongation, %		
	0 twists/m	150 twists/m	250 twists/m	0 twists/m	150 twists/m	250 twists/m
average	44,68	43,99	43,70	3,47	3,65	3,67
standard average	0,55	2,19	1,51	0,13	0,20	0,14
variation coefficient	1,23	4,99	3,45	3,74	5,50	3,80

- abrasion resistance (number of cycles) for para - amide yarn 220 dtex, conditional and wet status, table no. 2

Table 2. Yarns' parameters

	Abrasion resistance in conditional status			Abrasion resistance in wet status		
	0 twists/m	150 twists/m	250 twists/m	0 twists/m	150 twists/m	250 twists/m
average	724,76	1008,5	1349,16	673,06	972,1	1275
standard average	308,79	340,10	266,68	310,16	314,57	229,87
variation coefficient	42,60	33,72	19,76	46,08	32,36	18,03

The encode used for the abrasion resistance are:

- y_{103} - abrasion resistance for finished fabric, variant k250/0
- y_{104} – abrasion resistance for finished fabric, variant k250/150

The regression and correlation analysis attend to the description and research of the dependence of two or more variables. The regression attends to the dependence between the variables and the correlation study the dependence degree.

The correlation analysis shows the measure in which the mathematical function, named mathematical model, describe the system behaviour.

A program made by research staff from Textile Department was use for experimental data processing. The results are presented [2], [3], [4].

The simple regression equations are obtained in this form:

$$y = a x^2 + b x + c \tag{1}$$

where: a - x^2 coefficient in regression equation;
b - x coefficient in regression equation;
c - constant term.

The correlation coefficients calculated with the program are presented in table no.3

Table 3. The correlation coefficients

	The correlation coefficients	
	y_{103}	y_{104}
x_1	0,84	
x_2	0,86	0,93
x_3	0,76	
x_4	0,83	0,92
x_5	0,93	
x_6	0,94	0,97
x_7	0,92	
x_8	0,90	0,95
x_{11}		0,91
x_{31}		0,89
x_{51}		0,95
x_{71}		0,96

The correlation between the abrasion resistance of the finished fabric and the yarns characteristics is presented in figures no 1-16.

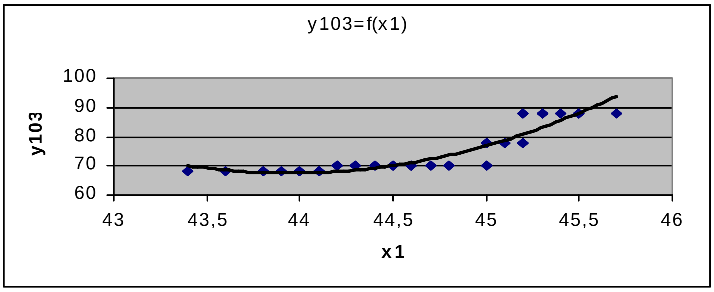

Figure 1: The dependence between the fabric' abrasion resistance and the breaking strength of the weft yarn, 0 twists

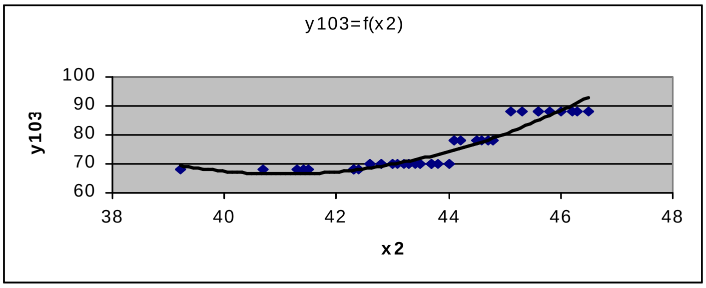

Figure 2: The dependence between the fabric' abrasion resistance and the breaking strength of the warp yarn

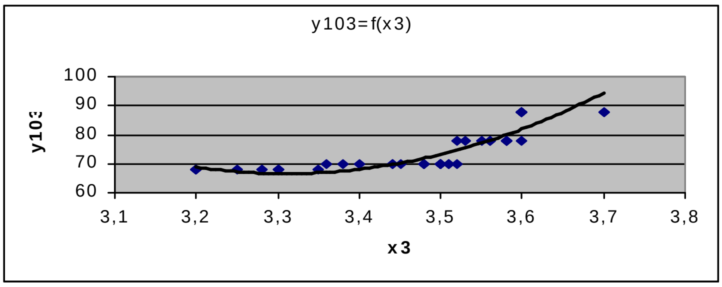

Figure 3: The dependence between the fabric' abrasion resistance and the breaking elongation for weft yarn, 0 twists

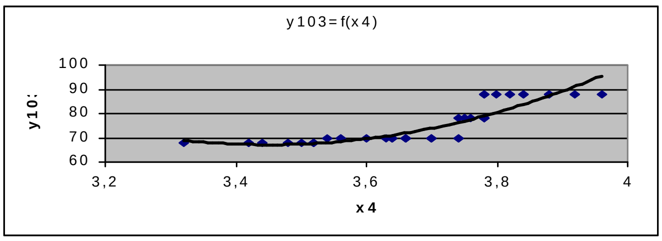

Figure 4: The dependence between the fabric' abrasion resistance and the breaking elongation for warp yarn

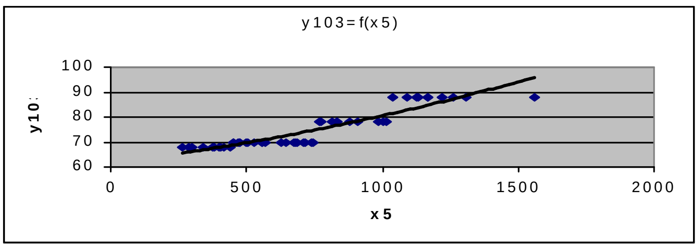

Figure 5: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the weft yarn, 0 twists

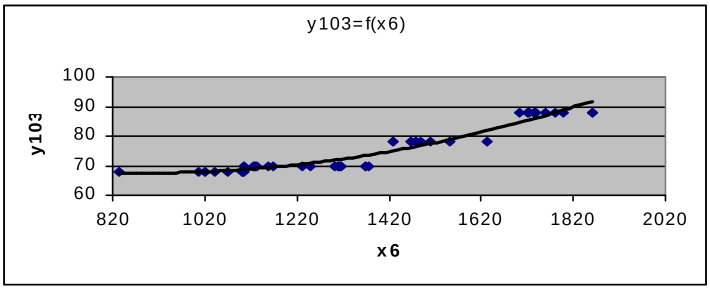

Figure 6: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the waft yarn

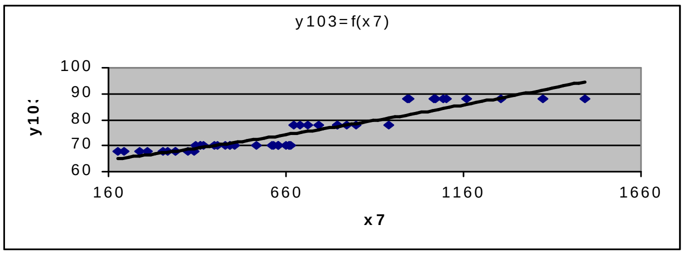

Figure 7: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the weft yarn, 0 twists

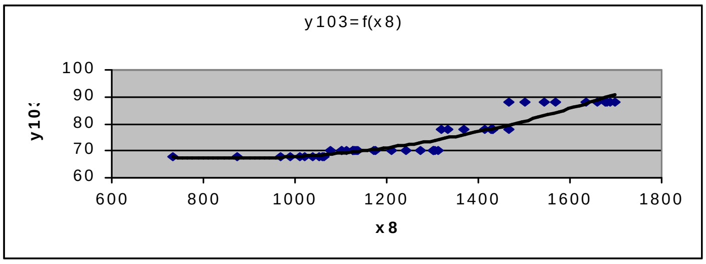

Figure 8: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the warp yarn

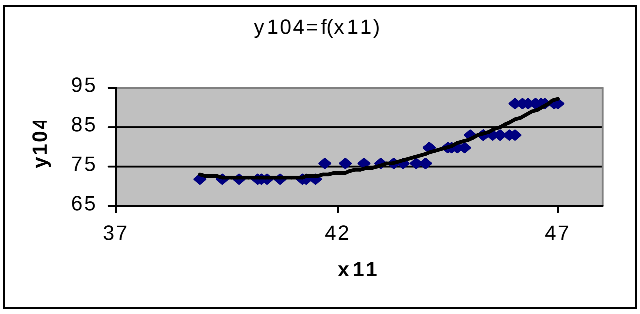

Figure 9: The dependence between the fabric' abrasion resistance and the breaking strength of the weft yarn, 150 twists

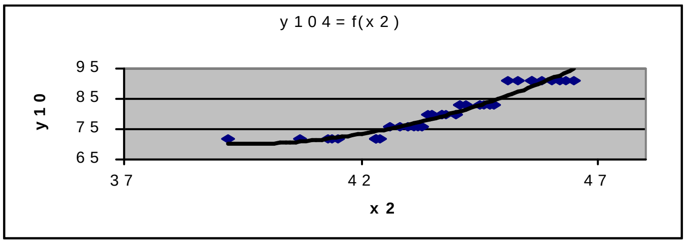

Figure 10: The dependence between the fabric' abrasion resistance and the breaking strength of the warp yarn

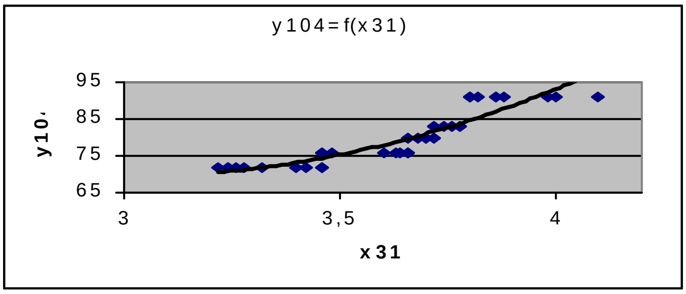

Figure 11: The dependence between the fabric' abrasion resistance and the breaking elongation for weft yarn, 0 twists

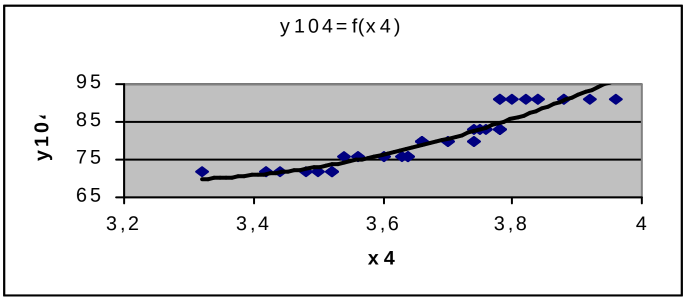

Figure 12: The dependence between the fabric' abrasion resistance and the breaking elongation for warp yarn

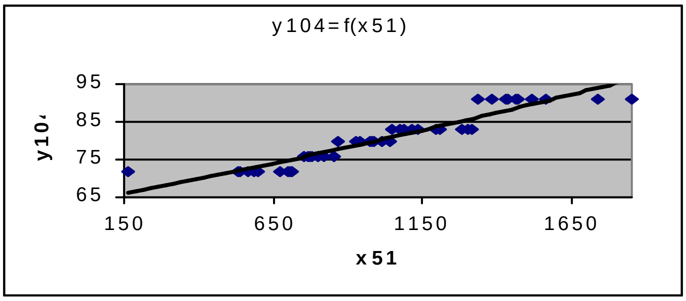

Fig. 13: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the weft yarn, 150 twists

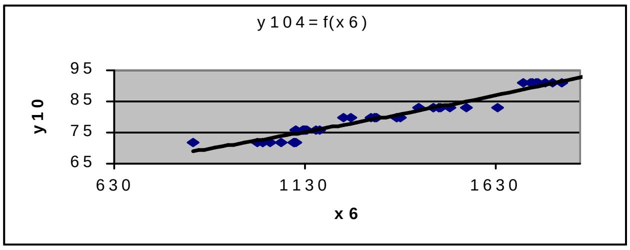

Fig.14: The dependence between the fabric' abrasion resistance and the abrasion resistance in conditional status for the waft yarn

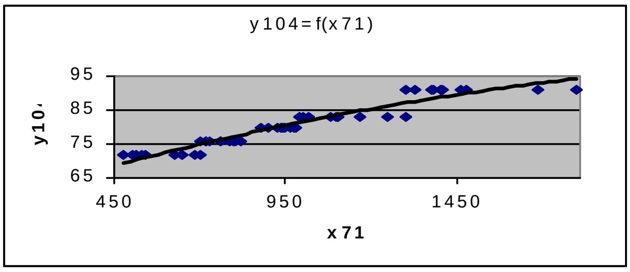

Fig. 15: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the weft yarn, 150 twists

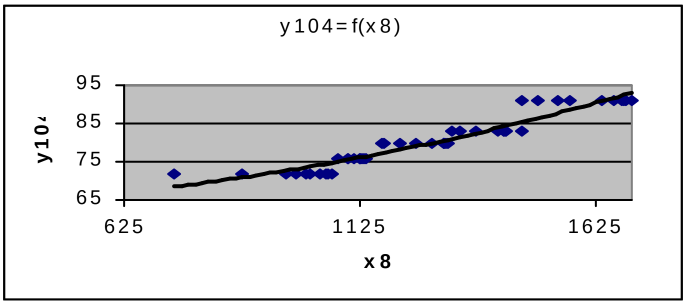

Fig. 16: The dependence between the fabric' abrasion resistance and the abrasion resistance in wet status for the warp yarn

3. CONCLUSIONS:

The regression equation obtained by rolling the program are:

$y_{103} = 8,6224\ x_1^2 - 757,95\ x_1 + 16724$ **(2)**

$y_{103} = 0,8948\ x_2^2 - 73,469\ x_2 + 1574,6$ **(3)**

$y_{103} = 182,95\ x_3^2 - 1211,2\ x_3 + 2071,1$ **(4)**

$y_{103} = 109,2\ x_4^2 - 753,59\ x_4 + 1367,3$ **(5)**

$y_{103} = 6E\text{-}06\ x_5^2 + 0,0132\ x_5 + 61,754$ **(6)**

$y_{103} = 3E\text{-}05\ x_6^2 - 0,046\ x_6 + 88,026$ **(7)**

$y_{103} = 4E\text{-}06\ x_7^2 + 0,0163\ x_7 + 61,791$ **(8)**

$y_{103} = 3E\text{-}05\ x_8^2 - 0,0577\ x_8 + 91,835$ **(9)**

$y_{104} = 0,4529\ x_{11}^2 - 36,498\ x_{11} + 807,29$ **(10)**

$y_{104} = 0,4922\ x_2^2 - 38,755\ x_2 + 832,91$ **(11)**

$y_{104} = 23,919\ x_{31}^2 - 143,76\ x_{31} + 285,48$ **(12)**

$y_{104} = 50,421\ x_4^2 - 325,77\ x_4 + 595,65$ **(13)**

$y_{104} = 1E\text{-}06\ x_{51}^2 + 0,0149\ x_{51} + 63,721$ **(14)**

$y_{104} = -7E\text{-}06\ x_6^2 + 0,0301\ x_6 - 6,6205$ **(15)**

$y_{104} = -8E\text{-}06\ x_{71}^2 + 0,0202\ x_{71} + 10,976$ **(16)**

$y_{104} = -4E\text{-}06\ x_8^2 + 0,021\ x_8 - 0,277$ **(17)**

4. REFERENCE

[1]. Avram, D.. (2005) *Textile structures– Yarns*, Ed. Performantica Iassy
[2]. Bona, M.(1993) *Statistical methods for the textile industry*, Editura Textilia, Italy
[3]. Ciocoiu, M., Cascaval.,(1996) “*Program packages for mathematical modelling of textile processes”*, Iassy
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[5]. Research agreement, in PNCDI INVENT Program, no 79/2003, Textile product with high performance in aeronautic field, 2003-2005, National Research - Development Institute for Textile and Leather, Bucharest and "Aurel Vlaicu" University from Arad

ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

RELATION OF THE PRODUCTS' DESIGN AND THEIR CONSTRUCTIVE STRUCTURE ACCORDING TO THE PROPOSED DESIGN

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Abstract: The quality of the final product depends 40 % of the quality of the creation, design and the product's concept activity. If this has a well defined conceptual basis, together with the research preceding the execution of the clothing producs one can perform the constructive-technological design of the clothes (comprising the making-up and also the finishing of the products). The research project has as a goal the scientific approach of the 3D design process with help of the program Staprim. By involving the intuition and the originality of the designer in the designing activity, this program influences the extension of the efficiency in the technological activity within the design for women clothing.
Key words: 3D design, women clothing, decorative ornaments.

1. INTRODUCTION

The modern design, systematization and analysis methods when developing the design of clothing products facilitates the relation between the design and the sketching of the clothing products (including the interior design elements, interior decorations, textiles and decorative panels) and also the area of design in the textile art or sketching, technologization, which are benefic for research institutions, academic design institutions, in particular creation and prototype design activities).

This paper indicates the aplicability of the study in activity areas as in the textiles industry by creating o strong connection between the designer and technologist.

That is why the constructive sketching and the preparatory technical stages in creating the clothes are a complex of necessary works for their development, using as an example the soft for clothing design, Staprim.

The creative part, the photographing of the customer then using the dimensions in the constructive solving of a model, its finalization by obtaing patterns is followed by the technical stage(obtaining the preparatory technical documentation for the introduction of the production of the new clothing designs).

2. GENERAL INFORMATION

For the 3D design of clothing one uses specific modules, necessary for the performance of designs, based on the initial specific information.

This being said, in the initial phase one performs the photographing of the human subject then makes the design/pattern based on the measurements introduced in the program specific to each suggested pattern, then follows the graduation of the patterns based on the initial data from the table.
With the help of these programs one can interfere on the basic design by changing the length of the newly created product, the position of some stiches in order to correspond to the proposed design (ex. figure 1, 2).

Fig. 1: The Staprim program- presentation

The technical and technical-applicative solutions comprise suggestions, ideas sketches, drafts, colors, trends, permitting the drawing of the indications for the model's design, the selection of the raw materials and auxiliaries, indications for the manufacturing, the interpretation of the documentation.

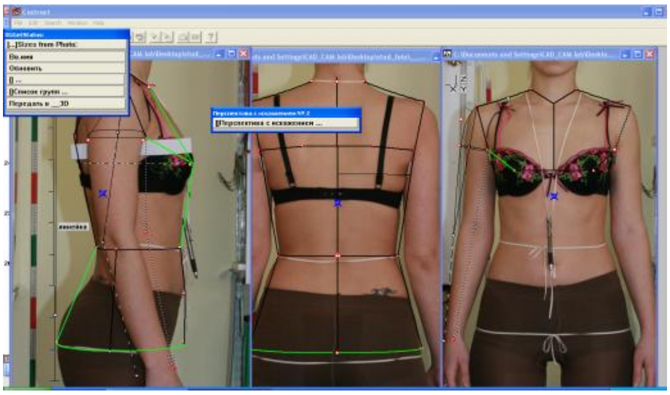


Fig.2: The introduction of the initial measurements after photographing the human subject

The shaping of the designs is being performed automatically by the program, using the data from the initial table(specific calculations, specific geometrical drawings), and one can interfere upon the clothes with motifs and ornaments or different accesories with a decorative role (example give in figure 3).

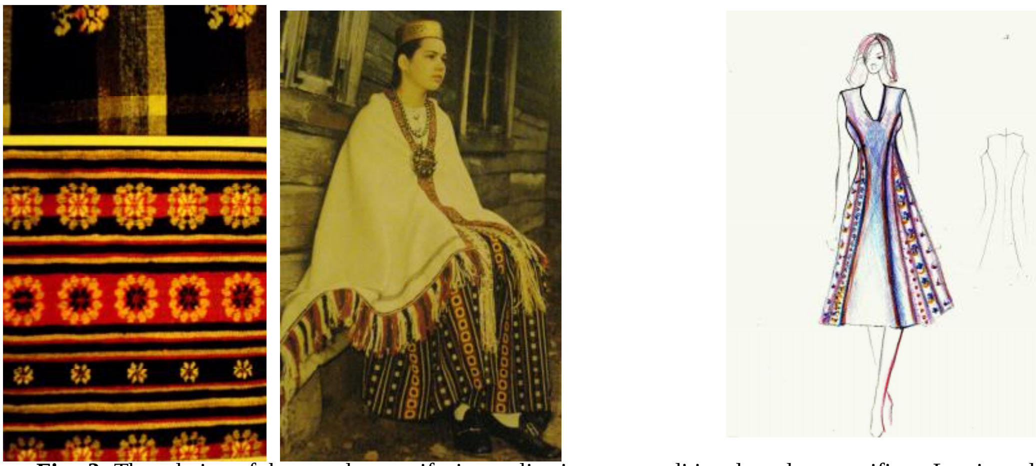


Fig.. 3: The relation of the popular motifs, its application on a traditional product specific to Latvia and the proposed version.

The technological diversification of the designs can be obtained through the variation of their lengths and width and through different details or suggested accessories by the designer (e.g. mini, midi, maxi dresses). In this modern design program, Staprim, the patterns are rapidly elaborated and are of a high quality. In the following figures (fig. 4, 5, 6) one can see selections of the main stages used in design.

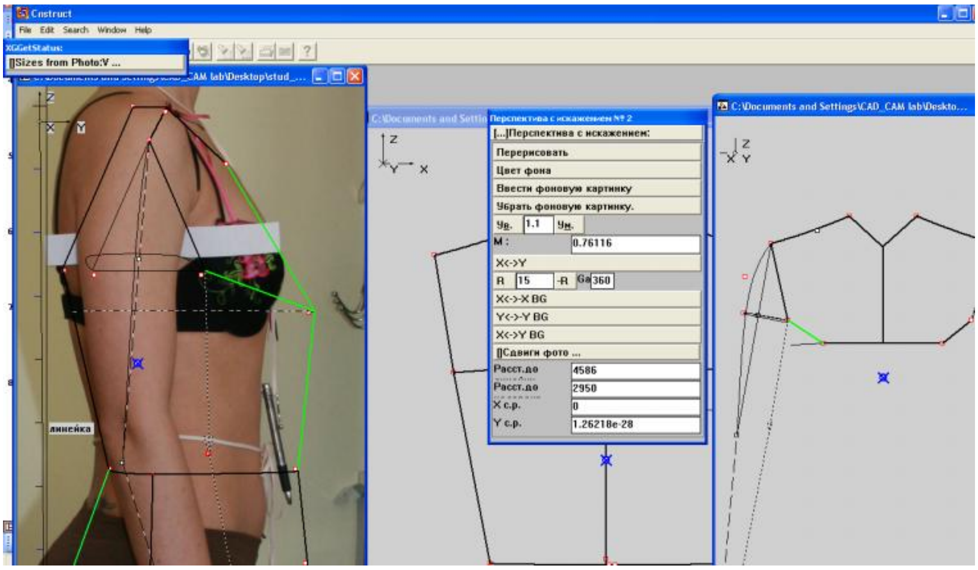


Fig. 4: The relation between the client’s image and the constructive structure performed with the help of the 3D design program Staprim.

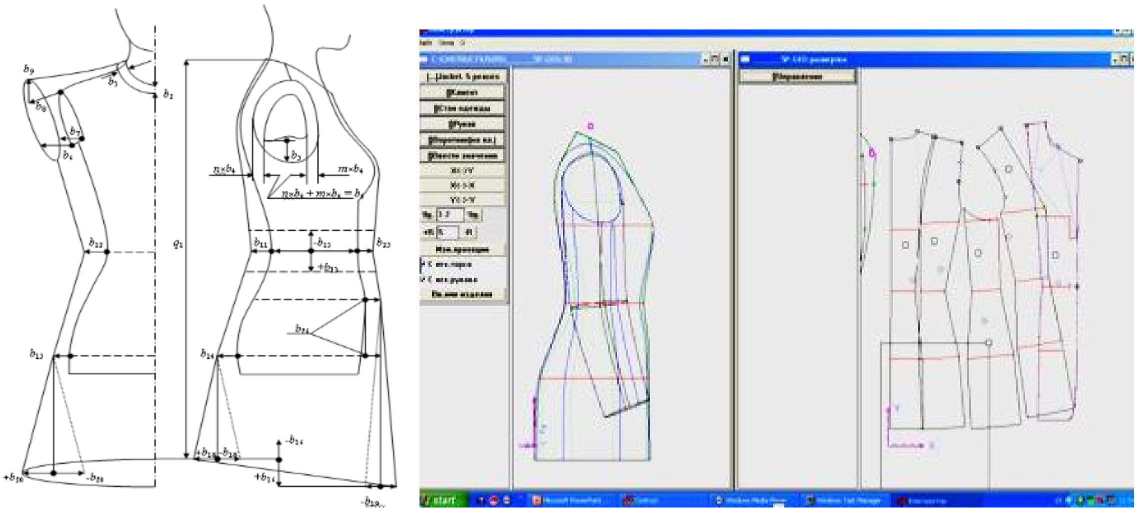


Fig..5: The virtual image of the model and the performing of the pattern according to the given dimensions.

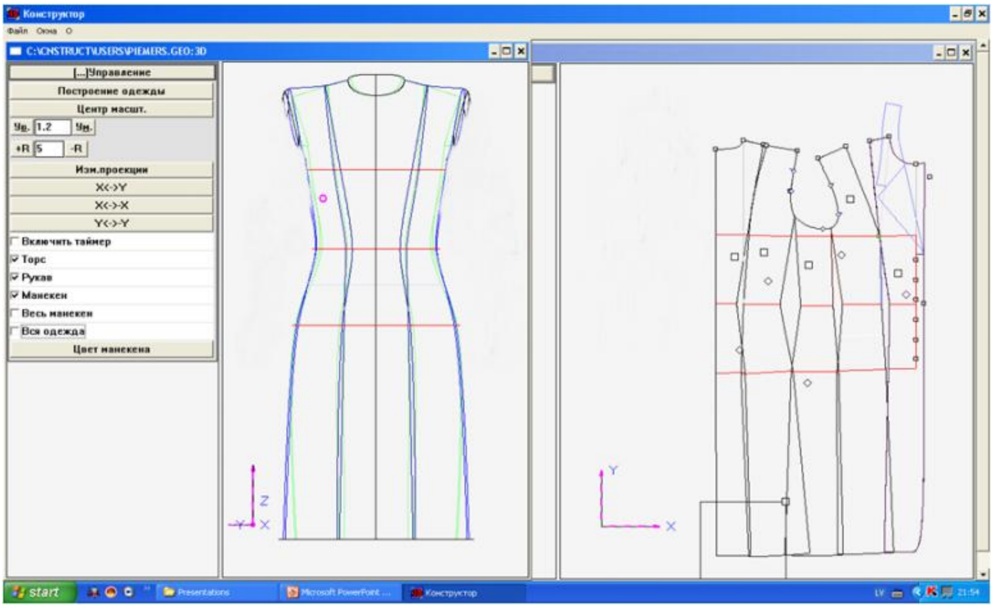


Fig..6: The modification of the design lines according to the proposed model

3.THE RELATION BETWEEN THE MODEL AND THE ASSOCIATED TRANSFORMATIONS OF THE BASIC PATTERN, WITH THE HELP OF THE STAPRIM PROGRAM.

The way of confectioning the clothing products is directly influenced by the technical documention, taking into account the orientation of the confectioners, technologists, engineers etc., being important information sources and technical characteristics of the fabrication process stages.

Using the technical documentation helps in design of any clothing product and in the processes of industrial production and also in creating the unique clothes or of small series(created on order in the luxury tailories and in the world's design industry);

the technical documentation is an assembly of very information, which comprises:

- photographing the model
- introduction of the data in the program
- obtaining the design pattern in stages
- graduation of the patterns
- saving these in the computer
- printing with the help of a plotter connected to a computer

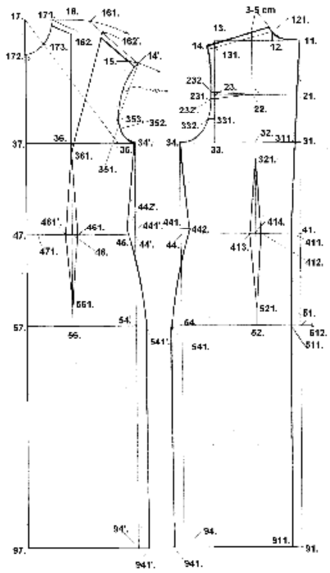
This helps the entire personnel which contributes to the performing of the clothing product, being an extremely important factor from the designing of the model and finishing with the proper confectioning of the prototype.

The design comprises model sketches, drafts, plans, the technical-artistic analysis, the goal of this product's design, the destination for which it was created, patterns etc.

Also in the construction of the pattern after the creation sketch(model) one uses graphical methods, the body's dimensions, the calculation of the necessary elements: height, bust circumference, material addition etc. Moreover, the initial data and the measurements are given in the modern design programs.

The necessary initial data of the construction (size 46-I-B)

(confectioned dress from fabrics, with semi-adjusted figure)



Body dimensions:

Body height = 174 cm
Bust circumference = 92 cm
Waist perimeter = 74 cm
Hips perimeter = 100 cm
Back length until waist = 42 cm

Product's dimensions:

Length of the product = 110 cm

Comfort additions:

Addition on the bust line = 3 cm
Addition on the waist line = 2 cm
Addition on the hips line = 2 cm

The addition on the bust line is distributed on the main segments of the pattern, for example:

On the width of the back Abs= 0.5 cm
On the diameter of the arm's cut Abr = 1.5 cm
On the width of the face Abf = 1 cm

Ab= Abs + Abr + Abf

The calculation of the secondary dimensions of the body:

The depth of the back cut ARS
The width of the back Is
The width of the arms's cut Ir
The width of the face If

6. CONCLUSIONS

The experimental results comnprise: sketch drawing, material samples, prototypes of clothing products, purchase of the necessary raw materials and accessories and the 3D design of the clothes created by the designer with the help of the Staprim program.

7. REFERENCES

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

THE SPECIFIC NATURE OF LABOUR JURISDICTION IN THE ROMANIAN LEGAL SYSTEM

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Abstract: The paper aims to highlight the specificity of labor jurisdiction, as a special jurisdiction, in the romanian legal system. The labour jurisdiction represents the entire activity sustained by certain organs in solving work conflicts and other demands regarding work relationships and its connected references, including regulations for the competent organs to solve these types of disputes and requests, as well as for the applicable procedural rules.The labour jurisdiction, a very complex institution designed to resolve conflicts that arise within intersubjective relations, is guided by a set of general principles of law activity, respectively the principles of organization and functioning of courts (legality, equality, gratuity, collegiality, publicity), as well as the principle of conducting the trial in civil lawsuit (contradictoriality, the right to defense, the judge's active role, availability, advertising, orality and continuity), while maintaining certain features resulting from the organization and operation of this jurisdiction, which it gives singularity.
Key words: justice, jurisdiction, juridical labor statement, principles of labor jurisdiction

1.UNDERSTANDINGS OF THE TERM OF JURISDICTION. TYPES OF JURISDICTION.

Doctrinal analysis highlight the idea that the term of jurisdiction has multiple understandings. Thus, as an initial understanding, the term of jurisdiction represents *the power to decide disputes arising between different subjects, natural or legal persons, by law enforcement* [6, pp.1-3]. The mentioned meaning is consistent with the original meaning of the term, which comes from Latin, from the word *juridicio,* word composed of *ius* (law) and *dicere* (to say) and it means `to give the right`. This understanding of jurisdiction, as the ensemble of the powers given to a magistrate for the administration of justice, has been maintained in modern law.

In another sense, the jurisdiction represents *all the organs through which the state distributes justice.* The Constitution and the law on judicial organization refers sometimes at `courts` and `tribunals` precisely in this sense.

In a broad sense, the concept of jurisdiction includes *both the trial activity attributable to the competent authorities to work with this function and statutory powers and procedures to be followed in the adjudication and settlement of disputes which arise between the subjects of legal relations, related to rights and obligations which form the content of these reports* [1, p.995].

Bodies having jurisdiction shall resolve cases if they are intimated of and by their injunction they solve the case. They restore the rule of law, ruling on specific cases. These are the borders within judicial acts are taking place. From this perspective, the doctrine [2, pp.26-27] stresses *the link between two fundamental concepts, the justice concept and the jurisdiction one*. Each of the two concepts have multiple meanings. Some of the meanings of the term of jurisdiction have been presented previously. By justice, we can understand "judicial authority" or "judicial power", and the implementation and the achievement of justice represents courts work activity. Also, justice is the result of this work, justice itself, establishing the rule of law in relations between people.

In this context, *the concept of jurisdiction does not preclude justice, the two concepts being correlative.*To work, any jurisdiction must have a legal basis. But, once institutionalized, it must provide, within its jurisdiction, law enforcement between the parties, because the law is the formal rule of law, its rational expression [5, p.229].

Jurisdiction is likely to be *classified* according to several criteria. These criteria relate either to the presence of contrary interests, the existence of a controversy, a dispute, by which we distinguish between contentious justice and graceful or voluntary justice, either to a matter to judge, such as civil jurisdiction, criminal, administrative, constitutional, labor law, etc., or to the extent of the powers, the common law jurisdiction and special jurisdiction and applicable legal rules or principles which determine the justice of law and justice in equity.

We believe that is relevant to the theme of the work, the classification analysis which is based on the criterion *of the amplitude of the powers* conferred to various judicial authorities. Thus, *common law jurisdiction (ordinary)* has functions that have an impact on all civil cases *(justitio plenior),* certain cases being removed from its scope, but only as a subject to express statutory provisions (*jurisdictia minus plena*) [6, pp.25-26]. Also, common law jurisdictions accomplish both trial and executive function, while special courts do not generally include executive activities. Common law jurisdictions are characterized by a complex procedure, governed by the Code of Civil Procedure, while special courts have a simplified procedure supplemented by common law rules on the matter.

The concept of jurisdiction necessarily relates, as we mentioned earlier, also to the bodies which the law recognizes their power to solve certain types of disputes. From this perspective, in our country ordinary jurisdiction is done by courts (art.126 alin.1 from The Constitution of Romania*).* The complexity of social life and the need for specialization in business law also led to the establishment of special jurisdictions.

Many countries have created special courts to resolve commercial disputes, administrative, family law, employment law, etc. For example, in France, special jurisdictions benefit of specific organs: there are commercial courts, conseils de prud-hommes, juvenile courts, courts of assizes, etc.

The trend of diversification of special courts had been criticized in the literature because of its disadvantages, namely: the competence`s conflicts multiplication, slowness in dealing with cases, increasing the expenses of the procedural costs, etc. Some authors emphasize that the existence of special courts may undermine even the judicial unit and the prestige of judicial authority [4, p.44].

However, the benefits of special courts can not be ignored. Thus, they provide guarantee for the best judgments, because the bodies that administer them have personnel assigned to the field that contributes to strengthening the prestige of these bodies. Also, a specialized court can provide a more flexible, faster and less expensive trial.

One of last statement to be made in this regard is that the special courts are separate by the extraordinary jurisdictions, category created by law in order to solve a specific case or for a particular person. It is discriminatory and may lead to an arbitrary court, contrary to the principles of law, and is often determined by political considerations or expediency.

Judicial activity can take many forms also depending by the next criterion: *nature of the proceedings* subjected to dispute, which is the subject of judicial activity, by the structure, functioning and the competence of the authorities named to realise it, using a certain procedure to solve the cases.

The development and diversification of human activity in all fields determined also, as a corollary, a specialization of jurisdictions as institutions called upon to judge and resolve disputes that arise in a variety of situations and circumstances and in a wide range of human activity.

Within this general trend of specialization of jurisdiction, in the romanian legal system arised the question of *creating a specialized labor jurisdiction on the grounds of a specified legal relationship of employment, generated by the labour contract and specified activities taking place in the world of work,* reflected in terms of regulations. The separation of the labour law from the civil law, led to the creation of a branch of law which is closely linked to the notion of employment, labor relations, and having a number of *specific features.*

The purpose of labor law is to regulate the legal relations of work (individual or collective), representing those social relations ruled by law, between a natural and a legal person, as a result of the provision of a work made by the first person the benefit of the second one, who, in turn, undertakes to remunerate him/her and create the conditions necessary for the provision of such work [10, p.13].

The legal work report is always personal (intuitu personae), and its implementation is characterized by a subordination of the person who is providing the work and its employment to a regulatory organized system and hierarchically functional. The legal right comes as a consequence of non-subordination and non-submission to the labor regulations [2, p.27].

Thus, *the premises of the labor jurisdiction organization as a special jurisdiction are to be found in the particularities of the legal work report and in the consideration of these features*, the labor jurisdiction is called to defend the protection function that is meet by the standards of labor law [2, p.24].

2. THE CONCEPT OF LABOUR JURISDICTION AND ITS SUBJECT MATTER

The labour jurisdiction represents the entire solving activity made by certain organs, of labor conflicts and other demands on labor relations and their associated relationships, including regulations relating to the competent authorities to resolve such disputes and claims, and to the applicable procedural rules [11, p.798].The labour jurisdiction is the attribute of the courts and, only as an exception, labor disputes and other claims related to labor relations and their connected relations can be handled by other bodies as provided by law, after a special procedure (eg. conflicts of interest arbitration).

Law rules on labor jurisdiction are those contained in *Law no. 168/1999 on the settlement of labor disputes, recently abrogated by Law no 62/2011 of social dialogue and in the Labour Code, modified by Law no.40/2011, art. 248, 249, art. 281-291*. Also have an impact in resolving individual labor conflicts, *Law no. 304/2004 on judicial organization*, particularly those relating to judicial assistants, *the Code of Civil Procedure* provisions relating to material competence of the courts in resolving individual labor conflicts and the courts of appeals jurisdiction to hear appeals against decisions of first instance, as well as the others provisions of the Code of Civil Procedure, which according to article 291 of the Labor Code.

Art. 281 of the Labor Code expressly determines that *the labour jurisdiction`s object is to resolve labor conflicts.*

Both the modified Labour Code, and Law no. 62/2011 on the settlement of labor disputes operates with a *suma divisio*: individual labor disputes and collective labor disputes.

Individual labor disputes (or conflicts) is that class of conflict of work that exercises the rights or performance of obligations arising from individual and collective labor contracts or collective agreements and labor relations service of civil servants as well as the laws or other rules and regulations. (Article 1, p.3 iii, lit.p, Law no.62/2011)

Collective labor disputes is that category of labor conflicts that occur between employees and employers is to start, conduct or completion of negotiations on labor contracts or collective agreements.(Article 1, p.3 iii, lit.o, Law no.62/2011)

3. APPLICABLE PRINCIPLES FOR LABOR JURISDICTION

The labour jurisdiction, a highly complex institution that seeks to resolve conflicts that arise within intersubjective relations, is guided by a set of *general principles* of law activity - the principles of organization and functioning of the courts [3, pp.125-141] (legality, equality, gratuitousness, collegiality, advertising) and the principles of conducting the trial in the civil trial (contradictoriality, the right to defense, the judge's active role, availability, advertising, orality and continuity), while maintaining certain *features* resulting from the organization and operation of this jurisdiction and *which it gives specificity.*

The doctrine [9, pp.724-725] formulated a set of *applicable principles to labor jurisdiction*, which highlights its specificity. We can include here:

- the referral of the labour jurisdiction bodies, usually by the person concerned and not by default
- accessibility - by removing or reducing the costs involved in solving the cases
-the composition of the panel of judges at first instance (the court) with the participation of legal aid,
- settling differences between the parties, if possible, through better understanding or dialogue, including in front of the courts, not just in the first day of hearings, but later, during trial
- rapidity in solving the labour cases and in the implementation of decisions on labor disputes.

According to art.285 of the Labour Code, which are fully consistent with the principles listed above, labor disputes are exempt from the legal duty and judicial stamp, and the applications related to these conflicts are examined by emergency (art. 286). Also, the Labour Code modifies the *ratione loci* competence of the courts entrusted to settle labor disputes, stating that the competent court is that in whose district the applicant has its domicile or residence or, where appropriate, address (art.284 point 2), fact that is in the benefit of employees and trade unions who act as plaintiffs in a labor dispute [8, p.105].

There are also guiding ideas invested with the value of a principle, such as the principle of tripartism, which justifies and requires the existence of tripartite labor competent judicial organ with professional judges, representatives of employers and employees, which is the basic principle of International Labour Organisation [13, p.535].Indeed the activity and structures of the ILO is based on the principle of tripartism, which customizes it to all other international organizations, principle that says that the three parties represented in all its organs and bodies (state, workers, employers), have full autonomy [7, p.9].

4. CONCLUSIONS:

The labour jurisdiction is a special one and its organizing premises are to be found in the particularities of the legal work report and in consideration of these features, labor jurisdiction is called to defend the protection function that meet the standards of employment law.

The legal relations of work (individual or collective), are defined as those social relations ruled by law, between a natural and a legal person, as a result of the provision of a work made by the first person the benefit of the second one, who, in turn, undertakes to remunerate him/her and create the conditions necessary for the provision of such work. The legal work report is always personal (intuitu personae), and its implementation is characterized by a subordination of the person who is providing the work and its employment to a regulatory organized system and hierarchically functional. The legal right comes as a consequence of non-subordination and non-submission to the labor regulations.

In line with the views of the wellknowed jurist Marco Barasch, who appreciated since 1947 that: "The labour jurisdiction specialization is seen as the most serious warranty of a genuine application", the romanian legislature is pursuing that goal today, although full specialization of labor law courts, on all levels of jurisdiction, was and still remains a virtual target, unrealized so far.

The trend of diversification of specialized jurisdictions has been criticized by the doctrine because of its disadvantages: multiplication of competence conflicts, slowness in dealing with cases, increasing the expenses of the trials, etc. Some authors emphasizes that the existence of special courts may undermine the unity of judicial system and the prestige of the judicial authority.

However, the benefits of special courts can not be ignored. Thus, they provide guarantee for the best judgments, because the bodies that administer them have personnel assigned to the field that contributes to strengthening the prestige of these bodies. Also, a specialized court can provide a more flexible, faster and less expensive trial.

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ECO-EFFICIENCY IN THE TEXTILE MANUFACTURING ACTIVITY BY APPOSITION ENVIRONMENTAL MANAGEMENT

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Abstract: In the frame of sustainable development the technological and ecological aspects have to be simultaneously taking into consideration.The paper addresses a topical issue for the textile industry, namely how to implement environmental management system and also profile companies to find the best solutions to meet ecological requirements and environmental performance.
Key words: : *textiles, pollution, wastewaters, monitoring, environmental program*

1. INTRODUCTION

Identifying all polluting activities is an essential step for effective environmental protection measures. This means preventive screening of potential occurrences of pollution, in addition to the existing inventory of polluting activities in textile. It is more useful to approach the problem of environmental *pollution prevention* still in the design stage of any technology from the textile industry. Pollution prevention focuses on reducing or eliminating waste before it is created. Pollution prevention pays off with reduced costs and better processes[1,2,]

In the textile proccesing, dyeing and finishing processes require water that eventually ends up as wastewater which has a serious negative impact on the aquatic ecological system.Textile finishing sector is characterized by the use of large quantities of chemicals, textiles that are processed mainly in aqueous media, part of the industries with the largest quantities of waste water [1, 5]. Effluents of textile industry are highly colored and the disposal of these wastes into receiving water causes damage to the environment as they may significantly affect photosynthetic activity in aquatic life due to reduced light penetration and may also be toxic to some aquatic life.

Monitoring of environmental factors, represents the effective practical tool, through which targeted factors are quantified and "monitored" in time, in order to protect, correct or avoid them.

A functional environmental management program requires the simultaneous performing of the following directions: hazardous factors attenuation for environment by means of the development and implementation of clean finishing technologies, development of modern techniques for treatment of wastewater deriving from textile processes and reducing of resources and materials.

Based on the optimized consumption, water, energy and other resources then can be recycled. The result is a form of textile production which is both commercially and environmentally sustainable [4] *Eco-efficiency* as relevant tools, may include: reduction of material intensity of textile products; reduction of dispersion of toxic materials; reduction of energy intensity, enhancement of materials recyclability; extension of textile product lifetime; use of sustainable renewable resource; increase the service intensity of products.

Table 1: Description of eco-efficiency objectives [5]

Objective	Features
Reducing the consumption of natural resources	-minimizing the use of energy, materials, water and land -enhancing recyclability and textile product durability
Reducing the impact on nature	-minimizing air emissions, water discharges, waste disposal and the dispersion of toxic substances, fostering the sustainable use of renewable resources
Increasing textile product or service value	-providing more benefits to customers through textile product functionality -providing additional services and focusing on selling the functional needs that customers actually want

2. ENVIRONMENTAL ASPECTS INDUCED BY THE TECHNOLOGIES PERFORMED BY A TEXTILE COMPANY AND ENVIRONMENTAL MANAGEMENT PROGRAM - A CASE STUDY

Environmental analysis was performed for all textile processes and technological activities from a textile company that processed fabrics. That have generated or having the potential to generate environmental impacts The company possesses the entire textile technological flux of obtaining of all textile products, endowing a wastewaters pre-treatment plant. Monitoring all polluting factors as well as the induced impacts onto environment and setting the significant environmental issues were made by applying a specific scale for assessing the severity of the impact.
After the assessment of impact and total score obtained, the most significant issues have been highlighted (Table 2).

Table 2: List of significant environmental aspects of a textile company

RELEVANT ENVIRONMENTAL ASPECTS			
Environmental aspect	**Affected Environmental factor**	**The original process**	**Significant aspect yes / no**
Unfixed dye and dyeing auxiliaries concentration in solutions	WATER	Dyeing section	yes
Unduly spent consumption of natural gas due to the heating system of the iron High atmosphere steam and temperature.	RESOURCES, AIR	Final finishing section	yes
Loss of water through condensation	RESOURCES, WATER	Dyeing section, prefixation apparatus	no
The occurrence of hazardous substances in dye baths as well as in the technological wastewater from pre-treatment tank	WATER SOL	Dyeing Branch Water pre-treatment plant	yes
Smell emanating from chemicals and pre-treatment and tank sludge	AIR	Chemical storehouse Water pre-treatment plant	yes

In order tom reduce or remove the environmental impact of significant environmental aspects, the company must continuously assess, document, implement, maintain and improve the environmental management system [3].
Taking into account the actual data from the environmental analysis, a general management program has been assessed and proposed including environmental objectives, targets and actions necessary to assure items and processes in the textile company eco-efficiency (Table 3).

Table 3 : Proposal environmental management program

Environmental aspects	Objectives	Targets	Required activities
Emissions of dust, textile powders	Maintaining within normal parameters of the concentration of textile dust form pollutants	Amount of absorbed powders by dust absorption system	Installation of additional absorption systems in production plants
Emissions in water from dyeing sections	Use of chemicals with low environmental impact in dyeing operations	Improved quality indicators of sewage Discoloration of water from pre-treatment station Increasing of dye fixation efficiency of	Substitution of dyes and auxiliaries with eco-friendly products Water detoxification and neutralization of dye wastewater Sludge and lint monitoring and from pre-treatment of waters deriving from dyeing plants
Emissions in water	Mechanic-biologic combined pre-treatment with activated sludge	Monitoring of pretreated wastewater discharged into the public sewerage system Minimizing of “hard biodegradable" compounds by adsorption purification with activated charcoal powder.	Improving of water quality by adding an extra step for the biological treatment Pre-treatment of mixed wastewater within an unitary own station and exhaustion of pretreated wastewater into the public sewage drainage in compliance with legal requirements.
Gas emissions into the atmosphere	Self monitoring of gas emissions	Permanent verification and monitoring of stations, boilers	Acquisition of equipment to control emissions from plants. Adequate Filters and exhaustion systems
Noise pollution	Reducing of a person’s daily exposure to noise.	Phonic insulation of noise sources from the production plants	Wearing of personnel protective equipment (helmets, air protectors)
Reducing of consumption of water, gas and energy	Recovery of water from prefixing plants	Reducing of water consumption	Installing of a small tank for collecting and recycling of water discharged from the apparatus
	Reducing the dye baths	Reduced water consumption	Acquisition of some dyeing devices with reduced bath ration
	Reducing of energy consumption	Reduced energy consumption	Simultaneously cooling during the rinsing operation of textile products
	Reducing of methane consumption, emission program	Reduced methane consumption	Replacement of thermal plant with another one more efficient
Soil Pollution by wastes	Recovery and exploitation of reusable wastes of thin film of polyethylene	Quantity of polyethylene film recovered	Recovery of polyethylene film from received packaging
Olfactory pollution	Reduction of olfactory odor caused by chemicals used in wet processes	Optimized consumption of volatile chemicals	Warehouse facilities with odor absorption device
Negative impact onto community expectations.	Special arrangements, facilities and measurements for environmental protection	Measures for resource conservation. Reducing the negative impact onto the environment and human health.	Volume of investments with real effect onto the environment

3. EFFICIENCY OF ENVIRONMENTAL PROGRAMS IN TEXTILE INDUSTRY

The current objective in textile industry management is the integrated prevention and decreasing of environment pollution, correlated at the exploiting of certain equipment. That is why some measures leading to a potential prevention, as well as to the air, water and soil emissions reduction, taking into consideration the management of wastes at a high level protection, generally speaking [5].

The current approach to the management from textile industry will be completed in a few key points: the description of processes, environmental risks and control techniques, current levels of consumption and emissions, wastewater reduction opportunities through prevention, exploiting and treatment, as well as levels of accepted emissions, monitoring compliance.Apposition of a management program by the textile company will certainly lead to the achievement of environmental performance. Development of pollution prevention methods such innovative textile technologies for wastewater treatment and reuse, information and communication management instruments, will help to environmental sustainability [1, 4].

For efficiency environmental programs in the textile industry a few issues will be followed:

-pollution prevention can be evaluated against the technical and economic options in terms of criteria that are most important to the specific facility (water waste, waste reduction and toxicity reduction of raw materials and energy consumption, lower costs operation and maintenance, short-term implementation period and easy implementation, regulatory compliance),

-weighing the advantages and disadvantages of each option in terms of solutions to be positive for environment

-some options may involve an assessment by means of the environment, particularly if they involve product or process changes or substitution of raw materials [4,5].

Based on efficiency for environmental program analysis, companies can re-engineer or re-design their processes to reduce the consumtion of resources, avoid the risk , reduce pollution and costs.

4. CONCLUSIONS

The proposed solutions regarding the apposition environmental programs must be further optimized in real life conditions of each textile company.

Finally, it can be claimed:

- Eco-efficiency will be just as important as the economic efficiency, for every textile company trying to stay competitive on a global market.
- The sustainable approach for environmental management implementation in textile manufacturing activities represents a major concern worldwide.
- The case study presented with selective data selection can be considered as an application simulation of an environmental management program in a company processing textile fabrics and wishing economic and ecologic efficiency.
- For each textile technological process is mandatory to adapt the treatment recipes in terms of quantity of chemicals used as well as their environmental behavior and management of textile processes from point of view of reducing environmental pollution.
- In this context, the above mentioned aspects represent a priority objective for the research in the textile industry, focusing on the production quality and increasing of eco-efficiency.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

HIGH QUALITY ATHLETIC SOCKS – materials and characteristics

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Abstract: The type of sock choose for sport can make, by them materials and design characteristics, a big difference in the comfort, safety and even performance. In athletic activities, wearing proper socks is critical because every action creates different stress points on the human foot. In odder to prevent injury, to reduce the incidence of blisters and other foot problems, the socks must keep feet dry and comfortable, no matter what the temperature, and to fit as well as possible. The paper concerns the types of fibers used in socks and the design conditions that largely affect the complex requirements imposed to all socks, and especially to the athletics ones. It is realised an over view of natural and synthetic fibers that help keeping good physiological conditions, minimize friction and create an environment that promotes healthier feet, and of the general and particular design characteristics that answer to the special needs imposed to the socks by different athletic activities.
Key words: athletic sock, fibers, design characteristics.

1. INTRODUCTION

Wearing the proper socks is critical to athletic activities, because more then common socks they must ensure comfort, safety and even performance.

High-performance athletic socks must reduce as much as possible the incidence of blisters and other foot problems, by [1]:

- a good protection of foot, against cold or excessive hot:
- an exceptionally well fit, to reduce friction;
- an appropriate cushioning;
- a good moisture transfer capacity, to ensure pleasant microclimate next to the skin, which remains dry and comfortable.

To solve these requirements, both material composition and design characteristics of the athletic socks are implied.

2. FIBERS FOR SPORT SOKCS

Now, socks are knitted by different types of fibers, whose properties largely affect the sock characteristics.

Cotton is a soft natural fiber that absorbs moisture very well, but it is not recommended for most athletic socks, because:

- it dries slowly and, if layered next to the skin, causes wet feet by holding moisture;
- the sock of cotton can easily lose its shape and stretch in the sport shoe.

These behaviors result in a high potential for blisters and infections.

Cotton can help pull moisture away from the foot only if layered away from the skin.

Wool fibers offer benefits in socks for cold weather exercises, because they are warm natural fibers that provide cushioning and retain heat when wet. In the same time wool socks have the disadvantage to retain moisture and to dry in a long time.

Merino Wool is a very fine, long silky fiber that guarantees a wool sock that won't itch. Wool is the most hydrophilic of all natural fibers, absorbing as much as 30% of its weight without feeling wet. Besides being a natural wicking fiber, wool doesn't attract dirt because it is an anti-static fiber.

Hydrophobic fibers are materials that tend to repel water. The newer athletic socks are made of these kind of synthetic fibers used as an inner moisture-repelling (hydrophobic) layer, combined with an outer layer of moisture-attracting (hydrophilic) fibers, which wick moisture away from feet.

Hollofil fiber offers superior insulation, each fiber having a column of trapped air which runs through the center. Because this hollow core cross-section Hollofil fibers are thicker, fluffier, and warmer than solid-core fibers of the same weight.

Ingeo is the first man-made fiber derived from 100% natural, annually renewable resources like corn. It has low odor retention, offering the wearer optimum comfort, confidence and freshness. It is soft to the hand and feels natural against the skin. Ingeo's excellent wicking properties transport moisture away from the foot. It dries very quickly, has superior low pilling performance, does not cause allergic reaction in third-party testing, and does not support bacterial proliferation. When products made of Ingeo come to the end of their useful life they can be returned to the earth without any negative impact on the environment unlike the problematic petroleum based products.

CoolMax is a synthetic fiber, with four-channel, specially engineered to quicly transport perspiration away from the skin to the surface of the sock where it can evaporate. CoolMax helps regulate temperature keep feet dry and comfortable, providing breathability even when wet [2].

Microfiber Acrylics are exceptionally soft, low-bulk synthetic fibers, wicking moisture way from feet, helping eliminate blisters.

Polypropylene is a lightweight synthetic fiber with higher thermal insulating value than most other solid core fibers, which offers excellent wicking in socks.

Thermolite provides warmth and comfort without weight even when wet. With its hollow-core fibers that trap air for greater insulation, Thermolite is lightweight while offering heavy-duty performance. The larger surface area allows for faster evaporation by speeding moisture away from the skin to the surface of the fabric. Thermolite also dries 20% faster than other insulating fabrics and 50% faster than cotton.

X-STATIC—The Silver Fiber is a silver-coated nylon fiber that:

- helps eliminate foot odor (even after wearing a few days without washing);
- inhibits foot bacteria and fungi. (Silver is used in hospitals to heal burn victims, and to protect patients against infection);
- transfers heat away from the foot, silver being the most conductive element, the hotter feet get, the better X-STATIC socks perform;
- continues to be effective wash-after-wash because, washing actually enhances the antimicrobial and therapeutic performance of the X-STATIC socks — water releasing more silver ions (water is a catalyst).

AXT 50/50 is a revolutionary intimate blend of merino wool, wool, and top - quality, long-staple polypropylene fiber that dries 25% faster than other merino wool socks and is $3^{1/2}$ times more abrasion resistant. The blend also resists deterioration from mildew, perspiration, and weather.

Socks with AXT 50/50 [3]:

- improve upon merino alone by offering better moisture transfer to help keep feet dry and prevent blisters;
- have greater durability for extended wear;
- weight less than other merino wool socks, so wearers carry a lighter load;
- do not support bacterial growth, so there is less chance of foot odor.

Drymax fibers were designed to not carry surface charges, so the positive and negative charges of the water are not attracted to them [4]. Consequently, a water drop is actualy bending around the fiber, rather than sticking to its surface (Fig.1). So, sweat droplets move instantly through the fibers, drymax socks staing dry and needing no drying time to keep the skin dry. In sport socks, Drymax fibers are utilise in a Dual Layer System including an inner and an outer layer, based on a plush structure (Fig.2):

- the plush yarn, wich creates the inner layer in a direct contact to the skin, is realised of Drymax fibers (super hydrophobic) that mechanically lift sweat off the skin, instantly transfering it to the outer layer;
- the based yarn, wich creates the outer layer, is realised af a (hydrophilic) moisture attracting fiber.

The Dual Layer creates a remuval moisture system capable of keeping the skin and the nails dry.

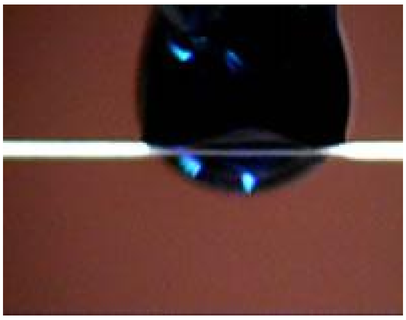

Fig. 1: Water drop bending around the fiber

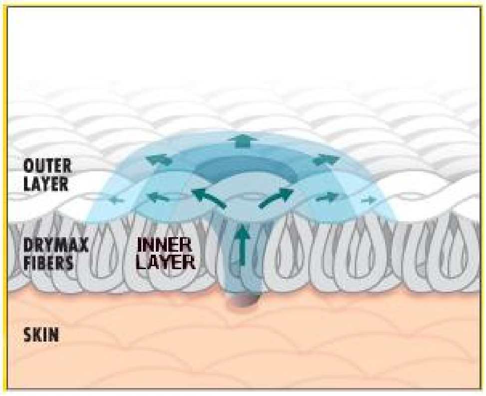

Fig. 2: Dual Layer System including an inner and an outer layer

3. SPECIAL DESIGN CHARACTERISTICS FOR ATHLETIC SOKCS

Wearing the proper sock is critical for athletic activities, more than for usual activities, reason to create socks that by them characteristics to ansver to the special needs imposed by this kind of activities.

♦ Active odor control

Because bacteria grow in damp environment, using yarns that keep the feet dry is the first condition to eliminate odors caused by them. To further eliminate odors, on, or inside the fibers, it were realised an antimicrobial treatment. By example, Drymax created MicroZap, a zirconium phosphate based ceramic ion-exchange resin, which contains silver. Because the silver antimicrobial is molecularly infused into Drymax fibers as they are being extruded, it is non-migratory, non-toxic, and produces long term Active Odor Control for socks, silver ions interfering with bacterias metabolism (Fig. 3).

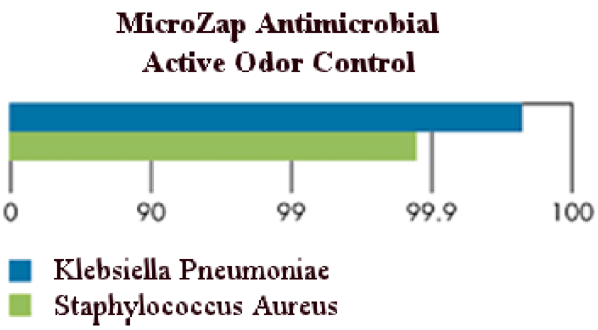

Fig. 3: Percent reduction bacteria

♦ Protective dense padding

Fat pads protect our feet, but them are destroy from shearing forces from walking and running on hard surfaces as hard floors and asphalt (Fig. 4). To protect the fat pads from shearing forces, the socks are designed with cushion fabrics in heel, forefoot and toe areas, based on terry structure (Fig. 5) [5].

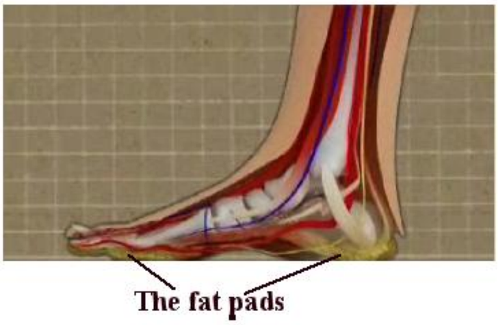

Fig.4: Fat pads

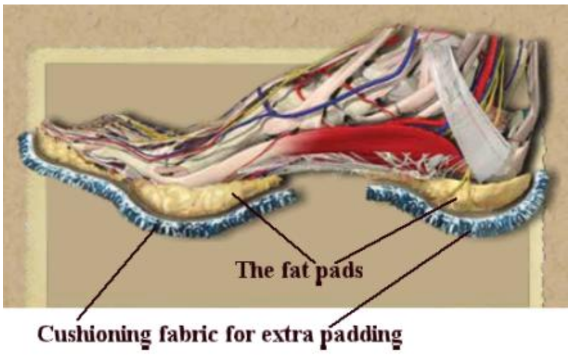

Fig. 5: Cushioning fabric

Over the past few years, the inside comfort of footwear has improved dramatically, eliminating the need for ultra thick socks. Thickly padded socks, affects the fit of the shoes, and ultimately the comfort of the feet. Dense padding is used as opposed to thick padding, because dense padding protects the feet without adversely affecting the fit of the shoes

In connection to the specific conditions of different athletic activities, Drymax designed five density levels of protective padding (Fig. 6), as example, a Medium Density sock having 43.200 terry loops in a square inch.

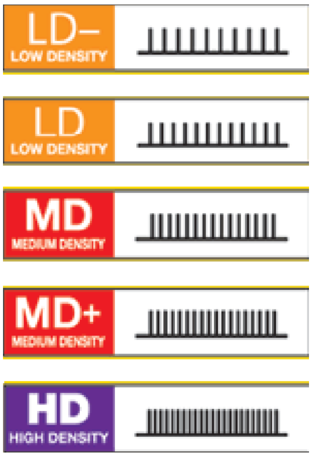

Fig. 6: Levels of protective padding

- Preventing blister

Foot blisters are most comeon on the toes, heel and ball of the foot. Blister on the feet are the most common sports imjury and seems inevitable when running ultra long distances, one study in the Journal of Sports Medicine, reporting that up to 39% of marathon runners experienced foot blisters. While distance running, feet get hot and perspire and socks become wet. Moisture significantly increases friction between socks and skin, a higher friction resulting in a greater chance of getting blisters. To prevent blisters during ultra-long distance runs, Drymax created Friction Free Blister Guard System. This system incorporates profilen and Drymax fibers blended together. Profilen, chemicaly known as polytetrafluoroctylene (PTFE), has the lowest coefficient of frictio of any fiber. This makes profilen the best to keep friction low between the skin and the sock (Fig.7).

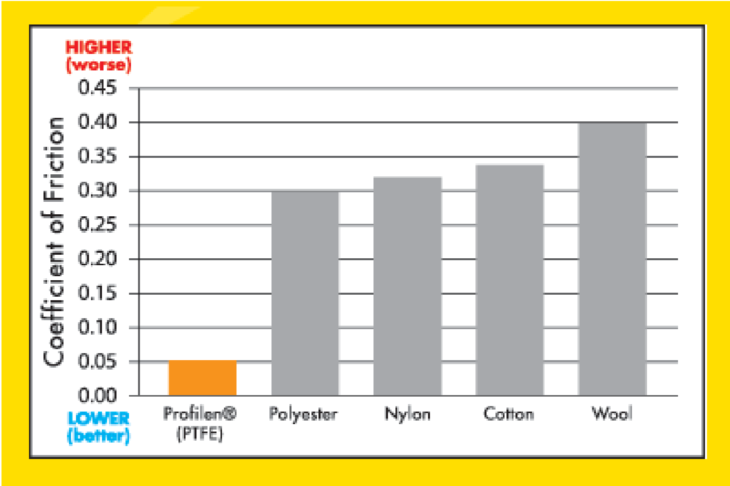

Fig. 7: Fiber friction comparation

♦ A 3D Advance Fit

Sock sizing systems have not changed much since the era of the "one-size-fits-all" tube socks. With this sizing, women and men with either small or large feet are unable to find properly fitting socks:

- on smaller feet, excess sock material "bunches up" in the shoe (Fig.8a);
- on larger sized feet, the socks were too tight.

So, improperly fitting socks can be uncomfortable and cause blisters.

The True Fit sizing system, developed by Drymax on special 3D anatomically shaped foot models, conform better to the shape of the foot (Fig.8b). The socks are aviable in 5 size, with 5/8 of an inch difference in length between each size. Each sock is coded using a color size-marker (S, M, L, XL, XXL), being much easier the sorting after laundering, end create even a conection to the level of the density (Fig.9).

Fig. 8.a: Improperly fitting sock

Fig. 8.b: Properly fitting sock

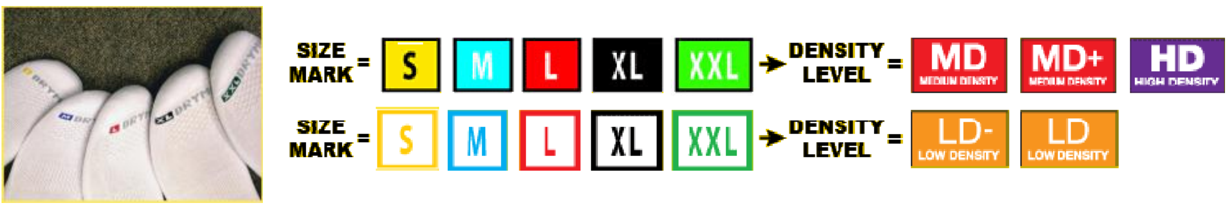

Fig. 9: Colored size code

♦ Areas with knitted structures to cool the feeet

For particular athletic activities, to keep the feet cooler and dry, the socks are designed with top mesh panels and bottom air vents (Fig. 10), that are corelated with the built-in vent system in the new generation of breathable sport shoes (Fig. 11) made by Adidas (Clima Cool), Mizuno (Intercool), Nike i.e.

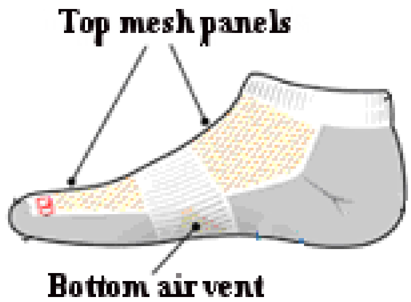

Fig. 10: Air vent areas

Fig. 11: Breathable sport shoe

♦ Seamless inside

To ensure the most comfortable fit without irritation at the toes, is used a linear-looped or Lin Toe seams. These seams feel flat and smooth against the foot.

Linear-looped seam: a “no feel” toe seam that uses very fine stitches for a flat, smooth seam.
Lin Toe seam (Fig. 12): a looped, “no feel” toe seam very much like hand- looped seam. It is flat and comfortable, but completely finished on the knitting machine.

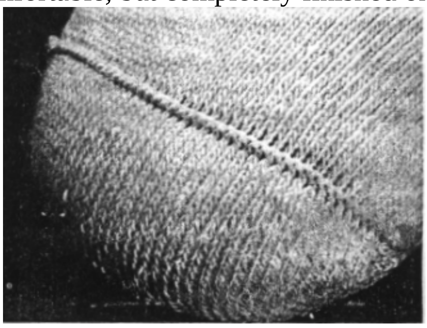

Fig. 12:
Lin Toe seam

♦ Long lasting comfort, durabilyty and looks

To last a long time, athletic socks must incorporate fibers that do not get stiff, shrink, or lose shape over time. In its socks, Drymax used special fibers, Drymax & Poiyester fibers, that have a comfortable springiness, and special abrasion resistant Nylon fiber reinforcements placed in the normal heel & toe wear areas.

As example are ilustrated a Running sock (Fig. 13) and a Hot weather running sock (Fig.14) that have the following special characteristics:

- a vanted arch band, that cools and dries feed and holds sock in place;
- breathable mesh, that cools and dries feet, placed only ovet the toes, or along the feet as stripe vents;
- excepting Hyper thin running socks (realised only by flat knit), the other running socks have protective padding with different density (MD+, LD, LD-), according to them destination.

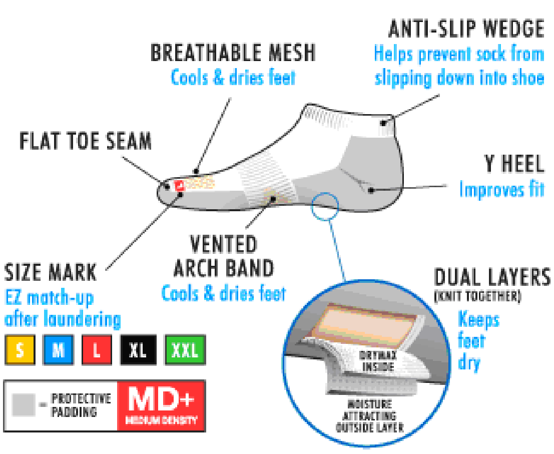

Fig. 13: Technical characteristics of Running socks

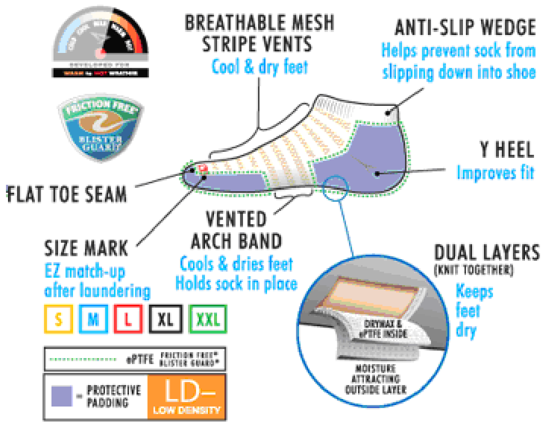

Fig. 14: Technical characteristics of Hot weather running socks

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

ASSEMBLING PARAMETERS OPTIMIZATION BY SEWING USED TO PROTECTIVE CLOTHING

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Abstract: The paper addresses problems on reconciling and degree of dependence between the strength characteristics of the seam assembling (breaking load, elongation at break) and sewing parameters (density steps in the seam, thread fineness to merge) by correlation analysis and regression analysis to optimize the parameters used in the assembly by sewing special purpose products. Experimental data for the study were obtained as a result of experimental research in laboratory conditions determining the load and seam elongation at break of 301 type assembly direction, the breaking load perpendicular to the direction of assembly for seven types of fabrics for protective clothing. For research were used SS-type joints – a1, are applied three densities of the steps in seam 3, 3.5, 4 steps / 1 cm and using three types of fineness of yarn to merge No.25/2, 30/2, 40/2 type Gütermann (Pes 100%). The result sought is finding functional dependencies represented analytically and graphically.

Key words: Breaking load, elongation at break, the density of steps, the fineness of the sewing thread, statistical and mathematical processing of experimental data.

1. INTRODUCTION

A good design of the protective clothing requires knowledge about complex constructive and technological aspects required to products while wearing and maintenance. Considering the harmful and damaging factors and risk factors to which is subject to protective clothing, by binding to the assembling by sewing used in the manufacture of protective clothing are imposed requirements of high quality, such as providing wear resistance, durability of the assembly, resistance bending etc. [1]
Qualitative assessment of quality indicators of assembling by sewing is influenced by structural properties of the joints and raw materials used, structure and density of points in the seam, technological parameters of sewing, thread connecting fineness, the fineness of needles used, type of finishing materials, etc. Sustainability assembling by sewing, is one of the main technological requirements imposed on special-purpose products, when products are continuously subjected to a series of requests (tensile, compression, bending, abrasion, weathering action and the noxious and harmful factors) is the assembling ability by sewing to resist to destroying to the action of external loads, it is characterized by the breaking load (effort, which broke wires in the assembly or material near the seam) and elongation at break. [1]

The most common application is the extent it can be analyzed in laboratory conditions, determining the behaviour of joints made with different samples with standard sizes. [3,4]

The purpose of this study was to determine the behavior of assembly lines (of 301- $SS_{a}1$), using seven types of fabrics for protective clothing, adopting various stitch densities of steps, such as 3; 3.5; 4 steps / 1 cm and fineness N_o. 25/2, 30/2, 40/2 type Gütermann (Pes 100%). The experiment is performed in accordance with the requirements set in STAS 28073-89. [5]

The dependence of the assembly parameters by sewing as the breaking load, elongation at break is recorded in the tensile test machine type PT-250M-2, the results obtained presenting interest from theoretical and experimental point of view. To appreciate the consistent results for each feature requires a considerable number of determinations, forming a basis for the statistical mathematical processing.

Process optimization using mathematical methods of analysis involves the methods of correlation analysis and regression analysis. [2]

Thus, the paper aims to determine the correlation between the empirical model and experimental data set, or the precision with which a model describes the experimental data using regression analysis provided.

2. METHODS USED, INTERPRETATION OF RESULTS

The estimation of linear weighting models by the method of least squares and calculate the statistics needed to perform the statistical tests associated to Regression procedure, one of the most complex form Excel statistical processing package. For 2D data processing system, the variable *y* corresponds to either load at break or elongation at break, and the variable *x* is represented either the density steps in the seam or the fineness thread. The correlations between indicators investigated in the paper is presented graphically on the function of type *y = f (x).*

In the tables below are centralized a lot of experimental data, the dependent variables representing the mean values corresponding to the 21 types of research on load and elongation at break of the assembly by stitching required to drive the assembly direction and perpendicular to the direction of assembly of seven types of experimental samples, applying three types of densities of the seams and using three types of thread fineness.

Table 1: Indicators needed to develop the mathematical model

The type of the samples	Dependent variable			Independent variable	
	y_1	y_2	y_3	x_1	x_2
S 1 (Cotton 100%) S 2 (Cotton 65%, Pes 35 %) S 3 (Cotton 35 %, Pes 65 %) S 4 (Cotton 35 %, Pes 65 %) S 5 (Polytetrafluoroethylene) S 6 (Polytetrafluoroethylene) S 7 (Pes 100 %)	T – The tear in the direction of the stitching task, N	E – Elongation at break relative to the direction of stitching, %	Tp – Tensile load perpendicular to the direction of stitching, N	D – density steps in the seam, steps/1cm	F – The fineness of thread, N_m.

The mathematical model for linear regression analysis is presented in table 2.

Table 2: The mathematical model for linear regression analysis

Nr.crt.		The values of the dependent variables			Values of independent variables	
		y_1 , T (N)	y_2 , E (%)	y_3 , Tp (N)	x_1 , D (steps /1cm)	x_2 , F (N_m)
1		2	3	4	5	6
S1	1	862	28	201,6	3	120
	2	1016,2	29	238,4	3	100
	3	1077,8	30,8	322,2	3	80
	4	930	28,8	253,6	3,5	120
	5	1097	31,8	260	3,5	100
	6	1097	31,2	329,4	3,5	80
	7	997	30,8	279,6	4	120
	8	1153	33	324,4	4	100
	9	1195	32,6	418,6	4	80
S2	1	716	20,4	260	3	120
	2	729	20,4	238	3	100
	3	769,6	20,4	418,6	3	80
	4	727,4	20,6	265	3,5	120
	5	733	22	260,8	3,5	100
	6	787,4	21	436,6	3,5	80
	7	751,6	21,5	284,2	4	120
	8	741,6	22,8	324,8	4	100
	9	813,7	22	529,6	4	80

Table 2: Further

1		2	3	4	5	6
S3	1	1002,4	31,8	228,2	3	120
	2	1005,2	32,4	240	3	100
	3	1109,6	37,2	401,4	3	80
	4	1011,4	32,1	242,2	3,5	120
	5	1013,6	35,2	282,2	3,5	100
	6	1139	39,2	402	3,5	80
	7	1015	34,2	272,4	4	120
	8	1038,2	37,6	317,2	4	100
	9	1172	40,4	423,6	4	80
S4	1	957	28,8	183,4	3	120
	2	1196,8	32	241,6	3	100
	3	1611,6	37,8	405	3	80
	4	1015,2	31,4	211,6	3,5	120
	5	1234,8	34	248	3,5	100
	6	1621,8	39	444	3,5	80
	7	1027,6	31,6	293,4	4	120
	8	1236,4	34,8	291,4	4	100
	9	1703,4	39,4	484	4	80
S5	1	380	23,2	287,4	3	120
	2	567,7	32,8	334,2	3	100
	3	583,2	32,8	420	3	80
	4	420,4	26,6	310,6	3,5	120
	5	584	35,34	345,6	3,5	100
	6	621	35,4	421,2	3,5	80
	7	495,4	31,2	335,2	4	120
	8	595	35,4	374,2	4	100
	9	625	38,4	427	4	80
S6	1	532,6	9,8	247,4	3	120
	2	525,8	12,8	259	3	100
	3	644,6	13	428	3	80
	4	534,4	10,6	252	3,5	120
	5	578,8	13	280	3,5	100
	6	672	14	436	3,5	80
	7	538	11,2	283	4	120
	8	596,6	13,8	355	4	100
	9	671,6	14,8	480,8	4	80
S7	1	1122,6	24	222,8	3	120
	2	1041,4	29,2	230,2	3	100
	3	1098	39,2	404,6	3	80
	4	828,75	27	249,6	3,5	120
	5	1057,2	33,2	256,4	3,5	100
	6	1116,8	30,2	477	3,5	80
	7	820	29,4	318	4	120
	8	1066,2	34,4	342,4	4	100
	9	1131,4	30,6	515	4	80

The dependence degree of estimated parameters *y* (load and elongation at break in the direction of assembly and perpendicular to the direction of assembly), *x* (density steps in the seam, fineness of thread) is established by determining the correlation coefficients.

The correlation coefficients for dependent and independent variables were calculated in Excel by applying Correl parameter, the results being presented in table 3.

Table 3: The correlation coefficients between the strength characteristics of the seam assembling and sewing parameters

Nr.crt.	The type of the samples	x_i	M.U.	y_1 , T (N)	y_2 , E (%)	y_3 , Tp (N)
1	S1	x_1 , D	Steps /1cm	0,528041	0,71429	0,584448
2		x_2 , F	N_m.	-0,7884	-0,5814	-0,75278
3	S2	x_1 , D	Steps /1cm	0,414378	0,833494	0,31401
4		x_2 , F	N_m.	-0,7888	-0,14709	-0,81416
5	S3	x_1 , D	Steps /1cm	0,23753	0,488094	0,267281
6		x_2 , F	N_m.	-0,8617	-0,84512	-0,90124
7	S4	x_1 , D	Steps /1cm	0,101952	0,277834	0,32125
8		x_2 , F	N_m.	-0,97763	-0,94155	-0,86716
9	S5	x_1 , D	Steps /1cm	0,299475	0,489348	0,26575
10		x_2 , F	N_m.	-0,8658	-0,77329	-0,9391
11	S6	x_1 , D	Steps /1cm	0,244398	0,362428	0,291771
12		x_2 , F	N_m.	-0,90749	-0,88018	-0,88987
13	S7	x_1 , D	Steps /1cm	-0,29073	0,065608	0,421392
14		x_2 , F	N_m.	-0,68382	-0,64296	-0,8038

Predicted values for dependent variables can be calculated from linear regression equations, summarized in table 4.

Table 4: Linear regression equations of the dependence between the strength characteristics of the seam assembling) and sewing parameters

Nr. crt.	The type of the samples	Variable	The linear regression equations	
			x_1 , D (steps /1cm)	x_2, F (N_m)
1	S1	T, (N)	$y_1 = f(x_1) = 129,67x_1+593,39$	$y_1 = f(x_2) = -26,67x_2+1469,5$
2		E, (%)	$y_2 = f(x_1) = 2,866x_1+20,633$	$y_2 = f(x_2) = -0,325x_2+35,82$
3		Tp, (N)	$y_3 = f(x_1) = 86,8x_1-11,822$	$y_3 = f(x_2) = -13,61x_2+507,55$
4	S2	T, (N)	$y_1 = f(x_1) = 30,767x_1+644,46$	$y_1 = f(x_2) = -6,77x_2+859,42$
5		E, (%)	$y_2 = f(x_1) = 1,7x_1+15,283$	$y_2 = f(x_2) = -0,06x_2+22,183$
6		Tp, (N)	$y_3 = f(x_1) = 74x_1-76,289$	$y_3 = f(x_2) = -22,065x_2+684,65$
7	S3	T, (N)	$y_1 = f(x_1) = 36x_1+930,27$	$y_1 = f(x_2) = -15,194x_2+1296,8$
8		E, (%)	$y_2 = f(x_1) = 3,6x_1+22,967$	$y_2 = f(x_2) = -0,78x_2+47,916$
9		Tp, (N)	$y_3 = f(x_1) = 47,867x_1+144,6$	$y_3 = f(x_2) = -19,366x_2+618,76$
10	S4	T, (N)	$y_1 = f(x_1) = 67,333x_1+1053,7$	$y_1 = f(x_2) = -80,154x_2+2558,5$
11		E, (%)	$y_2 = f(x_1) = 2,4x_1+25,911$	$y_2 = f(x_2) = -1,015x_2+50,386$
12		Tp, (N)	$y_3 = f(x_1) = 79,6x_1+32,778$	$y_3 = f(x_2) = -25,438x_2+714,15$
13	S5	T, (N)	$y_1 = f(x_1) = 61,5x_1+326,05$	$y_1 = f(x_2) = -24,614x_2+931,03$
14		E, (%)	$y_2 = f(x_1) = 5,4x_1+13,449$	$y_2 = f(x_2) = -1,189x_2+51,189$
15		Tp, (N)	$y_3 = f(x_1) = 31,6x_1+251,11$	$y_3 = f(x_2) = -13,912x_2+581,99$
16	S6	T, (N)	$y_1 = f(x_1) = 34,4x_1+467,87$	$y_1 = f(x_2) = -15,514x_2+833,91$
17		E, (%)	$y_2 = f(x_1) = 1,4x_1+7,655$	$y_2 = f(x_2) = -0,464x_2+19,914$
18		Tp, (N)	$y_3 = f(x_1)\ 61,46x_1+120,56$	$y_3 = f(x_2) = -22,488x_2+691,74$
19	S7	T, (N)	$y_1 = f(x_1) = -81,467x_1+1316,5$	$y_1 = f(x_2) = -25,646x_2+1437,4$
20		E, (%)	$y_2 = f(x_1)\ 0,6667x_1+28,467$	$y_2 = f(x_2) = -0,902x_2+45,095$
21		Tp, (N)	$y_3 = f(x_1) = 105,93x_1-35,65$	$y_3 = f(x_2) = -23,461x_2+706,58$

One way of interpreting the data obtained by applying linear regression analysis is a graphical representation of the type y = f(x) of the original data and the empirical model and those calculated from the regression.

In this paper is presented a series of charts of distribution function for the sample 1, the whole totally of graphic interpretation of the results of experiments encompassing 42 charts equated with the number calculated by linear regression equations.

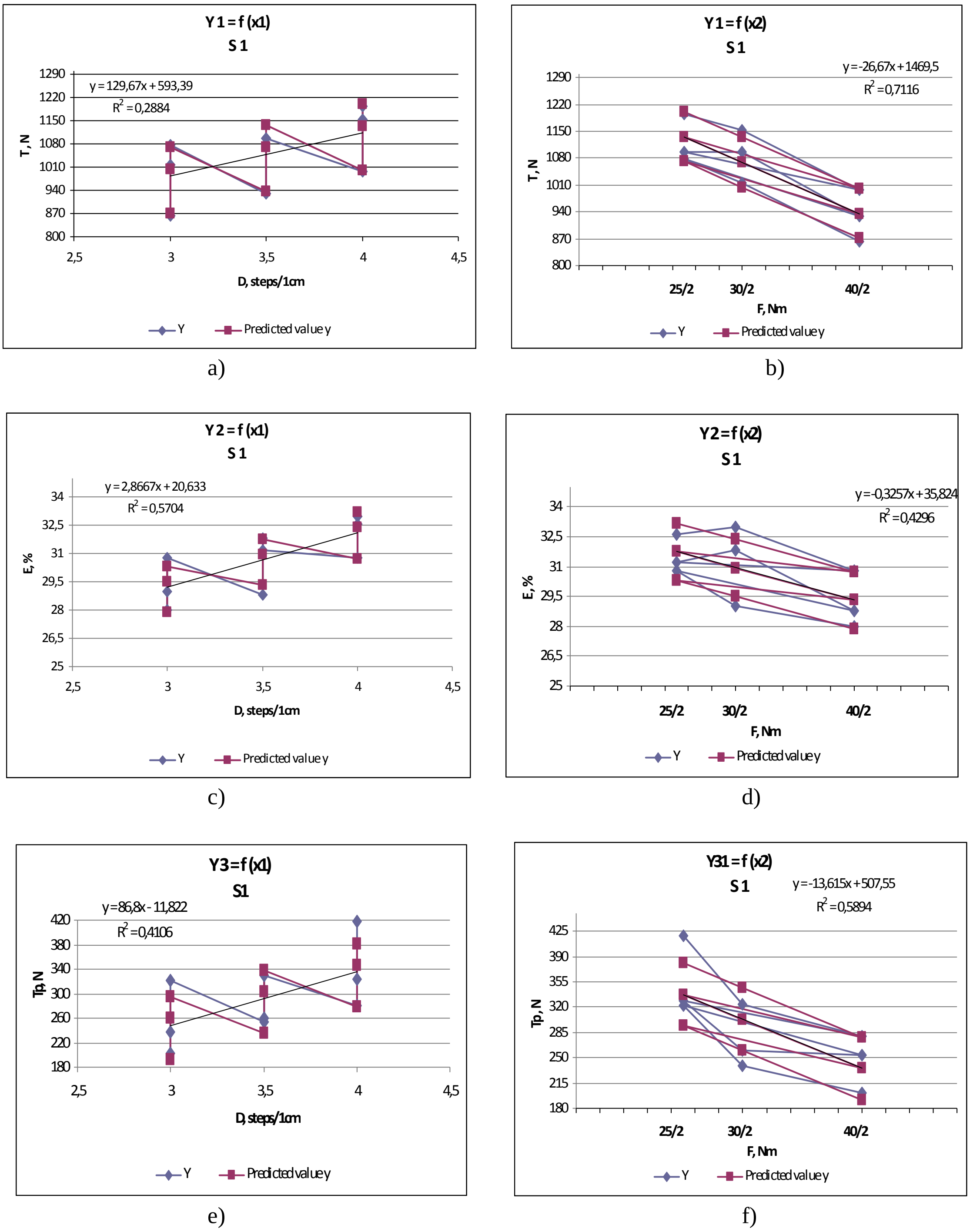

Fig. 1: Graphic interpretation of distribution function for the sample 1 the parameters:

a) the tear in the direction of the stitching task – density steps in the seam;
b) the tear in the direction of the stitching task – the fineness of thread;
c) elongation at break relative to the direction of stitching – density steps in the seam;
d) elongation at break relative to the direction of stitching – the fineness of thread;
e) tensile load perpendicular to the direction of stitching – density steps in the seam;
f) tensile load perpendicular to the direction of stitching – the fineness of thread

On linear regression coefficients presented in table 3 it can be stated that:

- for interdependence between dependent variables (y_1 – load and y_2 - elongation at break in the direction of assembly, y_3 - breaking load perpendicular to the direction of assembly) and the independent variable (x_1 - stitch density steps) is highlighted positive character, thus the links between equation variables are direct, namely by increase the dependent variable increases the independent variables of regression equation, (which confirms the graphical representations in Figure 1 a, c, e);

- for interdependence between dependent variables (y_1, y_2, y_3) and independent variable (x_2 - sewing thread fineness) gives the indirect link, dictated by the condition $r < 0$, means that with increasing the dependent variable decreases independent variables of regression equation (which confirms the graphical representations in Figure. 1 b, d, f). Thus increase in the permissible limit the joint strength with decreasing fineness thread of assembly;
- analyzing the correlation coefficients between the empirical model parameters (tab. 3) can show a strong link between moderate and dependent variables (S, A, Sp) and the fineness of the thread for all seven types of samples subjected to experimental research, which signifies the strong link between the finesse of sewing thread (Nm. 40/2, 30/2, 25/2) and adequate seam strength (type 301 - SS - $_a$1) in protective clothing. Intensity relationship between the variables (T, E, Tp) and the density steps in the range of densities of 3, 3.5, 4 step/1cm is strong and average for the samples S1 (cotton 100%), S2 (Cotton 65%, Polyester 35%), weak for samples S3, S4 (cotton 35%, Pes 65%), M5, M6 (polytetrafluoroethylen) and S7 (Pes 100%), meaning that the density selected by 3, 3.5, 4 steps in seam influences differently on the strength characteristics of the seam joints for samples with different structural characteristics.

3. CONCLUSIONS

This paper addresses the problem of optimizing the seam parameters that influence the strength characteristics of assembling by sewing for different types of fabric for protective clothing.

As results were obtained 42 equations of linear regression through which can be predicted the dependent variable values of the characteristics of resistance seam, as result being optimized the stitch density values in sewing and selected consistently the thread fineness depending on the assembly characteristics of assembling by sewing and the types of materials used to manufacture protective clothing.

Graphs of the distribution function of the experimental data and calculated on the basis of the regression shows a trend of increasing resistance characteristics of assemblies used in protective clothing sewn with increasing stitch density in the range of densities studied (3, 3.5, 4 step/1cm) and strength characteristics increase with decreasing stitch sewing thread fineness N_o.40/2, 30/2, 25/2 Gütermann (Pes 100%).

Using a Regression package of Excel program for calculating regression analysis allows a timely processing of large volumes of experimental data, mathematical models displayed in tabular and graphical meets study version and the conditions of calculation. The program allows the graphical display of the regression equations and coefficients of determination value R^2. Thus, calculations made in Excel were presented tabular and graphical, which allowed evaluating the quality of mathematical models of linear regression equations.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

THE FOOTWEAR DESIGNING SESSIONS USING CRISPIN DYNAMICS ENGINEER
1 ST PART: - Develop into a full shell

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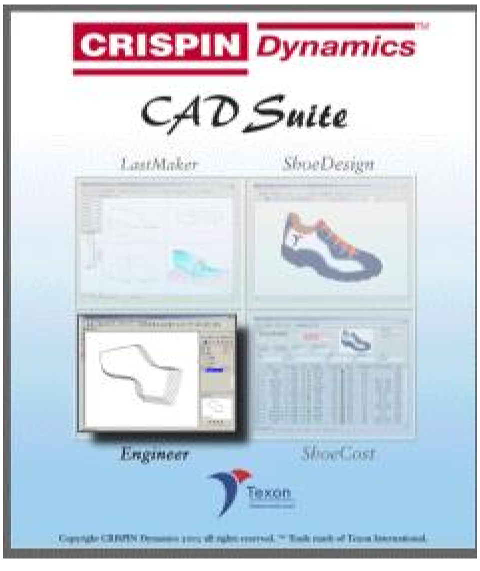
Abstract:This paper presents how the **CRISPIN Dynamics Engineer** can be used in designing of footwear products. This is a part of application **CRISPIN Dynamics CAD Suite**. This is a range of quality software products to give the shoemaker the advantage of latest technology. With **CRISPIN Dynamics,** one can visualize a range of designs on-screen, work out the costs of a new style and even cut out sample shoe components. Reliance on manual skills is largely eliminated, so the staff can work creatively, but with increased accuracy and productivity. One can even send designs to a distant office or manufacturing centre in a matter of minutes.
key words*:* footwear, design, computer, part, pattern.

1. INTRODUCTION



By classic methodology, designing footwear is a very complex and laborious activity. This is because classic methodology requires many manual graphic executions, which consume lot of the producer's time. Moreover, the results of this classical methodology may contain many inaccuracies with the most unpleasant consequences for the footwear producer. The decisive step in this way has been made some time ago, with the powerful technical development and massive implementation of electronically calculus systems and informatics, CAD (Computer Assisted Design).

With **CRISPIN Dynamics,** one can visualized a range of designs on-screen, work out the costs of a new style and even cut out sample shoe components. Reliance on manual skills is largely eliminated, so the staff can work creatively, but with increased accuracy and productivity. One can even send designs to a distant office or manufacturing centre in a matter of minutes.

2. THE FOOTWEAR DESIGNING SESSION

This paper presents the basic functions of **CRISPIN *Dynamics* CAD Suite Engineer** for footwear design**.** The software is a 2D application of the **CRISPIN Dynamics CAD Suite**. The **Engineer** program is broken into a series of 'tasks'. Each 'task' has a 'tool tray' that contains a number of separate functions to achieve the task. This are:

- **Drawing**
- **Grade**
- **Assess**

When the Engineering program first starts the Draw task is active and the tool tray is displayed, as shown in the above partial image.
For start of the base model on obtained using functions: digitize or flattening.
The first step in the footwear designing session is:

- **digitized form of the medium copy**
- **last flattening**

2.1 Digitize the flattened half shell or standard

The first step in a footwear design session is to save in the computer's memory the digitized form of "'half shell', or standard. Afterwards, the steps of digitizing are as follows:

- Prepare the flattened half shell or standard for digitizing by lightly marking where the key points to record are on the edges and internal lines.
- Align the shell on the digitizer, fix in place with a little low tack tape and digitize all the lines.

The process continues with the input of base line data from a 2D digitizing tablet. You can use any 2D digitizer supported by the 'Wintab' standard and as only 3 buttons (and delete) are needed it is easy to learn, quick and accurate.

To begin we will assume that the digitizing tablet has been correctly configured and calibrated if necessary. So the first step is to click on the digitize icon, shown above. There is a variation in the process if there is already data on the screen but for the moment let us assume this a new pattern. Align the shell on the digitizer, fix in place with a little low tack tape and digitize all the lines.

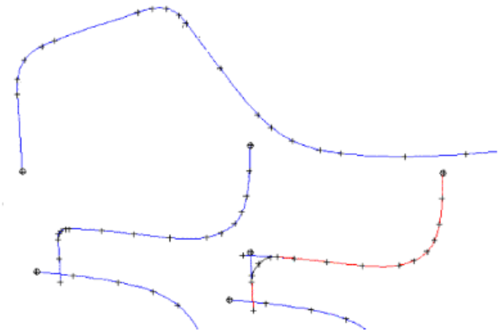


Fig. 2: Digitise the flattened half shell

For that prepare and mark the shell with a pencil, the points to digitize along the lines. In the process keep the number of data points to a minimum. In picture 2 there is one example of a digested the lines of the pattern.

2.2 Last Flattening

Flattening is the process that turns the 3D dimensional last and design into 2D data, to be used in a program like **Crispin 2D** to create and then grade pattern pieces. The operation on execute using the window flattening.

The type for flattening is:

a) Half

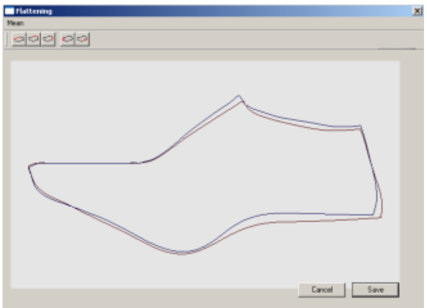


Fig. 3. Flatening the part inside and outside of the last

Splits the form down the back centre-line, and splits the forepart centre-line along its entire length, allowing the separate inside and outside forms to be superimposed. The relative positioning of the **inside** and **outside** forms and their **orientation** are with the '**Vamp Points**' of the two forms co-incident (fig. 3).

b)Full

Opens the inside and outside forms to a whole-cut shape (fig. 4).

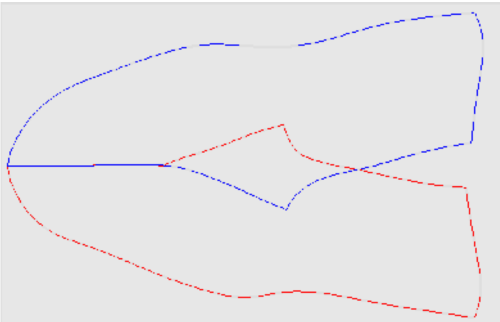


Fig. 4. Flatening full

3. RESULTS

In this paper is creating o base footwear using Crispin Dynamics CAD SUITE. **For this is** Flattening the last and style line (fig. 5).

Draw the style on the last surface. **Style-lines** are generated on the last surface with this 'user friendly' software product allowing new designs to be achieved in minimum time whilst achieving an accurate representation of the shoe. Enhanced visualization is achieved by applying features such as stitching, eyelets and laces together with colors and textures. An interactive sole design facility is provided.

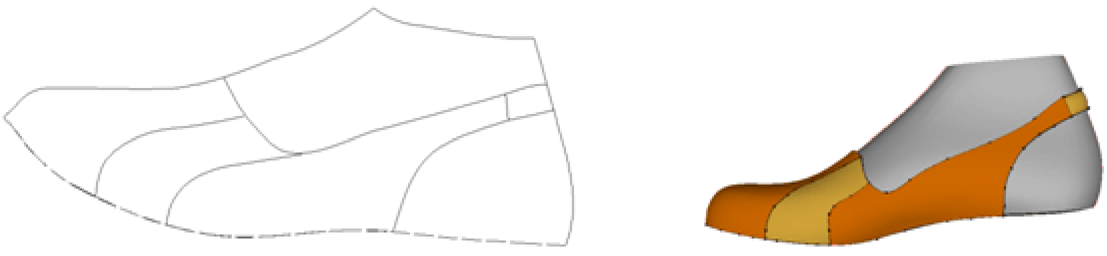


Fig. 5. Flattening the last and style line

3.1 Develop into a full shell

The system **CRISPIN *Dynamics* CAD Suite Engineer** offers many functions for the drawing of the footwear pattern. Using the CRISPIN function once can develop into a full shell and create sundries effect for the footwear patterns.

The following layout summarizes **Crispin** drawing functions for develop into a full shell.

The layout of CRISPIN **Dynamics Engineer** follows a pattern established by many PC programs using the 'single document' model as the basis of operation (see figure nr. 6). This means that a single instance of Engineer can only have one pattern file open at a time.

Engineer consists of these main areas:

- A title bar, that shows the program title with the name of the pattern currently loaded.
- A menu bar, at the top, following normal Windows convention.
- A main toolbar, underneath the menu bar (default location).
- A small 3 option task bar, underneath main tool bar.
- A tool tray at the left of the screen, the Draw, tool tray is automatically active at startup (see fig. 6).

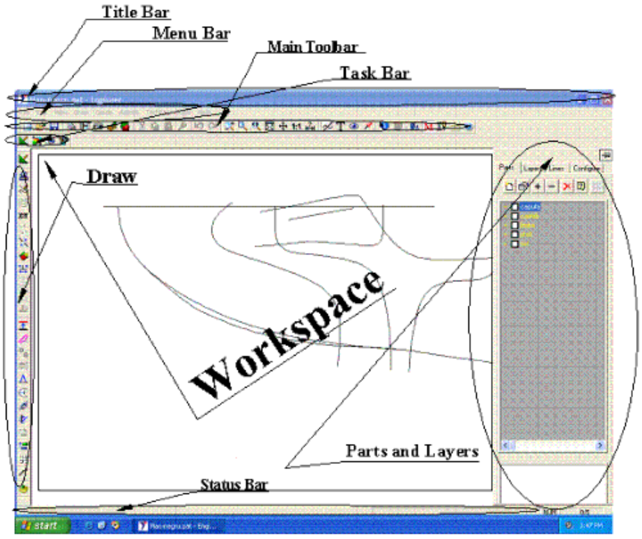


Fig. 6. The window Engineer for develop into a full shell

- The Parts and layers manager will 'slide out' from the right side of the screen when the mouse pointer 'hits' the side. There is an alternative 'icon browser' view of the parts not shown below.

A status bar at the base of the screen displays prompts and other information while the program is being used.

- Last but not least is the main workspace area. When a pattern is first loaded the program is in 'selection mode' waiting for a line type or function to be selected.

The system **CRISPIN *Dynamics* CAD Suite Engineer** offers many functions for the drawing of the footwear pattern. Using the CRISPIN function once can develop into a full shell and create sundries effect for the footwear patterns.

Picture 6 presents one example of developing full shell using this window and the graphics instruments.

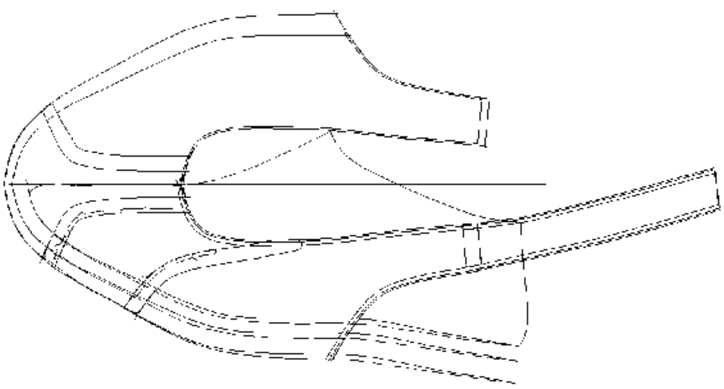


Fig. 6, The result using Engineer for develop into a full shell

4. CONCLUSION

The software produced by ***Crispin Dynamics*** has remarkable results in footwear design but it is working with an authorization of the company. A license 'authorizes' a computer to run specific **CRISPIN Dynamics** software. Licenses are often also used to specify which options within an application can be run.

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[7] ***, Crispin Dynamics CAD SUITE, 3D

THE FOOTWEAR DESIGNING SESSION USING CRISPIN DYNAMICS ENGINEER
2 ND PART: Creating the parts, Estimating the material consumption, Grading

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Abstract: By classic methodology, designing footwear 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. This product has been developed for shoemakers who wish to ensure that their business remains competitive by increasing the efficiency, speed and accuracy of pattern development and grading.
Key words: pattern, assess, consume, grade

1. INTRODUCTION

This paper presents the basic functions of **CRISPIN *Dynamics* CAD Suite Engineer** for footwear design**.** The software is a 2D application of the **CRISPIN Dynamics CAD Suite**. The **Engineer** program is broken into a series of 'tasks'. Each 'task' has a 'tool tray' that contains a number of separate functions to achieve the task. This are:

- **Drawing**
- **Grade**
- **Assess**

When the Engineering program first starts the Draw task is active and the tool tray is displayed, as shown in the above partial image
After develop the base footwear on create the individual parts and estimation the consume

2. CREATE THE INDIVIDUAL PARTS

The individual parts (see picture 1) will created using the menu **Parts Manager**.

The selection, creation and management of parts are on the first tab of the dialog that 'slides out' from the right side of the workspace, when the mouse cursor comes within 5 pixels of the edge.

In practice you simply 'bump' the mouse pointer to the edge of the screen and the dialog is displayed. This is easier when the program is 'maximized' as the pointer literally 'hits' the edge of the screen.

This does not happen in all circumstances, for example when 'dragging' an area with a mouse button held down. Also to minimize the accidental selection of this dialog there is a 500 millisecond delay before it activates. This delay can be changed by editing the registry.

The dialog can also be 'pinned' in the 'out' condition. In this mode the dialog will stay visible until a function is started at which point it will be hidden when the function is complete the dialog will re-appear (see picture 1).

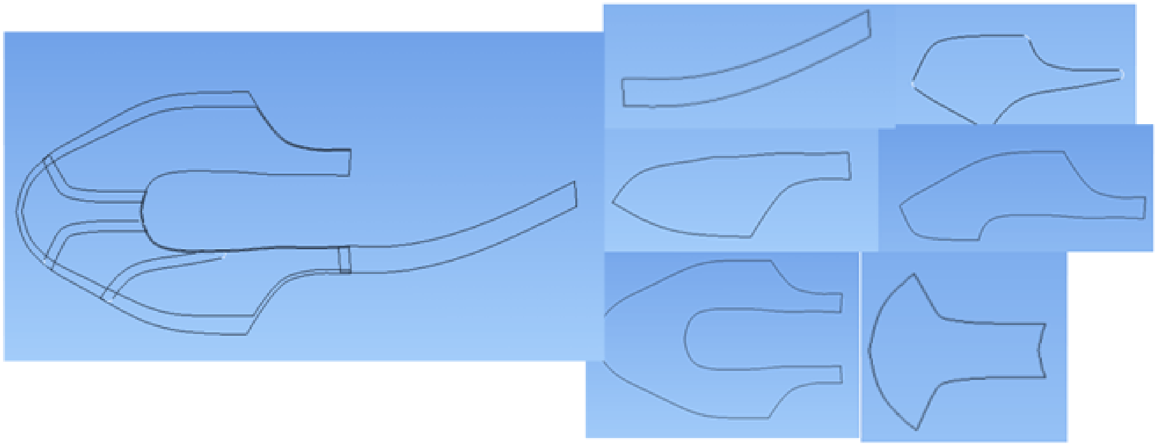

Fig. 1, Creating the parts using function 'Parts Manager'.
Using this function allows the operator to quickly view the part names developed in the pattern with the ability to view the parts as required

2. ESTIMATING THE MATERIAL CONSUMPTION

The user multiplies the pattern, which represents a working entity for Engineer, in order to find the economic arrangement for the reference points. In this purpose, the user must probe few arrangement variants, in the translation and rotate-translation system. The same process is used in establishing the arrangement factor for the two points of reference of the designed footwear product.

2.1 Assessment

Assessment in **Engineer** is a quick and simple method of checking the efficiency of a part based on the 'parallelogram' process. Interlock efficiency is important to know at the pattern stage of the shoe's development, as it can have an impact on the total cost of the shoe.
Assessment in **Engineer** is NOT in itself a costing facility, though the area data generated can be used for costing purposes.

2.1.1 Process

The **Assessment** function interlocks a single part boundary with itself, either at the same angle to which the part was defined in the pattern or rotated 180 grade.
The two interlocked parts are then duplicated and the duplicates interlocked with the two original parts. These four parts are then duplicated and interlocked with the preceding four parts.
With these eight parts in place, the software will then determine a parallelogram between four of the eight parts. The parallelogram will be created on the same intersections for each of the four parts. This is to ensure that one pair of the parts are completely represented within the efficiency area.

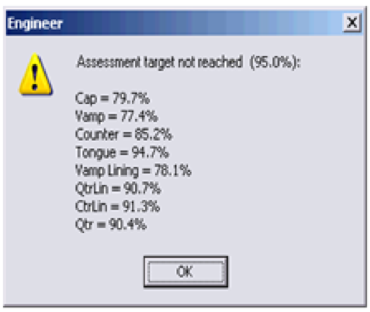

Fig. 2. Calculation the efficiency of a part based on the 'parallelogram' process

Note:

Within **Engineer** assessment can only be carried out on 'real' boundaries. A mirrored or other dependant copy of a boundary will be ignored.

Calculation

Taking the whole area used within the parallelogram and subtracting the known area of the parts leaves the waste area. The difference between the actual area used and the waste area remaining, gives the efficiency percentage.

3. RESULTS

In the follow figure are the results using the function assessment for base footwear and in the follow table is centralized the norm of the consume.

Fig. 3, For the patern of the base footwear calculation the efficiency of a part based on the 'parallelogram' process

Calculation the material consumption

denumire		aria	aria paralelogr	perimetru	Fa%			
reper	ns	un rep	rep set	un rep	rep set	un rep	rep set	
virf	2	0.4247	0.8494	0.557349	1.114698	3.16	6.32	76.2
caputa	2	0.4274	0.8548	0.465577	0.931155	3.27	6.54	91.8
carimb exterior	2	0.8343	1.6686	0.929065	1.858129	4.44	8.88	89.8
carimb interior	2	1.1751	2.3502	1.318855	2.63771	5.62	11.24	89.1
fisie	2	0.314	0.628	0.33298	0.66596	3.26	6.52	94.3
capt-caputa	2	2.1675	4.335	3.065771	6.131542	9.91	19.82	70.7
capt-fisie	2	0.2941	0.5882	0.301024	0.602047	3.09	6.18	97.7
TOTAL	14		11.2742		13.94124		65.5	80.86941

Ic	Dn	Dp	Dm+t	Dt	Amed set	U	Nc	a	pi	Apielii
0.97							17.37854			
1							17.91602			
1.03							18.4535			
1.1	19	7.384601	10.55677	37.07196	0.8053	62.92804	19.70762	39	0.02	150

4. MULTIPLYING THE DESIGNED FOOTWEAR PRODUCT'S PATTERN

Another indispensable stage of the process in designing footwear products is the multiplying the patterns in order to obtain the patterns for the superior and inferior number of the medium size number of the product.

The two reference points, the upper and the heel counter, were multiplied by following the arithmetic methods, also used in classical methods. The results of the two multiplied patterns are presented in figures number 5.

Using Crispin the grading a pattern and/or parts can be make using the **Grade Task Tool Tray**. This task is many fuctions wich launches the dialogs providing all the facilities to set up a size range and grading parameters. In picture 5 presents one examples of grade pattern.

The major functions for the grade are:

– Choice of **Arithmetic** or **Geometric grade** and whether or not width fittings apply.

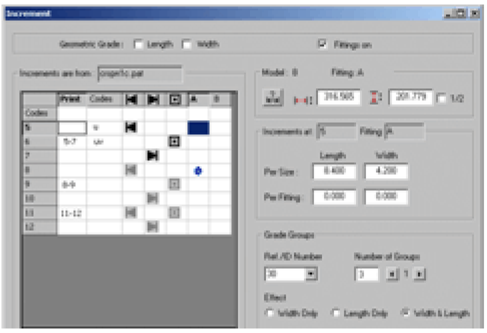

Fig. 4, The window function for grading

The shell-based grading system can be fully customized to suit the customer's requirements with both arithmetic and geometric calculations

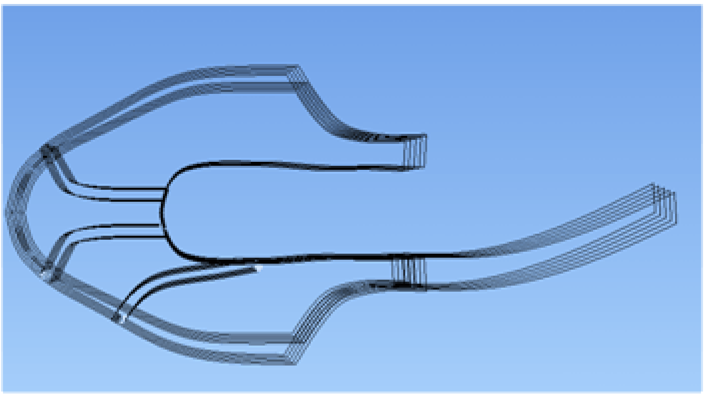

Fig. 5, The results after application function for grading

5. CONCLUSION

The software produced by ***Crispin Dynamics*** has remarkable results in footwear design but it is working with an authorization of the company. A license 'authorizes' a computer to run specific **CRISPIN Dynamics** software. Licenses are often also used to specify which options within an application can be run.

The license for the Faculty of Leather and Textiles, ***Crisipin Dynamisc Engineer*** was installed thanks to the generosity of *Luca Caironi*, *Sales Manager* for **CRISPIN Systems Limited**. We would like to take this opportunity and express our gratitude to him. This product has been developed for shoemakers who wish to ensure that their business remains competitive by increasing the efficiency, speed and accuracy of pattern development and grading.

6. REFERENCES

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[7] ***, Crispin Dynamics CAD SUITE, 3D

DESIGN OF NEW INDUSTRIAL SYSTEMS INTEGRATED ON THE COMPETITIVE MARKET AND THE RE-ENGINEERING-RISK CORRELATIONS

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Abstract: Reengineering operates with total re-projection models, which explore the impact of reinventing the industrial systems, seeking at the some time to intensify the correlations between technology-market. Thus, reengineering is a guide regarding the exceptional fusion of managerial processes with the business ones, regarded in a new holistic re-projection concept, based on the collaboration of all the factors, in order to reexamine each process for the total reconstruction of the industrial system. Reengineering should be applied to some new structures, which correspond to the changes generated in the world. If the change is not accepted, a powerful competitively crisis takes place. The three determinant forces of our days are clients, competition and change. Thus, the risk problems result from the fact that we live in a civilization of risk.

The paper presents the correlations between reengineering and risk when the projection of the industrial systems takes place.

Key words: reengineering, risk,industrial system, total re-projection .

1. INTRODUCTION

On the European continent we are now in the third phase, the final one for the development of a Unique Market, with rules that rapidly tend to lead to a complete unification and a unique currency. It is not difficult to foresee that this phase will slowly lead to a level of concentration of oligopolistic industries comparable to those in the Unites States. Important is the fact that a great part of the agreements established between European industrial systems are realized through a small scale economy, though sufficient for assuring the competition.

These agreements become favorable, and associated to the markets' globalization process, they frequently lead to high levels of efficiency. The technological factors are certainly at the base of the transformations that take place in these industrial systems, to which we can add strong elements of institutional kind linked by the privatization or liberalization politics in scientific research or at the level of higher education.

The fundamental critical resource of industrial systems is their capacity of responding to the competing markets dynamics by continuously modifying the technologies and their own production systems, together with an efficient management.

2. REENGINEERING AND THE RISK AT THE LEVEL OF INDUSTRIAL SYSTEMS DESIGN INTEGRATED INTO COMPETING MARKETS.

Industrial systems reengineering starts from new principles which lay the basis of some original approaches in a holistic unitary conception – production source – competing market of technological-managerial structure with the purpose of innovating and changing completely all the activities, including the installations implied in economical-engineering processes.

Reengineering operates with total redesign models, which exploit the impact of reinventing the industrial systems, seeking at the same time to intensify the technology-market correlations. Thus

reengineering is a guide regarding the efficient fusion of managerial processes with the business ones, seen in a new conception of holistic redesign, based on the collaboration of all the factors with the purpose of reexamining each process for reconstructing from bedrock the industrial system.
Reengineering reinvents the way the economical-engineering industrial systems should work properly in a holistic concept. Reengineering objectives do not refer to gradual improvements but they seek a qualitative jump in the field of technological and managerial performance, without neglecting the change of human resource mentality.

Reengineering key consists in changing the operations that industrial systems develop in order to innovate all the activities that should lead to minimizing the costs, satisfying the clients through quality and progress acceleration on the production-competing market direction. Reengineering should be applied to some new structures that correspond to the changes generated in the world. If the change is not accepted, we deal with a strong competition crisis. The three determinant forces of our days are the clients, the competition and change.

Within industrial systems, any person effectively implied in different existing processes, should be implied more or less in the process of risk monitoring. Risk problems result from the fact that we live in a civilization of risk. Risk occurrence generates crises, considered to be true breakages in the normal operation of any industrial system integrated into the competing market.

Approached theoretically, the risk occurs diagrammatic according to the next figure (figure 1), where the following can be emphasized:

- The main fields where it can become predominant;
- Its content: danger, inconvenient, possible perturbations;
- The span it can have;
- The two ways it can be identified: predictable or unpredictable.

Mathematically, the risk is defined as a set of triplets: R= $\{(s_{i,} p_{i,} x_i)\}$, in which

s_i = scenario description or identification
p_i = probability of that scenario
x_i = consequence or evaluation degree of that scenario
(damage degree)

Although risk definitions differ, all these contain two common elements: non-determination (incertitude) and loss.

Thus, risk is considered to be:

- An uncertain but possible event, its origin being found in incertitude;
- Unfavorable, once its effects are produced, they cannot be eliminated and they appear in the process of human, social, economical, political activities, as well as in human being and nature relationships;
- Possible and unwanted event, predictable and unpredictable.

Risk theory, in operational research starts from certain risk models, in a holistic, global conception. In order to understand the risk notion we start from uncertainty term, a term that expresses a state of incertitude about the future.

Economical incertitude has as source, either the objective character of a process, or the incomplete, approximate character of existent knowledge at a certain point about it. So incertitude refers to a state of hesitation linked by the effects to be obtained as a result of an action. Unlike incertitude, the risk is characterized by the possibility of describing a probability law for the wanted results which are stipulated to be obtained, indicating also the possibility of this law by the economical agents.

Risk and incertitude are found combined in different ratios, but in reality incertitude can be eliminated. In this way unpredictable events can trigger deviations that could change fundamentally the configuration of data highlighted by previous statistical observations.

Incertitude becomes a potential source of risk when it results from an incomplete piece of information or from resorting to incompatible sources. For most part of industrial systems, the methods of risk measuring with the help of probability theory are considered to be essential. Risk and probability are different concepts.

The decisions are taken in an uncertain and risky medium, an evaluation of the decision alternatives, their consequences is being made, considering that the decisions' effects are not known for sure. It is obvious that an efficient managerial strategy should include both programs and risk management procedures which actually aim at minimizing the probability of producing these risks and of potential exposure.

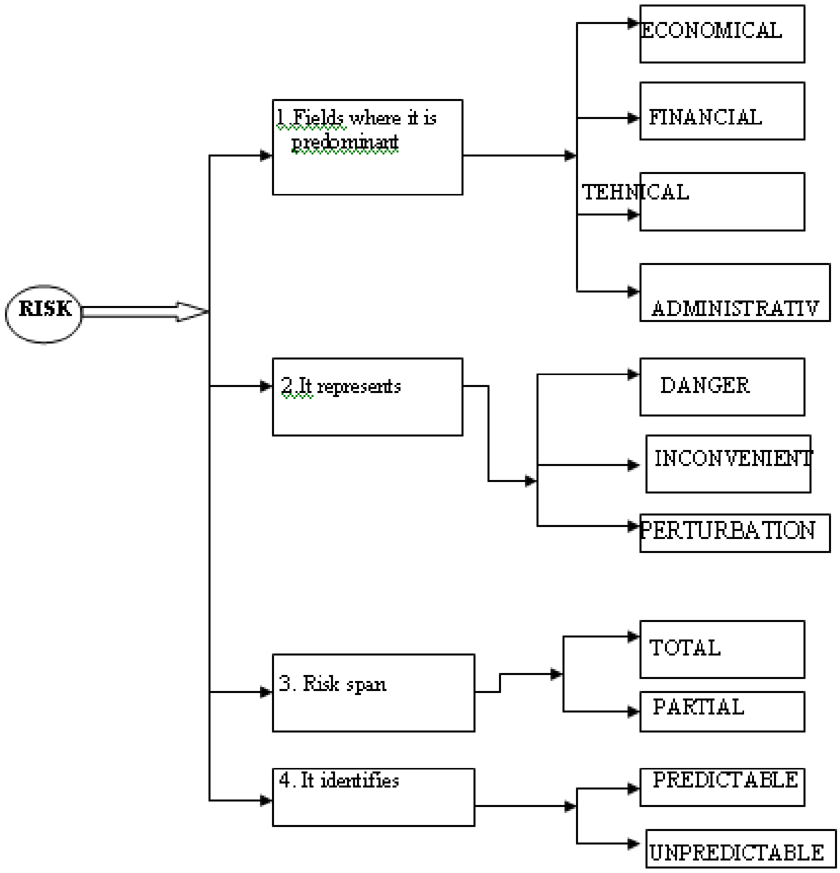

Fig. 1. Risk approach

The main objective of these politics is minimizing the losses or extra expenses supported by the industrial system, the foremost objective being the attaining of a bigger profit. French physician Louis de Broglie said that "We must pursue the risk because the risk is the condition for success". In this way, risk's domain sums to only three verbs:

- *Analysis* –we have to identify the risks and to evaluate the possible direct or indirect consequences,
- *Reduction* –we have to prevent in order to reduce or eliminate them and we have to insure ourselves regarding the occurrence of new risks and at the same time to diminish the unexpected effects through corresponding protection means,
- *Financing* – we have to master the assembly of accepted potential costs and loses. The last world innovations in evaluating the risks assume correlations between science and top technology, connection between sociology, genetic biology and environment.

The future implies a series of new, unpredictable unknown elements which will compel human imagination to new dimensions, towards evolution and knowledge, so that the human being who has an aversion towards risks should overcome it and it should become a challenge for him. Risk management within industrial systems has different meanings according to the persons involved in achieving this process. In a simple form, risk management is a *process of approaching risk within a system.*

The risk is defined and expressed in many ways by specialty publications. In the dictionary it is defined as being: *exposition to loss or damage possibility* or *hazard or loss possibility.*

From the point of view of an industrial system, the concept of risk has the following definitions:

- the incapacity of an industrial system of adapting in time and at the lowest cost to medium changes,
- variability of possible result according to an unsure, uncertain event,

- incertitude regarding a loss,
- possibility that the losses are higher than expected,
- the risk is made up of the possibility that a fact with unwanted consequences is about to be produced. This definition has at the basis the possibility that an event, anticipated with a certain probability or unpredicted by the legal person taking decisions, to be materialized and to influence negatively certain aspects of economical activities of the industrial system. In this case the emphasis lays on the effects that the respective event generates,
- incertitude regarding damage production,
- that situation in which there is the possibility of an unfavorable deviation of the expected result.

3. CONCLUSIONS

Through reengineering the determination of performances and establishing the rewards shifts from the activities to final results obtained, and the promotion criteria are changing, shifting from performance to ability. Specialists' work should be evaluated both on the basis of the quality registered and attaining the satisfaction degree of consumer's needs. The reward for the job fulfilled is achieved on the basis of outstanding performances of the new produced result, the wage system should be flexible. Promotion on another position within the industrial system should be done according to employer's skills. The employees should understand that the job they perform is solely for the clients and not for their manager, so the clients pay the employees and not the managers. Consumers should be satisfied by the quality of the products. Reengineering changes at the same time the managers' conception, in the way that it transforms them from supervisors in mentors who insure resources, answer to questions and prepare the development of each employer's carrier.

The decisions in the case of reengineering use are built and applied by the process team who takes all risks and distributes the profits. The process team members control their own activity, correct their own mistakes and communicate with all the collaborators to be up to date with all the news and at the same time are in contact with the needs of the competing market. Reengineering creates new types of managers (mentors) by transforming bosses into leaders, creators of valuable goods. Managers get closer to clients and creators of products solicited on the market. They have responsibilities regarding the performances of finished products, they pursue products' design and try to remove non-concordances emerged while producing these products, assuring in this way wages for the whole project team.

Reengineering application within industrial systems leads to the following changes:
- change of jobs structure and the people having them,
- change in the relationships between people working and the process team mentors,
- evolution of professional training of all employees with the purpose of becoming creators of valuable goods,
- change in the estimation and compensation way for the work performed,
- changing all production factors (people, positions, managers, values, management structures, business processes, means of developing work, employees education and culture, management system)

Modifying the connections between the processes within industrial systems and the jobs and structures' content leads to new ways of grouping people, new activities appear verified by managerial auto control, process teams appear guided by leaders, the evaluation systems are based on measuring the performances, change of wage earner beliefs of becoming creators of new values.

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APPROACHES ON THE DEVELOPMENT OF HANDBAGS

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Abstract: The development of leather goods is achievable by a series of methods such as: adorning the outside part, changing the pattern configuration and combining the basic materials. The diversification obtained through modification of pattern shape has to permit a correlation of shapes for each handbag side with its final shape, dimensioning being done accordingly to details of each side of handbag. The product functionality must be kept when modifying handbag patterns shape in terms of dimensions (length and width). Decoration of handbag implies keeping unchanged the detail configuration and the initial characteristics of materials in order to avoid too many details given by decorative elements.
Starting from a given pattern of the handbag, structural types are developed through changing the configuration of the outside component parts. The paper presents a series of particularities regarding the diversification of the handbags.
Key words: leather, leather goods, development, handbag, pattern

1. INTRODUCTION

Development process is an important part of product design. The development of a product through diversification starts from the premise that in the first step –drawing up a pattern, we take into consideration the following general criteria which represent the base line for design process: functional, aesthetical, social, economical and technical criteria [1, 5, 6].

Trough product development one could operate at pattern's concept without affecting any of these criteria mentioned above or without modifying any of the parameters regarding of them. The pattern is defined as a sum of characteristics (material, shape, colours, structure, modality of detailing-assembling and decoration) that make the difference between similar objects or between the same group objects [5].

The development process of a product uses series of techniques that go behind in obtaining an adequate number of patterns within the same group, followed up by analyzing the process of defining types, both for manufacturer and consumer. From among we mention: the combination of different kind of materials or materials which present different appearances, the modification of the pattern shape, decoration, the modality of manufacturing-assembling of details, the modality of closing and the handle system [3, 5].

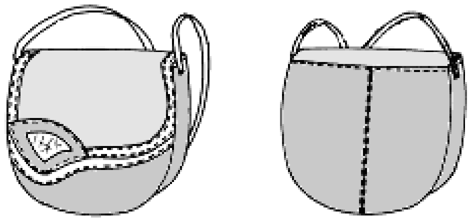
The aim of this study is to present a series of particularities regarding the diversification of flapped bags through: combination of materials, changing the pattern's shape and decorating the exterior details.

2. CHANGING SHAPE CONFIGURATION

The shape modification of the patterns is a development method very often used as a primary step. The shape of the handbag patterns is designed in a very simple way, following next step in manufacturing process, or to increasingly operate upon handbag details. This working method allows the verification of certain design elements and of the manufacturing process. The procedure of development through appearance modification of details uses all types of lines: straight line, scribble, curve, thin -thick, continuous – dotted line. In this way, the obtained patterns could be harmonized in the same group if they respect certain conditions:

- ✓ To maintain unchanged the product shape and make-up succession operation;
- ✓ To use the common structures for the applied materials (sides, linings).

Changing of details configuration for flapped handbags can be assured by maintaining the same handle/carry on system. The shape and dimensions both of the front side and backside determine the shape and dimensions of the whole handbag; front side taking different geometrical shapes (circle, square, rectangle, trapeze). The backside has the same shape as the front side. The backside can be made-up by a single element or by double identical details, which will be joined through 180 degrees turned seam [2], like in figure 1.



a) b)

Fig. 1: Flapped handbag (a); (b) -back side

For some flapped handbags, the backside could outline a single element, together with the flap [2], as in figure 2.

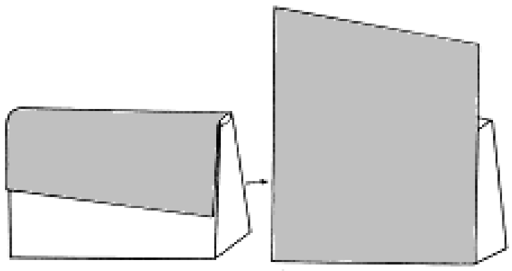
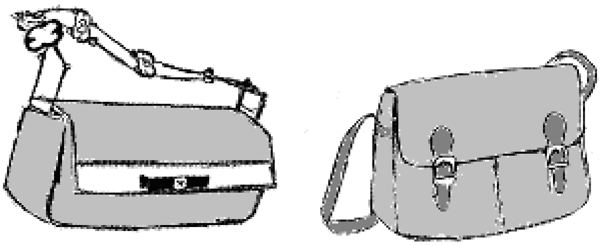


Fig. 2: Back side and flap

Also, there are some flapped handbags, which have the backside, the base and the front side forming a single detail, named the main part; furthermore for some handbags the front side, the bottom, the backside and the flap are forming a single element/detail.

Among flapped handbag, the lateral side represents the structuring element that is different in accordance with the way is fitted with the front side, base side and back side [3].



a) b)

Fig. 3: Handbag with invariable width of lateral side (a) and with a smaller width at the superior part (b)

The width of the lateral side at the superior part determines the opening dimension of the handbag and it could be equal with the width of the lateral side at the inferior part, figure 3a, or could be different in size, figure 3b.

The constructive shape of flapped handbag can be symmetrical or asymmetrical, being related to the shape of front side.

The flap may cover the front side in different proportions, respectively 1/3, ½, 2/3, 1/1 from the height of the front side of the leather good side, as presented in figure 4.

The flap may cover the front side in different proportions, respectively 1/3, ½, 2/3, 1/1 from the height of the front side of the leather good [2, 3].

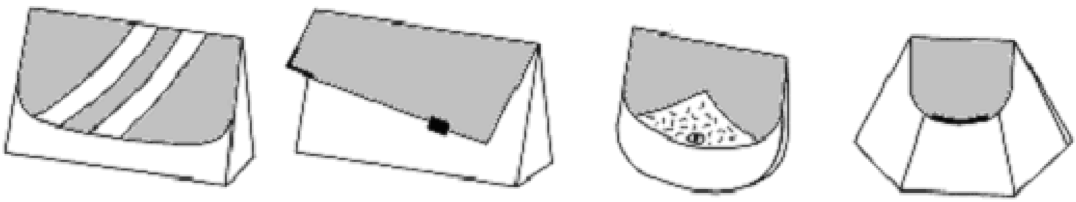


Fig. 4: Symmetrical and asymmetrical shapes for flapped handbag

The length of the flap in the coverage area of the leather product will be adjusted taking into account the type and functionality of the flap, being correlated with the base side width (especially for non rigid leather goods or semi rigid ones).

Therefore, between the width of the flap in the covering area and the width of the base of the leather product the next equation may be experimentally established [2, 4]:

$$Y = 0,7x - 6 \quad \textbf{(1)}$$

Where: y - width of the flap in the coverage area; x - width of the base.
The length of the flap in the covering up area of the leather good is usually equal with the length of front side (corresponding with the front side).

3. DECORATING A HANDBAG

Alongside with the effect created by the presence of certain details with different appearances, as a way of preparation and fitting of those details, for diversifying handbags the procedure of decoration can be used, maintaining the same configuration of the base details.

The decoration of the flapped handbag has to be done in respect with the condition of maintaining the primary characteristics of the materials and avoiding concentration of too many decorative elements for a single detail. Therefore, it is brought into attention, the effect done by an ornamental pattern in the area of a detail, effect that can be agreeable or not agreeable. Also, it is brought into attention the necessity of harmonization between appearance and ornament.

There are a large variety of techniques and methods that are used for the leather goods decoration. From all kind of the decoration possibilities, usually, for a flapped handbag the flap is the one with ornamentation, figure 5.

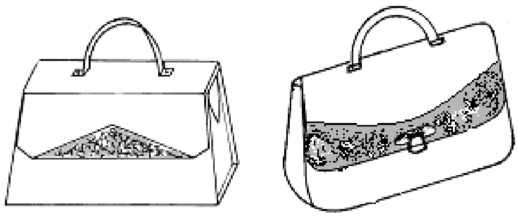


Fig. 5: Decoration of the handbag front side

If the flap covers the front side in 1/3 proportion of its height, then the front side could present different folds and ripples, being made up by a single detail or more, as in figure 6.

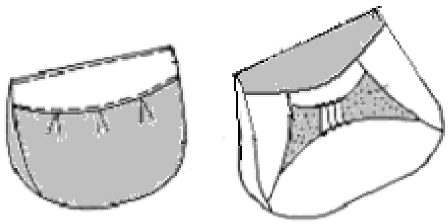


Fig. 6: Decoration of front side of flapped handbags

4. COMBINING MATERIALS

The flexible leather, tanned with minerals, vegetables or with a combination of two of them, is grouped in three big categories as function of surface’s appearance: smooth, velvet, abrade. On the other hand, leather substitutes were obtained after the natural leather; therefore these products are imitating perfectly the appearance of natural leather goods [5]. Diversification can affect the whole leather good and we are getting different leather goods taking into consideration different appearances or can affect just parts of leather good. So through combination of different types of materials we can obtain a big variety of patterns. Detailing of the right side has certain objectives, as the following:

- ✓ Using natural leather in accordance with their physical –mechanical features and with modifications made upon details, during manufacturing and carrying processes;
- ✓ Economical nesting of the handbag details on cutting;
- ✓ Enables possibilities of combination for different types of materials in manufacturing process.

This development technique enables a big number of types that are obtained keeping the pattern configurations unchanged. During this process there are not additional costs determined by designing and making cutting knives or changing the manufacturing techniques.

The selection of materials combination or chromatic combinations has to follow up chromatic laws and harmonies, figure 7.

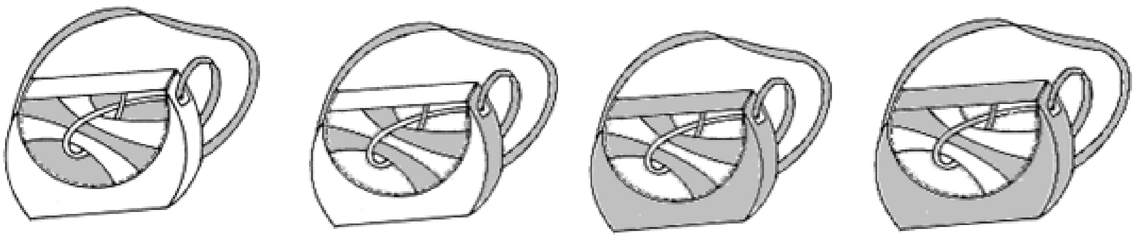


Fig. 7: The diversification of the flapped bags through combination of different colour materials

Some of the combinations are presented as it follows: mat – glossy, bright-dark, smooth – abraded, complementary colours; very close hue for one colour, leather - weave.

At the combination of materials, after detailing, there are technological, economical and aesthetical parameters to take into consideration, figure 8.

Fig. 8: The diversification of flapped bags through changing the surfaces' colours

Interested in drawing customer's potential attention to finished goods, the aesthetical parameters play an important role.

Under certain conditions, when materials have geometrical and physical-mechanical features that are almost the same, the association of different types of material is solved following features related to the appearance of surfaces: smoothness, colour and brightness.

5. CONCLUSION

The development techniques presented above, starting from a handbag given pattern, allow for obtain a big number of variants for patterns.

The development process through combination of materials and chromatic arrangement, the shape of details being unchanged, it has to be done absolutely to respect the chromatic laws and harmonies.

The diversification obtained through modifying pattern's shape has to respect certain conditions:

~Correlation between shape of each side with the final shape of the handbag;

~ Dimensioning accordingly to details of each handbag side;

~ Correlation of detail dimensions (length and width) with the final dimensions of the handbag in order to assure the product functionality.

At flapped handbag decoration, keeping unchanged the detail configuration and the initial characteristics of materials, it is necessary to avoid the details' concentration by usage of more elements with decorative function.

Through presented aspects, the presented paper emphasizes a series of particularities regarding the diversification of flapped handbags. One have to mention the fact that the diversification is not an objective but it is a modality through which these manufactured goods lead buyers to choose those products which properly match their needs and preferences.

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SOME ISSUES ABOUT TENSILE TESTING OF MEDICAL STOCKINGS
PART I. AXIAL TENSILE TESTING OF MEDICAL STOCKINGS

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Abstract: Compression therapy achieved through regular use of elastic medical stockings is one of the most known and used method for the treatment and prevention of venous diseases. Obtaining positive results in treating these diseases is conditioned by the use of medical stockings designed and manufactured so as to provide a gradual pressure along the leg, with a maximum value at the ankle. The stockings must be worn for a long period and therefore have to maintain gradual compression capacity all this time. This paper presents the results of the axial tensile tests applied to the elastic stockings, in order to assess the presence of a gradual compression along the leg and the ability of medical stockings to conserve the gradual capacity of compression after daily use. Tests were performed on the wale direction, using the semiautomatic testing system Mesdan TensoLab, equipped with suitable clamps for knitted fabric
Key words: medical stockings, compressive therapy, gradual compression, axial tensile test

1. INTRODUCTION

The most known and used method for the treatment and prevention of venous diseases is the use of elastic stockings with gradual compression (medical stockings) that acts by applying relatively low levels of static compression to the lower leg. The medical stockings stimulate the blood circulation through the body and prevents stagnation of the blood in the varicose veins by exerting a gradual pressure against the leg [1].

Depending on the the type and severity of disease, medical stockings has to provide a certain level of compression which is obtained by using the yarns with suitable elastic properties and the appropriate technique to knit the yarn into the final product. The compression level of medical stockings, expressed as pressure and measured in millimeters of mercury (mmHg), must reach different values along the leg, being higher at the ankle. Up from the ankle to the thigh, compression level is progressively reduced. Table 1 presents the compression classes for a range of medical stockings commercially available (ScudoTex®) in relation with their finesse and recomandation for use. Figure 1 shows the delimitation of differentiated compression zones along the leg [8].

Compression therapy achieved through regular use of elastic medical stockings exert a beneficial effect in the treatment and prevention of venous diseases, provided that the compressive features of stockings are preserved for a long enough period of time. Also, a pressure profile, with maximum level of compression at the ankle and minimum level to the thighs, must be achieved and maintained.

In this paper, the presence of a gradual compression along the leg and the ability of medical stockings to conserve the gradual capacity of compression after daily use were examined using the axial tensile test. The research was carried out within the framework of the CEEX 192/2006 project which aimed the investigation of possibilities to improve the method for the treatment venous diseases of the leg by using the compression supports made from knitted fabrics impregnated with medicine.

Table 1: Compression classes for medical stockings (ScudoTex®)

Compression classes		Finesse	Recomandation for use
Light	7÷9 mmHg	40 den 70 den	- Relaxing the tired, swollen legs; - Tonic action for the leg;
Light–Medium	10÷12 mmHg	70 den	- Improving the circulation problems during pregnancy; - Micro-massaging action;
Medium	15÷18 mmHg	70 den	- Ankle swelling, - Oedema; - First symptom of varicosity;
Medium–Strong	19÷22 mmHg	70 den 140 den	- Venous insufficiency - Superficial thrombus-phlebitis - Postoperative prophylaxis;
High	23÷26 mmHg	180 den	- Chronic venous insufficiency; - Accentuated trend to the development of varicose veins and formation of oedema;

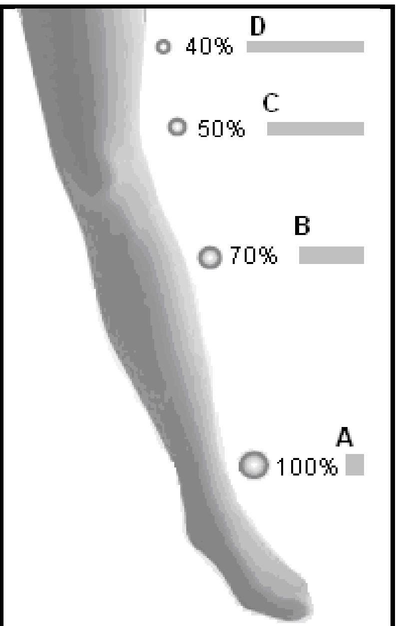


Figure 1. Differentiated compression zones along the leg

2. EXPERIMENTAL PART

2.1 Raw material

The European Standard [2] specifies that the raw material used for compression hosiery includes a stretchable yarn, achieved by covering an elastic core of polyurethane with other types of fibres (cotton or polyamide). Therefore, the yarns selected for the experiments were elastic yarns produced by wrapping polyamide filaments around an elastic core (Lycra®). After a preliminary study aiming to evaluate the tensional and elastic behaviour of several types of yarns, the optimum variant selected for the future experiments was single covered yarn made by 40% Lycra®, 156 dtex and 60% polyamide, 44 dtex /13 filaments [4].

The knitted structures used to produce medical stockings were designed at the Faculty of Textile-Leather and Industrial Management of Iasi (Romania), aiming to obtain a gradual pressure profile which to decrease from the ankle to the thigh, essential to ensure an effective compression treatment. The stockings were knitted on circular knitting machines at the ADESGO Company, using single jersey structures. Control over the compression degree was fulfilled by the amount of elastomer incorporated in the product and by the 3D knitting system, in which two elastic yarn systems, inlay and body yarns, were knitted together [6, 7]. Ten packages of medical stockings with maximum level of compression 30 mm Hg at ankle, classified in moderate compression classes - Ccl II, with 23 to 32 mmHg compression [2] have been created.

2.2 Tensile testing method

In order to assess the achieving of gradual compression levels and capacity of medical stockings to preserve their elastics features after daily use, samples of knitted fabric have been subdued to axial tensile test. Two groups of stockings have been tested: *new stockings* (before use) and *used stockings* (after 15 wearing-washing cycles). For each group of stockings, the samples were collected from four different areas or compression zones, delimited as follow (see Figure 1):

- A - the area around the ankle, where the maximum compression is developed
- B - the area around the calf, with intermediate compression
- C - the area above the knee, with medium compression
- D - the thigh area, with minimum compression

To distinguish between the samples taken from those two groups of tested stockings (new and used), the following notations were used:

- A_0, B_0, C_0, D_0 - the samples taken from each compression zone for the new stockings;

- A_1, B_1, C_1, D_1 - the samples taken from each compression zone for the used stockings.

Tests were performed on the wale direction, using the semiautomatic testing system Mesdan TensoLab, equipped with suitable clamps for knitted fabric. The knitted samples have been tested in the elastic range, without reaching the breaking point and for the applied loads the relative elongation was recorded. The force-elongation diagram of the elastic yarn selected for the experiments was used for setting the values of minimum and maximum force [3, 4].

Tests were performed in following conditions [5]:

- flat clamps;
- free gauge to clamp the fabric: 4 inch (100 mm);
- specimen size: 4 inch x 2 inch (100 mm x 50 mm, wale direction);
- minimum and maximum load: F_{min} = 0.65 N; F_{max} = 1.2 N;
- testing speed: 100 mm/min;
- testing direction: wale;
- mode control: continous semiautomatic.

All tested samples were conditioned at 65 ± 2% relative humidity and 20 ± 2°C for 24 hours before measuring, to relieve any localized stresses caused by handling during preparation.
Figures 2 and 3 presents the average curves force - elongation for those two types of stockings (new/used), corresponding to the minimum and maximum values of tensile load, for each compression zone and Table 2 shows the average values of relative elongation for the tested samples.

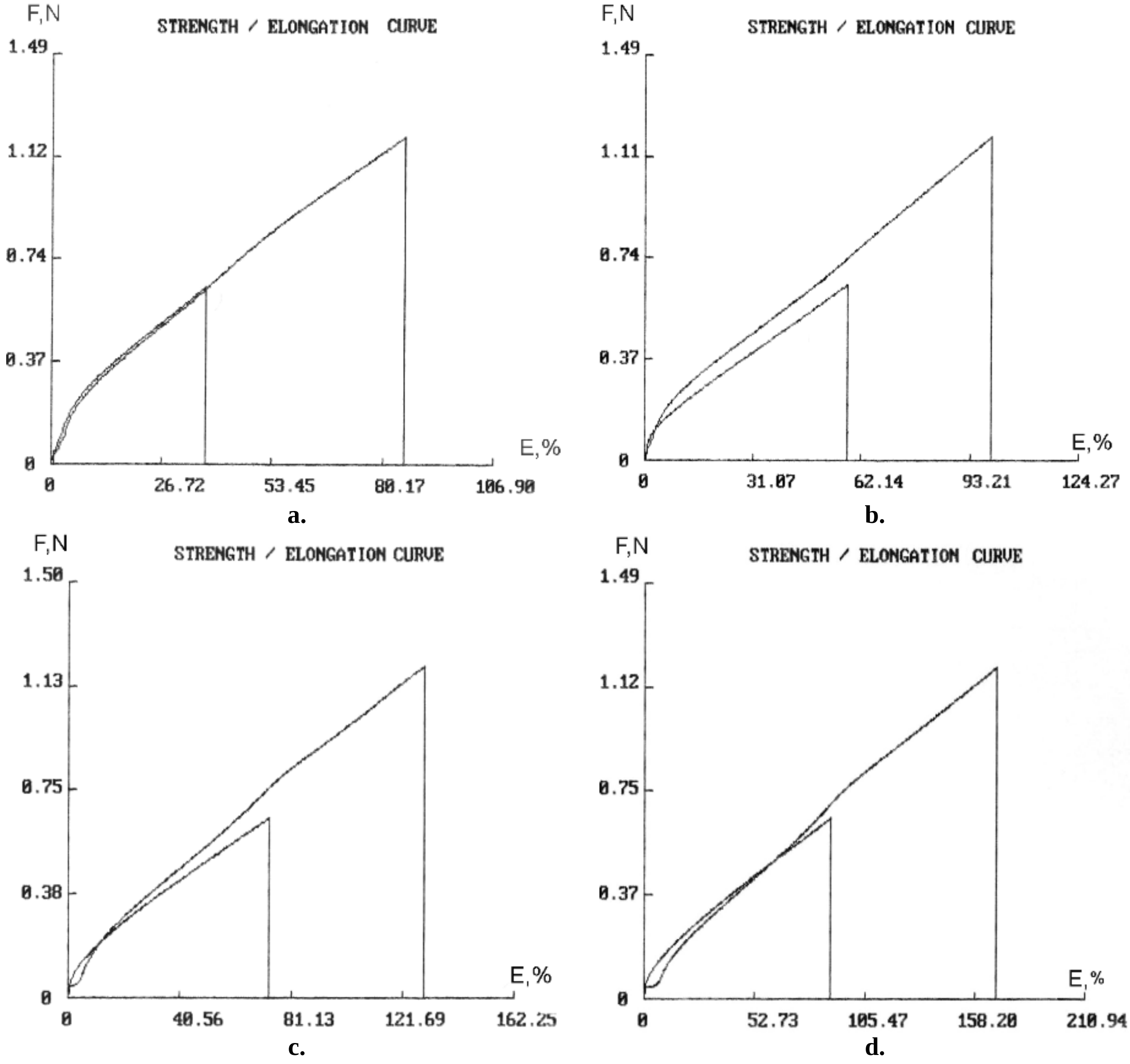


Figure 2: The curves strength-elongation for the new stockings: a – A_0 (maximum compression), b – B_0 (intermediate compression), c – C_0 (medium compression), d – D_0 (minimum compression)

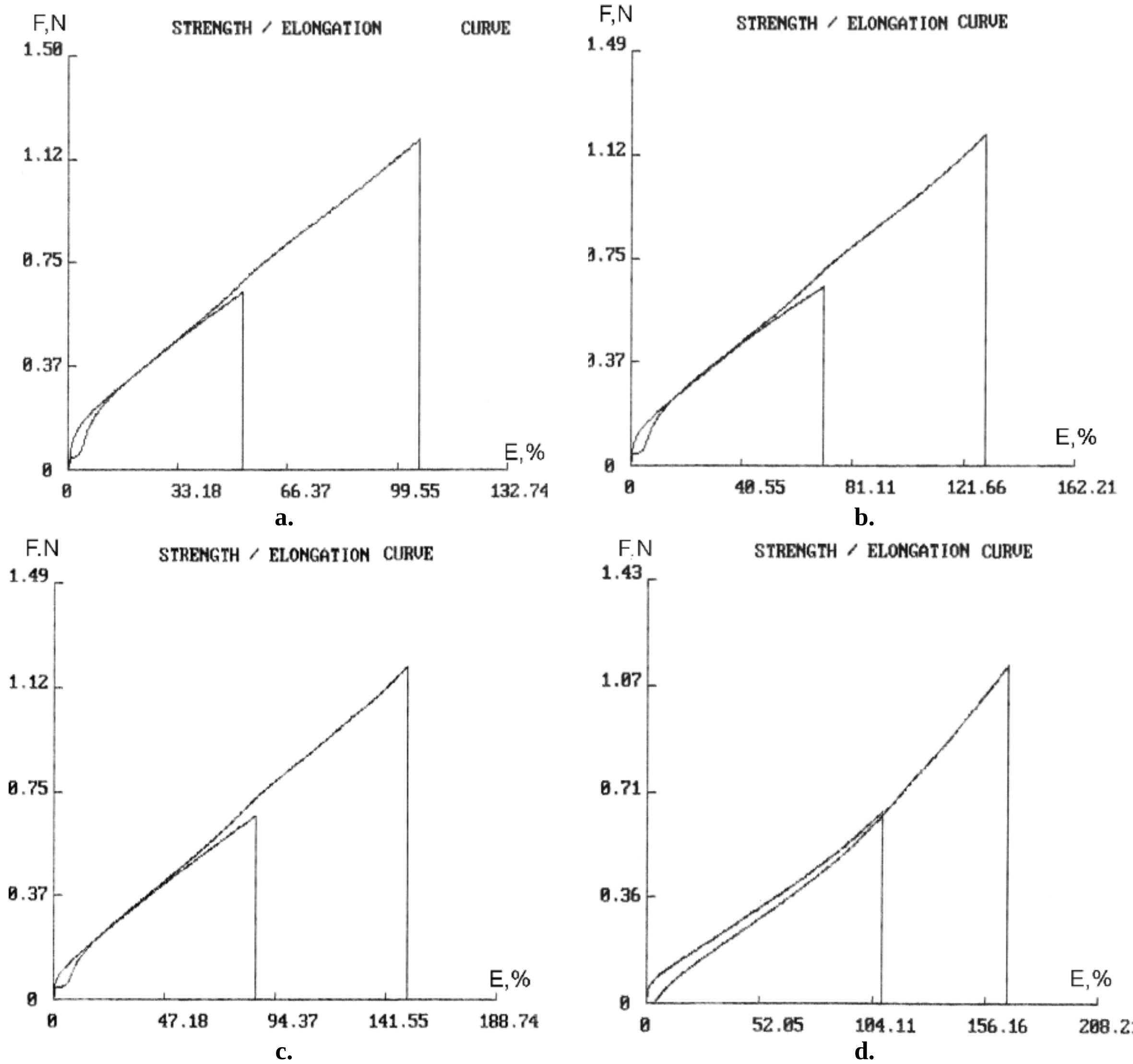


Figure 3: The curves force-deformation for the used stockings: a – A_1 (maximum compression), b – B_1 (intermediate compression), c – C_1 (medium compression), d – D_1 (minimum compression)

Table 2: The average values of relative elongation

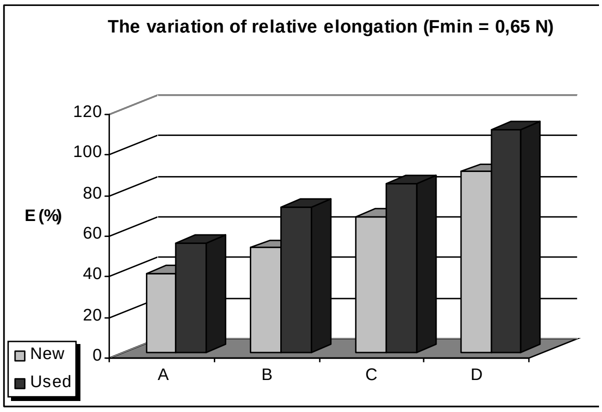
Type of stockings	Tensile load	Compression zone			
		A	B	C	D
New stockings	Fmin = 0.65 N	38.81	51.46	66.64	88.88
	Fmax = 1.2 N	88.67	100.22	133.32	153.14
Used stockings	Fmin = 0.65 N	53.90	71.71	83.12	109.80
	Fmax = 1.2 N	107.52	131.2	152.33	165.52

3. RESULTS AND DISCUSSION

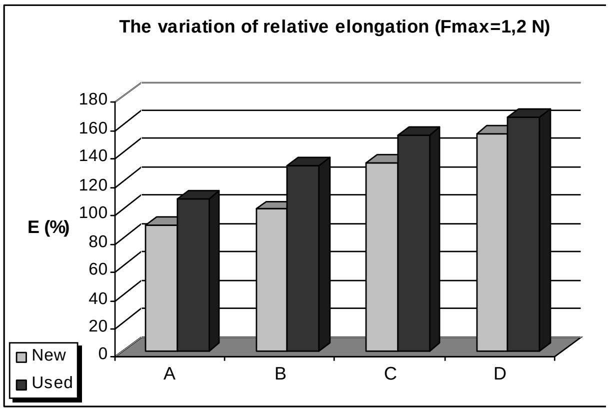
As can be seen in figures 2 and 3, in the selected testing range all the curves force–elongation for knitted samples showed similar forms, determined by the nature of raw material. The differences between these diagrams are given by the values of elongation. For a certain value of applied load, relative elongation corresponding to different compression zones, gradually increases, from zone A (ankle) to zone D (thigh), for both groups of elastic stockings. The growth in elongation has an evolution approximately linearly.

Considering that the deformation capacity of the sample is reversely proportional to its compression capacity (the smaller is the elongation, the bigger is the compression level), on can appreciate that the axial tensile test can be used to reveal the presence of a gradual compression along the stockings.

The results of axial tensile tests of the knitted samples at minimum and maximum load allowed a comparative representation of the relative elongation on different regions of the stockings, before use and after 15 wearing-washing cycles. Figure 4 shows the comparative representation for relative elongation.



a.



b.

Figure 4: Comparative representation of relative elongation on different compression zones of the medical stockings:
a. –minimum load value, b. – maximum load value.

The charts in figure 4 illustrates the different ways to answer to the tensile test of the samples, relative to the zone from where were taken and to the type of stockings (new or used). For both load values (0,65 cN and 1,2 cN), the elongation is smaller at the ankle (where a maximum compression level is required) and gradually increases to the thigh (where the compression level should be minimum). For used stockings, the elongation shows higher values than for the new stockings, regardless of the load value and the region where the samples were taken, but it is clearly visible that between those four tested areas the differences are maintained

Assuming that the value at the ankle is the 100% value of compression, for both types of stockings, the change in compression levels can be indicated by the percentage changes of elongation from zone A to zone D. Table 3 shows the values of compression levels expressed as percentage from compression at the ankle.

Table 3: Gradual compression of medical stockings,
expressed as percentage from compression at the ankle level

Type of stockings	Tensile load	Compression zone			
		A	B	C	D
New stockings	Fmin = 0.65 N	100	75	58	44
	Fmax = 1.2 N	100	88	67	58
Used stockings	Fmin = 0.65 N	100	75	65	49
	Fmax = 1.2 N	100	82	71	65

Can be noted that regardless of the tensile load value and the stockings state (new or used), the variation in compression level of tested stockings shows a pressure profile with maximum value at the ankle and the minimum value to the thighs. This variation of compression level is similar to that presented in figure 1, which confirms that the designed stockings are suitable for the compressive terapy of the venous diseases.

4. CONCLUSION

The aim of this paper was to assess the presence of a gradual compression along the leg and the ability of the designed medical stockings to conserve the gradual capacity of compression after daily use. The employed method was the axial tensile test, performed on the wale direction of the knitted structure, using semiautomatic testing system Mesdan TensoLab, equipped with suitable clamps for knitted fabric. Relative elongation was used to evaluate the compression capacity of the stockings on different zones along the leg.

The results of the axial tensile tests applied to the elastic stockings denoted the presence of gradual compression along the legs, confirming the concordance between the features of experimental medical stocking and their end use. Also the used method was able to assess the medical stockings ability to conserve their gradual capacity of compression after daily use.

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SOME ISSUES ABOUT TENSILE TESTING OF MEDICAL STOCKINGS.
PART II. FATIGUE TESTING OF MEDICAL STOCKINGS

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Abstract: Fatigue tests were carried through semiautomatic testing system Mesdan TensoLab, to emphasize the viscoelastic behavior of knitted medical stockings designed with gradual compression that is necessary for treatments of venous diseases. In order to appreciate the strength and viscoelastic features of the medical stockings, before and after daily use, were performed different tensile tests in the wale direction of the knitwear.
In this paper, have been performed two kind of fatigue testing: with time delay (relaxation) and with load cycles (hysteresis) on specimens sampled from the four compression zones along the leg of stockings, for both cases, before and after use. Fatigue testing results emphasized some changes of the mechanical characteristics regarding the medical stockings samples, but without affecting the suitability in preserving the gradual compression of the medical stockings after fifteen wearing-washing cycles.
Key words: medical stockings, gradual compression, fatigue tests, relaxation, hysteresis

1. INTRODUCTION

The knitted medical stockings made for treatment of venous diseases must fulfill proper functions during the wear under some restrictions of the priority criteria settled concordantly with the raw material and the stockings design parameters (finesse, gradual compression and size), [4, 6, 7].

Concerning the issue of mechanical characterization of medical stockings, many researches studied the tensile deformation for different values of the external stress applied to these products. The existing experimental studies for characterizing the tensile behavior of plain knitted fabrics include the uniaxial tensile test and the simultaneous biaxial tensile test [1].

This paper shows some issues approached in CEEX 192/2006 project. The main goal of this was to improve the solution for the treatment of chronically venous diseases of the leg by using compression hosiery made from knitted fabrics impregnated with medicine. One of the approached issues of the project was to find out what are the tensile testing methods adequate for the medical stockings; in this way, some results reported and published [4, 6, 7].

In order to appreciate the tensile and viscoelastic features of the medical stockings, before use and after daily use, were performed different tests in the wale direction of the knitwear, using the semiautomatic testing system Mesdan TensoLab. Part I of this paper presented the axial tensile testing results; in Part II are presented results of the actual fatigue tests, accomplished for the designed medical stockings.

2. EXPERIMENTS

2.1 Raw material

Medical compression stockings for treatment of the venous diseases were designed at the Faculty of Textile-Leather and Industrial Management of Iasi (Romania). After deploying a complex testing plan, which included studies both on the tensional and on the elastic behavior, a wide range of yarns suitable to the referred destination was stated; those yarns made by 40% Lycra®,156 dtex and

60% polyamide, 44 dtex /13 filaments were knitted on the circular weft knitting machines at the ADESGO Company [3].

Ten packages of the medical stockings were created and for each version was obtained a pressure profile that decreases from the ankle to the thighs (with maximum level of 30 mm Hg reached at ankle). This kind of hosiery is classified in the moderate compression class: Ccl II, with 23 to 32 mm Hg compression at the ankle [2].

In Part I of this paper, the description of measuring points was performed according to [5,8].Taking into account the four compression zones gradually assured, the experiments will refer to the following measuring points for attending the actual experimental part :

1. The ankle circumference at the smallest girth (A) has maximum compression (100 %);
2. The calf circumference at largest girth (B) has intermediate compression (70 %);
3. The above the knee level (C) has medium compression (50 %);
4. The thigh circumference at largest girth (D) has minimum compression (40%).

2.2. Fatigue testing methods

Part I of this paper pointed out the existence of a gradual compression along the leg, by using the strength tensile testing of medical stockings' samples on the wale directions. Acquired only for the behavior in elastic range (without reaching the breaking point), the testing results provided the concordance between experimental medical stockings manufacture and the product end-use. The sampling was performed by picking out specimens from the four compression zones (A to D) along the leg of the each stocking.

In normal utilization, knitted hosiery must be characterized through good elastic properties; according to [1,2], for approximately wear of six months it also should keeping the designed compression correlated to its compression class. That means successive wearing-washing cycles and this was the initial point for actual experiments.

Fatigue testing was carried out with Mesdan TensoLab semiautomatic testing system to characterize the viscoelastic behavior of stockings. For that can be performed two kind of tensile tests: with time delay: and with loading cycles; the former allow to assess both relaxation (achieved for $F(t)_{D=ct}$) and retardation (achieved for $D(t)_{F=ct}$) and the later allow to assess hysteresis.

Sampling was performed by picking out specimens from the four compression zones (A to D) along the leg of stockings for medical stockings before use and after 15 wearing-washing cycles.

Testing methodology for the fatigue tests was relied on the following conditions [4,6]:

- flat jaws for fabrics;
- free gauge to clamp the fabric: 4 inch (100 mm);
- specimen size: 4 inch x 2 inch (100 mm x 50 mm);
- predetermined loads: F_{min} = 0.65 N (relaxation and hysteresis) ; F_{max} = 1.2 N (hysteresis);
- testing speed: 100 mm/min;
- testing direction: wale;
- mode control: continuous
- testing time : 30 minutes (relaxation)
- number of cycles: 6 (hysteresis).

2.2.1. Fatigue testing of medical stockings with time delay reduction of force

In Part I, the medical stocking samples have been tested at axial traction only in the elastic range, without reaching the breaking point, pursuing the minimum and maximum forces (F_{min}= 0.65 N; F_{max}= 1.2 N); these were determined from the elastic range of force–elongation diagram plotted out for the yarns knitted in stockings. So, when were carried out relaxation tests for medical stockings samples (in Part II), each sample was extended in wale direction until the predetermined force (F_{min}=0.65 N) reached; next the moving clamp stops and started the measurements for the reduction of the force.

Table 1 includes numerical results of the relaxation tests, which allow assessing the rank of the dropped forces, for both kinds of medical stockings, by mean of the relaxation degree. For all measuring points, in this paper, was make use of index "0" for the sampling of stockings before use and of index "1" for the medical stockings samples after daily use.

Relaxation degree values (Rd, %) were calculated in Table 1 with the following expression:

$$Rd = (\text{Remanent force}/\text{Predetermined force}) * 100, \% \quad \textbf{(1)}$$

Table 1: Relaxation tests on medical stockings

Medical stockings	Predetermined force (F= 0.65 N)							
Before use	A_0	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.590	0.580	0.570	0.567	0.563	0.563
		Relaxation degree,%	90.76	89.23	87.69	87.23	86.61	86.61
	B_0	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.603	0.589	0.582	0.564	0.563	0.562
		Relaxation degree,%	92.76	90.61	89.53	86.76	86.61	86.46
	C_0	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.594	0.582	0.576	0.571	0.566	0.565
		Relaxation degree,%	91.38	89.53	88.61	87.84	87.08	86.07
	D_0	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.564	0.552	0.545	0.540	0.536	0.534
		Relaxation degree,%	86.76	84.92	83.84	83.07	82.46	82.15
After 15 wearing-washing cycles	A_1	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.572	0.557	0.552	0.546	0.543	0.539
		Relaxation degree,%	88.00	85.69	84.92	84.00	83.53	82.92
	B_1	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.575	0.560	0.555	0.551	0.547	0.544
		Relaxation degree,%	88.46	86.15	85.38	84.76	84.15	83.69
	C_1	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.574	0.565	0.556	0.553	0.551	0.549
		Relaxation degree,%	88.30	86.92	85.53	85.07	84.76	84.46
	D_1	Time delay, min	5	10	15	20	25	30
		Remanent force, N	0.583	0.567	0.560	0.555	0.550	0.548
		Relaxation degree,%	89.69	87.23	86.15	85.38	84.60	84.30

Figures 1 (a, b) show the dropping forces because of relaxation and Figures 2 (a, b) show the graphics of relaxation degree for both kinds of medical stockings tested at fatigue tests.

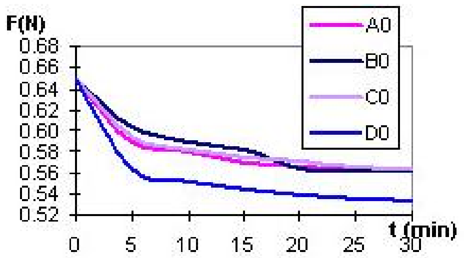

Figure 1.a.: Relaxation diagram (stockings before use).Dropped forces for the four compression zones along the leg of stockings

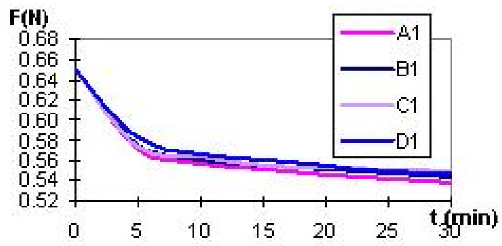

Figure 1.b.: Relaxation diagram (stockings (after 15 wearing – washing cycles).Dropped forces for the four compression zones along the leg of stockings

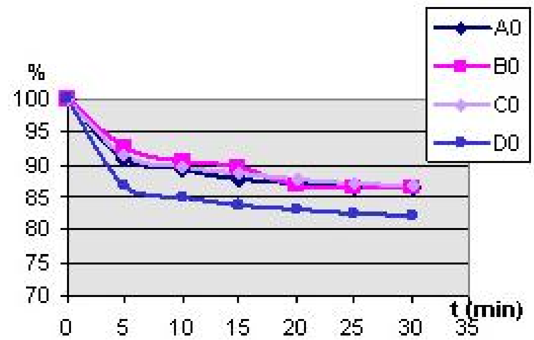

Figure 2.a.: Variation of relaxation degree (stockings before use)

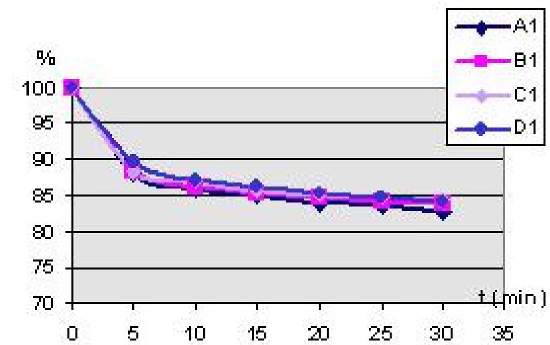

Figure 2.b.: Variation of relaxation degree (stockings after 15 wearing – washing cycles)

2.2.2. Fatigue testing of medical stockings with load cycles

Using Mesdan TensoLab system as well, the defined forces were applied on the medical stockings samples (from the four compression zones). The first loading cycle starting from the predetermined lower force (Fmin = 0.65 N) to the predetermined higher force (F max= 1.2 N); after that, the higher force was reduced, until the lowest force was reached again. For the fatigue tests purpose, in this paper six loading cycles for each sample repeated.

In Table 2 are showing the average values of elongation obtained after fatigue tests with six loading cycles (cc) accomplished on the medical stockings for the four compression zones.

Table 2.: Fatigue behavior of medical stockings deploying six loading cycles

Medical stockings sampling			1 cc		2 cc		3 cc		4 cc		5 cc		6 cc	
			F_{max}	F_{min}	F_{max}	F_{min}	F_{max}	F_{min}	F_{max}	F_{min}	F_{max}	F_{min}	F_{max}	F_{min}
Before use	A_0	E(%)	91.7	69.2	94.2	72.6	96.6	74.8	97.9	75.2	98.7	76.6	99.8	77.6
	B_0	E(%)	105.4	80.5	107.6	83.1	110.8	85.2	111.8	86.4	113.2	87.4	114	88.5
	C_0	E(%)	137.3	107.9	141	111.5	143.3	112.8	145.2	114.9	146.4	116.8	147.6	117.7
	D_0	E(%)	178.5	143.2	183.	148	186	150.2	188.3	152.8	190.3	154.6	191.8	155.4
After 15 wearing-washing cycles	A_1	E(%)	112.6	89.9	115.5	93.2	117.7	95.3	118.8	96.5	119.5	97.3	120.8	98.3
	B_1	E(%)	138.0	112.7	141.3	115.4	143.4	117.9	144.5	119.	145.8	120.2	146.5	121
	C_1	E(%)	160.2	128.5	163.5	133.9	165.9	136.5	167.5	138	168.8	139.3	169.8	140.5
	D_1	E(%)	186.3	157.8	190.4	162.6	192.5	163.7	193.9	165.9	194.9	167.6	196.2	169.1

Figures 3.a. and 3.b. show the hysteresis diagrams resulted as graphical representations of the fatigue tests with six load cycles between the two selected force values (F_{min} to F_{max}).

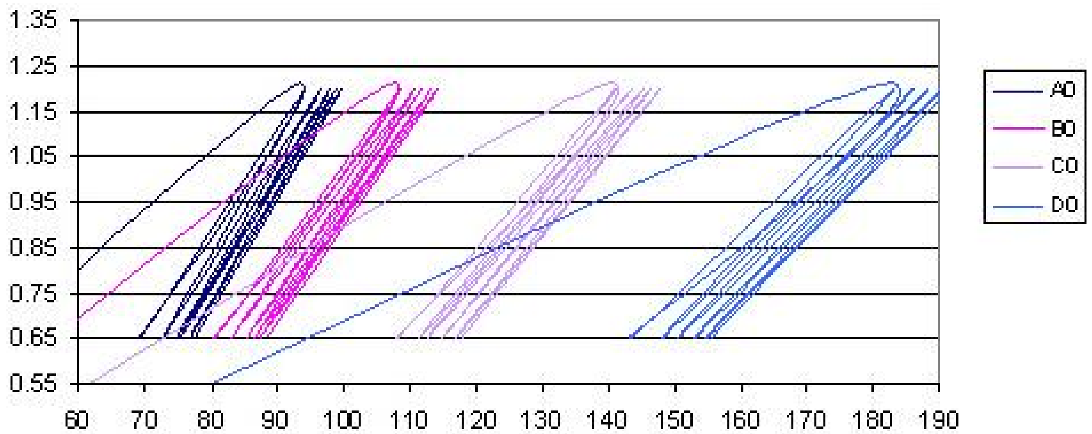

Figure 3.a.: Hysteresis diagram (stockings before use)
Fatigue tests with repetition of the load cycles for compression zones along the leg of stockings

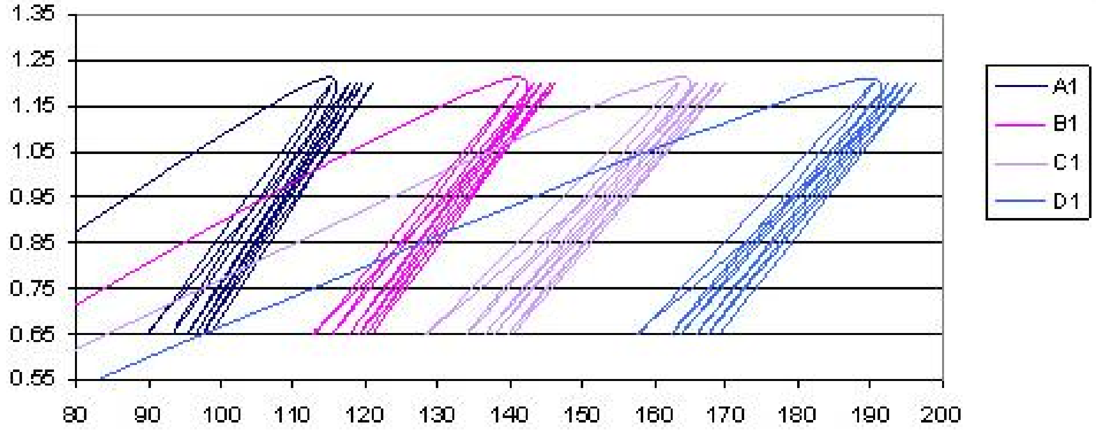

Figure 3.b.: Hysteresis diagram (stockings after 15 wearing – washing cycles)
Fatigue tests with repetition of the load cycles for compression zones along the leg of stockings

Apart from hysteresis diagrams were selected numerical results that allowed emphasizing as well, the viscoelastic behavior of the medical stockings through resilience index, R (see Table 3.)

Table 3. Numerical results from hysteresis diagrams for the work done appraising at the fatigue tests

Medical stockings sampling	Hysteresis diagram points	E1,1+	E2,1+	E1,1-	E2,6+	E1,6-	DE 1,1 (6)	DE 2,1 (6)	R
Before use	A_0	38.47	91.71	69.20	99.80	77.61	39.14	8.09	0.419
	B_0	59.23	105.40	80.47	114.09	100	40.77	8.69	0.415
	C_0	74.38	137.33	107.90	147.61	117.71	43.33	10.28	0.396
	D_0	90.57	178.57	143.23	191.80	155.42	64.85	13.23	0.403
After 15 wearing-washing cycles	A_1	53.90	112.57	115.52	120.85	98.38	44.48	8.28	0.366
	B_1	71.71	138.00	141.33	146.47	121.04	49.33	8.47	0.405
	C_1	83.12	160.13	163.52	169.80	140.57	57.45	9.67	0.362
	D_1	109.52	186.30	190.38	196.19	169.14	59.62	9.89	0.339

In the Table 3, are presented values for the measurement points identified in the hysteresis diagrams (see the Figure 3.a. and b.):
E1, 1+: elongation for F_{min}, during the first load cycle;
E2, 1+: elongation for F_{max}, during the first load cycle;
E1, 1- : elongation for F_{min}, after the first load cycle;
E2, 6+: elongation for F_{max}, at the 6-th load cycle;
E1, 6- : elongation for F_{min}, at the 6-th load cycle;

D E 1,1 (6): elongation between the first and the 6-th load cycle at the lower force limit (calculated as a difference between E 1,1+ şi E1,6- values);

D E 2,1 (6): elongation between the first and the 6-th load cycle at the upper force limit (calculated as a difference between E2,1+ and E2,6+ values);

R: *resilience index* calculated after the 6-th load cycle, as a report between aria below the force–deformation diagram of the hindmost load cycle and aria below the force–deformation diagram of the entire fatigue test (from the first until the last load cycle) for each stockings sample.

3. RESULTS AND DISCUSSIONS

According to the presented results, the following observations came out.

3.1. Fatigue testing of the medical stockings with time delay reduction of force:

- The reaction at the initial load (F_{min}=0.65 N) was approximately the same for all medical stockings specimens, for 30 minutes time range of testing. These were the results regardless of the both stockings' status before use and after fifteen wearing-washing cycles and regardless of the compression zone sampling (Fig.1.a. and b).
- The experiments pointed out more accentuated decrease in the relaxation degree (Table 1) during the first part of the loading time (0÷15 min) comparatively to the second part of loading time (15÷30 min). This behavior can be considered similar with the effect of first manipulations over the stockings for each wear.
- In addition, the relaxation degree directly correlated with the dropped force measured on different compression zones (Fig.2.a. and b.), showed different trends in those stages (before use, after 15 wearing-washing cycles).
- For all the samples, predetermined force (F =0.65 N) has dropped with values between 0.025 N to 0.041 N, after 30 minutes time delay. In the same manner, the actual relaxation degree has dropped with about 4.15% to 6.3 %, for the same range of the time delay.

3.2. Fatigue testing of medical stockings with load cycles:

- The hysteresis diagrams (Fig.3.a. and b) achieved as a results of six load cycles between two selected force values (0.65 N and 1.2 N) rehash in a other manner the viscoelastic behavior of medical stockings that have to preserve the designed gradual compression. Graphics indicate almost the same behavior for all medical stockings specimens, regardless of the both stockings' status (before use / after fifteen wearing-washing cycles) and compression zone sampling along the leg.

- Resilience index (Table 3) can provide the reaction and suitability of the designed medical stockings to subsequent fatigue tests, which can be related with the actual wear. Experimental results denote a better resilience of the samples taken over the medical stockings before use against medical stockings after use (15 wearing-washing cycles), but not very significant. The obtained R-values are the following: 0.419/ 0.366, for A_0/A_1 zones; 0.415 / 0.405 for B_0/B_1 zones; 0.396 / 0.362, for C_0/C_1 zones and 0.403/ 0.339 for D_0/D_1 zones.

4. CONCLUSIONS

Fatigue tests can serve to emphasize the viscoelastic behavior of knitted medical stockings that are designed with gradual compression, necessary for wear in treatments of venous diseases.

In normal wear, hosiery-knitting products, characterized by good elastic properties, should keep the designed compression correlated to their compression class, for approximately six months and that means successive wearing-washing cycles. Therefore, fatigue testing was carried out with Mesdan TensoLab semiautomatic tensile testing system to characterize the viscoelastic behavior of medical stockings designed for the treatment of venous diseases, that is to say with gradual compression along the leg.

Two kind of fatigue testing have been performed: with time delay (relaxation) and with load cycles (hysteresis). Sampling was performed by picking out specimens from four compression zones along the leg of stockings, before use and after fifteen wearing-washing cycles.

The results of the fatigue testing applied on medical stockings emphasized some changes of the mechanical characteristics between the four sections with gradual compression, regarding the medical stockings status. Fatigue testing first with time delay reduction of force and second, with loading cycles pointed out similar both the level of the dropped forces and the resilience index for all samples.

In this paper, all fatigue tests provided the medical stockings suitability in preserving the gradual compression after wearing-washing cycles, this behavior being similar to actual use.

Acknowledgement

CEEX 192/2006 project (Romania) supported this research.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

STUDY ON RANGE OF FABRIC COST PERCENTAGE AGAINST FOB PRICE OF KNIT GARMENTS

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Abstract: The price offered for the garments is called garments cost. Cost of a garment is depending on its style and materials used. If the style is so complicated like having pockets, fancy seams, lining & trims, decorative stitches etc the cost will be high. On the other hand, if garments are made from only basic fabric their cost will be low. The prime factor of costing is fabric cost because it occupies maximum portion of garments price. Here, it has been observed that 52%- 55% of garments price is occupied by fabric price. But this percentage varied from garment to garment according to their fabric specification. It has been also identified that the fabric cost percentage will be reduced in terms of its FOB price when the garments are characterized by design and vice-versa.

Key words: Garments costing, FOB price, Fabric price, Knit garments, Cost Sheet.

1. INTRODUCTION

A feature of all modern human societies is the wearing of garments, a category encompassing a wide variety of materials that cover the body. The primary purpose of clothing is functional, as a protection from the harmful elements. Clothes also enhance safety during hazardous activities such as cooking, by providing a barrier between the skin and the environment. Further, clothes provide a hygienic barrier, keeping toxins away from the body and limiting the transmission of germs.

2. FACTORS AFFECTING GARMENTS PRICE

- **Fabric prominence:**

The garments which are fabric salient known as fabric prominence garments. Here fabric is the main influencing factor to determine garments price. It is a simple garment normally having no costly designs, prints or features.

- **Design prominence:**

The garments which are made from lower price fabric but having costly decorative design for value addition belong in this category. The cost of the design occupies higher percentage in relation to total garment price.

- **Special quality:**

These types of garments have special quality like anti crease property, anti pilling property, soft handle property and also have other value addition features by washing such as super white wash, stone wash, acid wash etc. These types of quality substantially increase the manufacturing cost thus increase garments price & vice versa.

- **Special attributes:**

These types of garments have special attribute like soil release property, anti flammability, water repellent property etc .These types of garments are mostly used in technical purpose, and most of these are very expensive.

- **Donation:**

The donation amount of money is incurred to the price of garments .If donation amount is added then price of garments also increase.

3. COSTING

Preparing garments cost, the influencial factors are as below-

a) Fabric cost
b) Accessories/trimmings cost
c) Design cost (Print/Embroidery/Appliqué)
d) Cost of manufacturing
e) Documentation & Contingency cost
f) Mode of delivery cost
g) Profit

3.1 Knitted Fabric cost:

A significant portion of a garment cost is carried by the fabric cost. Fabric cost depends on its types & quality. It is measured by fabric consumption. Knitted fabric cost consists of:

a. Yarn Price,
b. Knitting Price,
c. Dyeing & Finishing Price,
d. Fabric Overhead Price.

Fabric consumption for T-Shirt (Kg/Doz) = [{(Body length in cm+ Sleeve length in cm + Sewing Allowance) × Full Chest (cm) × GSM × 12} / 10000000] + (10-15) % Allowance

Fabric Cost/Kg = Fabric Consumption (Kg/Doz) X (Yarn price/Kg + Knitting Price/Kg + Dyeing & Finishing Price/Kg + Fabric Overhead Price/ Kg)

3.2 Garments Costing

Garments costing is an important step, for both buyer & producer, mostly depends on the style. If the garment is simple, the cost will be less to make. If an expensive fabric has been chosen for a particular design, it would be wise to keep the details to a minimum. Using expensive fabric and many styling details often make the finished cost of the garment too high for the market which has been targeted. Costing of a garment is measured by a mathematical formula through figuring costs of fabric and accessories with labor plus business overheads and profit. Overhead costs are affected by such factors that machine depreciation, maintenance etc goes along with owning and running a business. Those all have to be considered into the costing of a garment.

4. RESEARCH METHODOLOGY

10 samples of basic round neck T-shirt of medium size have been produced. For producing samples, solid dyed fabrics of 180 GSM have been used with 5 types of following composition:

a. 100% Cotton, 24'S – For Single Jersey (S/J)
b. 100% Cotton, 30'S – For Pique
c. 100% Cotton, 40'S – For Interlock
d. 98% Cotton, 34'S & 2% Lycra, 20D – For Lycra S/J
e. 100% Cotton, 32'S – For 1X1 Rib

5. DATA

Table 1: Cost sheet preparation

	100% Cotton, 24'S, S/J	100% Cotton, 32'S, 1x1 Rib	100% Cotton, 30'S, Pique	100% Cotton, 40'S, Interlock	98% Cotton, 2% Lycra, 34'S & Lycra 20D S/J	Unit
Fabric Consumption	1.97	1.97	1.97	1.97	1.97	Kg/Doz
Fabric Price Details						
Yarn Price	$ 4.45	$ 4.70	$ 4.50	$ 5.20	$ 5.25	Per kg
Knitting Charge	$ 0.15	$ 0.24	$ 0.25	$ 0.26	$ 0.44	Per kg
Dyeing Charge	$ 1.34	$ 1.34	$ 1.34	$ 1.34	$ 1.78	Per kg
Overhead Cost	$ 0.10	$ 0.10	$ 0.10	$ 0.10	$ 0.10	Per kg
Total Fabric Price	$ 6.04	$ 6.37	$ 6.19	$ 6.90	$ 7.57	Per kg
Fabric Price	$ 11.89	$ 12.56	$ 12.19	$ 13.60	$ 14.92	Per Doz
Fabric Price	$ 0.99	$ 1.04	$ 1.01	$ 1.13	$ 1.24	Per pc
Accessories						
Sewing thread - 4 cones	$ 2.20	$ 2.20	$ 2.20	$ 2.20	$ 2.20	$ 0.55/Cone
Size Label	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30	
Finishing Material	$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 1.00	Per Doz
Cost of Making	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	Per Doz
Total Price	$ 18.39	$ 19.06	$ 18.69	$ 20.10	$ 21.42	Per Doz
Unit Price	$ 1.53	$ 1.59	$ 1.56	$ 1.67	$ 1.78	Per pc
Documentation 108%	$ 1.66	$ 1.72	$ 1.68	$ 1.81	$ 1.93	Per pc
Contingency 105%	$ 1.74	$ 1.80	$ 1.77	$ 1.90	$ 2.02	Per pc
Actual Price	**$ 1.74**	**$ 1.80**	**$ 1.77**	**$ 1.90**	**$ 2.02**	**Per pc**
FOB Price	**$ 1.82**	**$ 1.93**	**$ 1.94**	**$ 2.13**	**$ 2.33**	**Per pc**

*Yarn price based on October'2010

Table 2: Cost sheet – Fabric price vs. Garments price

	100% Cotton, 24'S, S/J	100% Cotton, 32'S, 1x1 Rib	100% Cotton, 30'S, Pique	100% Cotton, 40'S, Interlock	98% Cotton, 2% Lycra, 34'S & Lycra 20D S/J	Unit
Fabric Price	$ 11.89	$ 12.56	$ 12.19	$ 13.60	$ 14.92	Per Doz
Fabric Price	$ 0.99	$ 1.04	$ 1.01	$ 1.13	$ 1.24	Per pc
Actual Price	$ 1.74	$ 1.80	$ 1.77	$ 1.90	$ 2.02	Per pc
FOB Price	$ 1.82	$ 1.93	$ 1.94	$ 2.13	$ 2.33	Per pc
Fabric cost Vs Actual Price percentage	**56.89%**	**57.78%**	**57.06%**	**59.47%**	**61.38%**	
Fabric cost Vs FOB Price percentage	**54.39%**	**53.89%**	**52.58%**	**53.05%**	**53.22%**	

*Yarn price based on October'2010

6. RESULTS & DISCUSSION

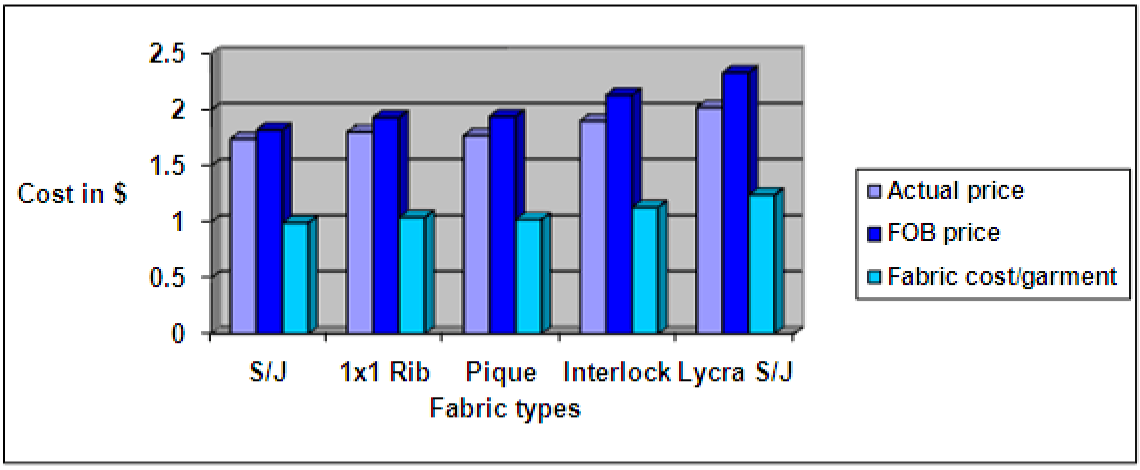

Fig. 1: Graphical presentation of Actual price, FOB price & Fabric cost of garments

Here it has been seen that Actual price, FOB price & Fabric cost/garment for Lycra S/J is \$2.02, \$2.33 & \$1.24 respectively. These are higher than that of other types of fabrics. In this graph S/J has the lowest Actual price, FOB price & Fabric cost/ garment which are respectively \$1.74, \$1.82 & \$0.99. It also found that Actual price, FOB price & Fabric cost/garment is the lowest for S/J and they are gradually increasing according to their nature of construction sequentially 1X1 Rib, Pique, Interlock and Lycra S/J.

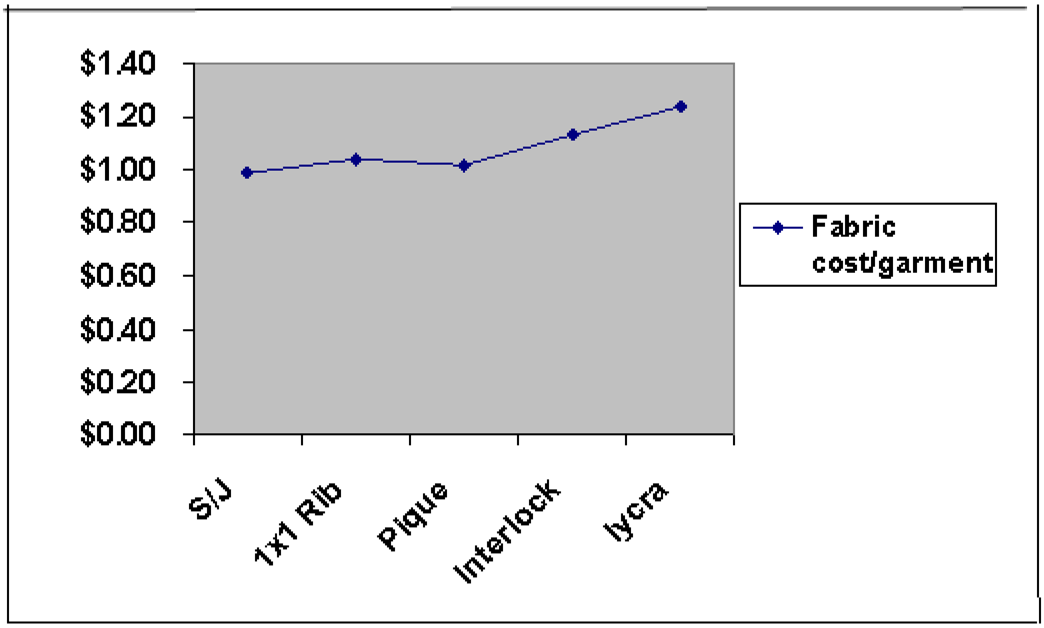

Fig. 2: Line diagram of Fabric cost of different garments

From this line diagram it can be shown, fabric cost/ garment of S/J is \$0.99 & this is the least among others. Lycra S/J has the highest fabric cost/garment which is \$1.24. It can be seen that the cost almost same 1×1 Rib, Pique & then it is increased gradually for Pique, Interlock and Lycra S/J. All of the Fabric cost/garments are ranged from \$0.99-\$1.24.

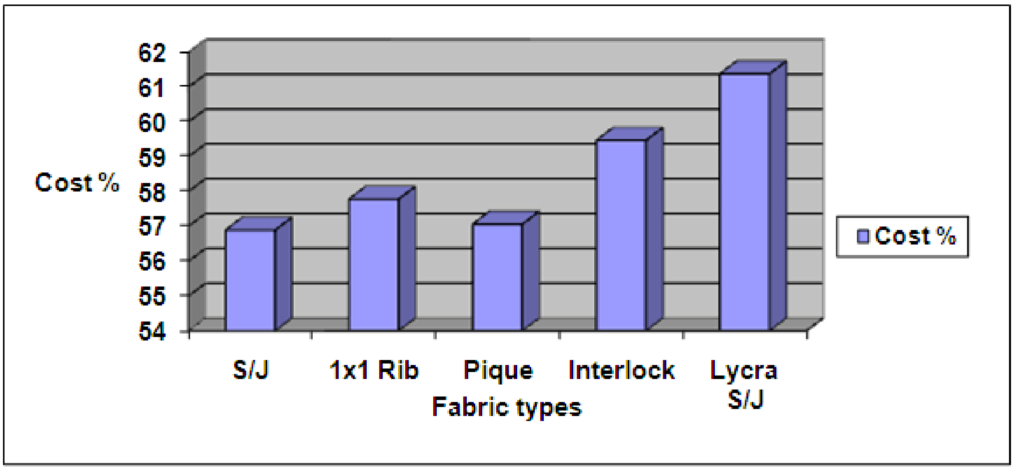

Fig. 3: Graphical presentation of Fabric cost percentage in relation to Actual price of garments

In this graph, it is found that the fabric cost percentage against Actual price has no remarkable difference for S/J, 1x1 Rib and Pique which are 56.89%, 57.78%, and 57.06% respectively. Then it is increased gradually from Pique to Lycra S/J. Here, Lycra S/J is occupied higher fabric cost percentage against Actual price, which is 61.38%. Pique showed less cost percentage 0.72% in compare to 1x1 Rib due to low yarn price used in Pique than that of 1x1 Rib.

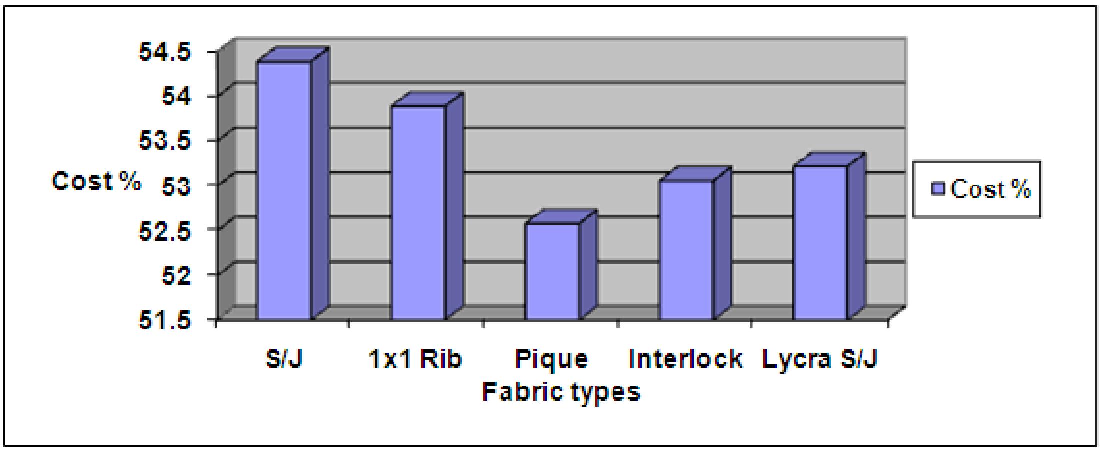

Fig. 4: Graphical presentation of Fabric cost percentage in relation to FOB price of garments

In this bar diagram, it has been illustrated that Fabric cost percentage against FOB price is maximum for S/J, which is 54.39% and minimum for Pique, which is 52.58%. The percentage is varying from S/J to Lycra S/J due to FOB price is combination of Actual price & profit in which profit percentage differ from S/J to Lycra S/J. It also can be mentioned that the cost% is decreased sharply from S/J to Pique & increased gradually from Pique to Lycra S/J.

7. FINDINGS

From this research, it has been found that basic structured garments are occupied lower (5%-10%) profit percentage and higher Fabric cost percentage (54.39%) in comparison to its FOB price. Again the knit garments that contained somewhat complex or fancy design depict higher profit (10%-15%) and lower Fabric cost percentage in comparison to basic structured garments. Here, it is identified that range of Fabric cost percentage is 52%-55%. Pique made garments are exhibited lowest Fabric cost percentage as its Fabric cost is low & FOB cost is high due to its wide acceptance.

8. CONCLUSIONS

Fabric cost occupies significant portion of garments cost .After calculating total cost breakdown, it can be concluded that fabric cost occupies (52%-55%) of total garment price. If fabric wastage can be minimized it will naturally boast up the profit earned from garments export.

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DESIGN CRITERIA FOR ANTI-SKID RELIEF DESIGN OF FOOTWEAR SOLES

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Abstract: The main function of the anti-skid relief is to avoid the slipping of the foot wearing footwear while in dynamics. The anti-skid relief is made on the sole surface which comes in contact with the support plan. The relief shapes, dimensions and position on the sole surface is done fallowing a set of well-defined rules. To elaborate the methodology for anti-skid relief design are taking in account a set of restrictions determined by the foot anatomy, the foot slip tendency while walking or performing sports, the influence of the relief shape on the foot comfort in dynamics, the wearing resistance as well as the technologies used in producing the moulds in which the soles will be formed. This paper presents a set of criteria which are the basics for the anti-skid relief design.

Key words: footwear, footwear soles, anti-skid relief, design, shoe design

1. INTRODUCTION

The anti-skid relief consists in a set of shapes which role is to avoid the foot slippage while walking. The slip stopping is obtained by both using relief shapes and positioning these shapes on the sole surface and the properties of the polimeric blends used to form the soles.

In this paper is presented a set of design restrictions for the anti-skid relief, determined by the slip tendency of the foot while in walking dynamics, by the influence of the relief shapes on the sole rigidity and resistance to repeated flexing, by the influence on the wearing resistance, by the profile and geometry of the relief.

2. THE ANALYSIS OF SOME ANTI-SKID RELIEF DESIGN CRITERIA

2.1. The slip tendency of the foot while walking

While walking, the foot passes successively through the phases of supported foot and oscillating foot. The supported foot presents a set of successive positions well defined in time: the impact moment, the support on the entire surface and the propulsion moment [4]. The slip tendency of the foot are accentuated in the phases in which the contact with the support plan has its' minimum value. In Fig.1a are highlighted probable slipping directions on the surface of a sole while walking [2, 3].

Considering the impact faze as in Fig.1b, is distinguished the apparition of a tangential component to the H plan, depending on the foot tilt at this moment [3], component whose value is calculated with the relation (1).

$$H = F \sin\alpha \ \ [\mathrm{N}] \qquad \textbf{(1)}$$

This component will determine the foot slip on direction 1 as in Fig.1a. If the plane presents a tilt in relation with the horizontal, as in Fig.1c, appears a second tangential component to the plane, which is noted with T and whose value is given by the relation (2). The T force will determine the foot slip in one of the directions 2 in Fig.1a.

$T = V \sin\beta$, [N] **(2)**

The vertical component V is calculated with the relation (3) and depends on the dynamic effort F with which the foot touches the support plane and on the α angle.

$V = F \cos\alpha$, [N] **(3)**

The foot slip is produced when the friction component on the plane direction is surpassed by one of the two tangential components to the H plan, respectively T.

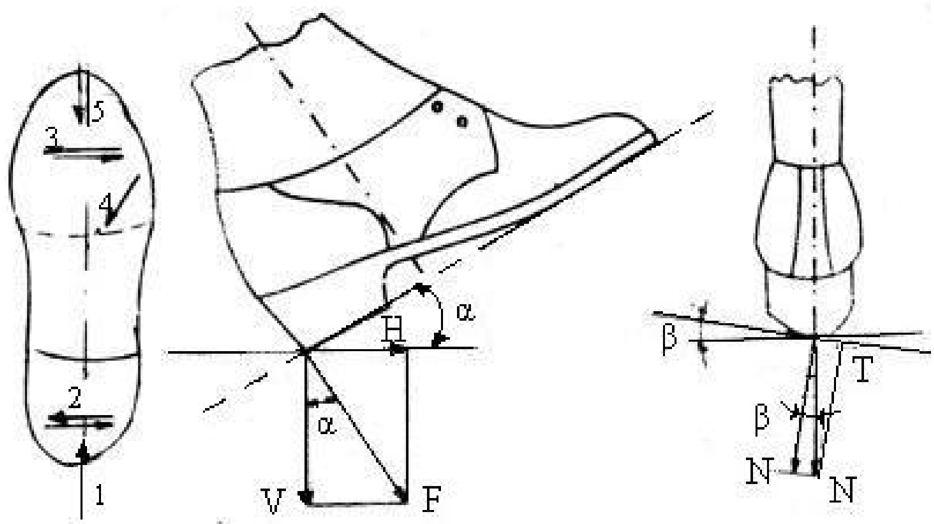

Fig. 1: Slip direction of the foot while walking

An important problem is that of the orientation of the relief in relation with the foot bottom surface lines [1, 5]. Following the lower part of the sole in Fig.1a, in which are highlighted the probable slip directions while walking, results the generic rule for orienting the anti-skid relief such as the picks or the protruding lines are positioned by perpendicular directions to these slip directions [2, 3].

On the surface of the hill in the directions 1 and 2 it is normal to give priority to the direction 1 parallel to the bottom surface line because the slipping under the influence of the horizontal component H at impact is possible for each step. This component manifests itself in a moment when the inertia pulls the body forward, a moment favourable for slipping. The contact with the support plan in this phase is produced sharply and the foot rotates in the tibia-astragals articulation and passed in the phase of supported foot. The coincidence of slipping on one of the directions 2 doesn't exclude the possibility of slipping on the direction 1. Concerning the possibility of slipping in the direction 2 towards interior or exterior, more probable is the movement towards exterior because of the calcaneus tendency to pass in valgus.

In propulsion phase, the probability of slipping is in the directions 3 and 4 in Fig.1a. The slipping in the directions 3 in the two directions is seen mainly when the plane forms an angle with the horizontal. The slipping in the direction 4 is possible while the body weight passes on the forefoot, when the tibia rotates in the tibia-astragal articulation and the gravity center moves forward. In this moment, the weight of the body passes on a single foot while the other foot is in oscillation phase. Even if the inertia pulls the body forward, accentuating the slipping components in the direction 4, a slipping tendency in the direction 3 generated by a slight tilt of the plane may favour the foot slipping and the unbalancing of the entire body. In consequence, to both probable slipping directions should be accorded the same importance.

2.2. The influence of the relief shapes on the sole rigidity

In the forefoot zone, with the anti-skid properties, the same importance should be given to the sole rigidity in the toes articulations zone [1, 5]. A factor that is taken into account in the sole rigidity calculation is the anti-skid relief [2, 3]. In Fig.2 is represented a section through a sole with thickness discontinuities caused by the presence of the anti-skid relief.

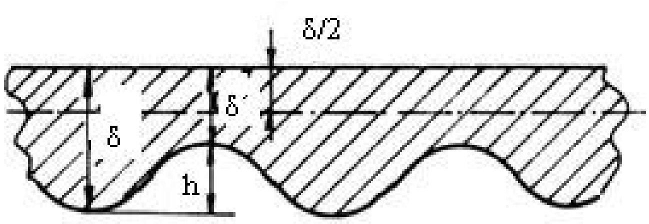

Fig. 2: Section through a sole with anti-skid relief

Considering that the flexing of the sole takes place in the zones of δ thickness**,** the mathematical relations lead to elevated values of the sole righty while flexing. The same mathematical relations applied to the sole zones with the thickness δ′ lead to much smaller values of the sole rigidity. Experimental values [2] reveals that the real values of the rigidity are determined by a sole thickness situated between δ and δ′, and this corresponds to the average value between these thicknesses. The rigidity for both the situations is calculated with the relations (4) and (5).

$$R = E\frac{b\delta^3}{12} \text{ [Ncm}^2\text{]} \quad \textbf{(4)}$$

$$R^{'} = E\frac{b(\delta^{'})^3}{12}, \text{ [Ncm}^2\text{]} \quad \textbf{(5)}$$

where: R – the rigidity of the rectangular section, [Ncm^2]; E – the elasticity module, [N/m^2]; b – the section width,[m]; δ, δ$^{'}$ – the section thickness, [m].

Because δ′< δ results that R$^{'}$<R. Noting the δ′/ δ with I_g, this can be considered a thickness index of the anti-skid relief. In concrete conditions, its values, experimentally determined, are between 0.3 and 0.9. Noting δ′= δ I_g the rigidity mathematical relation is calculated is in the relation (6).

$$R^{'} = E\frac{b(\delta^{'})^3}{12} = E\frac{b(\delta I_g)^3}{12} = RI_g^3 \quad \textbf{(6)}$$

Therefore, the bigger the thickness indexes the smaller the rigidity, the thickness index having a sub unitary value. The variation of the rigidity of the sole with anti-skid relief in relation with the thickness index is presented in the chart [2] in Fig.3.

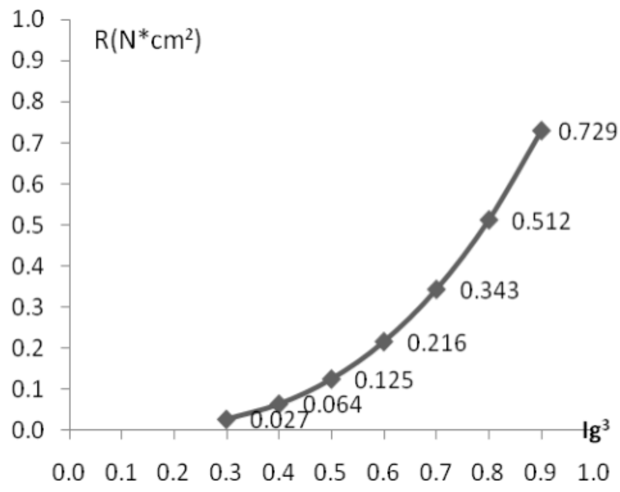

Fig. 3: The rigidity variation of the sole in relation with the thickness index

The sole rigidity influences the flexing mechanical work in the toes articulation zone. Considering the foot lifted on the forefoot in the propulsion phase at a curving radius ρ, whatever the thickness and rigidity of the sole, for this curving radius the exterior point of the heel is at a distance f in relation with the horizontal plan, as in Fig. 4.

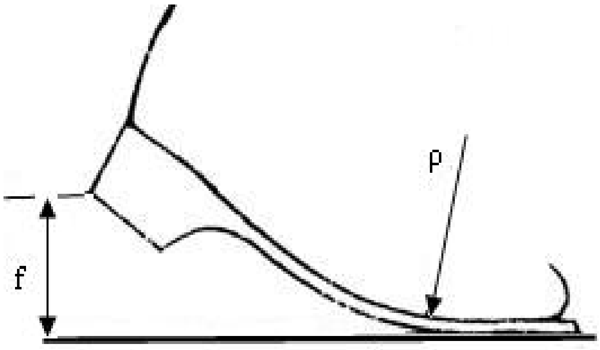

Fig. 4: The position of the heel in the sole flexing phase

The value for f is given by the relation (7).

$$f = \frac{Pl^3}{3R} \tag{7}$$

Applying the relation (7) to both cases with the thicknesses δ and δ’ and taking in account that the value of f = f’, the relations (8) and (9) are resulting.

$$\frac{Pl^3}{3R} = \frac{P^{'}l^3}{3R} \tag{8}$$

$$P^{'} = \frac{PR^{'}}{R} = \frac{PRI_g^3}{R} = PI_g^3 \tag{9}$$

Results that the bending effort in the minimum thickness zone depends on the cube of the thickness index. For the bending mechanical work, taking in account the equal movement with f are obtained the relations (10) and (11).

$$L = fP \tag{10}$$

$$L^{'} = fP^{'} = fPI_g^3 \tag{11}$$

From the relations (10) and (11) results that the mechanical work of the foot while bending is smaller if the sole bends on the thickness $\delta^{'}$.

Consequently, on the forefoot zone the anti-skid relief will be designed on parallel directions in relation with articulations line and the peaks of the relief will have minimum thickness in these zones.

2.3 The sole wearing resistance

The anti-skid relief has a significant role in increasing the wearing resistance of the sole. Considering a full section sole compared with a sole whose thickness has been reduced by the anti-skid relief, as in Fig. 5, is highlighted a set of different components which influences the wearing behaviour of the sole to slipping in relation with the plan [2,3].

The friction that leads to wearing can be slipping friction and rolling friction. In the case of the full section sole, the representations a and a´ in Fig.5, are highlighted the next components whose summed effects can accelerate the wear: σ_c – the unitary effort caused by the weight on the surface unit of the sole from the body weight, in the moment before the propulsion; σ_i – the unitary effort caused by the bending of the sole; f_a – the effort generated by the slip friction; an unitary effort generated by the rolling friction under the action of bending at a curvature radius of ρ.

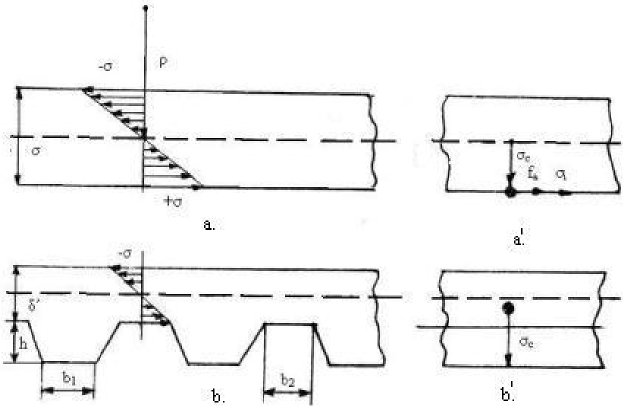

Fig. 5: The behavior of wearing at slipping of the sole

In the case of the sole with anti-skid profile, the figures b and b´, the bending takes place in the zone with the smaller thickness, δ'. In this case, the component of bending and the component generated by the rolling don't action, so the sole will take less wear.

2.4. The geometry of the anti-skid relief

The anti-skid relief can be [2] positive, when the relief shapes are outside of the thickness of the sole, as in the images in Fig.5.b,c,f or negative, when the relief shapes are inside the sole, as in the images in Fig.5.a, e.

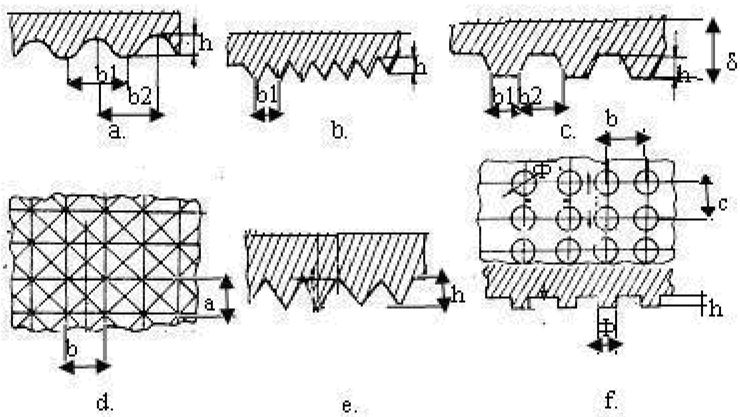

Fig. 6: Geometrical shapes of the anti-skid relief

Choosing between the two relief shapes can rely on different criteria, in relation with the anti-skid efficiency, the influence on the sole rigidity, the increasing of the sole weight, the impact of the relief over the hygiene of the cavities.

An anti-skid relief with negative profile presents a smaller probability to resist slipping because being disposed inside the sole will interlace only with the unevenness which are over the support plan. At a positive profile appears the probability that a higher number of relief picks will interlace with the unevenness of the support plan.

From the analysis of the sole rigidity variation in relation with the thickness index [2, 3], came the conclusion that the positive relief leads to a smaller rigidity. Therefore, the positive relief leads to a less fatigued foot while walking. The same conclusion comes in relation with the sole weight, which is smaller in the case of a positive relief.

The negative relief has the tendency to accumulate stones and mud in the cavities, which can be transported inside the buildings with negative consequences over the room hygiene.

Choosing between the positive and negative relief and their geometry is made in relation with the execution possibilities of the cavities and not lastly, in relation with the designer options while designing the relief.

Regarding the shapes, dimensions and distribution of the relief, results the fact that the relief can have shapes, dimensions and distributions that are not uniform but also shapes, dimensions and distributions arranged by certain rules. The uneven shapes and distributions are one with the highest degree of slip resistance, but the cavities of the moulds for such relief are harder to make. The relief shapes that have even distributions are in shapes of picks as pyramids, pyramid bases, cones, cone bases, cylinders, prisms, etc., like in Fig.6. In the examples in figure 6, the dimensions of the relief shapes are noted with letters to show that there are no restrictions in choosing them. In the context of a set of rules with generic character is needed that these dimensions are under specific relations. Studies [2] revealed the next situations: between the height h and the distance b between two picks, when is about a sinusoid trajectory with rounded lines or a trapezoidal trajectory, is recommended a relation of $h/b = 0.25$-0.5; in the case of the relief with picks, these can be arranged parallel or convergent, constituting also a diversification criteria; each pick can be linear or under curved lines; on the same region can be associated reliefs with linear trajectories and curved trajectories; in the case of zigzags trajectories is recommended the relation between the height of the relief and the distance between two relief shapes to be $h/b = 0.5$-0.7; in the case of the relief with pyramids, pyramid bases or cylinders, appear a set of restrictions regarding the height h, in relation with the dimension of the base is recommended a relation $\Phi/h > 1.5$ to avoid the bending of the relief elements, which can cause disequilibrium while walking.

Regarding the dimensions a and b, these can be equal or different.

In the case of a relief with cylindrical shape, appears the problem of distributing the cylinders on the surface of the sole. To resolve the distribution the relation between the contact are of the sole and the total sole area must be taken in account. This relation can vary between 0.2 and 0.5 to ensure the condition needed to avoid the flexing of the relief elements. Another problem is that of distributing the cylinders on the surface such as the centres of four neighbour cylinders form a square, parallelogram or rhombus.

3. CONCLUSIONS

- The role of the anti-skid relief is to avoid the foot slipping while in dynamics. The relief forms are made on the surface of the sole which comes in contact with the support plane.
- The design of the anti-skid relief is made following a set of rules well established. A set of restriction is taken into account:
    - the foot anatomy;
    - the slipping tendency of the foot while walking;
    - increasing the rigidity of the sole through relief shapes;
    - the weight of the sole;
    - the wearing resistance of the sole;
    - the geometry of the relief shapes;
    - the design of the anti-skid relief.

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QUALITY EVALUATION OF THE OE YARN USED IN KNITWEAR FABRICS

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Abstract: Producing high quality knitted fabrics, as well as the efficient use of raw material, requires knowing the major yarn proprieties in correlation with the product destination. The criteria used to establish the priority characteristics for a certain destination leads to narrowing the yarn pallet utilized for a particular domain.
This paper presents the results of the quality evaluation of several OE cotton yarns, witch were processed on large diameter circular knitting machines.
Key words: quality, yarns, characteristics, knitwears, evaluation.

1. INTRODUCTION

The selection of the characteristics for yarn evaluation can be regarded from two different points of view: the producer's (processability characteristics) and user's (characteristics of the knitted fabrics during its life). The designer is the one responsible for a better correlation between the two groups of characteristics.

The most important demands a yarn must meet in order for the knitting machine [1, 2, 8, 9] to work properly are:

- yarn count must correspond to machine gage;
- high uniformity level of the yarn;
- stabile yarn torsion (torsion equilibrium);
- the values of resistance and elongation must be situated in the admissible tolerance fields;
- the values of count regularity, torsion and yarn breaking force should be as high as possible;
- yarn humidity in the acceptable limits (experts recommend this should be >5% in standard condition);
- low yarn friction ratio;
- yarn utilized in correlation to the product destination.

Table 1 illustrates the yarn-knitted fabric relation, with regard to the influence of the yarn proprieties on the quality of the knitted fabrics, expressed through various quality indexes.

Table 1 Yarn-knitted fabric relation

Properties of the yarns	Yarn influence on:				
	Aspect of the knitted		Deformation and wear resistance	Comfort degree	Maintenance facility
	Touch	Surface aspect			
Count	xxx	xx	xx	xx	x
Torsion	xxx	xx	xxx	xx	x
Resistance	xx	0	xxx	0	0
Irregularity of the: -count -torsion -resistance	xx	xxx	xxx	x	x
Voluminosity	xxx	xx	xx	xxx	xx
Humidity percents	0	0	x	xxx	xxx

Properties of the yarns	Yarn influence on:				
	Aspect of the knitted		Deformation and wear resistance	Comfort degree	Maintenance facility
	Touch	Surface aspect			
Hairiness	xxx	xxx	x	xx	x
Contraction	0	0	0	0	xx
Electrostatic behaviour	0	0	0	xxx	xx

Legend:

xxx – major influence;
xx – medium influence;
x – little influence;
0 – no influence.

Determining the must important product quality characteristics is the first step in the correct quality evaluation, the starting point for a multicriterial analysis that is the base for the decisions regarding the optimum beneficiary's request and product quality ratio.

Considering that there is a large variety of yarns processed in knitting mills throughout the country (from the

The accurate knowledge of yarn characteristics is the starting point in knitted fabrics design ensuring [1, 6]:

- a complete and correct technical documentation;
- the cut – down in calculus errors for functional and technological design;
- the correct choice of structural parameters for a determined destination;
- the machine choice considering the yarn count – machine gauge correlation;
- the optimum machine load and the best yarn protection;
- the reduction of the differences between the calculated and the determined values of the structural and technological parameters.

2. GENERAL CONSIDERATION OF THE OE YARNS

Considering that there is a large variety of yarns processed in knitting mills throughout the country (from the point of view of their composition, structure, spinning process etc.), and the fact that the quality characteristics of the yarn will reflect directly in the quality of the knitted fabrics, the paper intends to establish the most important characteristics of yarns (simple quality indicators) which will be used to produce different structures on large diameter circular knitting machines. The yarns used on these machines for the present study are OE yarns (rotor spinning process).

For the processing of the OE yarns with a rotor for circular knitting machines with great diameter there are registered certain advantages in comparison with the yarns obtained by means of classic spinning processes.

The processability of the OE yarns with a rotor is better and the knitting machines' efficiency is higher. This is owed mainly to the following arguments [1, 2, 3, 5, 7, 8] (Table 2, 3):

Table 2 Comparison between the characteristics of OE and clasic yarns

Yarn characteristics	OE yarns versus clasic yarns
Uniformity	Higher
Voluminosity	Cca. 10 – 20% higher
Yarn diameter	Higher
Torsion	Cca. 15% higher
Twist liveliness	Better
Snarling	Lower
Hairiness	Lower
Fly tendency	Lower
Strenght	Similar or lower
Elongation	Higher or similar
Friction coefficient	Lower and constant value

Table 3 Evaluation of the yarn characteristics

Knitted fabric characteristics produced from OE yarns versus knitted fabric produced from clasic yarns	Evaluation
Uniformity	Higher
Voluminosity	Higher
Kover – factor	Higher
Handling	Rough
Appearance	Mat
Contraction	Higher

3. THE DETERMINATION OF MAJOR CHARACTERISTICS OF THE COTTON YARN – TYPE OE

The following yarn characteristics were determined experimentally: count, torsion, diameter (using microscope measurements), strength and breaking elongation.
Observation: The measurements took place respecting the indicators of the currently existing standards.

The working methodology took into consideration:

- a significant number of measurements (n > 50);
- calculation of trending typical values ($\overline{X}$) and scattering typical values (S, Cv);
- application of the Grubbs test, for testing and removal of aberrant values.

The yarn diameter is the key element for lay-out calculations of a knitted structure, with impact on workability and textile products characteristics. Experts have yet to clear the influence proportions of different factors on its value. Another unclear aspect is the fact that the professional literature doesn't indicate any distinct equations for calculating the yarn diameter obtained through different procedures spinning, classical or unconventional. In order to determine the yarn diameter values some authors elaborated empirical equations.
Hereby, Issum and Chamberlain, utilizing the photometric method, propose calculating the cotton yarn diameter with the relation [1, 6]:

$$d = \frac{1{,}536}{\sqrt{Nm}} + \left(0{,}0991 - 0{,}155 \cdot \frac{\alpha_m \cdot \sqrt{Nm}}{1000}\right) \quad (mm) \tag{1}$$

in which:

α_m – torsion coefficient;

Nm – yarn count;

On the same principle, taking into consideration the yarn torsion, Russian researcher F.A. Afoncikov, determines cotton yarn diameter [4] with the equation:

$$d = \frac{0{,}97}{\sqrt{Nm}} \cdot \sqrt{\frac{T^2 + 390400}{T^2 + 1525 \cdot Nm}} \quad (mm) \tag{2}$$

Currently, in practice [5] for determining the yarn diameter in loose (F) and in stretched (f) state the following equations are used:

$$F = \frac{c_1}{\sqrt{Nm}} \quad (mm) \tag{3}$$

The c_1 coefficient values depend on the nature of raw material and are calculated with:

$$c_{1,2} = \frac{2}{\sqrt{\pi \cdot \rho_{1,2}}} \tag{4}$$

in which: $\rho_{1,2}$ represent the specific mass of loose and stretched yarn.

Professional literature [5] indicates guiding values for c_1 and c_2 coefficients.

For the same raw material, indifferent to the spinning procedure, coefficients c_1 and c_2 have constant values, which is not accurate. The influence of torsion rate, count, yarn spinning system, etc, on the values of coefficients c_1 and c_2 as well as on the values of F (mm) and f (mm) is explicit [6]. For 100% cotton yarns, professional literature [5] indicates constant coefficient value of $c_1 = 1{,}25$.

The results experimentally obtained are centralized and presented in Table 4.

Table 4 Values of the measured yarn characteristics

Yarn composition and provenience		Cotton 100% OE yarn Romania	Cotton 100% OE yarn Turkey	Cotton 100% OE yarn Turkey	Cotton 100% OE yarn Romania	Cotton 100% OE yarn Turkey
Yarn count Nm	Offered	34/1	40/1	50/1	58/1	60/1
	Measured	34,2	40,1	49,7	58	59,1
Yarn count Ttex	-	29,2	24,9	20,1	17,2	16,9
Yarn diameter [mm] (measured)	F	0,2469	0,2469	0,2135	0,1741	0,1640
	f	0,2388	0,2256	0,2054	0,1649	0,1558
Yarn torsion [n/m]	-	604	634	714	776	830
Yarn breaking [cN]	-	323,40	233,80	218,69	247,60	216,40
Breaking elongation [%]	-	5,850	5,660	5,600	5,614	5,264

Table 5 presets a comparison between the values of measured diameters for the analyzed yarns and the values calculated for these yarns, based on known formulas: Chamberlain, Afoncicov and Hagiu.

TABLE 5 COMPARISON BETWEEN YARN DIAMETER MEASURED AND CALCULATED

Yarn composition and provenience		Cotton 100% OE yarn Romania	Cotton 100% OE yarn Turkey	Cotton 100% OE yarn Turkey	Cotton 100% OE yarn Romania	Cotton 100% OE yarn Turkey
Yarn count Nm		34/1 (34,2)	40/1 (40,1)	50/1 (49,7)	58/1 (58)	60/1 (59,1)
Yarn torsion [n/m]		604	634	714	776	830
Torsion coefficient α_m		103,28	100,12	101,28	101,89	107,96
Yarn diameter (F)	Measured	0,247	0,234	0,214	0,174	0,164
Calculated yarn diameter (F)	Issum-Chamberlain	0,268	0,219	0,206	0,181	0,170
	Afoncicov	0,223	0,200	0,171	0,153	0,149
	Hagiu	0,214	0,197	0,177	0,164	0,163

The variation of measured diameters for different yarn counts, compared to the variation of diameters calculated with the previous mentioned formulas is eloquently represented in figure 1.

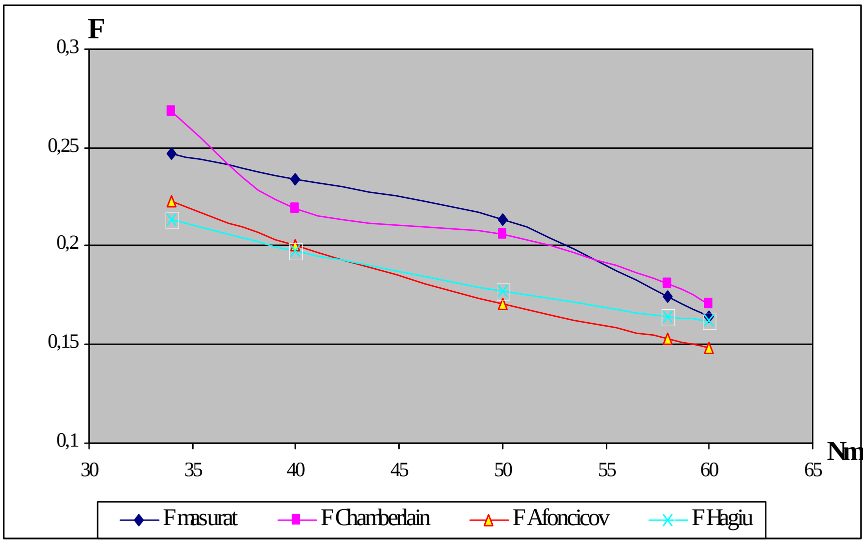

Figure 1 The variation of measured diameters yarn counts, compared to the variation of diameters calculated

For the same yarn count, between the measured diameters and the calculated ones exist significant differences, noticeable during the knitting process, as well as in aspect and structural characteristics of the resulting knitted fabric.

As such, taking into consideration that the yarn diameter modifies depending on the tension applied during measurement, we can conclude that, in order to exactly know the manner of adjusting the tension applied during yarn knitting and to precisely and correctly establish the structural characteristic of the knitted fabric, the best method for determining yarn diameter is the direct measurement. In this case, it is necessary to specify the tension applied on the yarn during measurement. The method is not operative but leads to good results.

Taking into consideration the fact that the yarn diameter influences directly the aspect of the knitted fabric, the structural and physical-mechanical proprieties as well as the yarn behavior during its processing on the knitted machine, one can draw the conclusion that without a detailed and correct knowledge of the yarn characteristics (preferably characteristics measured through experimental methods) the quality of the final product cannot be correctly evaluated.

Of real importance are the effort – elongation curves for each yarn category and each count obtained with an electronic dynamometer. This way are avoided measurement errors that occur on a classical dynamometer, when establishing the yarn break force as well as breaking elongation, also these diagrams enable determining the elastic domain in which technological processing of the yarns can take place without plastic strain. Both optimization of the yarns processing as well as the desired quality of the knitted fabric and final product are thus guaranteed.

For the analyzed yarns, processed on large diameter circular knitting machines, the intervals of the elastic domain for different yarn counts are presented in Table 6.

Table 6 The intervals of the elastic domain for different yarn counts

Yarn composition and provenience	Yarn count Nm	The intervals of the elastic domain	
		Pe [cN]	ε_e [%]
Cotton 100% - OE yarn Romania	34/1	38,81	0,181
Cotton 100% - OE yarn Turkey	40/1	37,64	0,204
Cotton 100% - OE yarn Turkey	50/1	36,52	0,176
Cotton 100% - classic yarn Romania	58/1	34,66	0,229
Cotton 100% - OE yarn Turkey	60/1	30,30	0,213

6. CONCLUSIONS

Producing high quality knitted fabrics, as well as the efficient use of raw material, requires knowing the major yarn proprieties in correlation with the product destination.

The accurate knowledge of yarn characteristics is the starting point in knitted fabrics design ensuring:

- a complete and correct technical documentation;
- the cut – down in calculus errors for functional and technological design;
- the correct choice of structural parameters for a determined destination;
- the machine choice considering the yarn count – machine gauge correlation;
- the optimum machine load and the best yarn protection;
- the reduction of the differences between the calculated and the determined values of the structural and technological parameters.

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THE NEW TEXTILES CURRICULUM IN ACCORDANCE WITH BOLOGNA: The Spanish experience

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Abstract: This presentation has the aim to **explain the way followed doing the new study plan in Engineering, Technology and Textile Design Degree studies**, adapted to Bologna criteria, signed by the 29 member education secretaries states European Union. Nowadays they are already 46 countries those that have attached to this Bologna process and have taken the commitment to adapt his study plans to this European common platform. These studies are given at Engineering Terrassa School, from beginnings of the academic course 2009, by a very satisfactory results.
Key words: Degree Textile Enginering, Bologna, Spanish experience.

1. INTRODUCTION

Throughout my career, I have found, in contact with business organizations, industrial and some public administrations, **the confusion in naming the textile studies in Spain**. In all honesty this confusion is understandable **due to the continuous changes in the lessons textiles curriculum**. Fortunately, today, the issue has been greatly simplified. **In Spain, Master and Degree Textile Engineering, are offered only in the Engineering Terrassa School**.

We are aware of the profound changes experienced by the global textile sector due to the productive enterprise relocation and open markets. Have to reinvent the future, adapting to new market needs. A senior official of a multinational distribution, a world leader, I requested a Technical Engineer (now called Graduated in Engineering, Technology and Textile Design) that meets the following profile: **"leader, young, ambitious, with a strong entrepreneurial spirit, with communication skills and team management". This profile is far from the conventional requirements. Our engineers were required, preferably, an excellent technical training on production, quality management and language skills**.

Reducing the demand for engineers for manufacturing plants, formed with conventional wisdom, is one of the factors bearing on the design new training textiles. **The new competitiveness factors go through the innovation and the higher value processes added and placed in unexploited sectors that use textiles. We need more professionals in research and development to develop new materials and textile structures, managers for the external outsourcing monitoring of products in the production chain, which is usually fragmented into several countries, Specialists in robotic production and good engineers with capacity for designing new textile products the market demands.**

2. MAIN OBJECTIVES BOLOGNA PROCESS

Provide **a single, easily understandable and comparative European qualification's system** and adopt a formative **system based in two fundamental cycles: Degree and Postdegree** studies, are two main objectives. Is complemented by **providing a credit European system** and promoting the **pupils mobility, teachers, investigators and administration staff.**

In all this long adjustment process have been legislated so much. All the documents it has been generated, are in the Bologna Process official web. (http://www.ond.vlaanderen.be/hogeronderwijs/bologna).

The Royal Decree 1393/2007, published on the 260 Official State Bulletin, on 30 October 2007, is the base document for the elaboration of the new Spain study plans. It's a curriculum reform, based on **flexibility and diversification**. The university autonomy is a reform key point, that is to say, the real capacity that every university has to design their own study plans, in a very competitive market, to give the answer at the society demands in a very open context, in constantly transformation. Emphasize also a very important **newness** on the Royal Decree: the necessity that **all the proposals can be evaluated** and the compulsory to have been acreditated for competent external organisms, o**n a cyclical basis, to continue imparting those studies.** Trying establish a genuine quality assurance process that in university world has been unusual. It's envisage and regulated for first time, the possibility that an university can lost a certification for doesn't reach the provided objectives.
There are many **access routes** to study Engineering, Technology and Textile Design Degree. **Higher-level vocational training students in industrial manufacturing processes speciality and industrial pattern speciality** have direct access. For **people over 25**, have to overcome an university entrance exam. Other very interesting way is **people over 45, without any academic titulation**, but with **enough professional experience in textiles** can study it too. If a **graduated foreign student** wants to continue Degree studies, have to request corresponding **convalidations** before doing the preregistration.

3. NEW BASES CURRICULUM TEXTILE ENGINEERING IN SPAIN

Education a**lso focuses on cross-curricular competencies**. In our studies plan we **had incorporated** the following cross-curricular competencies: **entrepreneurial and innovative, sustainability and social commitment, third language, effective oral and written communication, teamwork, use of information resources and independent learning.**
Competencies develop in a gradual, from the first course, so **have to ordain knowledge, skills and attitudes along the learning process**. This new approach implies **many changes in educational institution** and her members, because they should put **more emphasis on active forms learning** like problems resolution, projects elaboration, especially from the second course, conduct simulation, practices in companies , etc. Here the student has a relevant paper. Should be given a deep change in teaching methodology.

The response by the student to the teacher's explanations is positive exponential in the first fifteen minutes of the lecture, approximately, is decreasing attention to the minimum values, the next fifty minutes, approximately, to reach the time the student expects and the conclusions and end the session. The new teaching proposal aims to prevent this fall of attention, becasue before that it occurs, after a brief but sufficient explanation by the teacher, it propose to work the issue in groups. This cycle is repeated two or three times each academic session. The **new objective** should be **student learning** in the training context along life. It also requires a **great deal of coordination and overall planning by the school**. Requires a **major change** in the overall evaluation approach since it requires the student to build the response and this requires the execution of performance tests or production of products, projects, algorithms, protocols, reports, opinions, etc. We must find strategies to assess, for example, something as complex as the student's ability to do teamwork.

In developing a curriculum must **define the subjects** and courses that provide the **knowledge**, skills, working, and attitudes that enhance, **as well as how these concepts are integrated**. The competencies assessment system proposed in the new curriculum **is based on continuous assessment of student work, individual and group, conducted both in person and non-face. In our model, are weighted the following activities: Deliverables made by the students on specific topics proposed by Professor, various controls programmed according to each subject and complementary assessment activities (individual and joint projects, visits to factories, reference centers in the textile and attending trade fairs, seminars and conferences).**

With Bologna Process appears a new concept: the credit. In our approach, **each credit equals to 25 hours which the student will dedicate with the subjects studied**. In a 6-credit course, for example, the student must devote to it study, a total of 150 hours per semester, divided into **classroom theory, practice in laboratories and workshops and activities designed to monitor, tutoring or evaluation return of academic activities scheduled in the teaching guide. The burden on subjects**

not measured by class time it is measured from the hours of full-time student, both in the classroom as non-attendance.

The student presentiality in the different subjects in the new plan **is 45 hours per semester for theorical class, 45 hours on practice in laboratories and workshops and 60 hours for independent learning to prepare the projects commissioned by the teacher and expand the information provided in class**. It has drawn up a teaching guide which gives in detail all activities performed by the students during the academic year.

To sort all the aforementioned aspects, as an example and a synthesized form, give information on the Integrated Design in Textiles Products subject, which has awarded 6 credits and has a deep character identifier of the new curriculum philosophy. The main objectives to be achieved are to familiarize the student in the techniques and **fundamentals textile design** about yarn, fabric, pieces made, home textiles and technical textiles, develop in students the ability to apply these techniques to solve practical cases, co**mbining the creativity of a designer with the scientific rigor of an engineer.**

Integrated Design in Textiles Products subject which we have taken as example to give more details in new teaching approach, is divided into four content indicated in Table 1.

Table 1: Integrated Design in Textiles Products Subject: Hourly Structure

CONTENT	THEORIC ATTENDANCE HOURS	LABORATORY/WORK SHOP ATTENDANCE HOURS	DIRECT WORK NON-ATTENDANCE HOURS
Textile Design and Fashion fundamentals	10	5	20
Desisgning fancy yarns and special yarns for technical and intelligent fabrics	10	10	10
Fabric Design computer aided and industrial confection	5	20	20
Finishing Processes and Desing effects	20	10	10

Expose only a content from the first theme to show in more detail, the textile studies shift, in which in addition to technology and management, will g**reatly enhance the design concepts applied to fashion, textiles Home and technical uses**. The detailed first theme program is: Basic concepts in Fashion and Design.- Sequences in the creation in a yarn sample, fabric and clothing.- Home and technical textiles.- Inspiration Sources.- Trends.- Color cards.- Harmonies.- Main criteria for the fibers and yarns selection used in the major tissues design.- Scale model preparation and collection's graphic design.- Dissemination sample.- Critical study about some yarn collections, textiles, clothing, textile home and technical textiles.- Application of design principles learned to develop a comprehensive design project a garment given by the teacher.

To develop these contents have been established several related activities in which detailed all the support material (books to follow the course, selected websites, trends notebooks, and deliverables expected that the student must submit solved to evaluate this first theme's course that we have taken as a clarifying example).

As a final point to our exposure, we indicate in Table 2, the complete curriculum of Engineering, Technology and Textile Design Degree, which is offered in Engineering Terrassa School. The green ones show the basic training credit. The light blue ones, obligatory credits, that is to say, common subjects in an scope, dark blue ones, optional subjects, the yellow ones, the specialty credits and work placements and the Final Project are the pink ones. C1, C2...C8 are the semesters. Each simple box is equivalent to 6 credits,so, a total of 150 hours of study. Boxes which are in two semesters, are for 12-credit courses. As shown in Table 2 are planned for optional subjects so that students can customize their curriculum. **Optional subjects list is broad**, but we emphasize the intensifications in **strategic marketing and international trade in textiles, the subcontracting management** in the textile production chain and logistics applied to the textile industry.

Table 1.- Curriculum of Degree in Engineering, Technology and Textile Design

C1	Mathematics	Physics	Engineering graphic expression	Chemical	Environmental technology and sustantibility
C2			Computer basics	Materials science and technologies	Economics and bussiness management
C3	Mathematics	Fluid mechanics	Mechanical systems	Electrical systems	Production organization
C4	Probability and statistics	Electronic systems	Industrial automation and control	Materials for the textile product design	Thermal engineering
C5	Linear structures and nonwovens laminates design	Colouring materials and auxiliary products	Bleachig and dyeing design colorimetry	Structures design knitting laminated	Design of woven structures
C6	Optional subject 1	Finishing processes and design effects	Design in dyeing printing and coating processes	Tailorability textile structures	Global textiles products development
C7	Optional subject 2	Optaional subject 3	Optional subject 4	Innovation project manegement	Project methodology and guidance
C8	Optional subject 5	Final project	Final project	Final project	Final project

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

INFLUENCE OF FABRIC TIGHTNESS ON SPIRALITY OF WEFT-KNITTED PLAIN COTTON FABRIC

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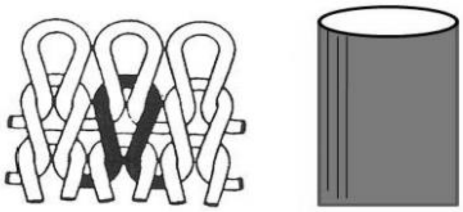
Abstract: Global demand for knitted garments is growing at a faster rate than that of woven items.Currently around 50% of clothing needs in the developed countries is met by knit goods. So ensuring the required quality in a knitted fabric is a vital issue for the manufacturer. One of the major problems encountered in knitted fabric is spirality. It affects particularly single jersey fabric and presents a serious problem during garment confection and use. So controlling spirality is a basic requirement for producing quality knitted fabric. Though there are several factors that contribute to knitted fabric spirality, yarn twist and relative tightness of the fabric are said to be the most significant ones. In this work the basic single jersey fabric, i.e. plain jersey cotton fabrics were produced by a Hosiery knitting machine and spirality values were observed for different yarn T.P.I. and tightness factor at relaxed state. It was found that tightness factor has a direct influence on knitted fabric spirality with a high degree of correlation. The work thus gives an idea to deal this problem by controlling the knitting parameters.

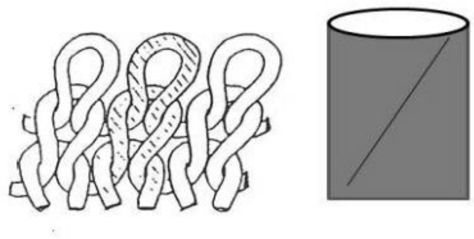
Key words: Knitted Fabric,Single jersey, Spirality, Tightness Factor, Yarn Count, T.P.I, Stith Length, Regression

1. INTRODUCTION

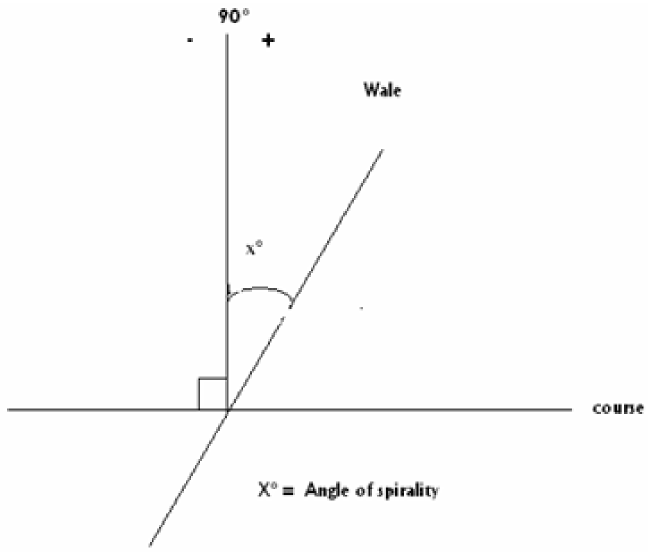
Spirality is a distortion of a knitted fabric whereby the wales and courses align at an angle other than 90°.Terms such as “fabric skew”, “fabric torque”or “wale skew”, are also used to describe fabric spirality [4]. It is a critical problem for single jersey structure and creates significant problems at the clothing step. Though the general tradition for solving the problem is to follow special method during finishing but this type of prevention does not last longer and therefore not helpful for quality manufacturing.



(a) Ideal course/wale loop alignment



(b) Wale Skew



There are two factors that are responsible for the deviation from 90° between courses and Wales. Due to spiral arrangement of the courses in the fabric, multifeeder machines show a distortion from 90˚ in course-wale alignment, which is known as ‘Pattern Drop’.It is a characteristic of the machine rather than the yarn. Deviation from 90˚ can also be caused by twisting of the wales where yarns have residual torque. The term ‘Spirality’ originally refers to such type of deviation [1].

Besides the torque, spirality is also governed by fabric tightness, fibre parameter, yarn formation system and fabric finishing [5]. The influence of fabric tightness can be understood easily from the sense that tightness contols the yarn and loop movement and thus affect any distortion. Fabric tightness of the knitted fabric is generally expressed by Tightness Factor which is a measure of the relationship between the loop length of a knitted fabric and the count of the yarn employed to construct it. The usual formula is:

$$\text{Tightness Factor (T.F.)} = \sqrt{\frac{tex}{stitch\ length(mm)}} \text{ in SI unit.}$$

As loop length and yarn count are two great knitting parameters, an experimental work on knitted fabric spirality with respect to tightness factor will provide the knowledge to control this problem from the knitter’s side.s

2. EXPERIMENTAL PROCEDURE

The experimental work has been done in the laboratory of Ahsanullah University of Science and Technology. All the test procedure has been performed according to following sequences.

1. Cotton yarn cones of five different counts (20/1 Ne, 24/1 Ne, 26/1 Ne, 30/1 Ne and 32/1 Ne, were taken. Twists per inch (T.P.I.) of these yarns were determined by Quadrant Twist Tester.
2. Plain jersey fabric of different stitch lengths were produced by different counts of yarn in a Hosiery knitting machine. In this way a total of twenty (20) samples of different tightness factor were obtained. The produced fabrics are almost free of ‘Pattern Drop’ as the machine is of single-feeder type.Stitch lengths of these samples were measured by HATRA Course LengthTester.
3. The samples were subjected to dry relaxation procedure (temperature: 27˚C, relative humidity: 65%, time: 48hours.) So samples were obtained at dry relaxed state.
4. Spirality of those fabrics were measured very cautiously by protractor (according to the CTI test mehod [1]) and noted against the corresponding tightness factors.
5. Relation between fabric tightness and spirality were shown by graphical and statistical analysis

3. RESULTS

Table 1 shows the summarized results obtained through the experimental procedure

Table 1: Spirality values against different tightness factors for the observed knitted samples

Fabric Sample No.	Yarn T.P.I.	Yarn Count (Ne)	Stitch length(mm)	Tightness factor(in SI unit)	Measured Spirality
1	15.1	20/1	7.88	.69	41°
2			6.03	.90	36°
3			4.92	1.104	27°
4			4.69	1.160	23°
5	18.2	24/1	7.76	0.640	48°
6			6.08	0.816	38°
7			4.96	1.00	31°
8			4.82	1.03	27°
9	18.5	26/1	8.27	0.576	45°
10			6.49	0.734	35°
11			5.00	0.953	30°
12			4.74	1.005	26°

13	19.5	30/1	8.26	0.535	55°
14			6.09	0.727	40°
15			4.94	0.896	33°
16			4.66	0.950	27°
17	21.6	32/1	8.32	0.516	46°
18			6.49	0.662	40°
19			4.95	0.868	35°
20			4.74	0.906	31°

4. 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 for yarns of different T.P.I.

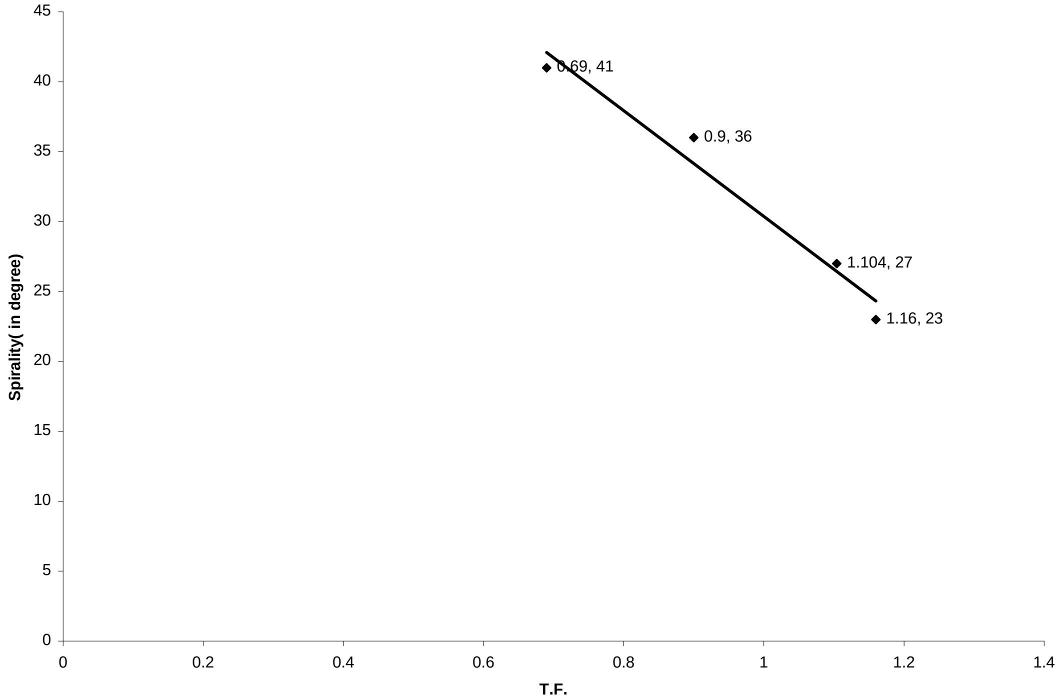


Fig. 2: Tightness factor vs. spirality with trend line for 20/1 Ne (T.P.I. =15.1)

Table 2: Statistical analysis for figure2

Regression Statistics	
Multiple R	0.983416456
R Square	0.967107926
Adjusted R Square	0.950661889
Standard Error	1.826043269
Observations	4

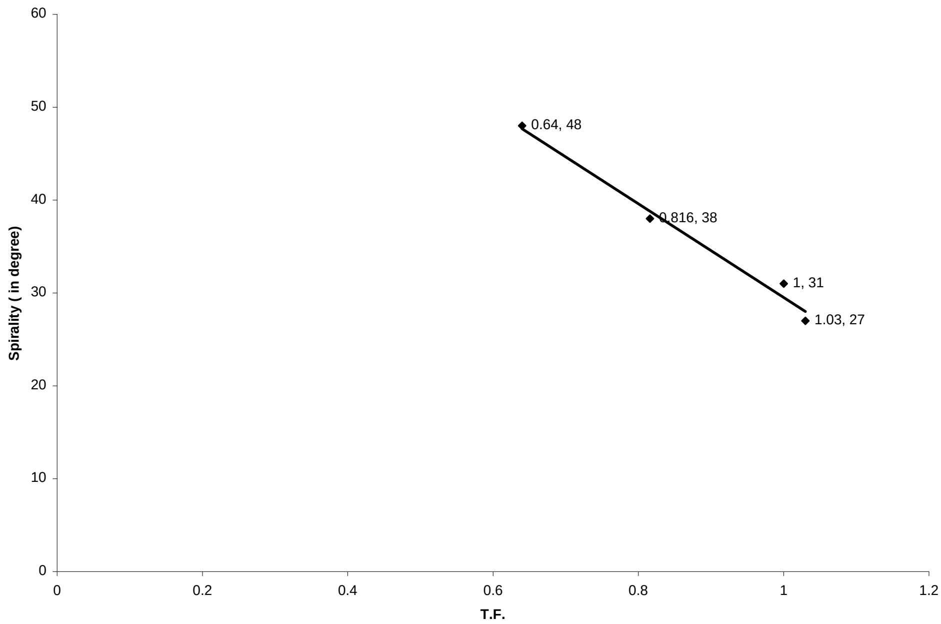


Fig. 3: Tightness factor vs. spirality with trend line for 24/1 Ne (T.P.I. =18.2)

Table 3: Statistical analysis for figure3

Regression Statistics	
Multiple R	0.992195933
R Square	0.98445277
Adjusted R Square	0.976679154
Standard Error	1.405168408
Observations	4

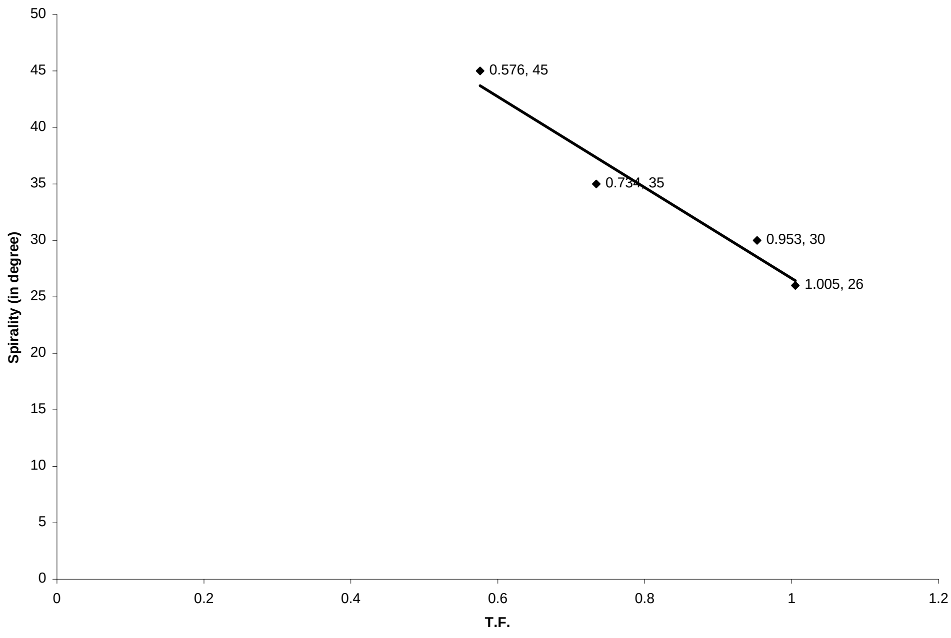


Fig. 4: Tightness factor vs. spirality with trend line for 26/1 Ne (T.P.I. =18.5)

Table 4: Statistical analysis for figure4

Regression Statistics	
Multiple R	0.97612939
R Square	0.952828586
Adjusted R Square	0.92924288
Standard Error	2.182730576
Observations	4

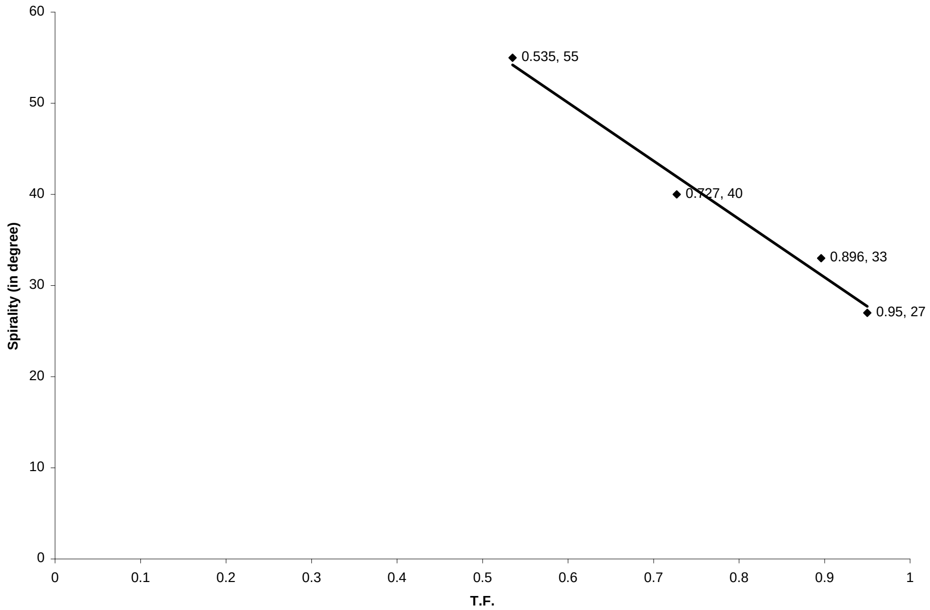


Fig. 5: Tightness factor vs. spirality with trend line for 30/1 Ne (T.P.I. =19.5)

Table 5: Statistical analysis for figure5

Regression Statistics	
Multiple R	0.990427276
R Square	0.980946189
Adjusted R Square	0.971419284
Standard Error	2.03982253
Observations	4

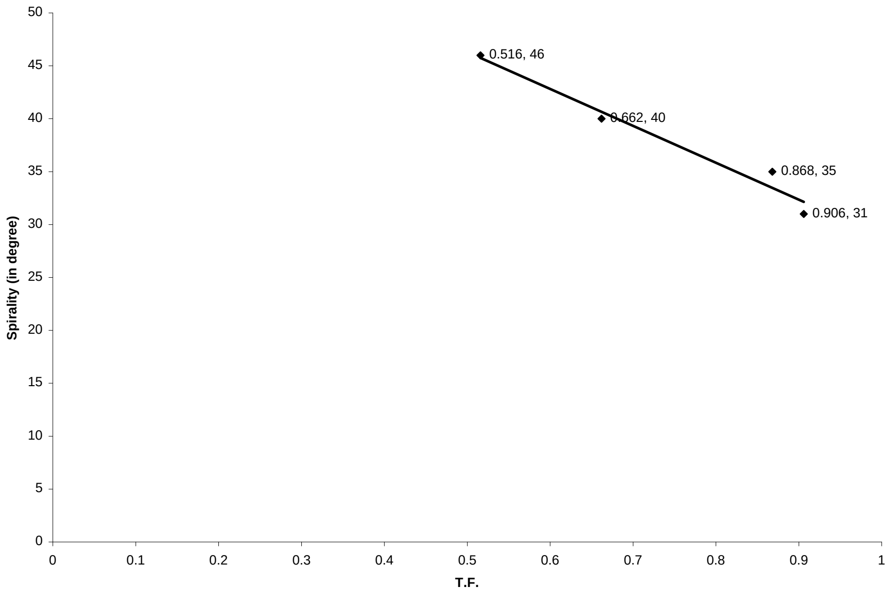


Fig. 6: Tightness factor vs. spirality with trend line for 32/1 Ne (T.P.I. =21.6)

Table 6: Statistical analysis for figure6

Regression Statistics	
Multiple R	0.983418659
R Square	0.967112259
Adjusted R Square	0.950668389
Standard Error	1.439419207
Observations	4

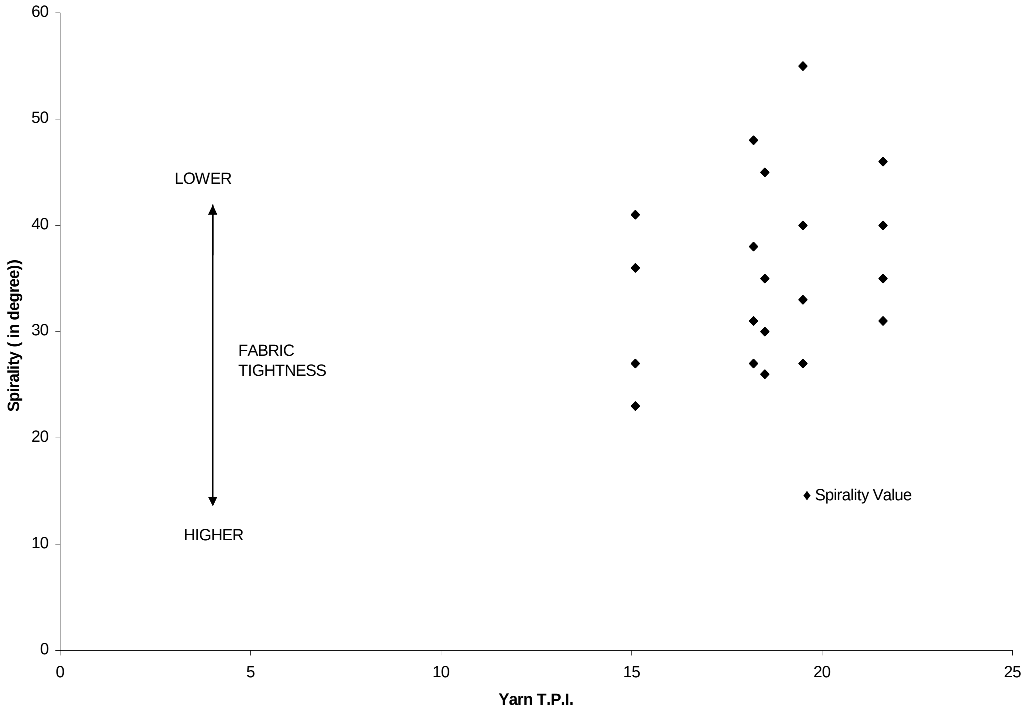


Fig. 6: Summarized graphical representation showing the relationship between spirality and tightness factor for yarns with different T.P.I.

5. DISCUSSION ON RESULTS:

1. From the obtained graphical diagrams it was found that tightness factor (T.F) has a direct influence on spirality,i.e. spirality increases due to decrease of tightness factor and spirality decreases due to increase of tightness factor.It may be also commented that for the same yarn count if stitch length is
increased then spirality will be increased and vice-versa.It may also be commented that for the same stitch length if yarn count is increased then spirality will be decreased and vice-versa.

2. The values of spirality were too high as fabric tightness values were very low(less than 1 in most cases). However in commercial production environment, fabrics are generally knitted with optimum tightness factor (near 1.5) and the amount of spirality is generally controlled within 10°. [2]

3. For all cases, R^2 values were obtained within the range 0.95-.98 indicating a high degree of correlationship between the tightness factor (T.F.) and the spirality. Standard error ($S_{e)}$) values are also found within acceptable limits. These express the 'goodness of fit' of the drawn trendline[3].So any value of spirality for different tightness factors for a given T.P.I. may be guessed very accurately from the obtained trendline.

4. The summarized figure (Figure 6) represents the whole results in a concise form showing the relationship between spirality and tightness factor for yarns with different T.P.I.

6. CONCLUSION:

The work shows that knitted fabric spirality increases or decreases according to decrease or increase in fabric tightness. So it is possible to control spirality by changing the tightness factor of a knitted fabric. But as tightness factor also influence fabric dimension and performance i.e. width, G.S.M and shrinkage; controlling spirality by changing tightness factor must be done very carefully so that other quality parameters do not exceed acceptable limits. Otherwise the knitter should consider knitting fabric with yarns of lower T.P.I..It should be remembered that this type of distortion can not be eliminated but must be controlled within the acceptable limit.

Acknowledgments:

The present work was executed at the Knitting and Q.C.Laboratory of Ahsanullah University of Science and Technology, Dhaka. The author would like to thank the laboratory stuff and the students taking the project work under his supervision in Spring10 semester for their co-operative hands.

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POLYPYRROLE WOVEN FABRICS FOR HEATING APPLICATIONS

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Abstract: Conductive polymer polypyrrole was used for coating different woven materials in order to obtain a homogenous heating surface. The method used for polymerization of pyrrole was the oxidative polymerization in aqueous solution. The textile substrate used was a viscose woven fabric. A comb pattern was used to distribute the power across the fabric by printing conductive ink onto polypyrrole coated fabrics or by sewing conductive yarns. The heat generation was recorded using a thermographic camera; for the sample with copper yarns, the temperature achieved is 35°C. The current was 17 mA and the voltage 29.8 V and for the sample with copper yarns coated with silver, the temperature achieved is 32°C, the current was 5 mA and the voltage 26 V. The heating element can be incorporated into articles of clothing, such as jackets, pants, gloves, footwear, etc.; it can be also used in heating pads and blankets; sports equipments, such as uniforms, helmets, pads, skates and boots, textile home furnishings, medical heating devices, etc.
Key words: conductive polymer, polypyrrole, conductive coating, conductive yarns, textile heating element.

1. INTRODUCTION

Demand for electrically conductive textiles is increasing in recent years. Electrically conductive textile have many potential applications, such as sensors, static charge dissipation, filters, electro-magnetic interference shield, and special purpose clothing acting as protection or dust and germ free purpose, sportswear, automotive, medical, military, etc [1].

The conductive textiles have became a field of great interest in the last dacade, due to the fact that they open new possibilities of obtaining new textile fabrics which besides the mechanical properties specifics to textiles possess electrical and thermal properties also. The techniques used to make conductive textile fabrics are multiple going from intinsecally conductive fibres (carbon nanotubes fibres, stainless steel fibres), until woven fabrics which incorporate sensors, LED`s, diodes, transistors, etc. The conductive textiles are created using several textile manufacturing techniques: weaving, sewing, printing with inks, coatings with conductive polymers or conductive fillers, plating with metals, lamination of electrical circuit substrates to a fabric, embroidering and applique of electrical conductors and circuits onto the fabric.

Among the manufacturing processes, various coating techniques have been attractive due to simple in process and easy to handle. The textiles produced not only gain controllable electrical properties, but also maintain their excellent physical properties of the textiles such as mechanical strength and flexibility [2].

Alessio Varesano and all reported producing electrically conductive fabrics by deposition of a thin film of doped polypyrrole on the surface of cotton fibres trough in situ oxidative chemical polymerization in aqueous solutions of pyrrole, oxidant and doping agents, at room temperature. The electrically conductive fabrics can be used for applications as technical textiles with antistatic (low electrical resistance), heat generation, hygroscopy, antibacterial and high temperature resistance properties [3].

Most applications are based on electrical and thermal properties of these textiles that were obtained, in the past, by means of the insertion of metallic wires inside the yarns, by coating fibers with metals or conductive films or by incorporating conductive fillers [4]. A new approach consists of the introduction of conductive polymers linked to the fibers. Polypyrrole (Ppy) is one of the most promising candidates for this kind of applications, in the conjugated polymer group including PEDOT, polyaniline, polythiophene, etc., the preparation and properties of which are well described in literature [5, 6,7].

Conductive polymers have represented a major breakthrough of the past century, due their remarkable electrical and thermal properties. Because of their adjustable electrical conductivity, ranging from antistatic to highly conductive, conductive polymers can be used in a various range of applications, like sensors, antistatic materials, protective equipments, health, heating fabrics, etc. [8-11]. Among conductive polymers, polypyrrole was considered suitable material for coating textile substrates in order to obtain a resistive heating fabric. Conductive polymer Ppy was used often to obtain conductive textile trough chemical polymerization of pyrolle directly onto the textile surface. The polymerization of pyrrole can be performed onto different textile substrates, like fibers, yarns, fabrics [8-15].

Ppy coatings trough oxidative polymerization of the monomer of pyrrole onto a textile substrate is an often used method, the influence factors being according to the literature, the thickness of the Ppy layer, which depend of Ppy amount, the oxidant-dopant ratio, the structure of the fibers/textile fabric used. The PPy was choose because present a good afinity both for natural and chemical fibers. Textile substrates can be easily coated by imersing them into a solution containing pyrrole, a oxidant and a dopant. The phisical and mechanical properties of conductive textiles can be affected by the monomers, the doping agents, and the synthesys parameters, such are time, temperature, Ph and the stirring rate of the solution.

In this paper coatings with polypyrrole layer were performed onto textile substrates from viscose, the polymerization of pyrrole taking place in aqueous solution at 5° C. Using a thin film of Ppy onto a textile fabric for heating purposes present the advantage that is a simple and efficient method and in the same time require a little amount of time; in the process of obtaining heating fabric, conductive polymer polypyrrole was choose for its electrical and thermal properties and the fabric while the fabric gives elasticity and flexibility to the final conductive fabric obtained.

2. EXPERIMENTAL

In this study plain woven viscose fabric were used, with 18 yarns/ cm in the warp and 11 yarns/ cm in the weft. The type of the weave is plain 1/1. For the experimental tests the fabric sample dimensions are 50 mm x 50 mm, in the structure being added conductive yarns in order to form a conductive surface able to heat, as it can be seen in Figure 1. The pattern designed for conductive yarns is intended to decrease the electrical resistance by creating a parallel electrical resistance. The conductive yarns (1,3 in the figure) used were from ELEKTRISOLA Feindraht AG yarns with rubber core and covered with copper wire type K306B and yarns with rubber core and covered with copper wire with silver coating type K105. The pyrolle was from Sigma Aldrich (98%).

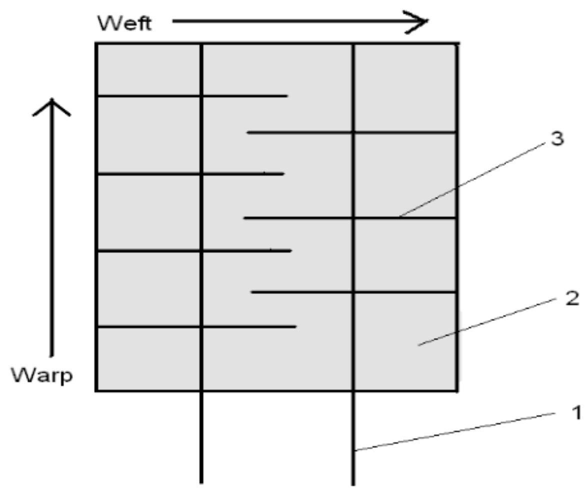


Fig. 1. Schematic representation of the conductive yarns in the woven fabric

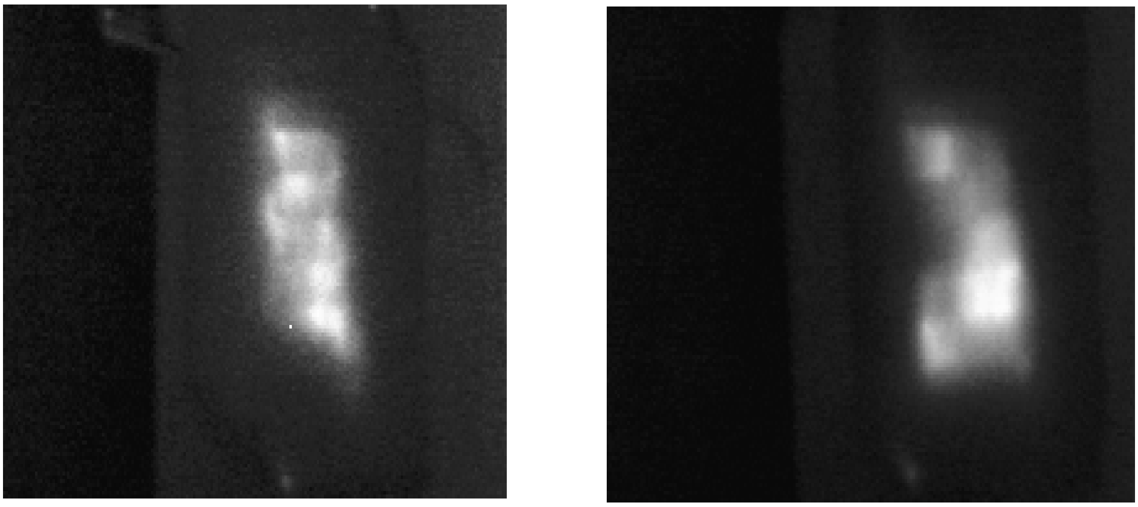
First step is immersing the samples in a solution containing NaOH 2M at 80° C for 30 min. The samples were rinsed after that with distillated water and dried. The samples were introduced into a solution containing 2.830ml/L pyrrole and water for an hour at room temperature in order to obtain a good penetration of the monomer deep into the textile substrate. Meanwhile, a solution FeCl3-BSA, containing 25.7061 g /L $FeCl_3$ and 2.1526 g/L BSA dissolved in 1 l distillated water was prepared. The solution prepared was added to the pyrrole solution and the polymerization process begun. The polymerization process was carried out for two hours at 5° C. It was observed that the color of the solution changes during the process, in the end having a dark green color, which indicates that the polymerization was successful. After two hours the samples were removed from the solution and rinse with distillated water until the water was clear for eliminate the surplus of polypyrrole, and dried at room temperature for 24 hours.

For investigation of heating efficiency the samples were connected to a dc power supply and the temperature was measured using an AGEMA Thermovision® 900 System, 900 IR camera. This system provides photos of the samples, as it can be observed in Figure 2.

3. RESULTS AND DISSCUTIONS

Electrically conductive fabrics were produced by polymerization of pyrrole. For decrease the electrical resistance, but also to acquire a power supply element, conductive yarns were added to the samples as it can be seen in Figure 1; the conductive yarns were inserted by sewing them manually or using a sewing machine. Because the conductive yarn is quite thick and rigid, in order to obtain smoother surface, some textile yarns have been removed in the warp, respectively in the weft direction and the conductive yarns were inserted by manually sewing. The problem that occurs with sewing the conductive yarns is the fact that the performance can be limited by the electrical connection made to the device.

For the sample with copper yarns, the temperature achieved is 35°C. The current was 17 mA and the voltage 29.8 V and for the sample with copper yarns coated with silver, the temperature achieved is 32°C. The current was 5 mA and the voltage 26 V.



(a) (b)

Fig. 2. Heating fabric with copper yarns with silver coating and polypyrrole layer (a) and with copper yarns and polypyrrole layer (b)

The results indicate that the temperature is rising with the increase of the voltage applied. There were some hot spots, especially in the centre of the samples, one explanation being the fact that the coating thickness was not the same in every point of the heating fabric and maybe the conections between the conductive materials are not perfect.

4. CONCLUSIONS

Conductive polymer polypyrrole was used for coating different woven materials in order to obtain a homogenous heating surface. The method used for polymerization of pyrrole was the oxidative polymerization in aqueous solution. The textile substrate used was a viscose woven fabric. A pattern was used to create a parallel resistance and also distribute the power across the fabric onto polypyrrole coated fabrics by sewing conductive yarns. The heat generation was recorded using a thermographic camera; for the sample with copper yarns, the temperature achieved is 35°C. The current was 17 mA and the voltage 29.8 V and for the sample with copper yarns coated with silver, the temperature achieved is 32°C, the current was 5 mA and the voltage 26 V. The investigation of thermal properties in normal environmental condition of temperature and relative humidity, shows that these materials are conductive fabrics able to heat. If the heating elements it supposed to be integrated into the clothing, for example underwear, in order to achieve a comfortable sensation of warmth, the temperature next to the body must be near the body temperature, fact that was achieved satisfactory in this experiment.

Acknowledgements: The authors would like to thank to researchers staff from Department of Textiles, Ghent University, Belgium, were the experimental part of this paper was carried out.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

CONTRIBUTIONS TO THE EXPERIMENTAL STUDY OF THE DRAGGING PHENOMENON IN THE CASE OF KNITTED WARP STITCH

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Abstract: Given that the structures were identical and were tested on the same machine, it can highlight the main factor influencing the phenomenon of drag is the raw material, its nature and its characteristics (coefficient of friction and length density)

Key words: dragging phenomenon equipment, charmeuse wire.

1. INTRODUCTION

Testing knits was done according to ASTM 434, like BS 3220, which are obtained and are compared to the stress-elongation curves for the assembled sample by stitching and seamless sample. In addition to calculating the resistance of sliding, is measured the assembly resistance.

2. GENERAL INFORMATION

Samples were made according to ASTM 434; test samples are presented schematically and as real appearance are showed in Figure 1.

Also in accordance with the standard and is given the assembly type used in practice for these knits, we used a simple seam, represented in Figure 2. The justification for using a simple stitch that covers the warp knits is similar to a point with fabrics. In addition, this type of seam is used in practice by sewing on straight lines.

Lacing was done on a Minerva type machine, using a needle Φ = 0.9. The chosen mesh density was 4 eyes / cm, the choice of this value is justified by its practical use. After sewing, the knit has been cut on a line of 100 mm which was bent the sample, so that the two components of the assembly to become independent.

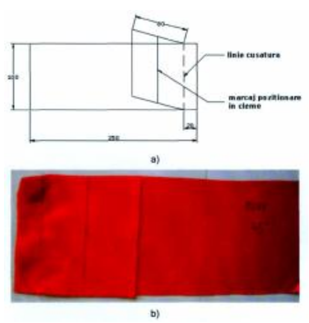

Fig. 1. The sample used for knit test - a principle of implementation (a) and layout (b)

Knitted samples were coded so as to specify the knit type and test direction. For example, code P275 30 indicates the structure of PES charmeuse wire, tested at an angle of 30 °.

For testing we used a test machine TINIUS OLSEN, T HK5 model presented together in Figure 2 for a full grip knit, clips were used width of 100 mm, illustrated in Figure 3.

Fig. 2. Testing machine Tinius Olsen HK5T model

Fig. 3. Clips used for testing

Selected parameters to conduct the testing are:

• The maximum force applied – It was used a cell of 5 kN maximum value of 700 N was introduced;

• The length of the sample - as defined by the distance between the clips is 80 mm. Samples taken from the reactor had a length of 350 mm, which allows the capture and disposition of samples as shown in detail in Figure 4.

• Elongation - Elongation of 100 mm was selected for all tests taken.

• Speed -Test - ASTM 434 standard provides a speed of 300$\pm$10 mm / minute.

• Pretensioning - Pretensioning 4.45 N was required, under the standard.

• Number of tests - Although the standard provides a number of five tests, 10 samples were tested for each knit one, in order to obtain data that can be handled mathematically precise.

Tensile testing was performed first for the request for the assembled material and then for the knit without assembly. The two stages are illustrated in Figure 4. The appearance of samples after testing is illustrated in Figure 5.

Fig.4. Testing samples with and without assembly area

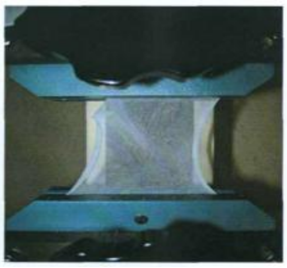

Fig. 5 – Samples layout after testing

It is noted that in general the testing sample with assembly with sewing thread breakage was found, except the structure of nylon monofilament yarn charmeuse, code R20. In this case, regardless the direction in which testing was performed, material breakage occurred in the assembly zone, the explanation referring to the smoothness of its particularly high, given the length of the raw material density of 22 den. 5.

Experimental results and discussions

Stress-elongation curve pairs obtained for the four materials types and for the four test angles were taken as raw data and processed in Excel.

Fig. 6. Assembled sample layout after testing in the case of R20 knit

A first observation concerns the stress-elongation curves for the assembled samples. The fact that the samples have been assembled with the stitching reinforcement at the ends, as required by standard, make these charts to submit to a certain level of force slightly less of it, then rise again the force and a break point occurs sewing thread. Corresponding decrease in force with disposing uncured ends, which does not mean the destruction and stitching of the seam.

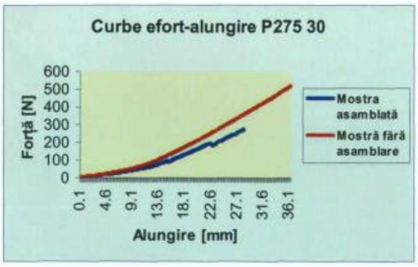

Fig. 7. Stress-elongation curves for the sample with and without assembly
for P275 30 knit

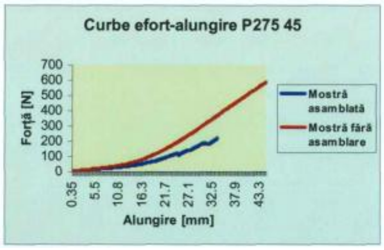

Fig. 8. Stress-elongation curves for the sample with and without assembly
for P276 45 knit

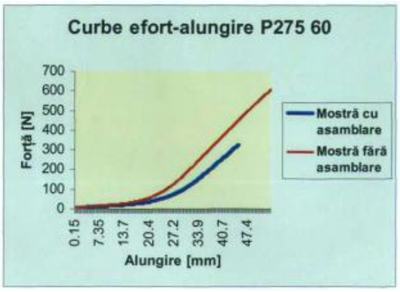

Fig. 9. Stress-elongation curves for the sample with and without assembly
for P275 60 knit

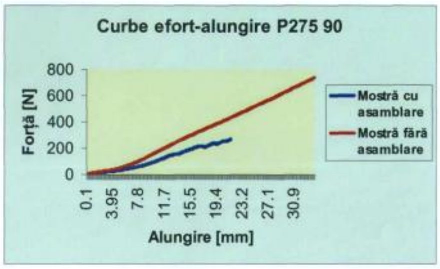

Fig. 10. Stress-elongation curves for the sample with and without assembly
for P275 90 knit

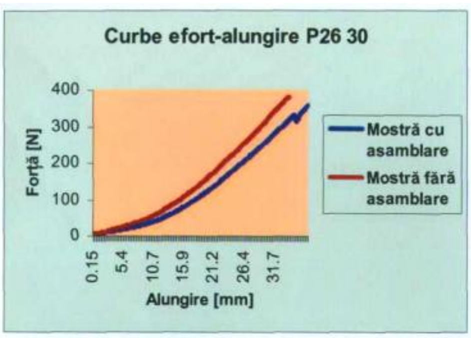

Fig. 11. Stress-elongation curves for the sample with and without assembly
for P26 30 knit

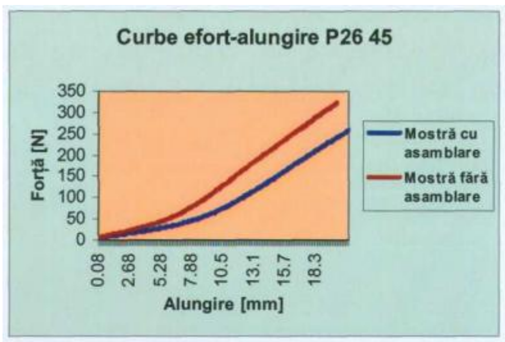

Fig. 12. Stress-elongation curves for the sample with and without assembly
for P26 45 knit

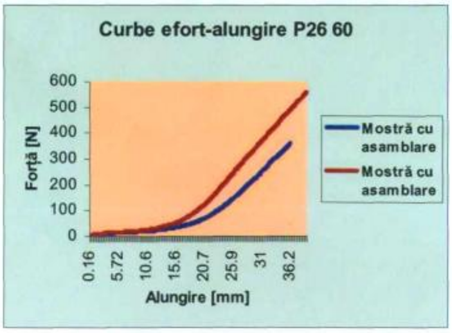

Fig. 13. Stress-elongation curves for the sample with and without assembly for P26 60 knit

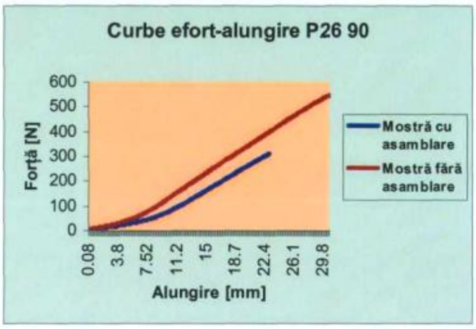

Fig. 14. Stress-elongation curves for the sample with and without assembly for P26 90 knit

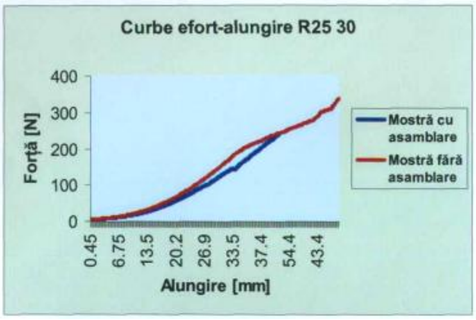

Fig.15. Stress-elongation curves for the sample with and without assembly for R25 30 knit

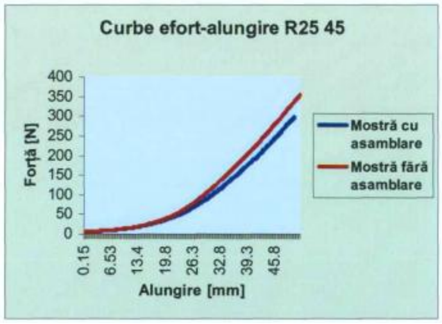

Fig. 16. Stress-elongation curves for the sample with and without assembly for R25 45 knit

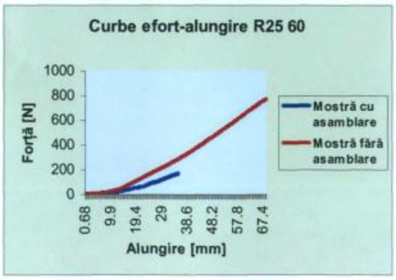

Fig. 17. Stress-elongation curves for the sample with and without assembly for R25 60 knit

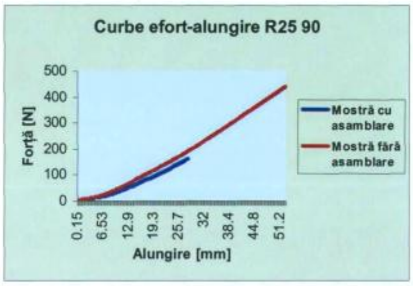

Fig. 18. Stress-elongation curves for the sample with and without assembly for R25 90 knit

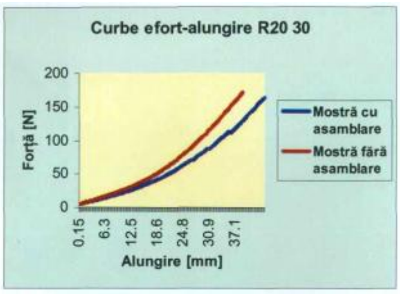

Fig.19. Stress-elongation curves for the sample with and without assembly for R20 30 knit

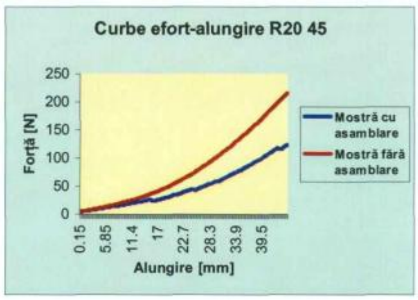

Fig. 20. Stress-elongation curves for the sample with and without assembly for R20 45 knit

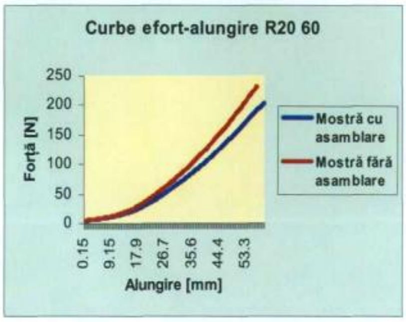

Fig. 21. Stress-elongation curves for the sample with and without assembly
for R20 60 knit

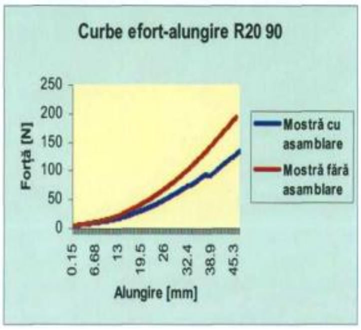

Fig. 22. Stress-elongation curves for the sample with and without assembly
for R20 90 knit

Table 1 centralizes the average values of breaking force and elongation at break when is tested with and without assembly, and the average values determined for the resistance to sliding. In the "observations" are presented the number of tests that could determine slip resistance - there was a distance of 6.4 mm between the two stress-elongation curves.

Table1. Mean values of strength, beak elongation and sliding resistance

Knit code	Testing sample with assembly		Testing sample without assembly		Sliding resistance	Observations
	Breaking force [N]	Elongation at breaking [mm]	Breaking force [N]	Elongation at breaking [mm]		
P275 30	273,75	28,13	522,22	37,86	178,8	3 values from 10 tests
P275 45	281,175	34,5	582,15	43,85	186,75	2 values from 10 tests
P275 60	**300,70**	**44,16**	**620,63**	**54,41**	235,50	5 values from 10 tests
P275 90	265,59	21,93	615,81	34,35	245,65	2 values from 5 tests
P26 30	**361,18**	35,75	390,21	35,39	369,67	3 values from 6 tests
P26 45	229,28	35,37	341,81	**43,13**	250,33	3 values from 10 tests
P26 60	353,38	**40,30**	**529,71**	41,00	252	3 values from 6 tests
P26 90	291,98	27,46	**527,69**	30,16	224,45	4 values from 8 tests
R25 30	**274,26**	45,51	355,60	50,88	**238,17**	7 values from 8 tests
R25 45	237,70	46,01	439,48	53,02	**191,37**	5 values from 10 tests
R25 60	171,85	40,92	**683,84**	**67,99**	**116,64**	10 values from 10 tests
R25 90	151,55	38,115	477,25	57,26	**98,41**	10 values from 10 tests
R20 30	152,78	50,53	179,70	45,87	**78,84**	10 values from 10 tests
R20 45	139,47	50,91	193,98	46,25	**58,11**	10 values from 10 tests
R20 60	143,69	**53,58**	188,08	**54,51**	**110,42**	10 values from 10 tests
R20 90	**162,43**	51,12	**199,01**	47,14	**90,43**	10 values from 10 tests

The data presented in Table 1 can draw some initial conclusions.

Where assembled samples tested, the range of variation of breaking force for the P275 is quite compact knit namely N 269.6 - 300.7 N. In terms of elongation at break, the range is 22-44 mm, corresponding to a relative elongation of 27-55%. Elongation at break was the lowest of all tested knits, suggesting a lower elasticity and knit a higher coefficient of friction for yarn. Experimental data indicate that the material has the highest resistance test in the direction of 60 °, the situation was determined and the highest elongation (44.15 mm). The other way, in which they requested knit breaking forces close in value, indicating a similar behavior. The minimum value was determined for the direction of 90 °. It can therefore say that the direction in which the knitted fabric is made, does not significantly influence the behavior of mechanically.For samples without assembly, breaking force values vary significantly with angle test. The lowest resistance is found in the direction of 30 °, while the maximum value was determined for the test angle of 60 °. To test angle of 90 °, breaking strength is close to the maximum. Compared with the values recorded for samples with assembly breaking strength are approximately double every for all directions, which indicates that the sewing thread used significantly influences the resistance assembly. Elongation at break is also higher than that recorded for the first case. Figure 23 shows the variation of breaking force to P275 knit for every angle of the test sample with both the assembly and the sample without assembly.

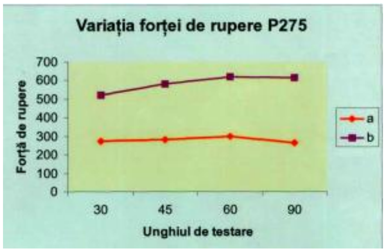

Fig. 23. Changes in breaking strength test angle P275 knit
a - sample with assembly, b - sample without assembly

The second type of knit code P26 is the least resistant steering angle of 45 °, for both types of samples (with and without assembly). Highest breaking strength of samples was seen assembled for directions 30 ° and 60 °, while for samples without assembly maximum force was determined for angles 60 ° and 90 °. This indicates that the strong direction towards is 600. This time the differences between the two types of samples are not so large. In addition, elongations at break are similar. One explanation may be the presence of amplitude related segments of the bond = 3 satin knit structure derived from that limited sample elongation. Furthermore, the position of the segments makes the knit structure to test them under 30 and 60 to have approximately vertical, assuming the forces to which the sample is subjected. Figure 24 illustrates the change in breaking force compared with the angle of application for both types of samples tested. It is noted near the breaking strength values for the direction of 30 ° and similar trend for samples with and without assembly.

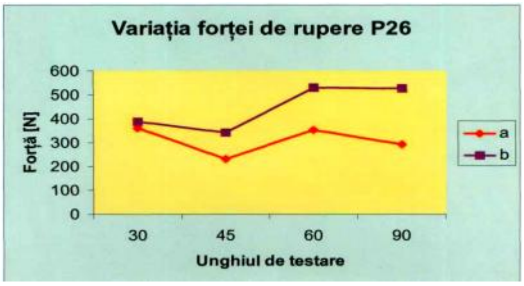

Fig. 24. Changes in breaking strength test angle P26 knit
a - sample with assembly, b - sample without assembly

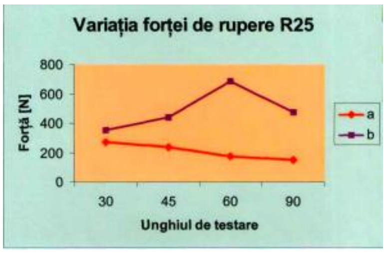

Fig. 25. Changes in breaking strength test angle R25 knit
a - sample with assembly, b - sample without assembly

Poly filament yarn knit made of polyamide, code R25 has lower values of breaking force for assembling samples in the range 151 - 275N and samples without assembly between 355 - 683N. In tests with samples assembled the best direction at the request of tensile strength is the direction of 30 ° with a value of 274.26 N breaking force, followed by the corresponding value of the test angle of 45 °. Other lines have much lower values of breaking force. Maximum force to break free knit assembly is an isolated peak (683N), knit like P275 60, but otherwise the values are significantly lower and closer.
Elongation at break is higher than for PES knitted fabric, exceeding 50%. For samples without assembly, elongations reach a maximum of 84.98% and while the corresponding maximum breaking strength 683N, for the direction testing of 60 °. This is due to greater elasticity of polyamide yarns. Figure 3.29 shows the variation of breaking force by the direction the test was performed. From the figure we can see that if the assembly sample breaking force value of testing angle gradually declines, while the sample without assembly test power increases with the angle to 60 °, at 90 ° recorded a decrease.Knit yarn made of poly-monofilament **R20** has the smoothest reaction to the request for expansion. Breaking force determined from experimental assembly samples are between 139 to 162.5 N, while for samples without assembling these values are in the range between 179 - 199N. There is, therefore, that the knit resistances to extension with and without assembly are so close in value and mechanical assembly maintains knit characteristics. It should be noted that this case is nearing an ideal assembly where the assembly characteristics to identify themselves with the material. For both types of samples, the highest breaking force was determined to test the direction angle of 90 °.As for elongation at break, elongation relative values exceeding 55%, reaching up to 68%. In the case of assembly for the elongation at break knit has great values, but very close to the 4- testing way between

50.5 and 53.6 mm. The only type of knit that for test directions of 30 °, 45 ° and 90 °, the elongation samples with assembly is greater than joining samples without assembly. The only exception is the elongation at break determined angle of 60 °, which is almost equal but with elongation for the sample without assembly. Figure 26 illustrates the change in breaking force compared with the testing angle was conducted. It notes the proximity of the two graphs and the low variation.For knits made from PES poly-filament stitch, sliding resistance testing was unfortunately not conclusive. No values were obtained for each test, the number of tests in which there was a removal of 6.4 mm is variable. However it should be noted that such data existed, but which in most cases exceeded the level of 200 N. It can therefore conclude that the phenomenon of drag is not significant in these knits. The main reason may be the nature of raw materials and relatively high coefficient of friction, the slip stitch yarn. Moreover, as already mentioned in the discussion carried on experimental data obtained for P275 knit, these structures have a thickness and smoothness rather than sewing thread may have influenced the stress-elongation curve turn, limiting the opening seam. If they would use a fine sewing thread certainly lower that the results would have shown the phenomenon of drag.

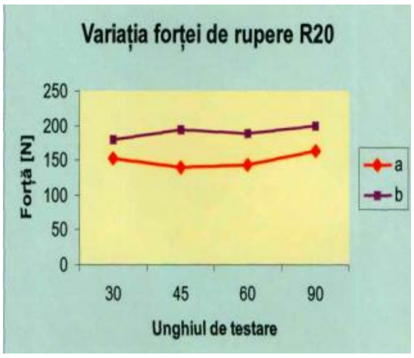

Fig. 26. Changes in breaking strength test angle R20 knit,

In the case of knitted fabrics made of poly and mono filament yarn of polyamide was found but the existence of the sliding stitch phenomenon. Knitting R25 (Satin, polyamide poly-filament) the lowest resistance to sliding stitch directions was found for testing of 60 ° and 90 °, with values of 116N, respectively 98N. These values, small enough to be easily achieved in the conduct of the products significantly influences product availability (reliability and maintenance). It is clear that the produced clothing product designer for both directions of arrangement of the assemblies is to be avoided.For the other two directions, the average values determined are close to or above 200N. By way of ordering these assemblies to be as strongly recommend in product design.R20 charmeuse knit from monofilament yarn has the lowest resistance to sliding, with values ranging between 58 to 110.5 N. The minimum value was determined for the angle of 45 ° while the maximum value is for 60 °. These values provide the product designer knitted important information about its lightness degree, highlighting the need for using this type of knitted products with high or very high degree of looseness.The experimental study of the foil is used to justify the recommendation for R20 knit and even R25 knit (polyamide yarn knits) the seam with edges which highlight the phenomenon intertwined edge stitch removal is diminished.

3.CONCLUSIONS

Given that the structures were identical and were tested on the same machine, it can highlight the main factor influencing the phenomenon of drag is the raw material, its nature and its characteristics (coefficient of friction and length density). The thread is finer and knit has a lower compactness, the drag resistance is lower. Also, the stitch dragging is influenced by the direction in which the material is assembled knitting.

Figure 27 shows variation of slip resistance of polyamide yarn for knitted fabric according to the direction in which the material was assembled and tested. The apparent similarity of the behavior of two knits for assembly directions 60 ° and 90 °.

Also, the presented chart emphasizes the behavior to linear sliding is reverse proportional with the assembly angle of more compact material (R25), indicating that the direction of 30 ° to be optimal in this regard.

Compared with the R25 satin structure, charmeuse knit R20 has a non-linear evolution of the slide. For this reason, the design of products made of knit apparel charmeuse slip which would not be custom made, with the type of product, assembly direction.

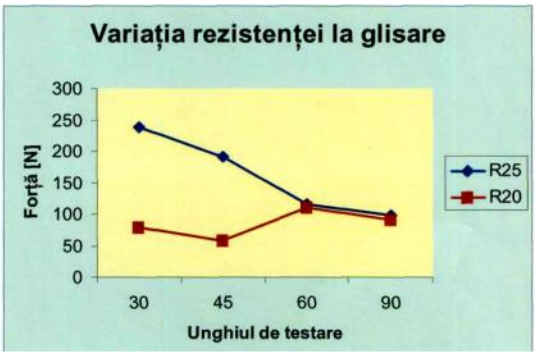

Fig. 27. Variation depending on the sliding resistance test angle for polyamide knits

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

OPPORTUNITIES FOR IMPROVEMENT ORGANIZATION OF WORK TIME IN A COMPANY

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Abstract: This paper exhibits the achieved study on the structure of the performer work time, involving productive and unproductive time, which contain, each of them, some other components. The quality of operations, work productivity, using degree of equipments depend of work time efficiency. The research was conducted in the leather factory in the Chisinau city. The circular diagrams were prepared based on questionnaires from 100 workers. The survey results allowed formulating the following conclusions: workers require a break to recover and to continue the started process, especially after 14:00; after this time is the most difficult to maintain the initial rate of work activity; majority of workers required, besides the two breaks, an another one betwen 10-15 minutes, etc.
Key words: time, breaks, worker, gymnastics, company.

1. INTRODUCTION

In any living organism that does something a different phenomena is occurring inside that temporarily reduce the feeling of mental or physical faculties and tend to inactivity. Activities that may be causing fatigue: physical or sensoryal and mental or cerebral. Physical fatigue can be caused by dynamic and static movements, resulting after operations which the muscles are kept under tans to keep the body in the desired position.

The production activities, beside the mechanical effort made by worker, there are a number of factors related to environment the work is carried out and exercising a direct influence on the degree of fatigue.

By their nature, these factors can be grouped as follows: the physical environment, the psychological environment and the rest.

2. CURRENT SITUATION IN THE MOLDOVA REPUBLIC

Until the 1990 in R. Moldova in the footwear and leather companies workers were following breaks:

1. 9^{00} - 9^{10} - rest break;
2. 11^{00} - 11^{35} - lunch break;
3. 14^{00} - 14^{10} - rest break.

Nowadays, these breaks are more reduced, some companies have adopted only the lunch break, and others both lunch and rest break lasting five minutes. Negative effects felt immediately by increasing the number of injury cases. Because fatigue is causing bottlenecks in the movement, in which attention is reduced and creat favorable conditions for accidents.

3. STRUCTURE OF WORKERS TIME WORK

Among the worker's working time, time use machine and work time through all stages of transition object manufacturing process, worker time structure is the most complex. However, the efficiency of working time depends on both the usability of equipment, as well as during labor objects passing through the phases of processing technology.
In figure 1 is shown worker's working time.

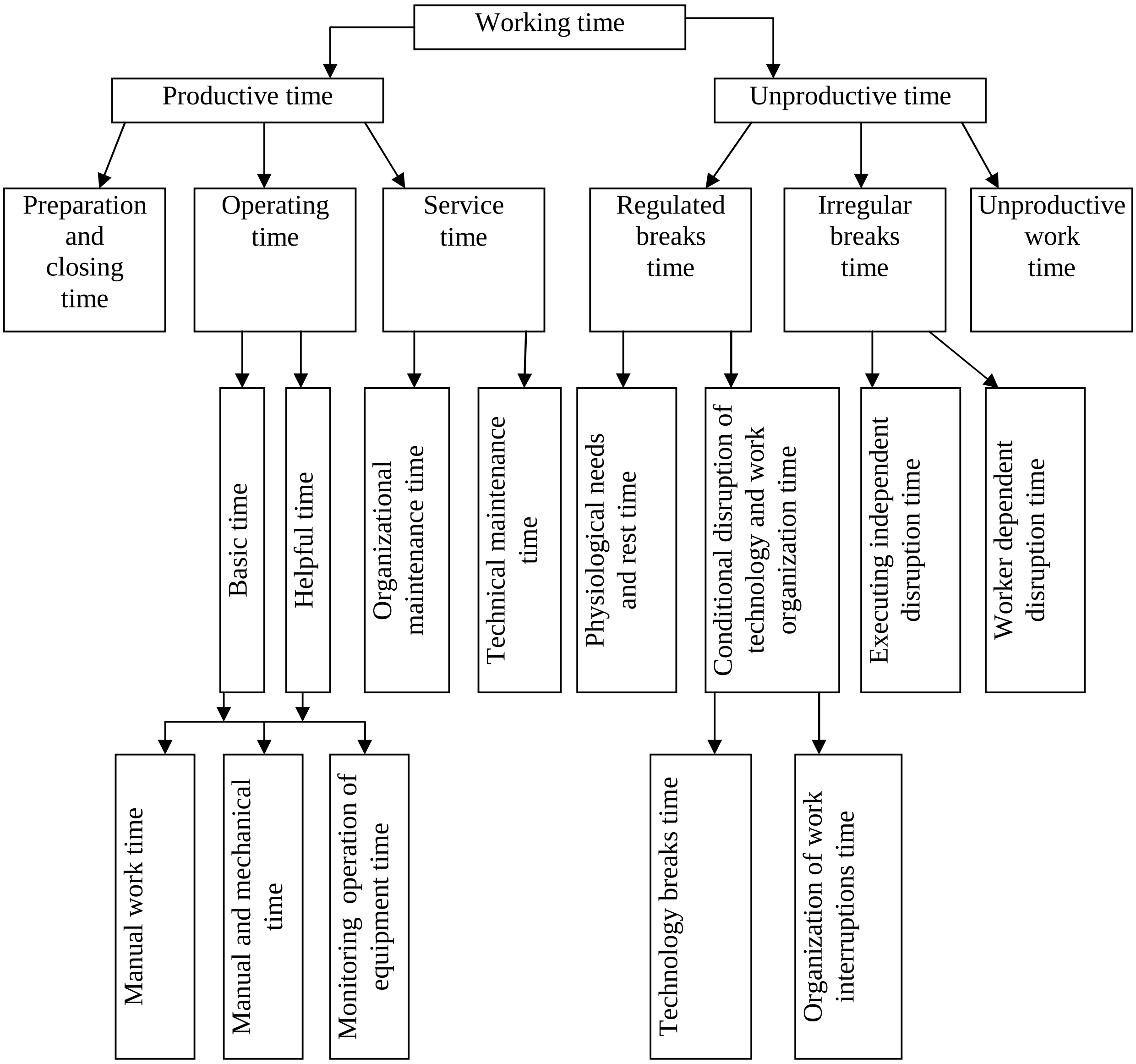


Fig. 1. Structure of working time

Working time is available to a worker during the normal working hours to perform tasks of the work covered by duration of working hours.

Productive time is time during which the worker performed the work necessary to achieve certain tasks. *Training-closing time* is the time during which the worker, before beginning a job, workplace creates workplace conditions for their performance and cleaning it after finishing their work. *Operating time* is the time during which the worker performs or supervises the work required of qualitative and quantitative changes in work items. *Organizational maintenance time* in which worker ensure the entire period of work activity, to maintaining normal operation of the equipment and tools, as well as organizing, purchasing, order and cleanliness of the workplace, according to the tasks set.

Unproductive time is the time during which interrupts occur at work or the worker performing actions that are necessary to carry out its work load. *Time refers to the regulated disruption* of the work breaks for rest and physiological needs of the worker and the breaks put on technology and work organization. *Unproductive work time* is the time when the worker made action unnecessary normal course of the production. *Irregular interruption time* can be dependent or independent from worker. Dependent outages due to employee misconduct discipline at work, and those generated by executing independent organization or natural causes, such as lack of raw materials, parts, obsolete equipment, etc.

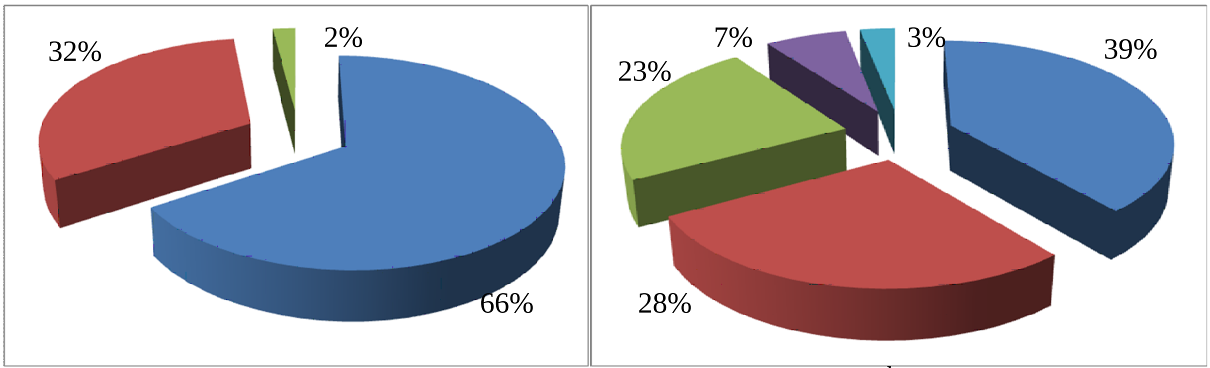
4. EXPERIMENT AND DISCUSSION

The research was carried out in a leather company in the Chisinau city. The research purpose was both to improve the working conditions of workers at minimum request nervous physical and unproductive work time reduction. In the company breaking time is very short interruptions - thirty minutes for lunch break and five minutes for gymnastics. That is why workers are getting very tired and nervous. We developed a questionnaire with several questions (table 1) answered by 100 workers (women and men) from different operations. The survey developed more categories of workers, the authors intention is to clarify and compare options as man's position during the work activity - standing, seated.

Table 1. Questionnaire

No. crt.	Number of breaks ?			What would you like to do during breaks ?				
	Few	Many	Suffitcien	To rest	Do gymnastics	Let's chat	Practice some games	To do otherwise
1	2	3	4	5	6	7	8	9

The results can be shown as circular diagrams (figure 2).



a. *b.*

Figure 2. The survey results, where *a* is the number of breaks, *b* – what you want to do on break

1. Number of breaks
- 66 % the total number of respondent believes that fewer breaks;
- 32% - are sufficient breaks;
- 2% - there are many breaks.
2. What do you do during the break
- 39% - want to rest in a rest room, a comfortable armchair, etc.;
- 28% - want to read a newspaper, to help those left behind, out in the open air etc.;
- 23% - prefer to do gymnastics;
- 7% - to discuss a specific topic;
- 3% - to play checkers, chess, etc.

In that unit have noted certain deficiencies in respect of working time:
- Regulated breaks dependent performers (due to those who rush to fulfill the task).
- Unregulated breaks, independent performers (due to lack of parts, semi, materiarilor ancillary equipment is too old and lack of spare parts).

5. CONCLUSIONS

The survey results allowed formulating the following conclusions:

- Workers require a break to recover and to continue the started process, especially after 14:00, after this time is the most difficult to maintain the initial pace of work activity. Most workers require, besides the two breaks, at another time than 10-15 minutes
- 66% respondent is the number of workers employed in assembly operations of parts and supplies, so they are the ones who fail to rebuild strength and still require a break.
- 32% respondent is the number of workers who are working on fixing accessories, frames, etc.. These workers were waiting for, so they should fill the gap formed during work. Worked all day on foot, they would need a rest specific legs (a comfortable armchair).
- To reduce unproductive work time, that company would have to change old equipment, carry out timely repair of equipment, and control their anointing as their maintenance is carried out by each worker.
- To reduce irregular interruption time, which are independent of executing, you can try a redestribuire tasks, assigned to the 32% of performers and other light work.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

CONSIDERATIONS ON PERFORMANCE OF Outlast® MATERIALS

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Abstract: The paper analyzes the performance in the comfort of clothing, how to test the reactions and phase change materials in general and Outlast material, in particular. Highlight all the wider use of these materials, which have the capacity to absorb, store and release excess heat from the body when needed. It mainly treats Outlast smart textiles, highlighting the operation, testing, and areas of increasingly broader use
Key words: PCM textile, Outlast, thermal balance, comfort, fashion, clothing thermal insulation.

1. INTRODUCTION

Smart textiles are present in everyday lives of consumers. Tissues that help astronauts in space and researchers in Antarctica, can also be used by ordinary people. These tissues are characterized by phase change materials (PCM), which are able to absorb, store and release excess body heat when needed. The result is less sweating and cool, skin microclimate is influenced in a positive way, improving efficiency and performance. The so-called phase change materials (PCM), are present in the examples listed above and there are so many products today: winning each time more and more applications, from clothes, underwear, socks, shoes and accessories for beds and sleeping bags. PCM's can be found even in "exotic" articles as body armor, vehicles, special medical or industrial applications where heat plays an important role.

Fig. 1.

PCM phase change materials are combining two technologies:
¬ microencapsulation;
¬ phase change.

2. HOW PHASE CHANGE MATERIALS (PCM)?

2.1 What's PCM?

The principle is easily demonstrated. Looking at the phase change material (PCM), we see that two well-known technologies are successfully combined: an anallogy can be made with chewing gum. When chewing gum is chewed, microcapsules are destroyed and the flavor is released. Another example is magazine perfume testers. Microcapsules are destroyed when the paper is rubbed and the smell is released. The capsules are very small, about 3 million in a cm2.

The difference in Outlast ® materials: Microcapsules are also used, but the framework is stable and not destroyed. The capsules are small: about 1,000 caught in a PIN head (about 3 million per cm ²). Thermocules ™ (patented Outlast ®)capsules are capable of phase or state change.

Microcapsules which affects the skin create a microclimate. The human body is sensitive to temperature changes and therefore comfort zone has some well-defined limits, such as average body temperature is 36.6 ° C. Internal temperature (heart, kidney) varies very little between the limits, usually 37 ° C. The temperature outside of the skin and in limbs as a general rule is lower and varies between 28 ° C and 33 ° C. If the normal temperature is between 36.5 ° C and 37.4 ° C, and it increases a little, it leads to fever and hypothermia if it falls. Where are variations, they can be positively influenced by Outlast ® materials, working as dynamic as possible, maintaining personal comfort zone and reducing unpleasant sensations of hot or cold.

The microcapsules (patented technology) called Outlast Thermocules are stored in a wax-like substance, capable of phase change. This simple physical process is well known. For example, the water becomes ice or vapor when energy is applied or not. And PCM technology takes advantage of this law of physics. PCM Outlast technology was originally developed to help NASA astronauts from extreme temperature changes in space. Occasionally, there are products on the market that make a reference to NASA, most of them without authorization. "Official clearance (or official license) granted by the U.S. Space Foundation, a nonprofit organization linked to NASA happened in May 2003 and granted this privilege to Outlast, with the prestigious stamp of approval Certified Space Technology". Worldwide, only 34 companies received the seal, and Outlast Adaptive Comfort is between them, unique textile application:

Outlast material absorbs excess body heat when too much is created, and releases heat into the body when necessary. They are classified according to the rating SFR-Smart Fabric Ratings (the tissue level of intelligence), which is a measure of energy storage capacity of the fabric. Outlast reduces overheating and cooling products, and the heat is evenly distributed. A positive "side effect": it dramatically reduces perspiration. However, it significantly increases comfort. There are more and more applications of this material. Because of Outlast material ,the body adapts better to the external influences of temperature the level of comfort even in stressful situations is increased. Outlast Clothing and footwear offers greater comfort in all seasons. From inside out: Outlast products allow the body to remain comfortable and reduce the temperature, neither too hot nor too cold. A study of Eidgenössischen Materialprüfungs und Forschungsanstalt (EMPA), St. Gallen (Switzerland), found that the production of sweat in clothing can be reduced to one third. Outlast Footwear reduces sweating almost by half. Heat is generated when the body is active,when it is idle it becomes cool. With Outlast activity level is different: it is always comfortable.

2.2.Outlast and continuously improving performance

The American company specializing in research, development and design of phase change materials (PCM) has announced an improvement patented temperature control system for clothes and quilt stuffed.

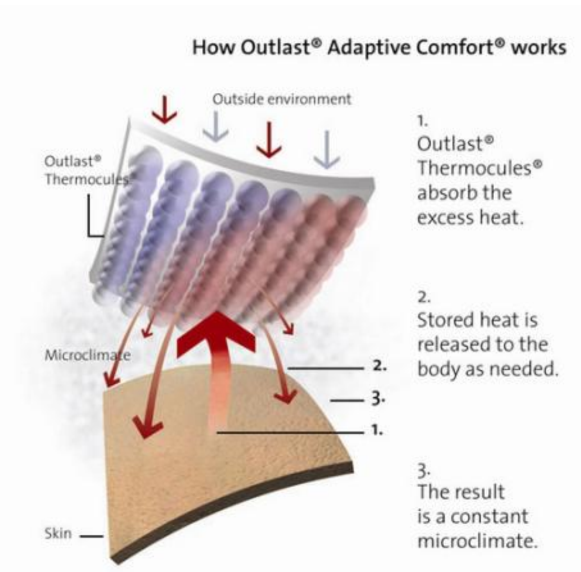

Fig.2.

The famous patented Outlast microcapsules, called Thermocules, have increased the quality by developing a new process known by the acronym MIC (Matrix Infusion Coating). Compared with products of this type (viscous) the new method greatly increases the heat absorption and storage capacity for its use when most needed, thereby keeping the skin at the same temperature regardless of outside temperature changes. Oulast MIC is an application based on a new set of chemistry. "We have applied our technology already known by a new engineering process that is invisible and has no material bearing on the question," said Martin Bentz, director general of Outlast Europe GmbH.

In short, a new twist in the development of new ways to solve the eternal problem of mankind: maintaining a stable temperature to achieve maximum comfort. Garments absorb excess heat from the body, giving a feeling of freshness, and we return the surplus, protecting from cold, when necessary. SOLBRU company launched a new line of smart textiles: Solbru Nautica. These are garments that protect both thermoregulatory cold and heat, adapting to different climatic conditions and to other physical activities. To achieve this goal, the tissue adapts Outlast microcapsules, a product developed by NASA, to be able to withstand extreme weather conditions occurring in space.

The main featureof Outlast is its ability to thermoregulate: it absorbs excess heat generated by the human body, giving a feeling of freshness, and releases heat in the body, protecting it from cold, when needed. Thus, a garment treated with Outlast provides a sense of thermal comfort at all times and under all circumstances, adapting quickly to the contrasting climatic conditions.

2.3. Test Method: ASTM D7024

Physiological tests show that Outlast ® materials improve the behavior of traditional materials. In addition, other features suggest that the dynamic thermal Outlast ® products, which are based on sound science, can be verified with further tests. Amercian Society for Testing and Materials (ASTM) approved a new standard for measuring the amount of latent energy in textile materials. The first "test method for steady state and dynamic thermal performance of textile materials", was determined by ASTM in June 2004, based on years of research and tests on materials that have become phase change materials (PCMs) by Outlast Technologies, Inc., and Prof. Dr. Douglas Hitt, director of solar energy applications at the University of Colorado. Now for the first time, it is possible to measure the amount of heat retained in the tissues. Founded in 1898, ASTM International is one of the most important organizations in the world to develop standards, a reliable source of technical standards for materials, products, systems and services.

"Phase change technology in textiles and latent energy by adjusting the temperature growth became a new approach to provide comfort and performance. Standard test methods used to determine the value of isolation of traditional fabrics, do not measure the energy stored in these new and innovative smart materials, "says Volker Schuster, technical director of Outlast Europe. However, a method and apparatus is necessary to us as ASTM D1518 "Standard Test Method for Thermal Transmittance of Textile Materials", which only determines the value of R (or CLO value as used in industry), a steady state. Hartmann continues: "The nine test method measures the dynamic changes in temperature, and quantifies different temperature change in the properties of a material in a dynamic environment and it can measure the effects of temperature and how much the fabric can absorb, store and release energy. This test provides a measure of PCM technology to separate temperature control and thermal insulation properties of a tissue". From the industry perspective, this new ASTM standard clearly demonstrates and explains the benefits of incorporating dynamic thermal properties of fibers and fabrics, and is also important with regard to competition specifications.

Under the microscope

Depending on end use, there are different ways to apply Outlast ® technology: (Fig.3.)

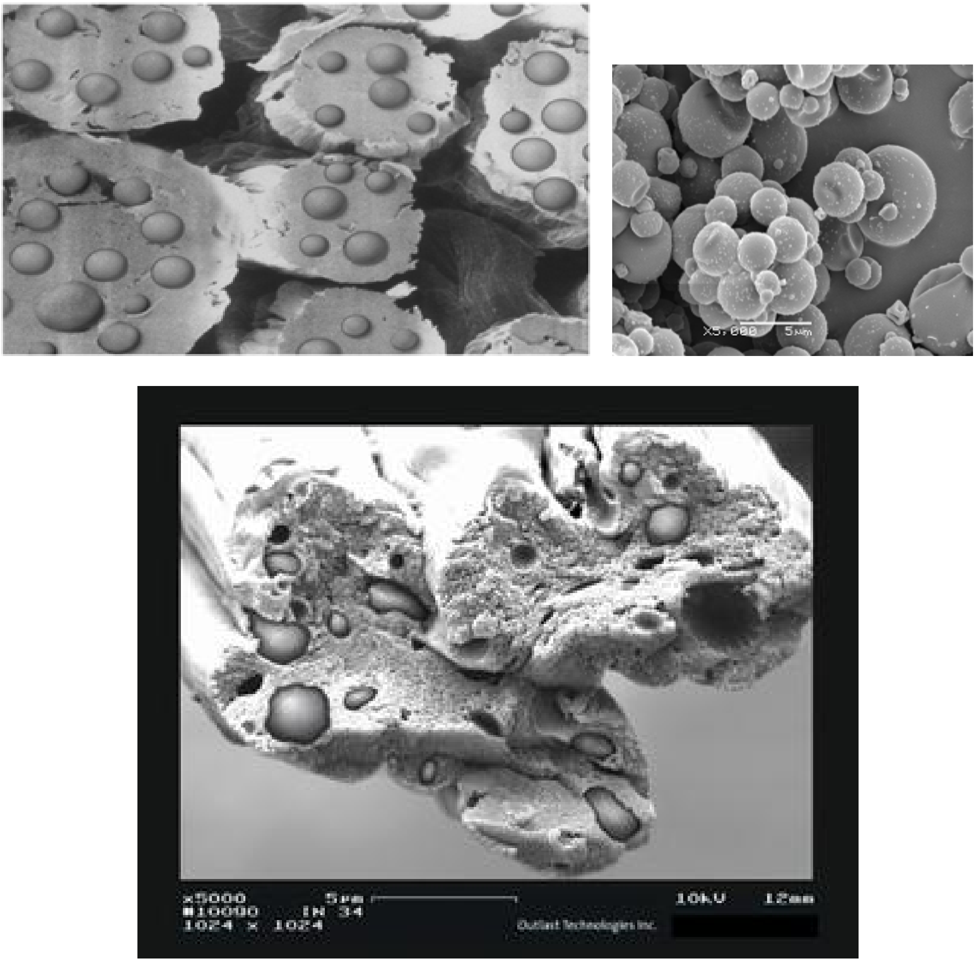

Fig. 3. Outlast fiber polyacryl

Thermocules ® Outlast ® fibers: Here microcapsules are located within the fiber. The fibers are spun to manufacture, later, socks, underwear and knitwear. These products are kept in direct contact with skin.

2.4. Outlast ® Benefits

Outlast ® material maintains comfort by absorbing body heat when too much is created and releasing it when needed. Users will feel more heat with less clothes and generate less sweat.

- Comfort all day;
- Heat without too many clothes;
- Protection against overheating;
- Protection against undercooling;
- The body adapts to caloric needs
- Less sweat.

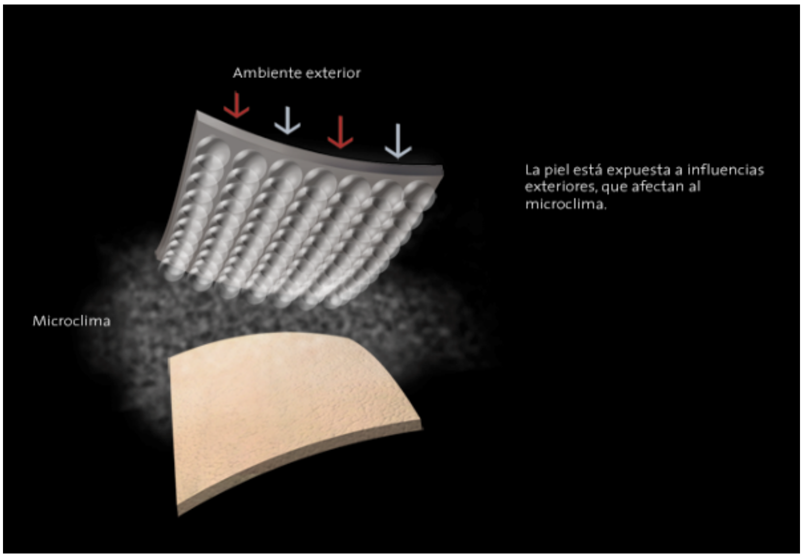

Fig.5.

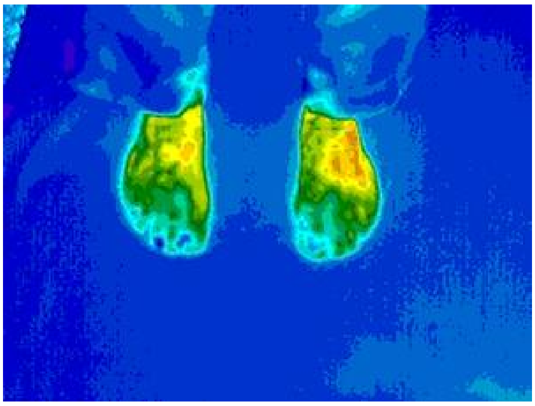

Fig.6. With Outlast ® Adaptive Comfort ® technology

Outlast ® technology was originally developed by NASA to protect astronauts from temperature fluctuations in space. Outlast ® material is a phase change material (PCM) containing microcapsules that can be mixed with other compounds that are suitable for application in fibers, fabrics and laminated materials. Outlast ® materials have the ability to interact with the human body to help balance temperature because heat is absorbed, stored and used to maintain a comfort zone.

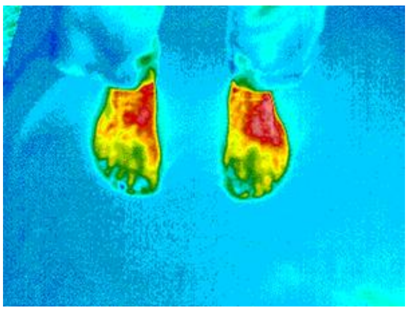

Fig.7. Without Outlast ® Adaptive Comfort ®

One way to demonstrate the performance of Outlast ® products as compared with traditional products is a thermal imaging camera *. This camera shows the differences of color temperature. From the hottest to the coldest, the colors are: white, red, yellow, green and blue. Outlast ® images show some socks that have been used in a hot environment, preventing the feet from overheating and reducing the individual sweat. In a cold environment, it would reducing cooling. Outlast ® Adaptive Comfort ® benefits at a glance:

• Adjust the temperature;
• Reduces the overheating;
• Reduces perspiration;
• Reduce cooling temperature;
• Active temperature control.
* Heat 2% Accuracy

3. CONCLUSION

Outlast ® is a class of temperature balancing materials using microcapsules (Thermocules ®) that absorb and store excess heat, releasing it when needed most. Outlast ® materials continuously adapt to changing thermal needs of human bodies.

When Outlast ® technology is used as part of a viscose or acrylic fiber, is becomes a permanent part of clothing. Outlast ® thermal regulation technology can be incorporated into textiles for various processes. Besides the technology of viscose and acrylic fiber, the Outlast ® Thermocules® are entered directly into yarns and fabrics, and Outlast ® material can be laminated directly using the treatment applied by filling or spraying finished clothing. All Outlast ® fabrics, laminates and fiber are more effective when they are designed to be used as materials for coating or between coating and the product itself.

All products containing Outlast ® technology are tested and certified by Outlast ® logo label. Outlast Technologies, Inc. holds the patent for the original technology for thermoregulation and ingredients for fibers, fabrics and laminates.

Outlast ® was originally developed by NASA for use in gloves and other applications in garments such as trousers and socks to absorb heat and sweat and improve the temperature found in space and at high altitudes. In 2005, Outlast ® technology was introduced into the Space Hall of Fame for making a technology originally developed for space exploration into products that help improve quality of life on earth.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

GORE-TEX AND SYMPATEX TEXTILE WATERPROOFING

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Abstract: Waterproofing is the treatment of reduction of water absorbing propreties of materials. It is more of a coating than a finishing process because it uses polymer materials for covering spaces and pores. These textiles leaves no air or water vapor to pass through the material because the pores are completely coated . This material is impermeable to liquid water, and air and water vapor. It resists the water test with a pressure in the water column> 1000mm, before the first drops of water start to penetrate. Depending on the methods used to waterproof and textile media, you can get waterproof breathable, microporous membranes such as GORE-TEX, or hydrophilic membranes - SYMPATEX
Key words: GORE-TEX, Sympatex, vapour permeability, waterproof textiles, chemical technology, textile oleofobisation

1. INTRODUCTION

Currently there are several technological options for obtaining a textile material with hydrophobic properties:
1. Waterproofing additives
2. Waterproofing agents - reactive type resins
3. Waterproofing by chemical modification of fiber

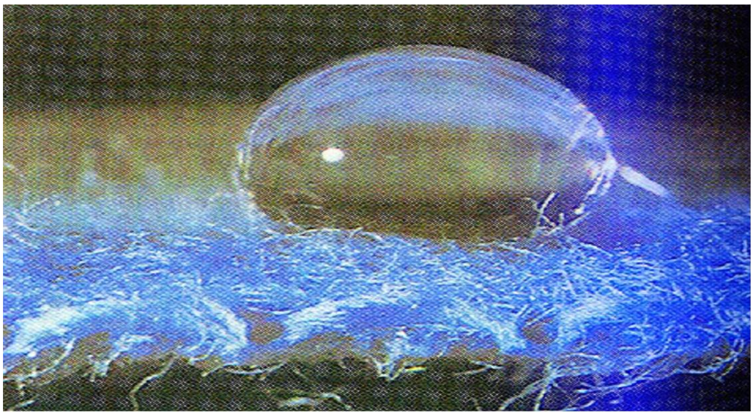

Fig.1. Hidrophob fabric

Most hydrophobic textile fabrics are processed to reject certain substances .

In general, natural fibers due to their capillarity are more or less hydrophilic, depending on the degree of removal of products that accompany them. Synthetic fibers are very hydrophilic and retain a certain amount of water on their surface but do not swell, while the regenerated cellulose fibers absorb water and swell easily because of their constitution. To make waterproof fabric structure a closed structure has to be adopted, high density and high yarn twist, in order to minimize interstices between fiber and yarn

Finally the choice of method depends on final destination .If you need to be breathable (ie to allow the passage of perspiration) the material is chosen to be permeable to water vapor, and if not, is chosen to be completely impermeable.

2. GENERAL INFORMATION

In pursuit of impermeable material that does not allow passage of water through them, but of air, the following chemicals can be used:

a) drying oils (linseed oil) that can be applied on a portion of the material in the form of pulp obtained by a solution of oil in organic solvents;

b) Natural rubber is the classic waterproof substance.

Tipically only one side of the material is covered with a layer of rubber. Application of natural rubber latex is made by fulard soaking in a dilute dispersion or dressing with a scraper device and a corresponding viscosity paste. Both dispersion and paste contain the the necessary additions for rubber vulcanization (sulfur and accelerators). During drying, the latex is coagulated into fibers with vulcanization occurring at the same time.

c) synthetic rubber has also found application in production of waterproof materials, in the form of aqueous dispersions or pastes, thus achieving a similar effect to natural latex.

d) silicone emulsions. In our country linkable silicones are used to waterproof fabrics of polyamide filament yarns for rain clothing, achieving results similar to those that use polyurethanes or acrylates. In a number of companies polyacrylic resin fibers are used for sealing materials or in combination with silicones (Romanian products: Medacril IPA1 and IPA2).

Evaluation of the effects produced by the method of resistance to water penetration under increasing pressure. Waterproofing is the application on the fabric surface of a continuous uniform coating that completely blocks the pores and interstices of the fabric, so that no water, no air, or sweat is allowed through. Waterproofing effect depends on three factors: the nature of the fiber, fabric structure, and treatment received.

2.1. Waterproof - Breathable (waterpoof & breathable)

The difference between them is waterproof ing and degree of pore filling, in the case of breathable waterproofing, open pores remain, that are permeable to water vapor. They do not allow air or water vapor to pass through the material, but allows water vapor to circulate:
- Water permeability> 130 cm water column
- Air permeability <1'5 ml/cm2/sec
- Vapor permeability (sweating)> 3000 g/m2/24hours.

Collection
- Very dense fabric with water resistant treatment
- Microporous coatings or laminates
- Compact hydrophilic coatings or laminates
- The combination of coverage and compact hydrophilic microporous laminate + hidrophile compact.

Treatment	Basic fabric	Imperm./resp.	Sample
Verry dense fabric	100% cotton/microfiber	+/+++ +/+	Valves
Resistant fabric	Structure very dense	++/+++	Silicon/fluorcarbon
Coating	Density	+++/- ++	Coagulation/ foam
Rolling	No limitation	++/+++	GORE-TEX, SYMPATEX

+++ strong impermeability, ++ medium imp., + less imp., - without imp.

2.2. Membranes:

Extremely thin films (10 m) with a high resistance to penetration of liquid water and permeable to water vapor. Conventional textile laminated to provide mechanic resistence.

TYPES: - microporous;
- hydrophilic.

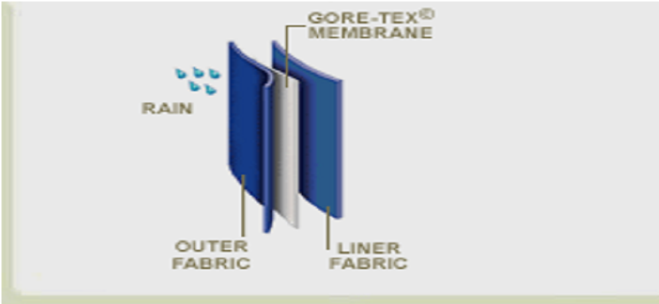

Fig. 2. Microporous membranes

Microporous membranes: Gore-tex: membrane developed first by W. Gore. A film of polytetrafluoroethylene (PTFE) expanded. It contains 1.4 billion pores per cm2. Pore size is smaller than water droplets (2-3 mm compared with 100 m). Hydrophobic nature of PTFE, and small size of pores prevent water penetration, with higher than water pressure. Water transfer, water vapor and air through the microporous membrane is possible .

- Pore 20,000 times smaller than a drop of water (Fig.3.)

Fig. 3. Pore 20 000 times smaller than a drop of water

- Pore 700 times smaller than drop of water (Fig. 4.)

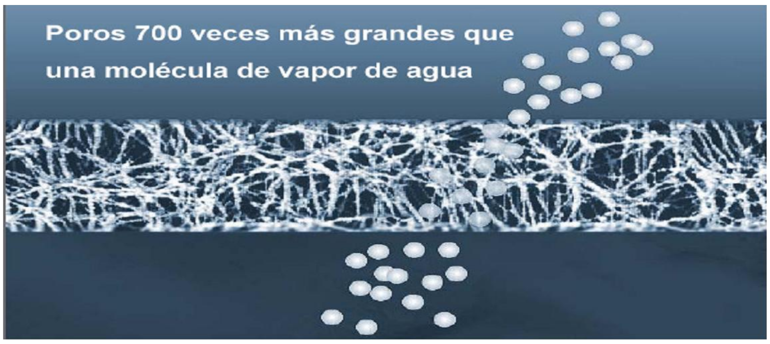

Fig. 4. Pore 700 times smaller than drop of water

- Do not allow wind penetration (Fig. 5.)

Fig. 5. Wind penetration

Features of Gore-tex membrane:

- polytetrafluoroethylene (PTFE) hydrophobic
- Lightweight 20 g/m2
- thin: 1 / 1000 mm = 10 mm
- microporous million pores/cm2 1400
- resistant to extreme temperatures - 250 ° C to 260 ° C
- physically resistant to bending under high loads (low temperatures and extreme loads)
- Do not allow wind penetration, waterproof and breathable long-term

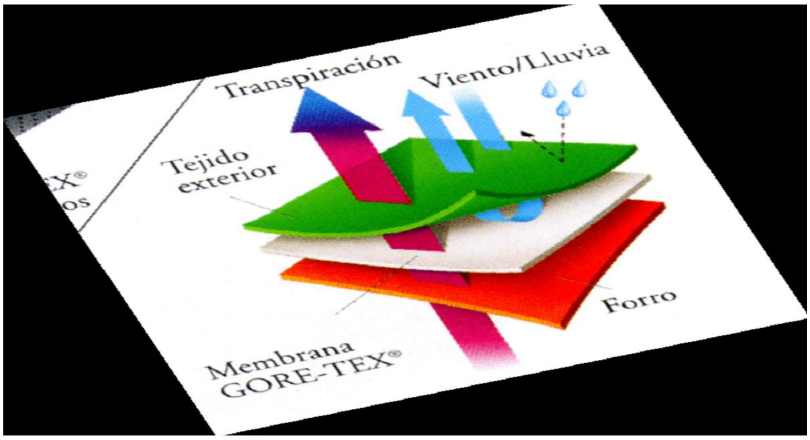

Fig.6. Hydrophilic membrane

Hydrophilic membrane (Fig.6.)

The films are continuous, non-porous, made of polyester or polyurethane. Incorporated into the polymer 40% by weight is polyethylene oxide (CH2CH2O), which is hydrophilic polymer with an amorphous region. The transport of water vapor diffusion occurs between the hydrophilic chains of polymer molecular chain. One of the first hydrophilic membranes, was Sympatex of Azco, a modified polyester.

Vapor transport

Hydrophilic amorphous areas of the membrane act as molecular pores.

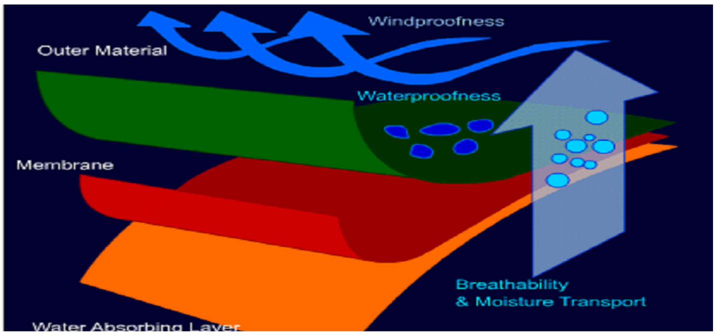

Fig. 7. Breathability and moisture transport

Microporous coatings

Coatings with a structure similar to that of microporous membranes. We present some interconnected microchannels, with dimensions lower than water drops, but larger than molecules of water vapor.

Methods of production:
-- wet Coagulation
-- Thermo – Coagulation
-- Foam Coatings

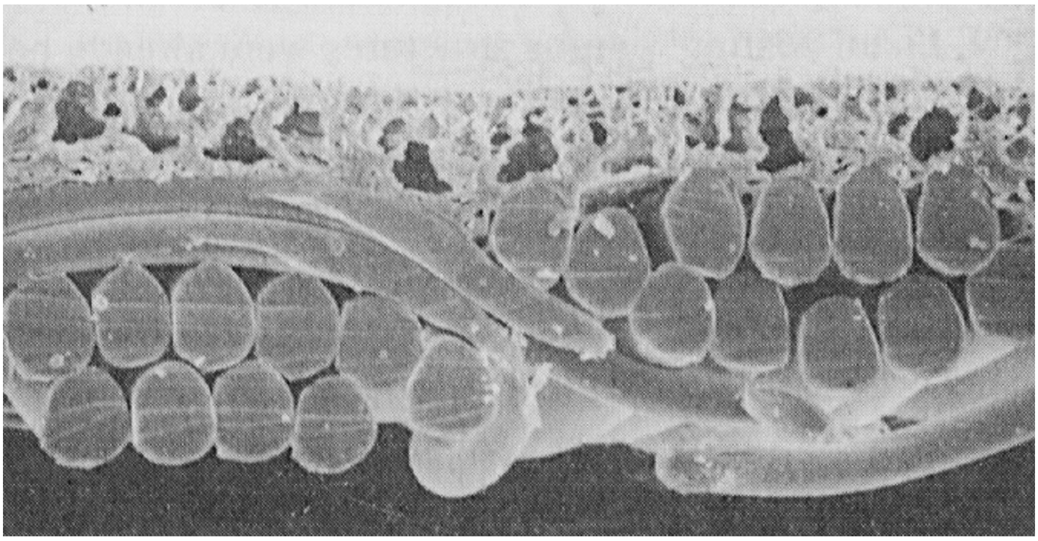

Fig. 8.

As a general rule, hygrophobic materials are not to be washed by dry wash method (organic solvent). Pressure washing is decided by the attachment of the agent. The best resistance are obtained by covalent binding piridiniu salts, the poor treatment heavens, and paraffin wax emulsions / waxes and metal salts.

A waterproof material but permeable to the passage of water vapor / air and perspiration, is obtained by dipping, in the process known as padding.

2.3. Impermeable to oil (oil repellent) - antipete

Technology of oil repellent

Oil repellent finishes include giving property to a textile material to reject oily liquids, thus ensuring protection against pollution. Oil repellent principle consists in treating textile materials and substances miscible with oil in terms of their energy to the surface to behave like water to fatty acids. In this respect, organic substances derived from hydrocarbons are more or less miscible with oils and therefore can not be used in the finishing stage. A replacement of hydrogen from hydrocarbons is only possible with fluorine characterized by small radius tome.

To obtain the properties of hydrocarbon chain, oleofobisation agent chains must have at least four carbon atoms, and end with a CF3 group. In such textile products called "carbon fluorine resin" is used in two ways: in water emulsions and solutions in organic solvents.

a. fluorpolymer emulsions in water are used for all types of fibers, giving stable behaviour in dry cleaning finishes. It is produced both as active cation and as ionic products. For treatment of cellulosic fibers, water emulsions can be applied together with reagents and the additional anti-wrinkle effect contributes to an improvement of the repellent. Fluorpolymers can be applied by padding or exhaustion in the tub with reel. After impregnation is dried at temperatures of 100 - 110 ° C and then heated to 150 - 170 º C.

b. fluorpolymer solutions in organic solvents can be applied to fabrics or knits. Their application may be created by fulard or by spraying. Fluorpolimer solutions are used in textiles with chemical cleaners. After treatment with a solution of fluorpolymers the material is dried and temperature thermofixed at 80-100 º C.

Do not allow the passage of fatty substances, prevent staining with oils, are used in carpets, upholstery, etc..

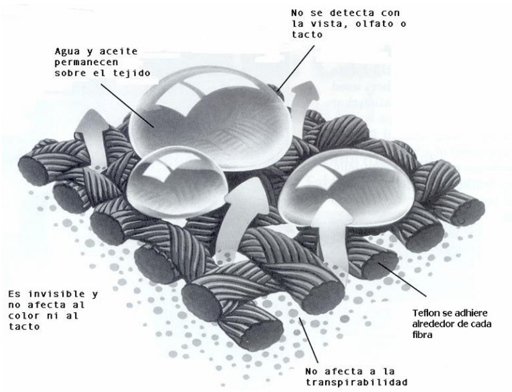

Fig. 9

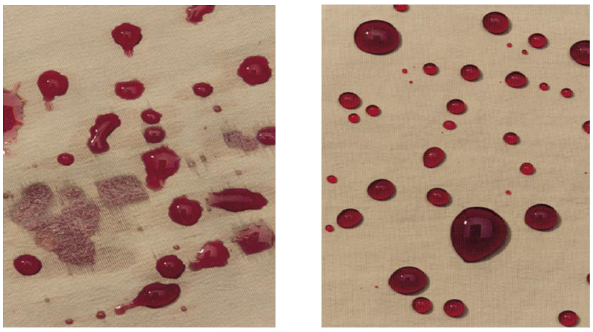

Fig10.Before and after the treatements with oilrepellant

3. CONCLUSIONS

Sealing material is useful and gives extra comfort because it does not allow the passage of water from the outside (waterproof surface), but allows perspiration vapor passing from the inside out (inside permeable). Waterproof that does not allow passage of water, but is permeable to air and water vapor (perspiration vapor transfer), is obtained by dipping, and by the process known as padding. Sealing also helps in the manufacturing process that, because this membrane isolates heat while maintaining body heat, the material does not require applying a thick layer of wadding linen, so the product is made much easier / more practical.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

ALGORITHM FOR DESIGNING CROSS-STRIPED FABRICS WITH MASS MODIFIED THROUGH YARN SETTING METHOD

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Abstract: Redesigning the cross-striped fabrics obtained through the association of weft yarns with different weave, lengthwise density or/and setting on the cross stripes consists in the fact that no modifications are brought to the yarns from the warp system, and the weft yarns preserve their initial longwise density.
The proposed method offers the possibility to obtain, on the same warp, a diversity of cross-striped fabrics with different density and length (width) or weave.
Key words: weave, cross stripes, yarn setting, lengthwise density, and mass.

1. INTRODUCTION

The cross-striped fabrics are obtained from base, derived or combined weaves, associated in groups of weft yarns which form cross stripes with widths, yarn setting, weaves and/or lengthwise density in random succession, constituted in repeats of the weft threads (Rb) which form the basic element for designing this family of fabrics.

In practice, there are numerous cases when the beneficiary requires to modify (in plus or in minus) the mass of a certain already existing fabric. Under these circumstances, the fabric needs to be redesigned such that to preserve its striped aspect, as well as the stripes proportion.
In the case of cross-striped fabrics, it is much easier to obtain a fabric with modified mass without acting upon the warp system. Technologically, the simplest solution consists in mass modification by acting upon the weft setting and/or yarn count, using the warp of the already existing fabric.

The calculation method and algorithm used to redesign the fabrics in terms of the imposed mass, which represent the object of this paper, are completely original.

The singularity of the method consists in the fact that no modifications are brought to the threads from the warp system, preserving for this thread system the parameters of yarn setting and lengthwise density of the reference fabric, while changing only the parameters of the threads from the weft system.

In this way, one can obtain on the same warp, several versions of the fabric with modified mass, operating only upon the weft threads system, for which one can modify accordingly, the thread setting, the lengthwise density, the weave or all the parameters, in order to obtain the fabric with the desired mass.

The mass of the already existing fabric can be modified through the following procedures:

Modification of yarn system setting, while preserving the lengthwise yarns density, which we called "the Method of settings"

Modification of the lengthwise density, while preserving the yarn setting, called "the Method of lengthwise density";

Simultaneous modification of both setting and lengthwise density of the yarn systems, called "Mixed method".

The proposed methods present an important practical advantage, due to the fact that they bring no modification to the warp system (warp beam) to produce a fabric with modified mass.

From the technological standpoint and the point of view of the warp and weft yarns preparation for weaving, a significant difference is evident between the two types of fabrics with longitudinal and cross stripes, in favour of the cross-striped weaves.

That is why the cross-striped fabrics present an advantage which makes them the favourite against the fabrics with longitudinal stripes.

2. THE METHOD OF SETTING FOR THE MASS MODIFICATION OF THE CROSS-STRIPED FABRICS

The method of setting for the design of the cross-striped fabrics consists in re-dimensioning the weft setting in order to obtain the imposed (required) mass.

The principle of the method consists in the following:

The cross-striped fabric is decomposed in several partial fabrics, whose basic parameters: yarn setting, lengthwise density and weft yarn weave, as well as the other characteristics (contraction) correspond to the specific of each stripe.

The warp yarn system preserves its characteristics from the reference fabric, without modifications.

The mass modification is only carried out for the weft yarn system.

The calculations only take into account the width of the finished fabric, without selvages: $l'_f = l_f - l_m$, l'_f in mm.

3. ALGORITHM FOR THE CALCULATION AND DESIGN THROUGH YARN SETTING METHOD

The flow sheet from Table 1 describes in a logical form the algorithm for the calculation and design of the cross-striped fabrics with pre-established mass.

Table 1: Flow sheet for designing the cross-striped fabrics with pre-established mass. Yarn setting method.

Input data	Symbol	MU
Characteristics of reference fabric		
Width – finite	lf	m
- selvages	lm	m
ground width	l’f =lf ·lm	m
- width of stripe (i)	Li	cm
Lengthwise density of yarns from:		
- warp: ground	Tu	tex
salvages	Tum	tex
- weft: of stripes (i)	Tbi	tex
Yarns setting from:		
- warp	Pu	fire/10 cm
- weft from stripe (i)	Pbi	fire/10 cm
Yarns contraction:		
from warp	au med	%
from weft, in stripe (i)	abi	%
Mass loss or gain	±pf	%

↓

1. Calculus of reference fabric mass:

$$Mt = \left[\frac{Pu \cdot Tt_u \cdot l'_f}{100 - a_{u_{med}}} + \sum_{i=1}^{n} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi} \cdot l'_f}{100(100 - a_{b_i})} \right] \cdot \frac{100 \pm p_f}{100}; \; l'_f \text{ în m}$$

↓

2. Modified mass calculus:

$$M^{'}t = Mt_i \frac{100 \pm m}{100}$$

↓

3. Mass calculus for partial fabric with weave (i):

$$Mt = \left[\frac{Pu\ Tt_u \cdot l_f^{'}}{100\text{-}a_{u_{med}}} + \sum_{i=1}^{n} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi} \cdot l_f^{'}}{100(100 - a_{b_i})} \right] \cdot \frac{100 \pm p_f}{100}$$

② ①

↓

4. Calculus of modified mass for partial fabrics:

$$M^{'}t_i = Mt_i \frac{100 \pm m}{100}$$

↓

5. Calculus of mass difference for fabrics:

$$\Delta Mt_i = Mt_i \pm M^{'}t_i$$

↓

repeated (i) times

6. Calculus of modified mass of the weft yarns for fabric (i):

$$M^{'}b_i = Mb_i \pm \Delta Mt_i$$

↓

7. Calculus of weft yarn setting in the re-designed fabric:

$$Pb_i = \frac{M^{'}b_i (100 - a_{bi})}{Tt_{bi} \cdot l_f^{'}} \frac{100}{100 \pm p_f}; \ l_f^{'} \text{ în m}$$

↓

8. Calculus of imposed mass $M^{'}t_{i_a}$ for fabric (i):

Apply the relation from point 3, where $Pb_i = P'b_i$

↓

9. Calculus of redesigned mass deviation:

$$\Delta M^{'}b_i = M^{'}t_1 \pm M^{'}t_{i_a}$$

Accepted deviation $\Delta M^{'}b_i \le [(2...3)/100] \cdot M^{'}t_1$

↓

10. Comparison check test for yarn setting Pb_i

$$\frac{Pb_1}{P^{'}b_1} \cong \frac{Pb_2}{P^{'}b_2} \cong ... \cong \frac{Pb_n}{P^{'}b_n} \cong ct.$$

↓

11. Calculus of the weft repeat length:
- length of cross stripes

$$l_{ij} = \frac{10 \cdot n_{ij}}{Pb_i}$$

- length of weft repeat

$$L_{Rb} = \sum_{i=1}^{n} l_{ij}$$

↓

12. Calculus of yarn number in the weft repeat:

$$n_{ij} = l_{ij} \frac{Pb_i}{10}; \quad \mathrm{Rb} = \sum_{i=1}^{n} \mathrm{n}_{ij}$$

↓

③

13. Calculus of repeats number for 1 m of fabric:

$$N_R = \frac{100}{L_{Rb}} = R + (r \ cm)$$

$$r = 100 - L_{Rb} \cdot R$$

↓

14. Calculus of yarn number from stripes (i) for 1m of fabric:

$$n_{mj} = R \cdot l_{ij} + \frac{n_{ij} \cdot r_{ij}}{l_{ij}}; \quad \mathrm{Rb}_m = \sum_{i=1}^{n} \mathrm{n}_{mj}$$

↓

15. Calculus of setting and weave stripes for (i) for 1m of fabric:

$$Li = \frac{10 n_{mj}}{Pb_i}; \quad \sum_{i=1}^{n} \mathrm{Lb}_i = 100 \text{ cm}$$

↓

16. Calculus of total mass of redesigned fabric:

$$M^{'}t_a = \left[\frac{Pu \cdot Tt_u \cdot l^{'}_f}{100 - au_{med}} + \sum_{i=1}^{n} \frac{Lb_i \cdot P^{'}b_i \cdot Tt_{b_i} \cdot l^{'}_f}{100(100 - ab_i)} \right] \cdot \frac{100 \pm p_f}{100}; l^{'}_f \text{ în m}$$

↓

17. Calculus of total mass deviation:

$$\Delta M^{'}t = M^{'}t_a \pm M^{'}t$$

Accepted deviation $\Delta M^{'}t \leq [(2...3)/100] \cdot M^{'}t$

↓

Scheme of weft repeat						UM
	Stripes					
Weave (i)	1	2	3	2	…	
Incomplete repeat r_{ij}	r_{11}	r_{21}	r_{31}	r_{22}	…	yarns
Stripe length l_{ij}	l_{11}	l_{21}	l_{31}	l_{22}	…	cm

Yarn setting Pb_i	Pb_1	Pb_2	Pb_3	Pb_2	…	yarns/10cm
Yarn count on stripes n_{ij}	n_{11}	n_{21}	n_{31}	n_{22}	…	yarns
Length of repeat L_{Rb}	$\sum l_{ij}$					cm
Yarn number of repeat Rb	$\sum n_{ij}$					yarns

4. EXPERIMENTAL PART

The algorithm for the calculation of mass modification of cross-striped fabric is applied for a fabric with woolen yarns, whose structural characteristics for the reference fabric are given in Table 2, for which a mass diminution of m= 5% is requested.
The problem was solved based on the flow sheet which concerns the design of fabrics with imposed mass, through the yarn setting method.

4.1. Structural characteristics of the reference cross-striped fabric

Table 2:

Characteristics	Symbol	Values
1.Weave (i) in weft stripes	Lg_1 cloth	
	Ru=Rb=	2
	$t_u=t_b=$	2
	$Lg_2\ D\frac{2}{2}/$	
	Ru=Rb=	4
	$t_u=t_b=$	2
	$Lg_3\ D\frac{2\ \ 1}{2\ \ 1}$	
	Ru=Rb=	6
	$t_u=t_b=$	4
2. Stripe width in the weft repeat l_{ij}	$l_{11}=$	3 cm
	$l_{21}=$	1.6 cm
	$l_{31}=$	0.8 cm
	$l_{22}=$	2.0 cm
3. Width of:		
- weft stripes for 1 m of fabric Lb_I	$Lb_1=$	41.5cm
	$Lb_2=$	45.5cm
	$Lb_3=$	13.0cm
- fabrics without selvages	$l'_f=$	1.7 cm
- selvages	$l_m=$	3.0cm
4. Lengthwise density of the yarns from:		
- warp	$Tt_u=$	25·2 tex
- weft	$Tt_{b1}=$	25·2 tex
	$Tt_{b2}=$	20·2 tex
	$Tt_{b3}=$	20.8·2tex
5. Yarn setting in: - warp	Pu=	160yarns/10cm
- weft	$Pb_1=$	180yarns/10cm
	$Pb_2=$	200yarns/10cm
	$Pb_3=$	240yarns/10cm
6. Yarn contraction in: - warp	$a_{u\ med}=$	6 %
- weft	$a_{b1}=$	8 %
	$a_{b2}=$	10 %
	$a_{b3}=$	12 %
7. Mass loss or gain	$p_f=$	4 %
8. Mass of reference fabric	m=	255.3 g/m
9. Mass diminution	Δm=	%

4.2. Obtained results

Table 3: Scheme of the weft repeat for the redesigned fabric

	Stripes ij				MU
Weave	1	2	3	2	yarns
Incomplete repeat r_{ij}	3.0	0.8	-	-	cm
Stripe length l_{ij}	3.0	1.6	0.8	2.0	cm
Yarn setting Pb_i	165	180	220	180	yarns/10cm
Number of yarns per stripes n_{ij}	50	28	18	36	yarns
Length of weave repeat L_{Rb}	7.4				cm
Yarn number of a repeat Rb	132				yarns

Table 4: Scheme of the weave repeat in weft for 1 m of fabric

Weave	1	2	3	UM
Yarn setting on stripes	165	180	220	yarns/10cm
Total yarn number on stripes nmi	700	847	234	yarns
Total width of stripes with setting Lbi	42.4	47	10.6	cm
Number of weft yarns for 1 m of fabric	$\sum_{i=1}^{3} n_{mi} = 1781\, fire$			
Mass of redesigned fabric	242.36 g/m			
Deviation of redesigned mass	-0.64 g/m			

5. CONCLUSIONS

The peculiarities of the method proposed for redesigning the cross-striped fabrics consist in the fact that no modification are being brought to the yarns from the warp system, preserving for this yarn system the parameters of yarn setting and lengthwise density from the reference fabric, while modifying only the parameters of the weft system.

Several variants of the fabric with modified mass can be obtained on the same warp, by acting only upon the weft yarn system for which one can modify, accordingly, the yarn setting, lengthwise density, weave or all these parameters, in order to obtain the fabric with the desired mass.

The cross-striped fabrics obtained by associating the weft yarns with different yarn setting or/and lengthwise density on stripes, present a peculiarity as reported to the fabrics longitudinal stripes. It consists in the fact that the mass can be changed only by changing the weft yarns setting, the wanted results being thus obtained without altering the warp yarn setting, which implies in all the cases another warp beam.

From the technological standpoint and from the point of view of the preparation of the yarns (form warp and weft) for weaving, there is a significant difference between the two types of fabrics, with longitudinal and cross stripes respectively, in favor of the cross-striped fabrics. The mass modification for the fabrics with longitudinal stripes necessitates the complete replacement of the existing warp with a new warp with other parameters of yarn setting and lengthwise density, which implies a new technological process to obtain the warp beam, starting from warping, gluing, pass- till weaving.

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"ESTHIS PROTOTYPING: THE SUITABILITY OF GOLD COATED YARN ELECTRODES FOR MONITORING PHYSIOLOGICAL AND BIOMECHANICAL VARIABLES: E-TEXTILE SOLUTIONS

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Abstract: Smart garments are in fashion the last few years. In particular in medical applications they have a great potential. A lot of research is doing in this field. A number of research teams from universities and research institutes are working intensively the last years in this field. Body monitoring in view of analysis of health status or movements are important objectives. Currently research on sensors for monitoring heart rate and movement is quite well advanced. This paper will provide an overview of the potential of smart garments focusing to the problems towards the integration of textile sensor in a garment.
Key words: Smart garment, textrodes, heart monitoring, respiration monitoring, durability.

1. INTRODUCTION

Smart or intelligent textile products are an emerging area in textiles. Smart textiles can sense parameters from the environment and react on it. They are high tech products with a high added value, knowledge based, highly specialised and addressing specific target groups. Their contribution to society and quality of life is quite obvious. Clothes on the other way are the best interface between the human body and a computer that can monitor our medical condition.

In case health problems or environmental threats are detected, a smart suit can send out a warning or even protect instantaneously. Consequently they will become an important tool in view of prevention.

2. MONITORING SYSTEMS

Many body parameters can provide useful information on health status of a person. There are several cases that this can be extremely important for some persons or for medical reasons or for other reasons of continuous monitoring. Several research projects are being undertaken for measuring heart rate and cardiograms via biopotential recordings, as well as respiration rate via measurement of movement of the chest.

On long term a smart suit can assist in the rehabilitation process by supply of drugs, activation of muscles and many others. Theoretically one could measure many parameters from the body as well as from the environment.

Some of the parameters like cardiogram and temperature are commonly measured using conventional sensors, while others are being unexploited. Some of the parameters that are not measured today (odour, spectra) can reveal a lot of information on health status, but also on other aspects like stress and thermal comfort. Permanent monitoring that will become possible with textile sensors opens up new perspectives for the traditional parameters too. Permanent monitoring supported by self learning devices will allow the set up of personal profiles for each individual, so that conditions deviating from the normal state can be traced the soonest possible. In addition combination of several body parameters with ambient information like location, type of activity (context awareness) will provide a powerful tool for accurate definition of a person's status.

Full success however will only be achieved when the sensors and all related components are entirely converted into 100% textile materials. This is a big challenge because, apart from technical

considerations, concepts, materials, structures and treatments must be focusing on the appropriateness for use in or as a textile material. This includes criteria like flexibility, water (laundry) resistance, durability against deformation, radiation etc.
Although the research is quite successful several problems have to be solved. Some of these problems will be addressed hereafter.

3. HEART RATE

The first physiological parameter measured using intelligent textiles is the heart activity. Heart signals are one of the basic parameters in health care. The heart is a muscle controlled by the brain though electric impulses. Since the body is a vessel filled with aqueous electrolyte, these signals can be detected in all of its parts. The generated difference in electrical potential can be measured on different spots on the skin. This signal is the electrocardiogram or ECG. The ECG of a normal person in rest has a fundamental frequency of about 1.2 Hz. The -20dB point of the Fourier transform of the ECG is situated around 35Hz. At 100 Hz and 300 Hz, the signal strength is as low as -40dB and -60dB respectively. Metallic plate electrodes are commonly used to capture these signals while instruments are analyzing the results, extracting the required parameters such as frequency and phase. In order to improve the contact with the skin and accordingly the quality of the signal, an electro-conductive gel is used. One of the problems with such gels is that they cause irritation of the skin after some hours.
But in essence a conductive material is used to capture the signal. Today several electro-conductive fibers are available, making it possible to replace the traditional plate electrode. In addition electro-conductive gels are not used.

The skin has a low electrical conductivity. So the contact between skin and electrode is quite important. Although the signals have lost some accuracy, they are still clear enough to extract the required information.

4. SWEATING OR PERSPIRATION

Sweating or perspiration is the production and evaporation of sweat, a fluid consisting primarily of water, electrolytes and a few organic compounds. Perspiration can either be insensible or sensible. Insensible perspiration seems to be caused by the diffusion of water through our skin and helps to improve our grip by facilitating the mechanical interaction between the skin and surfaces, whilst sensible perspiration is associated with the eccrine sweat glands and thermoregulation. The sweat rate is the flow of water vapour emitted by the skin, i.e. the amount of water emitted per unit area during a defined period of time.

Measuring the sweat rate is challenging due to the low flow of water involved. The literature reports for adults an average sweat loss of about 500-700 ml/day in mild climate conditions (T=25°C, R.H.=50%), but the excretion of about one litre of sweat in 15 minutes is also possible in extreme conditions (i.e. during a sauna). If an average value of 1.7 m^2 is used for the body surface area, a range of possible sweat rates can be calculated (0.2 - 40 g/m2·min). These values are whole body averages, so higher or lower rates may occur in different body regions. A number of pathologies (hyperhidrosis, anhidrosis, diabetes, hyperthyroidism etc) as well as physiological conditions (stress, physical effort, menopause etc) may result in increased or decreased sweat rates, but the indirect calculation of a whole body average value from the weight loss is the only reference method. Being able to continuously measure this parameter may find important applications in medicine and in sports, but a wearable system would be needed for this purpose.

This work presents the results obtained in the development of a textile humidity sensor and of a sweat rate sensor.

5. RESPIRATION RATE

Respiration rate can be derived from the deformation of the fabric due to expansion/ contraction of the chest. So strain sensors are the base for such measurements. Alternatively, using inductance analysis via a shirt that is considered as a coil wrapped around the chest leads to similar results.

The pieze-resistive effect of the textile structure can be based on 2 principles. One uses piezo-resistive fibres, the other piezo-resistive yarns. In yarns this effect is based mainly on the change in contact between the fibres during yarn extension.

At this moment, several clinical trials are being undertaken to validate heart and respiration rate measurements. It can be expected that the first industrial prototypes will appear soon. So it appears that this type of products is now a fact. But when looking at long term effects, many questions remain unanswered.

6. TEXTILE ELECTRODES

Electro-textiles (e-textiles): they have been developed for use in garments to incorporate signal and power transmission between electronic devices. They are implemented by the use of specially modified fibers and yarns which provide electro-conductive properties. Work in e-textiles has so far been focused on prototyping and demonstration, rather than studying the underlying mechanics of electrically conducting textile materials.

Studying the fundamental material behavior has been essential to developing a science base for e-textiles. Thus far, the observed electromechanical response of conducting textile materials dictates e-textile applicability and feasibility.

Stainless steel fibers are often being used for textile electrodes, as their conductivity is far better than that of conductive polymeric fibers. However, their mechanical properties are much different from those of polymeric fibers and as a consequence they behave differently during use of the textile. Each deformation leads to a small shift of the fibers of different type.

These fibers are much more stiff and so they drastically reduce the handle of the fabric. They have a black color and this may affect the aesthetics of the fabric. Thirdly depending on the function of the fibers and yarns, such protruding ends may lead to false or distorted signals.

Repeated mechanical deformation rearranges the fiber position in the yarn. Consequently the conductivity of staple fiber yarns is expected to change during normal use in clothes. Excessive deformation possibly leads to direct damage of the conductive fibers. Metal fibers are rather brittle, so they break. This also causes the yarn to be less conductive.

Tao (Tao, 2004) has reported similar effects with PAN and PPy coated fibres: at extensions from 6%, cracks appear at the coated surface.

It is quite clear that all factors that affect the conductivity of the material, also affect its proper functioning in the intelligent textile.

Also interconnections between different components (sensors, actuators, electronics, battery, wires) have been reported in many studies as weak spots, in particular at places where soft (textile) and hard (electronics) elements are connected.

7. LONG TERM STABILITY OF TEXTILE ELECTRODES

To evaluate the performance of textile electrodes, ECG recordings are generally made on test persons. Therefore these measurements are subject to very large variations. The reason for the limited reproducibility of intelligent textile sensing systems is their use in a very complicated environment, such as the human body surface. Many parameters can possibly interfere with the measured signal (e.g. a measured potential is not only dependent on heartbeat but also on neuron reactions (activity) in the body, instantaneous conductivity of the skin, humidity and oxygen concentration of the surrounding air, humidity of the skin in contact with the intelligent textile electrodes, contact surface between textile electrodes and skin surface.). Such interferences overrule differences between actual textile samples. As a result it is not possible to understand and gain insight in the working mechanism of the textile sensor system.

For the evaluation of the textile electrodes in a stable environment an electrochemical cell has been created. Electrochemical impedance spectroscopy has been used to develop a cell simulating the body / textile electrode system. The electrochemical cell basically consists of a PVC tube filled with electrolyte solution (simulating the body fluid) covered at the edges by PTFE membranes (mimicking the skin). The textile electrodes are put on top of the membranes (Fig. 2). The cell was validated using Palladium electrodes.

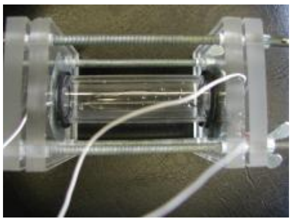

Fig. 1 – Electrochemical cell (Priniotakis, 2005)

An alternating potential of varying frequency is applied between the textile electrodes and the resulting alternating current is measured. For the experiments, a potentiostat PGSTAT20 of ECO Chemie was used extended with a Frequency Response Analyser (FRA) module in order to be able to perform impedance measurements. The frequency of the applied alternating potential varied from 1mHz to 1MHz, with a maximum amplitude of 10 mV.

Obviously, heart rate sensors are in permanent contact with the skin. This means that they will be wetted by sweat. Sweat contains a.o. NaCl, and this causes corrosion, as is illustrated in the following graph (Fig. 3) that presents the increase of electric resistance in time when the material is in contact with artificial sweat (measured using the set up described above)

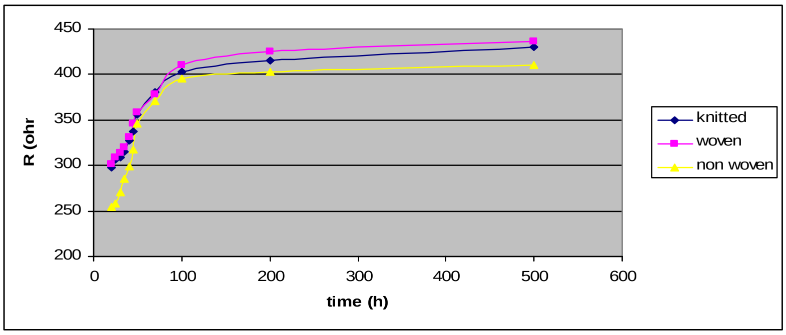

Fig. 2 – Effect of corrosion of stainless steel fabrics on electrical conductivity (Priniotakis, 2005)

This graph clearly demonstrates that corrosion has a significant impact on the conductivity of the sensor: the resistance nearly doubles in a couple of weeks time. This means that the accuracy of the sensor will be reduced significantly.

8. ELECTRICAL RESISTANCE OF GOLD COATED YARNS MEASUREMENT TECHNIQUE

The electrically conductive yarns are used by ESTHIS research team are produced through an electroless method using a deposition solution which contains a gold salt in combination with complexing agents so that finally the para-aramide yarns are coated with gold. The selection of gold as a sensing material in order to measure signals from the body, is justified by excellent electrical conductivity, biocompatibility and corrosion resistance.

The para-aramide yarns that were used are the Twaron brand which have 1100dtex fineness and consist of 1000 fibers per cross section.

Fig. 3- Gold coated para-aramide yarns (ESTHIS, all rights reserved)

Experiments were performed in order to define the relationship between fiber composition and morphology, tensile behavior, and electrical resistance in the strained, post-strained or post-damaged state.

Several lengths have been measured and compared with the characteristics of various copper or silver / silver plated wire conductors.

Resistance has been measured in various signal amplitudes.

Conductivity of multifilament yarns was measured on a custom built apparatus using a two-point probe method. The method and infrastructure used to measure includes an insulated table and probes appropriately modified for use with digital multimeters.

9. MECHANICAL CHARACTERIZATION OF FABRIC STRAIN SENSORS

In order to investigate the properties of piezoresistive fabric sensors, a protocol of mechanical characterization has been implemented. The fabric strain sensors have been subjected to predetermined mechanical stimuli imposed by a PC controlled system. Corresponding variations of electrical resistance have been collected through voltage divider, gathered by an acquisition card (National Instruments PCIMIO- 16E-4)) with sampling rate of 64 Hz.

Several samples of strain sensors have been subjected to different uniaxial mechanical stimuli following signals such as step and trapezium, both of them with variable strain amplitudes, and sinusoidal cycles with variable strain amplitudes at selected frequencies. Uniaxial mechanical stimuli have been applied along the length of both kinds of piezoresistive sensors. The mechanical characterization aims to study the electrical response of fabric strain sensor as a function of the external mechanical stimuli.

10. ACQUISITION OF BIOMECHANICAL SIGNALS THROUGH FABRIC STRAIN SENSORS

In order to evaluate the performances of knitted piezoresistive fabric sensors for biomechanical monitoring, the knitted piezoresistive sensors have been tested to detect both the respiration signal as a function of thorax movement and the elbow bends. A seamless t-shirt with fabric strain sensors has been realised respiratory signal. Strain fabric sensors signals have been acquired using a voltage divider to convert resistance to voltage, gathered by an acquisition card with sampling rate of 1000 Hz. The knitted piezoresistive fabric sensors are sensitive to during the respiratory activity. The elbow bends signal detected by knitted piezoresistive fabric sensors has been compared with a commercial movement tracking system.

The piezoresistive sensors performances allow the detection of movement index, while the printed piezoresistive sensors showed to be more efficient in the realisation of wearable kinaesthetic systems for gesture and posture monitoring.

11. GARMENTS FOR BIOMECHANICAL MONITORING

From design and manufacturing perspective, a special process has been set up to realize biomechanical monitoring garments, where sensors and connections are realized with the same conductive materials. This choice has been adopted in order to solve a critical issue related to the connectivity between the coated strain sensors and the electronics, keeping the elasticity and wearability of garment. For this reason printing and cabling was realized before the cut and sew phase, by using a hybrid solution: coating on the sewing done with conductive flexible yarns that are used as conductive cables.

In this work a description of novel sensors developed to be integrated in sensorised garments for monitoring vital signs and body gesture/posture has been presented. The main advantage ensured by these systems is the possibility of wearing them for a long period of time without discomfort. Several issues deriving from the employment of the new technology which has consented the realization of these unobtrusive devices have been addressed. Moreover, it has been pointed out the use of these sensorised garments as a valid alternative to existing instrumentation applicable in several health care areas. Finally, results on the performances of the sensing systems were briefly reported.

12. CONCLUSIONS

Smart textiles are finding their way to our society. They are part of a broad system of health care, electronics, textiles and private consumers. Many parts are being established, unfortunately often on an isolated base. Several research projects have demonstrated the capacity of textiles for becoming successful elements of smart health care systems.

However, treating such systems like we treat our textiles every day is a huge challenge. In some cases requirements regarding durability overrule technological specifications for functionality. Consequently evaluation of durability should be included as an important research task. Non technological considerations like ethics have to be taken into account more than ever, also during the research phase. The way to reliable commercial products is still long and many challenges are ahead. Nevertheless it is clear that smart textiles are no longer a visionary dream but have become a lab scale product.

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THE ELABORATION OF THE DYEING RECIPES FOR WOOL

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***Abstract*:** This work presents a calculation method of dyeing used to reproduce different colours in the case of dyeing system wool-acid dyes. This system shows certain specific particularities, concerning wool fibres morphology. The different aspect of the wool surface versus other fibres causes some difficulties related to light remission reproducibility

The calculation procedure of dyeing formulation was tested for case of using of the unitary dyes.
***Key words*:** wool, acid dyes, remission, dyeing, Kubelka-Munk

1. INTRODUCTION

Kubelka-Munk theory has established a relationship between optical properties of dyed textile materials, the concentration of colouring material, and the concentration of dye which was dyeing. Kubelka-Munk relationship was established with the optical properties of colour (light absorption and diffusion) and the remission of the wave length at which absorption of light energy is maximum (λ_{max}) [1, 2].

Since Kubelka-Munk relationship were established on the basis of theoretical validity testing. We applied the relation in case of wool dyeing [1, 3].

Wool fabrics samples were dyed with three single dyes (red, blue and yellow). The sample were measured, the absorption and remission spectrums were recorded for every single dyes at different concentration.

Another wool fabrics samples were dyed with mixtures of two or three dyes. The dyeing concentration in mixtures was the same with those used for dyeing with single dyes.

All the dyed samples were measured. Determined remission was used for calculation of dyeing formula with dyes mixtures. The remission curves were used for verifying of Kubelka-Munk theory in the case of dyeing with known dyes mixtures.

The obtained values for dyeing with dyes mixtures were compared with the calculated values. Based on differences in the two cases were established the corrections for most accurate reproducibility of colour.

Based on these results the final formulation was calculated and applied.

2. EXPERIMENTAL PART

2.1. Materials:

- 100 % Wool woven fabric

2.2. Reagents:

- Acid dyes: Bemacid Yellow GR; Bemacid Red BLF; Bemacid Brilliant Blue;
- Non ionic washing agent FELOSAN RGN ;
- All used chemical were reagent with analytical purity (Merck)

2.3. Aparates:

- Laboratory dyeing machine with temperature control,
- Spectrophotometer Specord 200 UV/VIZ

2.4. Experiments:

Before dyeing wool woven fabric was washed with a 2 g/L solution of nonionic agent namely FELOSAN RGN;

The calibrations dyeing have been done with six concentrations: 0, 1%; 0, 25%; 0, 50%; 1%; 1, 5%; 2%. (O.W.F.), at pH= 4 – 4, 5 realized with acetic acid. Liquor ratio for dyeing was 1:20;
The reproduced sample was dyed with a concentration of 1, 5% (O.W.F.) dyes mixtures of the three dyes mentioned above, in the equal proportion 0, 5 % (O.W.F.).

3. RESULTS AND DISCUSSIONS

CALCULATION 1

The results showed the correlation between dyeing remissions with single dyes and the remissions in the case of dyes mixtures. The colours obtained with dyes mixtures are less bright than the colour of each single dye.
For a quantitative interpretation of interactions between the dyes in the mixture it can be used Kubelka – Monk relation, which is valuable for colours obtained by dyeing with dyes mixtures:

$$\frac{K}{S} = \frac{(1-R)^2}{2R} \qquad \textbf{(1)}$$

K refers to dyes mixture and is a sum of absorption coefficient of each single dyes and absorption coefficient of each dyes and of non-dyed fabric.

$$K = K_a + K_b + K_c + K_t \qquad \textbf{(2)}$$

Those three dyes show the following absorption coefficient for a certain wavelength:

$$K_a = A\,S\,c_a\,,\ K_b = B\,S\,c_b\,,\ K_c = C\,S\,c_c \qquad \textbf{(3)}$$

The spectral remission of a colour obtained by dyeing with these dyes blend became:

$$\frac{(1-R)^2}{2R} = \frac{K}{S} = \frac{K_a + K_b + K_c + K_t}{S} = A \cdot c_a + B \cdot c_b + C \cdot c_c + F(R_t) \qquad \textbf{(4)}$$

CALCULATION 2

The remission functions for calibration dyes and for the fabric have been calculated with Kubelka-Munk relation (1), the calibration factors with relations (5).
These factors are shown in the table no. 3. Using of Kubelka-Munk theory has been found the following concentration for reproduction of initial colour: Ca=0, 31% (red); Cb=0, 27% (yellow); Cc=0, 50% (blue) [4].

$$\begin{aligned} A_1\,c_a + B_1\,c_b + C_1\,c_c &= F(R_1) \\ A_2\,c_a + B_2\,c_b + C_2\,c_c &= F(R_2) \\ A_3\,c_a + B_3\,c_b + C_3\,c_c &= F(R_3) \end{aligned} \qquad \textbf{(5)}$$

Some colour differences between initial sample and the sample dyed with calculated concentration have been noticed. The equation systems (5) allow the calculation of necessary corrections, for a good reproducibility.

The values for the corrections are calculated with equation system (6)

$$c_a = \alpha_1 .F(R_1) + \alpha_2.F(R_2) + \alpha_3 .F(R_3)$$
$$c_b = \beta_1. F(R_1) + \beta_2.F(R_2) + \beta_3 .F(R_3) \quad (6)$$
$$c_c = \gamma_1 . F(R_1) + \gamma_2.F(R_2) + \gamma_3 .F(R_3)$$

The obtained values are:
Δc_a=-0,02%, Δc_b=0,15%, Δc_c=0,33%,
Corrected values are:
C_a=0,31+Δc_a=0,31+(-0,02)=0,29% (red);
C_b=0, 27+Δcb=0, 27+0, 15=0, 42% (yellow);
C_c=0, 50+Δc_c=0, 50+0, 33=0, 83% (blue);
This method is possible to apply for repeated dyeing with small corrections.

RESULTS 1

Table 1 Remissions for samples dyed with single dyes and with their mixture

Nr.	Wave length (nm)	Concentration (%) (O.W. F.)			
		1.50%	0.50%	0.50%	0.50%
		Y+R+B	Red	Yellow	Blue
1	400	10.0	15.0	28.0	10.0
2	420	9.5	13.0	34.0	9.8
3	440	8.8	12.0	41.0	9.2
4	460	9.0	10.0	36.5	9.5
5	480	8.9	9.5	32.0	11.0
6	500	9.0	9.0	25.0	22.0
7	520	8.5	9.5	20.0	41.5
8	540	8.0	9.8	15.0	53.0
9	560	8.8	11.0	14.0	57.0
10	580	11.8	21.0	13.0	60.0
11	600	11.9	40.0	14.0	61.0
12	620	18.8	57.0	21.5	65.0
13	640	12.0	58.0	12.0	60.0
14	660	13.0	59.0	14.0	59.5
15	680	19.1	59.5	21.5	61.0
16	700	37.2	61.0	38.5	61.5

RESULTS 2

Table 2 Dyeing remissions at the three established wavelength

Nr.	Colored material	Dyeing remissions (R%)		
		λ1=420 nm	λ 2=560 nm	λ 3=640 nm
1	Non-dyed, textile material	48%	55,5%	60%
2	Dye 1	13%	11% %	58%
3	Dye 2	9,8%	57%	60%
4	Dye 3	34%	14%	12%

RESULTS 3

Table 3 Calibration factors for single acid dyes

		Fabric color parameters	Dyes concentration		
			Red (a)	Yellow (b)	Blue (c)
			$c_a^e = 0{,}5\%$	$c_b^e = 0{,}5\%$	$c_c^e = 0{,}5\%$
λ1=420	R	48,0 %	13%	9,8%	34%
	$F(R) = (1-R)^2/2R$	0,28	2,91	4,15	0,64
	$F(R) - F(R_t)$	-	2,63	3,87	0,36
	$F(R)-F(R_t)/c^e$	-	$A_1 = 5{,}26$	$B_1 = 7{,}74$	$C_1 = 0{,}72$
λ2=560	R	55,5%	11,0%	57%	14%
	$F(R) = (1-R)^2/2R$	0,18	3,60	0,16	2,64
	$F(R) - F(R_t)$	-	3,42	-0,02	2,46
	$F(R)-F(R_t)/c^e$	-	$A_2 = 6{,}84$	$B_2 = -0{,}03$	$C_2 = 4{,}93$
λ3=640	R	60%	58%	60%	12%
	$F(R) = (1-R)^2/2R$	0,13	0,15	0,13	3,23
	$F(R) - F(R_t)$	-	0,02	0,00	3,09
	$F(R)-F(R_t)/c^e$	-	$A_3 = 0{,}04$	$B_3 = 0{,}0$	$C_3 = 6{,}19$

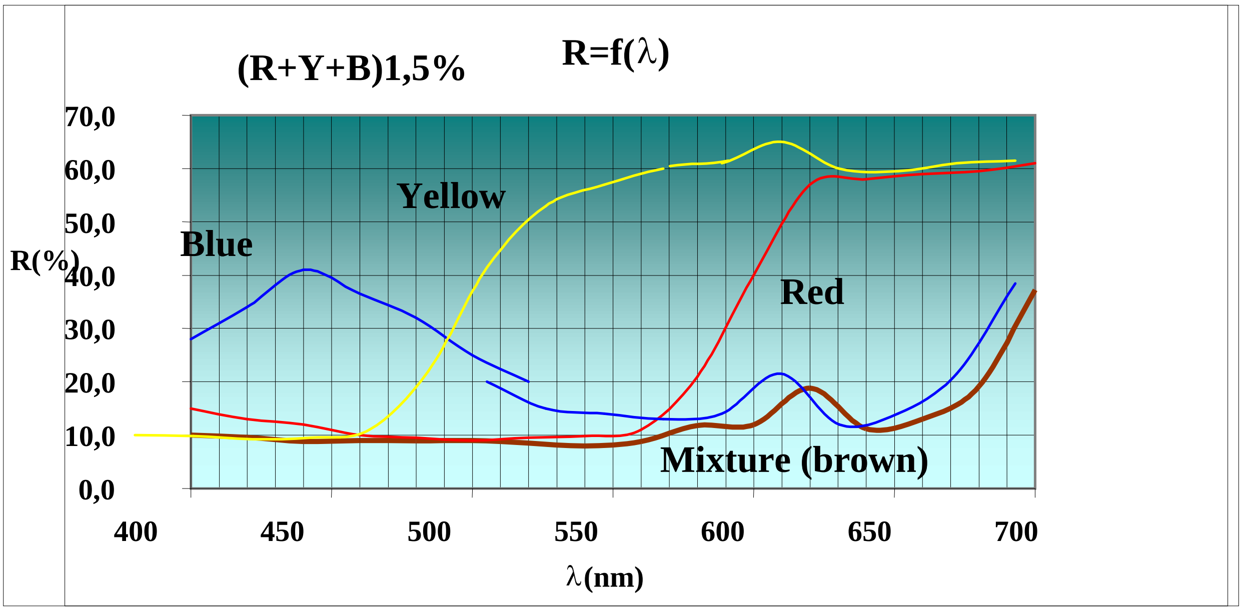

Figure.1 Remission curves for single dyes and for the mixtures

4. CONCLUSIONS

The dyed sample calculated with a formula based on Kubelka-Munk theory shows different remission curve. There were differences from the reference sample.

There are some differences due to the following possible occurrence:

- Kubelka-Munk theory approximations are to far by real dyes behaviour;
- There is a different in the case of using it single or in mixtures;
- The dyes exhaustion capacity is dependent by dye concentration in the dyeing bath;
- For these differences is necessary to correct the dyeing formula;
- Calculation method could be applied both for laboratory scale and industrial dyeing.

The differences between calculated and corrected formulation are bigger for intense colours and for low exhaustion capacity dyes. For industrial application it is necessary to realize a comprehensive data base for entire range of acid dyes, in a large number of nuances and intensities.

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DATABASE ON BIOCIDES FOR TEXTILE PROTECTION

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Abstract: In recent years, the desire to control bacteria, fungi, mold, algae and eliminate some human health problems, damage, stains, smells, a number of materials that have been antimicrobially modified increased considerably. Biocides are used to maintain textiles in good hygienic conditions to avoid formation of mold and their deterioration. This paper aims to provide an analysis tool for the most common biocides used in textile industry for the protection materials. We designed and developed a database in which we introduced useful information for the most common biocides and which can be supplemented and updated later with other new substances.
Key words: Database, textiles, biocides, antibacterial, biosafety, protection.

1. INTRODUCTION

Biocides are used daily in households and industry being essential to maintain high standards of health and hygiene, destroying mold, germs and pests.
Studies show that biocidal products market in Europe is about 27% of the world market and is expected to grow in the following years.

Biocidal products must not constitute a threat to health or human life or to animals and therefore need to be made thorough examination of all biocidal products before being distributed on the market.

Consumers should have acces to information on biocidal products which are used to remove harmful organisms from different fabrics. This database is an effective way to provide essential information on the biocides used to protect textile.

2. GENERAL INFORMATION

In recent years, the desire to control bacteria, fungi, mold, algae and eliminate some human health problems, damage, stains, smells, a number of materials that have been antimicrobially modified increased considerably [4].

Biocidal products used to treat various textile materials are designed to neutralize and prevent the action or to exercise an effective control on the development of any harmful organism by chemical or biological ways [1]. At the same time, biocides may manifest harmful effects on humans, animals and environment and therefore the option to use should take into account various aspects.

Biocides are used to maintain textiles in good hygienic conditions to avoid formation of mold and their deterioration [2], [6].

Biocides based products have many uses, depending on the agent against which they must act, being indispensable in various fields such as: [1]

- textile industry, to protect against biodegradation support materials;

- medicine (to prevent and control infections);
- food, pharmaceutical and cosmetics industries - to prevent the development of microorganisms that alter the properties of the products;
- the treatment of waters - to prevent release of harmful organisms into the environment.

For the bio safety of different materials we need to know well enough the effects of biocides on our health and environment, so we can minimize the unwanted effects by choosing in full compliance with the requirements.

This paper aims to provide an analysis tool for the most common biocides used in textile industry for the protection materials. A biocidal which shows antimicrobial effectiveness for the textile industry must destroy microorganisms but it is very important for this to be done safely and without adversely affecting other important characteristics of textile materials.

We have a large amount of information on biocidal products (more than 300 biocides) but which can not be properly understood if we do not have a database type application that allows fast processing and sorting of information, their extraction on different search criteria [3].

We designed and developed a database in which we introduced useful information for the most common biocides and which can be supplemented and updated later with other new substances.
If a user inserts a list of substances into a database form, the application analyzes all these substances and sorts them according to the required needs, such as environmental toxicity, toxicity to human health, material protection efficiency and so on.

Our database has a public character, being accessible online for researchers, teachers, students, producers and the wide public and generally for anyone wishing to obtain specialized and complete information about these substances and components of any product, about the effects they have on the environment and living organisms, particularly human.

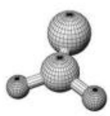
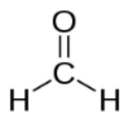
Biocides presented in the database were divided into 22 classes of substances, of which we mention the most important: alcohols, aldehydes, phenols, acids, amides, azoles, organometallic compounds, dibenzamide, oxidizing agents, antibiotics, etc.

Fields with information that we have presented in this database for each biocide are structured as follows:

• Chemical name (IUPAC) and commercial;
• Chemical and structural formula;
• Code numbers: CAS-No, EINECS-No, EC-No., EEC-No. and other code numbers;
• Short presentation of the history of substance;
• Methods of manufacturing / production of the biocid;
• Information about the framing in the chemical hazard category;
• Physical, chemical, toxicological and ecotoxicological properties
• Antimicrobial effectiveness and applications of the biocidal product;
• Information on the antimicrobial action of the biocide on the bacteria, yeasts.

To understand how we structured fields with information from the database we present in Table 1, file of a biocide used in protection of textiles.

Table 1: Information on formaldehyde

Substance Class	**ALDEHYDES**
Chemical name	**Formaldehyde**
Other names	Oxomethylene; Oxymethylene; Methanal; Methyl aldehyde; Methylene oxide; Morbicid; BFV; Formalin; formalin 40; Formic aldehyde
Molecular Formula	CH_2O
Structural Formula 	O = CH2 
Codures	CAS-No.: 50-00-0; EINECS-No: 200-001-8
Historic	
Formaldehyde was first reported by the Russian chemist Aleksandr Butlerov and was conclusively identified by August Wilhelm von Hofmann.	
Manufacturing method	

Formaldehyde is produced industrially by the catalytic oxidation of methanol. The most common catalysts are silver metal or a mixture of aniron and molybdenum or vanadium oxides. In the commonly used formox process, methanol and oxygen react at cca. 250–400 °C in presence of iron oxide in combination with molybdenum and/or vanadium to produce formaldehyde according to the chemical equation: $$2\ CH_3OH + O_2 \rightarrow 2\ CH_2O + 2\ H_2O$$	
Chemical and physical properties	
Molecular mass, g/mol	30,03
Appearance	reagent gas, colorless, inflammable, pungent smell; gas ideal gas law-abiding
Boiling point,°C (101 kPa)	-19
Solidification point, °C	-118
Flash point, °C	~ 300
Stability	Dry gas that tends to slightly polymerisation; formaldehyde as a reducing agent is easily oxidized, for example: by hydrogen peroxide, iodine, sodium permanganate;
Solubility	Soluble in H_2O (up to 55%), soluble in alcohols, soluble in polar solvents
Toxicitate/Ecotoxicitate	
Formaldehyde can be toxic, allergenic and carcinogenic. At concentrations above 0.1 ppm formaldehyde in air can irritate eyes and mucous membranes. Formaldehyde at this concentration inhaled can cause headache, a burning sensation in the throat and difficulty breathing as well as triggering or aggravating asthma symptoms [5]. Starting September 2007, the European Union banned the use of formaldehyde due to its carcinogenic properties as a biocide under the Biocidal Products Directive (98/8/EC).	
Symbols of danger alert	 T-toxic  X_i-irritant
Applications in textile, construction, automotive	
In 2005, annual global production of formaldehyde was estimated at 23 million tonnes (50 billion pounds). The textile industry uses formaldehyde-based resins as finishers to make fabrics crease-resistant. Formaldehyde is a common stepping stone for the synthesis of several complex compounds and materials. Formaldehyde is a common building block for the synthesis of more complex compounds and materials. Formaldehyde-based materials are key to the manufacture of automobiles.Formaldehyde is used in cosmetic products and in polymer dispersions (natural and synthetic latex) often in combination with other microbicides [5]. The value of sales of formaldehyde and derivative products was over $145 billion in 2003, about 1.2% of the Gross Domestic Product of the United States and Canada. An aqueous solution of formaldehyde can be useful as a disinfectant as it kills most bacteria and fungi (including their spores). Formaldehyde solutions are applied topically in medicine to dry the skin, such as in the treatment of warts. Many aquarists use formaldehyde as a treatment for the parasites *Ichthyophthirius multifiliis* and *Cryptocaryon irritans*.	
Antimicrobial efficacy	
Formaldehyde shows a good antimicrobial efficacy covering bacteria, fungi and yeasts. Formaldehyde present sporicidal and virucidal effects. Broad spectrum of antimicrobial efficacy is due to chemical reactivity of formaldehyde which belongs to the electrophilic active agents.	

To interrogate on multi-criteria database, it was necessary structuring properties of substances in several tables (*Table 2: Class of substances, Table 3: Substances, Table 4: Applications, Table 5: Antimicrobial efficacy*) as shown in the entity-relationship diagram of Figure 1.

The arrows in the diagram highlights the connection that is created between the tables in the database.

Table 2: Class of substances

# class id	Name class	Observations
1	Alcohols	Alcohols are characterized by acting at a quick rate but only in comparatively high concentrations.
2	Aldehydes	Aldehydes belong to the group of electrophilic active agents
3	Phenols	Phenol derivatives are membrane-active microbicides. Phenols shows the optimal antimicrobial activity in their undissociated state.
4	Acids	Acids are membrane-active microbicides and display significant antimicrobial activity when they are present in their undissociated state.

Table 3: Substances

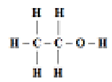
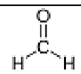
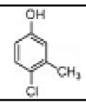
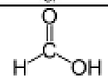
#chemical name	class id	Molecular formula	Structural formula	File
Ethanol	1	C_2H_6O		ethanol.pfd
Formaldehyde	2	CH_2O		formaldehyde.pdf
4-Chloro-3-methylphenol	3	C_7H_7ClO		4_Chloro_3_methylphenol.pdf
Formic Acid	4	CH_2O_2		formicacid.pdf

Table 4: Applications

#applications id	Chemical name	Applications
1	Ethanol	Removal white wine stains on textiles
2	Ethanol	used as a motor fuel and fuel additive.
3	Ethanol	important industrial ingredient used as a base chemical for other organic compounds
4	Formaldehyde	The textile industry uses formaldehyde-based resins as finishers to make fabrics crease-resistant.
5	Formaldehyde	used in cosmetic products and in polymer dispersions
6	4-Chloro-3-methylphenol	is used for conservation of products containing protein (textiles)
7	4-Chloro-3-methylphenol	is an important active ingredient in disinfectants. Due to their broad activity spectrum and favourable properties it is used like preservative for the in-can/in-tank protection of very different functional fluids.
8	Formic Acid	is used as organic solvent for the manufacture of insecticides and tannery industry

Table 5: Antimicrobial efficacy

#Antimicrobial efficacy id	Chemical name	Description
1	Ethanol	The presence of water is essential for the antimicrobial effectiveness of ethanol.
2	Formaldehyde	shows a good antimicrobial efficacy covering bacteria, fungi and yeasts and present sporicidal and virucidal effects. Broad spectrum of antimicrobial efficacy is due to chemical reactivity of formaldehyde which belongs to the electrophilic active agents.
3	4-Chloro-3-methylphenol	it covers bacteria, yeasts and mould producing fungi and is most effective between pH 4 and 8.
4	Formic Acid	

Fig. 1. Entity-relationship diagram

3. CONCLUSIONS

All chemicals which are used for protecting textiles, regardless of how they are used, affect our life and environment, to a certain extent.The harmful effects need to be well known by all the producers and the consumers to discourage the use of the substances with risks for long-term environmental pollution or of serious illness among living organism.

Exploiting the information provided in this database we can draw conclusions about how the antimicrobial action of biocides on different materials, on toxicity and ecotoxicity so we can manage the potential risks of biocides.

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Acknowledgement
This paper was realised with the support of EURODOC “Doctoral Scholarships for research performance at European level” project, financed by the European Social Found and Romanian Government.

A PROPOSAL FOR REVISITING FOOTWEAR TRADITION FOR INNOVATION

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Abstract: Footwear has evolved from ancient times and through the centuries from protective sandals to a protective and aesthetic part of clothing. Today, there are many varieties of styles and materials used in the shoe industry. It is also noteworthy that some old fashions repeat themselves with only minor changes. It is a fact that some of the world's most famous and popular companies have achieved that fame from cloth and footwear fashion and design. Tradition and culture have a huge impact on footwear design and on the motives and modes of how people buy and wear footwear. Therefore, tradition and culture of specific nation or region can create very important role at creating brand identities of European footwear companies. The aim of this paper is to present a Development of Innovation project proposal regarding revisiting traditional footwear so as to adapt it to up-to-date footwear training curriculum and production. The proposal aims to rediscover the peculiarities of traditional footwear and originality of cultural heritage of specific regions in order to transfer their design and models into VET curriculum so as to revive the traditions to create innovative products.
Key words: Footwear, Tradition, Innovation, Curriculum

1. INTRODUCTION

According to the report by European Commission: Trade: textile and Footwear, EU textile exports in 2009 is €30.4billion, EU textile imports in 2009: €74.9billion and EU share of global textile exports in 2009: around 3.6%. Biggest markets for EU textile exports in 2009 are Switzerland, Russia, USA, Turkey and Tunisia. The focus of the European Commission's work in the textile and clothing sector is embedded in the framework of the renewed Market Access Strategy and aims to remove barriers to European textile exports in growing markets abroad, and fighting counterfeiting, which is highly damaging for EU textile and clothing producers. As for the data about Footwear sector, according to the same report, EU footwear exports in 2009: €4.7 billion, EU footwear imports in 2009: €12.4 billion and EU share of global footwear exports in 2009: 0.5%. Biggest markets for EU footwear exports are USA, Russia, Switzerland and Japan. The EU is a major producer and exporter of footwear, especially high quality, high value fashion shoes. In 2009, the EU was the second global exporter of footwear exporting €4.7 billion worth of shoes globally. The report also remarks that, as with textiles and clothing, EU footwear exporters continue to face obstacles to exports in many markets, both in the form of high tariffs and non-tariff barriers. The footwear sector also suffers from the impact of counterfeiting and piracy. On the European market, EU producers face strong competition from low priced imports. Anti-dumping measures put in place since 2006 have been extended in December 2009 in order to counter unfair competition from China and Vietnam. According to the report, an additional challenge for EU footwear producers is ensuring a steady and open supply of raw materials. The leather goods sector is widely affected by export taxes and export restrictions. Because the price of raw materials can be between 30 and 50% of the cost of production in this sector, barriers that raise the costs of raw materials can pose a serious problem. The EU addresses these problems through both its bilateral trade negotiations with raw material-exporting countries and its Market access partnership. The Footwear sector in Europe is one of the most populated traditional sectors, constituted majority by SMEs, and a workforce of all low-qualified, 85% of who develop operative activities. This sector of activity is one that absorbs the most, the new technologies and processes and it’s very much engaged with the modernization at a technical, technological and personnel level.

On the other hand, the clothing and footwear industry can be considered to be one of the oldest sector in the human history and developments in this industry have always been based on styles and fashions. Footwear has evolved from ancient times and through the centuries from protective sandals to a protective and aesthetic part of clothing. Today, there are many varieties of styles and materials used in the shoe industry. It is also noteworthy that some old fashions repeat themselves with only minor changes. One of the reasons for this is that most of them normally depend on the cultural practices of a particular group of people in the society. Thus, most people identify themselves with cloth and footwear fashions easily. In addition, the clothing and footwear industry especially in the modern world is directly related with employment and income generation. It is a fact that some of the world’s most famous and popular companies have achieved that fame from cloth and footwear fashion and design. On the other hand, tradition is regarded as a power that bonds people together and creates societies and organizations. It also helps to create new products for the future through organisations that stress and make use of the past to create new products. For such organisations, innovation is the process of creating new methods or things that would help attain the goals faster or with less effort. Thus, it is important that innovation can be achieved by the maintenance of tradition in mind and transforming it to novel products. So, we can work at creating new methods of ensuring that what needs to be done gets done. There should be no battle between the old and the new in any organization. According to Mark Cooray (1995) tradition is important in any culture or civilisation. Continuity in an era of change is something which people need and desire. Tradition and culture have a huge impact on footwear design and on the motives and modes of how people buy and wear footwear. Therefore tradition and culture of specific nation or region can create very important role at creating brand identities of European footwear companies. In the era of confusion and fast pace of life a lot of tradition and culture is hidden and forgotten, which reflects also in the “emptyness” and boredom of footwear design that often carries no message. Subconsciously people are aspired to the fundamentals of the region that they belong to and if companies would be able to integrate that traditional and cultural heritage and originality of specific region to the design of the footwear, this would increase their chances to succeed on particular market with meaningful design innovations.

2. CURRICULUM DEVELOPMENT IN VET

It is argued by Boud (2003:46) that the term *curriculum* is not widely used by universities. Boud believes that the term *course development* provides a much stronger emphasis for the content of the curriculum and all the various aspects that create the educational environment. He presents the case for creating work as the curriculum: “… here needs to be a focus on an educational approach to the curriculum, not a narrow operational competency-based approach suitable for predefined learning outcomes. Competency-based frameworks that delineate the universe of outcomes – such as those used in vocational education and training derived from industry-based occupational standards – are unlikely to be appropriate except for relatively low-level work-based programmes”. Boud is clearly making a distinction between university and vocational curriculum. This leads us to examine the curriculum in the context of the Vocational Education and Training (VET) system. Encyclopaedia Britannica (2006:202) sets out the history of curriculum development and claims that it has undergone vast changes in the last century: “… curriculum has responded to social issues by including such subjects as consumer education (or other applications of the economics of a free enterprise society), ethnic or multicultural education, environmental education, sex and family-life education, and substance-abuse education. Recent interest in vocational-technical education has been directed toward establishing specialized vocational schools, improving career information resources, integrating school and work experience, utilizing community resources, and meeting the needs of the labour market. … Computers have become increasingly important in education not only as a field of study but also as reference and teaching aids”.

Curriculum Development has long been regarded as a core-component of Technical and Vocational Education and Training. In the history of Technical and Vocational Education, a systematic approach to curriculum development is relatively recent. Due to lack of resources, experience and traditions, there have been certain tendencies in some developing countries simply to copy existing Curriculum materials from industrialised nations without proper adaptation to the local situation and needs, which has often proved to be inappropriate and expensive. According to the Final Report by UNEVOC (1993) Curriculum developed for vocational training should not only meet the goals and objectives of training but also be implemented effectively. There have been a variety of models that have been tried in the past and hence curriculum development has either been in the subjective or objective mode. But recently the trainers and educationalists have developed competency based curriculum which can be implemented using multi-media educational resources that have now become available. Such an approach allows open entry/open exit philosophy of Curriculum implementation to be adopted to allow the trainees to learn at one's own pace in the most flexible way. According to Helen Bowers (2006), the future of competency-based training may well contain surprises and the results of strategic planning can only be faintly seen through future misty proposals. Knowledge of the learning approaches by students, the benefits of communities of practice in the classroom and the quality of competency-based curriculum in Vocational Education and Training is the epistemological key to applied learning. This has to be combined with an ontological focus to ensure that curriculum encourages teaching, knowing and learning and becomes part of who we are rather than just something a teacher must follow.

The most recent approach towards curriculum development is the modular approach. In this approach, the subject matter has been divided into modules and the modules are studied through workstations. The Learning process is student-centred rather than teacher-centred. The modules are sub-divided into learning elements and these elements are learnt by carrying out tasks, which help to acquire employable skills. This approach of curriculum development, obviously, assumes the availability of resources for its implementation.

3. AIM OF THE PAPER

The aim of this paper is to present a Development of Innovation project proposal regarding revisiting traditional footwear so as to adapt it to up-to-date footwear training curriculum and production. The proposal aims to rediscover the peculiarities of traditional footwear and originality of cultural heritage of specific regions in order to transfer their design and models into VET curriculum so as to revive the traditions to create innovative products. The project will produce printed and electronic materials describing the design and models of the traditional footwear in the partner countries while at the same time presenting also specifics of national culture that could be transferred into footwear design ideas. In addition, these materials will be the base of the innovative curriculum to be used in the VET related with footwear. The printed materials and curriculum that will be developed will be in English, Turkish, Romanian and Slovenian. Thus, the curriculum and material will create a new methodology, which is modular curriculum.

4. THE CONSORTIUM

The consortium can carry out the tasks in the project as each partner has experience and already worked on previous projects. The project consortium has been set up based on the partners' national and European acknowledgment in training and research. The partnership consists of three partners representing Turkey (Selcuk University), Romania (University of Oradea) and Slovenia (Industrial Development and Testing Center for Leather and Footwear). The partners will develop and improve the common training module to be used firstly in their respective countries as a product of Balkan cooperation. The project consortium has been set up based on the partners' national and European acknowledgment in training and research. The partnership also comprises of members with strong support from the Governing bodies of each country. This will produce a strong partnership with knowledge and information on the requirements for training and the industry. Thus, through the support of the Governing bodies, the partnership will achieve the successful implementation of the Project. Since all the partners are training and research organizations that have been engaged in training and research for years, they have the potential and capacity to get feedback either from the present trainees or from the organizations outside that serve the same training.

5. EUROPEAN BENEFIT

In a remarkably short time, economic globalization has changed the world's economic order, bringing with it new challenges and opportunities. European footwear companies cannot compete in this new environment unless it becomes more innovative and responds more effectively to consumers' needs and preferences. The European Union possesses extraordinary potential for innovation. Europe has a longstanding tradition of producing breakthrough inventions; it has a wealth of creative people and can build on its cultural diversity. It has laid the foundations for one of the largest single markets in the world, where innovative products and services may be commercialised on a large scale. In addition, the European Commission is formulating, influencing and, where appropriate, implementing policies and programmes to increase Europe's innovativeness. The Commission is trying to make sure innovation is thoroughly understood and approached comprehensively, thereby contributing to greater competitiveness, sustainability and job creation (EU: Enterprise and Industry).

In this context, the footwear sector and SMEs are economically and culturally important as they retain local, regional and national traditions while employing local primary materials and local labour, and making a large impact on the European economy. Despite the importance of traditional practices and cultural heritage for footwear design no thorough study has been made up to now on this area, let alone transforming this kind of study into innovative curriculum. The target group of the project are trainees, students, trainer, lecturer, and consultants and footwear sector. The content is also relevant for people who re-entry in the training in the field of footwear industry. This project will respond to these issues through developing innovative materials and curriculum that will help VET learners, apprentices and people working in the footwear sector in SMEs in terms of innovative product design and training. The target groups of the project are trainees, students, trainer, lecturer, and consultants and footwear sector. The content is also relevant for people who re-entry in the training in the field of footwear industry.

The project focuses on developing new design ideas and themes and renewal of crafts, which can be capitalized on a multicultural plan. Traditions, experiences and, above all, traditional cultural heritage in traditional footwear domain will be capitalized in order to develop, in an innovative way, yet traditional at the same time, fashion and design. The project will function as a meeting point between time, space and people, cultures and events, a mean of diversity and cultural contacts in the context of continuous formation. By sharing knowledge and expertise, the partners will work to emphasize their labour similarities and differences in the adult education area, developing new skills; they will also share best practices in order to improve public awareness on traditional footwear.

6. OBJECTIVES

The project aims to contribute to the development of quality lifelong learning and to promote high performance, innovation and a European dimension in systems and practices in the field. The project will improve vocational and educational training curricula on footwear in Turkey, Romania and Slovenia by focusing on the development of innovation and good practice. The results will be transposed into a printed and electronic form, making it available on European level. By accessing the training curriculum, trainers and teachers, adult learners, as well as trainees and apprentice will be keeping up to date with skills and knowledge necessary for innovative training. The project aims also to help promote creativity, competitiveness, employability and the growth of an entrepreneurial spirit. In a world increasingly based on knowledge and information, education and training are put at the core. The industry needs to make learning a lifelong endeavour to deal with their employees of all ages continuously developing their skills. By creating a new content and material, the project will help both workers and footwear industry to transform the way they learn, interact and work in order to meet the needs for competitiveness, employability and entrepreneurial spirit.

Another objective is to support improvements in quality and innovation in vocational education and training systems, institutions and practices. This objective can be achieved by improving the qualifications and competencies of the trainees in footwear field and it is directly related to the well-designed and programmed curriculum to be carried out on footwear training. Considering that education is a dynamic process, it will be possible through this project, through its dynamic and continuous characteristics, to improve the quality of vocational education and accession to vocational training will be carried out. The project also aims to enhance the attractiveness of vocational education and training and mobility for employers and individuals and to facilitate the mobility of working trainees. The project, with the new material and curriculum, will help innovation and attraction in training. The common training and methodology envisaged in the project will increase the cooperation between the partner countries. This will help mobility of employment in the partner countries and in EU. As this project provides new training tools, it will create new job opportunities for the individuals in partner countries and thus this will contribute to employment exchange in EU.

In addition, the project wants to facilitate the development of innovative practices in the field of vocational education and training other than at tertiary level, and their transfer, including from one participating country to others. The curriculum will be based on modular approach and will help the vocational training in partner countries to have a common curriculum and training method. This innovative practice in vocational education and training may help the unification and circulation of workforce if the common curriculum becomes a unique, accepted footwear curriculum among the vocational organizations in EU. The materials offered will help unemployed workers to get better jobs by upgrading their skills.

7. CONCLUSION

The proposal aims to rediscover the peculiarities of traditional footwear and originality of cultural heritage of specific regions in order to transfer their design and models into VET curriculum so as to revive the traditions to create innovative products. The project will contribute to enrich the vocational training tool needs mentioned in the objectives of LDV program. It is also expected that will respond to such aims as it is to strengthen the role of education and training within the Lisbon process at both European and national level not only to promote competitiveness but also sustainable economic growth and social cohesion and to support implementation of the Education and Training 2010 work programme. Thus, once the target sectors and educational institutions have the training materials and curriculum, they will be in a position where they will need recruiting their workers. This will broaden their activity in a more effective manner. As potential users, the training organizations, the SMEs, and the universities, colleges, vocational schools, training centres will have an opportunity to modify and add to their way of footwear training. Vocational training systems and practices will be enriched and updated according to proposed curriculum in the footwear sector. In the short term, trainers will have a tested curriculum and training materials for immediate use; trainees and apprentices will have an easy access to the web site where they will have access to the materials in English, Turkish, Romanian and Slovenian; technicians will be able to update and add to their knowledge and find a source for immediate solutions to the problems faced in their workplace. In the long-term, the SMEs and Universities, colleges, vocational schools will utilise the training tool by having new training materials and curriculum based on the new models and designs derived out of traditional footwear.

In terms of vocational training systems and practices, it is expected to eliminate the discrepancy between the levels of training provided by various training centres. Even after the official project end, the partnership will maintain for dissemination and valorisation activities to broaden it to other EU countries. This may help the unification and circulation of workforce if.

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EXPERIMENTAL RESEARCH ON THE BEHAVIOUR OF LEATHER SUBSTITUTES UNDER TENSILE STRESS

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Abstract: This study presents the research results regarding the behaviour under tensile stress of some of the leather substitutes currently used in showmaking, and the influence of speed and duration of tensile stress on the total deformation and plastic strain.
Key words: leather substitutes, process, speed, duration, tensile stress.

1. INTRODUCTION

Materials for uppers must be able to withstand the stress during the spacial shaping process and during usage, and ensure the preservation of shape and dimensional stability of the product, in time [1].

During the spacial shaping process, shoe uppers are subject to tensile stress, which occurs when they are pulled on the last. The shoe uppers are strained in such a way as to take on the complex spacial form of the last and to ensure the reliability of the shape after the last is removed from the finished product and, most importantly, during use [1], [2].

Taking into account that the total deformation obtained through tensile stress is the sum of a number of elastic and plastic strains, after the stress is removed and the elastic component of the strain is gone, the plastic component must ensure the given spacial shape [1], [3]. The weight of the plastic strain with regard to the total deformation reflects the shaping capacity of the materials, and it is considered that the greater this weight is, the higher the reliability of the shape obtained during the shaping process will be.

The magnitude of the strain during tensile stress is influenced by the composition and structure of the materials, the duration of the stress, the speed of the tensile process etc.

If after the strain the material maintains the strained state for a certain period of time, the rearrangement of the structural elements results in a relaxation of the tensions in the material and an increase in remanent deformation [1], [4].

Starting from these aspects, this study presents the research results regarding the behaviour under tensile stress of some of the leather substitutes currently used in showmaking, and the influence of speed and duration of tensile stress on the total deformation and plastic strain.

2. THE EXPERIMENTAL COMPONENT

During the experiments, the materials used were leather substitutes with PU film, on nonwoven and knit support, used for making shoe uppers by SC TRICOSTAR Oradea, as follows:

IP1- substitute with PVC matte film, on knit support, thickness δ=1,0 mm

IP2 – substitute with PU lacquer film, on nonwoven support, 1,0 mm thick

The experiments were done with a pendulum dynamometer, with simple leather substitute specimens as well as reinforced specimens (doubled with leather substitute lining).

The specimens were stressed on the pendulum dynamometer on set values for tension: 0.5 daN/mm^2 ;0.75 daN/mm^2 and 1daN/mm^2 , and different stess speeds: 50 mm/minute, 100 mm/minute, and 150 mm/minute.

Table 1 shows the average values for total and plastic deformation, on tensile stress with set values without maintaining the tension [5].

Tab.1. – Average values of total and plastic deformation –tensile stress with set values, without maintaining tension

Material	Specimen type	Speed [mm/min.]	σ=0.5daN/mm^2		σ=0.75 daN/mm^2		σ=1 daN/mm^2	
			ε_t [%]	ε_r [%]	ε_t [%]	ε_r [%]	ε_t [%]	ε_r [%]
Substitute IP1	**simple**	50	30.6	2.6	46.3	5.3	58.3	6.3
		100	29.6	2.3	44.6	4.6	52.6	5.0
		150	26	2.0	40.3	3.6	50.3	4.0
	complex	50	24.6	3.6	34.3	6.0	47.6	7.3
		100	23.6	3.3	33.3	5.3	44.3	7.0
		150	21.3	3.0	30.0	5.0	43.3	6.6
Substitute IP2	**simple**	50	11.3	1.3	16.3	1.6	25.0	2.0
		100	9.00	1.00	15.3	1.3	19.6	1.6
		150	8.00	0.6	12.3	1.00	14.0	1.3
	complex	50	9.6	1.0	15.3	1.3	21.6	2.0
		100	8.3	0.6	12.6	1.0	15.0	1.6
		150	6.00	0.3	10.3	0.6	12.3	1.3

3. RESULTS AND INTERPRETATIONS

Based on the experimental data shown in table 2, the graphs show the variation in total deformation for IP1 (matte film substitute) with regard to tensile stress for different stress speeds (v=50mm/min, v=100mm/min and v=150mm/min.) fig.1.a for simple specimens and fig.1.b for specimens doubled with leather substitute lining.

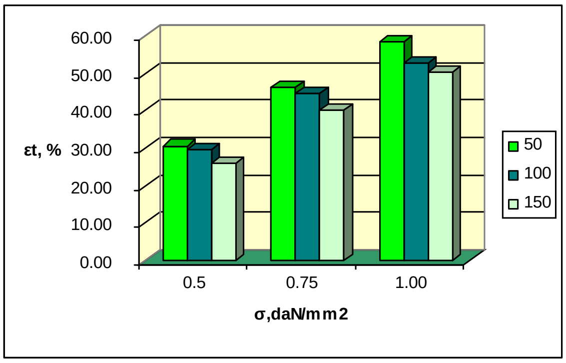


Fig.1.a. The variation of total deformation with regard to tensile stress for simple specimens σ=0.5, 0.75 and 1daN/mm^2

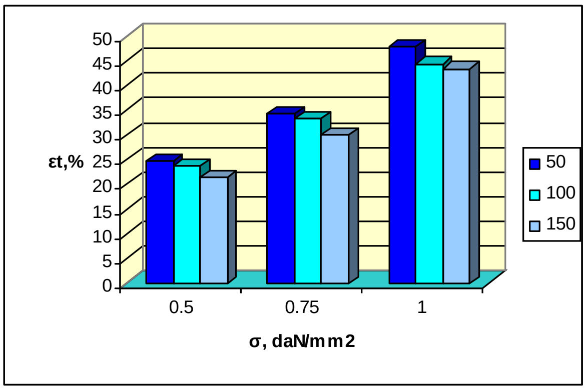


Fig.1.b. The variation of total deformation with regard to tensile stress for reinforced specimens σ=0.5, 0.75 and 1daN/mm2

Fig. 2 and fig. 3 show the variation of total deformation with regard to the value of tensile stress for stress speeds of 100mm/min for both simple and reinforced (doubled with leather substitute lining) specimens.

For a constant value of stress speed, according to fig. 2 and fig. 3, there is a rise in total deformation when the tensile stress rises, for both simple and reinforced specimens.

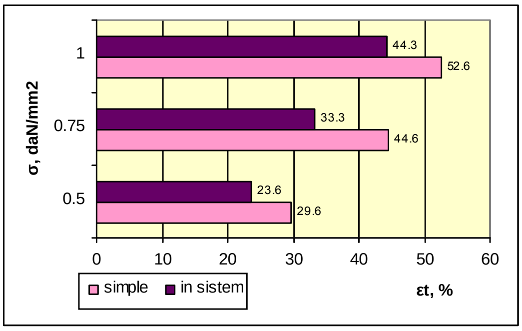


Fig2. Total elongation for simple and reinforced specimens – IP1 (v=100mm/min.)

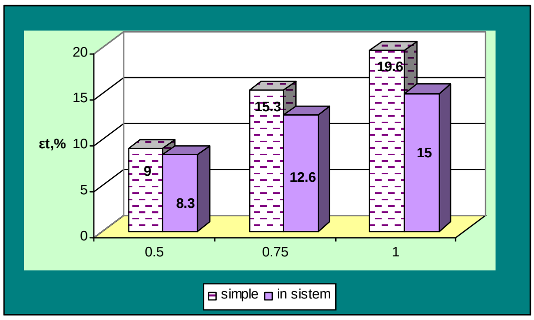


Fig.3. Total elongation for simple and reinforced specimens – IP2 (v=100mm/min.)

The deformability of the specimens decreases when they are doubled with lining.

Fig.4 shows the variation in plastic elongation for both simple and reinforced specimens, for the IP1 substitute, with a medium stress speed of 100mm/min. As fig. 4 shows, the plastic elongation increases for reinforced specimens; the plastic deformation represents a small weight in total deformation.

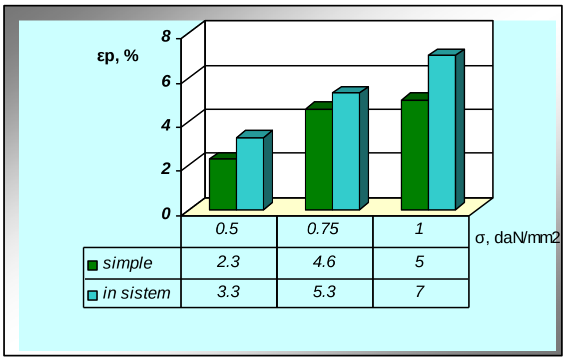


Fig.4. Plastic elongation for simple and reinforced specimens – IP1

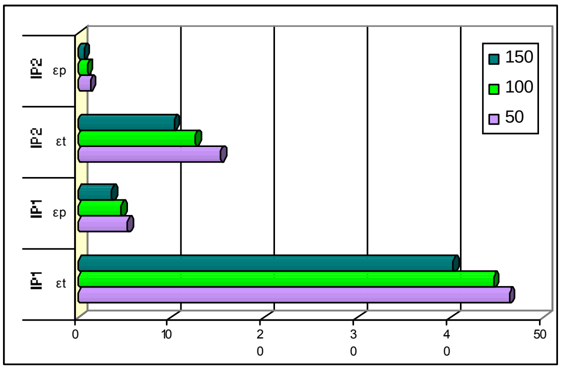


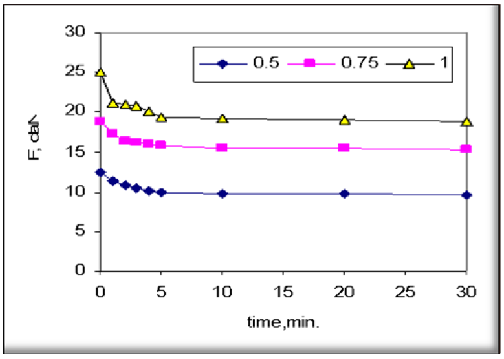
Fig.5. Total and plastic elongation – reinforced specimens (v= 50, 100 and 150mm/min.)

Fig.5 shows the variation in total and plastic elongation when the specimens are doubled with leather substitute lining for the two substitutes (IP1 and IP2), for a tensile stress of 0,75daN/mm^2.

The deformability of substitute IP2 is different than that of IP1 – fig. 5. In this case, the recorded values for total elongation are smaller than those obtained for substitute IP1, both for simple and reinforced specimens.

The graphic representation shows the obvious differences in total elongation, as well as plastic elongation.

For the matte film substitute (IP1) fig.6 shows the influence of relaxation on tension, at a stress speed of 100mm/min.



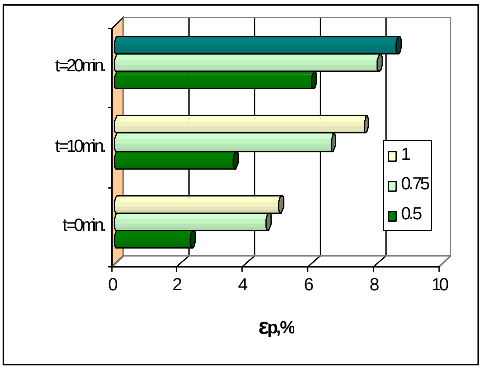


Fig.6. Relaxation of tensions function of time (IP1-matte film substitute)

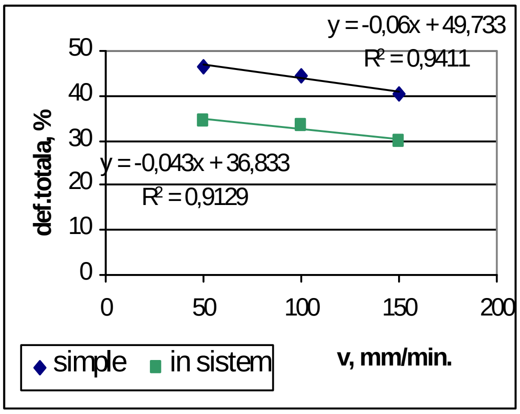
Fig.7. Variation in plastic elongation when maintaining tension for 10 and 20 minutes

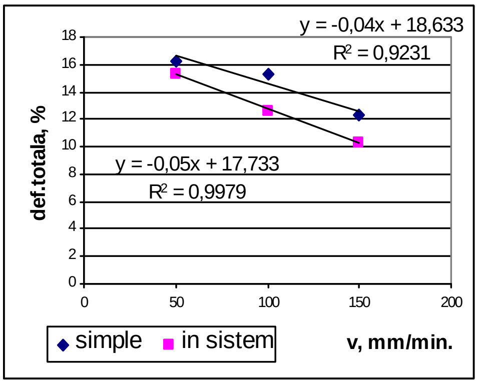
Clearly, the decrease in force at the time of stress occurs in the 0 – 5 minutes interval.

For the matte film substitute IP1 – with a matte PVC film with a thickness of δ=1,0 mm, fig. 7 shows the variation in plastic deformation when maintaining tension for 10 and 20 minutes, respectively, in comparison to specimens for which tension was not maintained (t=0).

By maintaining the tensioned state, the plastic elongation increases for all set values for tensile stress at an average speed of 100mm/min.

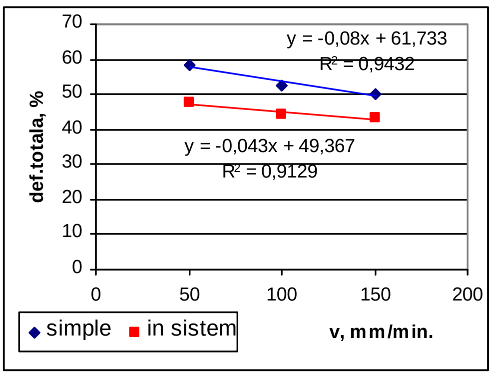
The dependence of total deformation on stress speed for the two substitutes is shown in fig. 8.

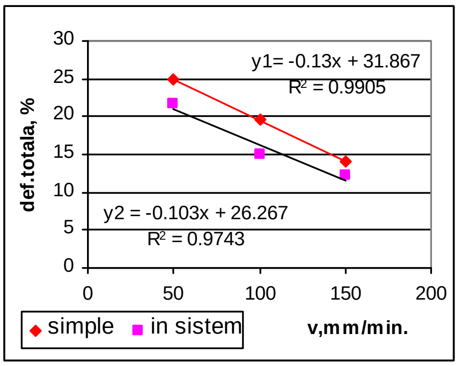




Substitute IP1 Substitute IP2

Fig.8a. The dependence of total deformation on stress speed, tension of 0,75daN/mm2





Substitute IP1 Substitute IP2

Fig.8b. . The dependence of total deformation on stress speed, , tension of 1daN/mm2

According to fig.8, the linear unifactorial regression models resulting from the experimental data are described by the general expression:

y= - ax+b

where:

y-dependent variable, the total deformation in %

x-independent variable, the stress speed, in mm/min.

a and b- the regression equation coeficients.

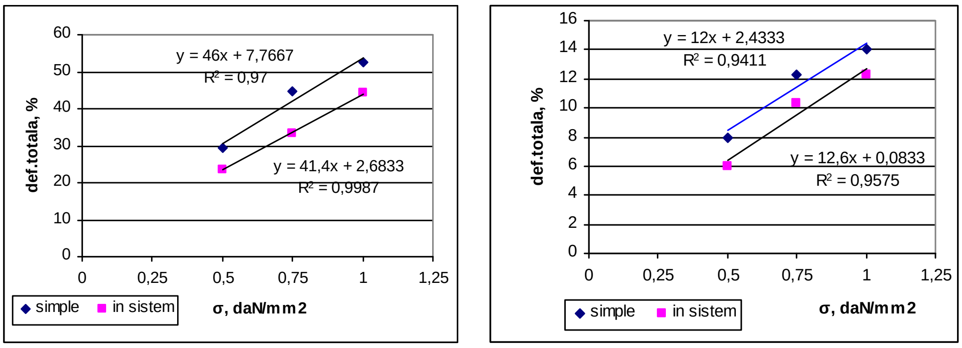
The values of the linear regression equation coeficients, are shown in tab.2.

Tab.2. The values of the linear regression equation coeficients

Coef.		**Substitute IP1**		**Substitute IP2**	
	Σ, daN/mm^2	**simple**	**reinforced**	**simple**	**reinforced**
a	0.5	-0.046	-0.033	-0.033	-0.036
	0.75	-0.06	-0.043	-0.04	-0.05
	1	-0.08	-0.043	-0.13	-0.103
b	0.5	33.333	26.467	12.733	11.567
	0.75	49.733	36.833	18.633	17.733
	1	61.733	49.367	31.867	26.267
R^2	0.5	0.9038	0.9508	0.9508	0.9749
	0.75	0.941	0.9129	0.9231	0.9979
	1	0.9432	0.9129	0.9905	0.9743

The values of coeficients a and b depend on the nature of the substitute, of that of the specimens and the tensile stress.

The dependence of the total deformation of the two substitutes on the tensile stress at a stress speed of 100mm/min., is shown in fig.9.



IP1 IP2

Fig.9. Variation of total deformation function of tensile stress

In this case, the dependence of the deformation on tensile stress is described by a linear regression equation as follows:

y= cx+d

The values of the linear regression equation coeficients are shown in tab.3.

Tab.3. The values of the linear regression equation coeficients

Coef.	V, mm/min.	Substitute IP1		Substitute IP2	
		simple	**reinforced**	**simple**	**reinforced**
a	50	55.4	46	22.8	20
	100	46	41.4	18.6	13.4
	150	48.6	44	12	12.6
b	50	3.5167	1	1.2	1.1667
	100	7.766	2.683	0.25	1.9167
	150	2.4167	1.14667	2.433	0.083
R^2	50	0.9941	0.9919	0.9156	0.978
	100	0.9700	0.9987	0.9597	0.9739
	150	0.9897	0.9856	0.9411	0.9575

The values of coeficients c and d are dependent on stress speed and substitute type.

4. CONCLUSIONS

In practical shoemaking conditions, the greatest influence of the deformation capacity of materials on the quality of the footwear manifests during the spacial shaping process. The way the materials which form the shoe upper behave during the manufacturing process, as well as during use, depends on a multitude of factors.

From the experimental reseach done on leather substitutes on different supports, the following conclusions were drawn:

- The deformability of the tested substitutes depends on the nature of the substitute’s support, tensile stress and stress speed, and the period for which tension is maintained;
- During the spacial shaping process, it is necessary to reinforce the substitutes with adhesive and thermoadhesive knits, to diminish their deformability;
- Plastic deformation represents a small part of total deformation, which requires that the tensioned state be maintained in order to relax the tensions in the material;
- Maintaining tension causes an increase in the plastic deformation for all set values for tensile stress, at an average stress speed of 100mm/min.
- The dependence of total deformation on stress speed in described by a linear regression equation:

$$\varepsilon = - av + b$$

where the coeficients a and b depend on the nature of the substitute, that of the specimens and tensile stress.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

INVESTIGATION OF THE MAJOR FAULTS IN KNIT APPAREL INDUSTRIES AND ITS ALTERING PROCESS

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Abstract: textile and apparel industry product quality is calculated in terms of quality and standard of fibers, yarns, fabric construction, color fastness, surface designs and the final finished garment products. Quality assurance covers all the process within a company that contributes to the production of quality products. The inspect is carried out by representatives of the current production and the result record on control chart. Which is a process to Assure the product quality Acceptable or not. A number of factories have taken in the analysis the majority of the faults. Then the faults need to identify and count them. After analysis the percentage of different faults in knit garment, most of the faults covered by broken stitch, skip stitch, puckering and uneven stitch which is around 70% of total fault. And all those fault produce due to low quality of stitching and machine performance.
Key words: Quality, Apparel, Faults, stitch, alter

1. INTRODUCTION

The cut and sew technique is by far the simplest method of garment construction whereby individual panel shapes are cut from a long length of fabric or cloth (circular knitting machines) [1]. For every industry or business, to get increased sales and better name amongst consumers and fellow companies it is important to maintain a level of quality. In the garment industry quality control is practiced right from the initial stage of sourcing raw materials to the stage of final finished garment. For textile and apparel industry product quality is calculated in terms of quality and standard of fibers, yarns, fabric construction, color fastness, surface designs and the final finished garment products. However quality expectations for export are related to the type of customer segments and the retail outlets. There are a number of factors on which quality fitness of garment industry is based such as – performance, reliability, durability, visual and perceived quality of the garment. Quality needs to be defined in terms of a particular framework of cost [2]. Here some of main fabric properties that are taken into consideration for garment manufacturing for export basis:

- Overall look of the garment.
- Right formation of the garment.
- Feel and fall of the garment.
- Physical properties.
- Color fastness of the garment.
- Finishing properties
- Presentation of the final produced garment.

2. MATERIALS AND METHOD

Fabric goes through various processes before it takes the shape of an apparel. The actual ready to wear apparel involves many more processes right from pattern drafting to garment construction which include pattern designing and pattern making, grading, marker making, apparel cutting, sewing, pressing and finishing. Quality Assurance process the bulk pollution is examined before delivery to the customer to see if it meets the specifications. The consumers want to get high quality products in low price. The products should reach the consumers with right quality depends on the cost. Quality assurance covers all the process within a company that contributes to the production of quality products. The inspect is carried out by representatives of the current production and the result record on control chart. Which is a process to Assure the product quality Acceptable or not. The aim of garment inspection is to visually inspect articles at random from a delivery in order to verify their general conformity and appearance with instruction/description and/or sample received.

3. EXPERIMENTAL PROCEDURE

Generally garments inspection is done by AQL(Acceptance Quality Level). The AQL inspection takes the samples from a goods, inspect them & depends on the quality of samples inspected & decide to accept or reject them. It provides with the sampling plans, the no. of samples to be inspected & the acceptable quality level.[3] For giving better production inspection has done. Every garment must be checked with the AQL scale. All fault must be indicate with mark. And then the inspection report created with all infomration. Inspection report must be filled in and signed off by supplier QA technician where all faults in garments mentioned. If the quality is accepted, it passed. Otherwise it reject with declaration. To analysis the majority of fault in knit garment, a number of garment must be checked in every factory. A number of factories have taken in the analysis the majority of the faults. Then the faults need to identify and count them. Then the number must be compare with graphical representation and analysis among different factories.

4. DATA ANALYSIS

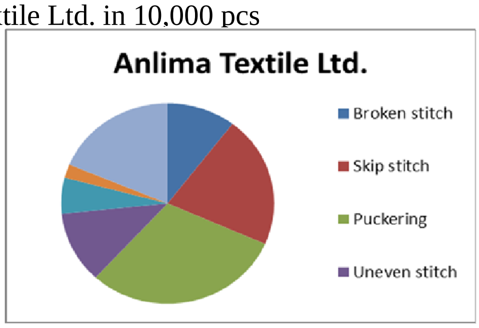
For the study purpose, three well known knit apparel industries of Bangladesh investigated to find out the major faults in knit apparel production.

<u>CASE-1: Anlima Textiles Ltd (Savar, Dhaka).</u>

It is a knit garment of 22 production lines. It produces basically T-shirt and polo shirt. 10,000 pcs garments at random inspectioned and the fault garment found 124 pcs. The faults are analysised below:-

Table-1: fault percentage of Anlima Textile Ltd. in 10,000 pcs

Types of faults	Percentage
Broken stitch	10.33%
Skip stitch	20.92%
Puckering	29.89%
Uneven stitch	11.41%
Tension Bad	5.70%
Twisting	2.17%
Others (fabric fault)	18.48%

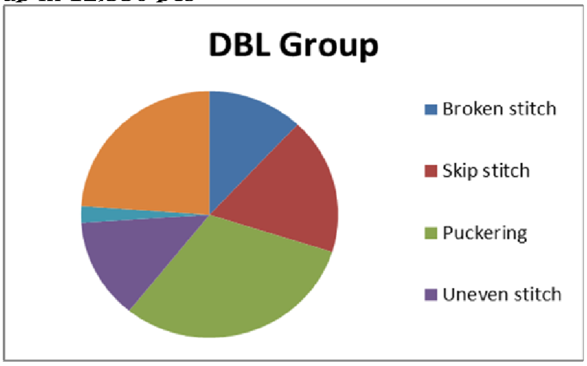


<u>CASE-2: DBL Group (Kashimpur,Gazipur).</u>

It is a knit garment of 90 production lines. It produces basically all kinds of knit products. 12,550 pcs garments at random inspectioned and the fault garment found 169 pcs. The faults are analysised below:-

Table-2: fault percentage of DBL Group in 12.550 pcs

Types of faults	Percentage
Broken stitch	12.00%
Skip stitch	17.90%
Puckering	30.85%
Uneven stitch	13.21%
Twisting	2.17%
Others (fabric fault)	23.87%

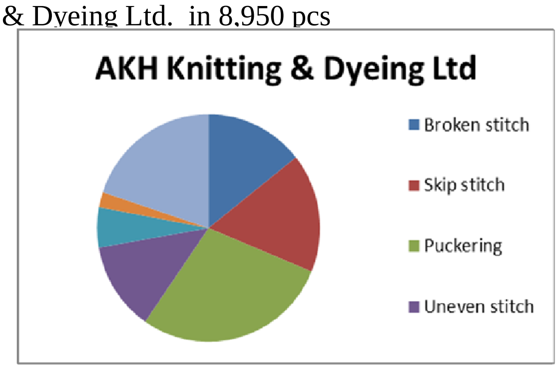


CASE-3: AKH Knitting & Dyeing Ltd (Savar, Dhaka).

It is a knit garment of 40 production lines. It produces basically all kinds of knit products. 8,950 pcs garments at random inspectioned and the fault garment found 170 pcs. The faults are analysised below:-

Table-3: fault percentage of AKH Knitting & Dyeing Ltd. in 8.950 pcs

Types of faults	Percentage
Broken stitch	14.34%
Skip stitch	16.90%
Puckering	28.39%
Uneven stitch	12.61%
Tension Bad	5.70%
Twisting	2.17%
Others (fabric fault)	19.89%



5. RESULT AND DICUSSION

Factory name	Broken stitch (%)
Anlima Textiles Ltd	10.33%
DBL Group	12.00%
AKH Knitting & Dyeing Ltd	14.34%

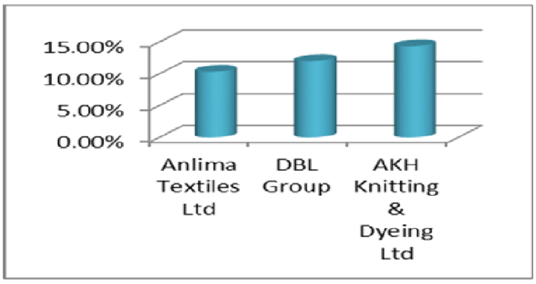


Figure 1: compare between the amount of broken stitch percentage in different factories

From figure -1, Broken stitch found more then 10% of all faults in knit garments.

Factory name	Skip stitch (%)
Anlima Textiles Ltd	20.92%
DBL Group	17.90%
AKH Knitting & Dyeing Ltd	16.90%

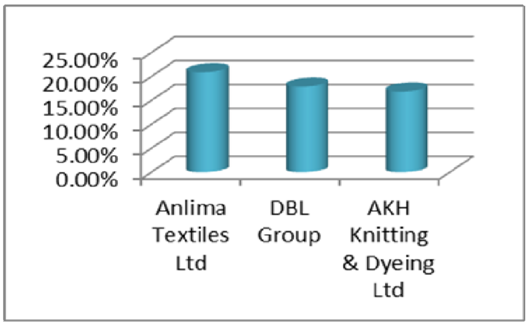


Figure 2: compare between the amount of skip stitch percentage in different factories

From figure -2, skip stitch founds 17 - 20% of all faults in knit garments.

Factory name	Puckering (%)
Anlima Textiles Ltd	29.89%
DBL Group	30.85%
AKH Knitting & Dyeing Ltd	28.39%

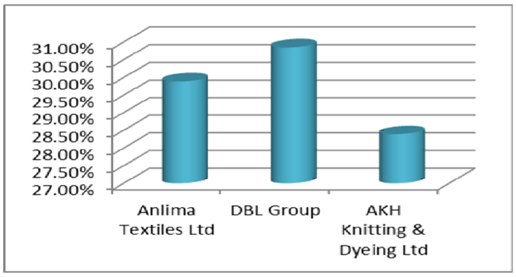


Figure 3: compare between the amount of puckering percentage in different factories

From figure -3, puckering founds more then 28% of all faults in knit garments which is the highest persentage of fault in all knit garment factories.

Factory name	Uneven stitch (%)
Anlima Textiles Ltd	11.41%
DBL Group	13.21%
AKH Knitting & Dyeing Ltd	12.61%

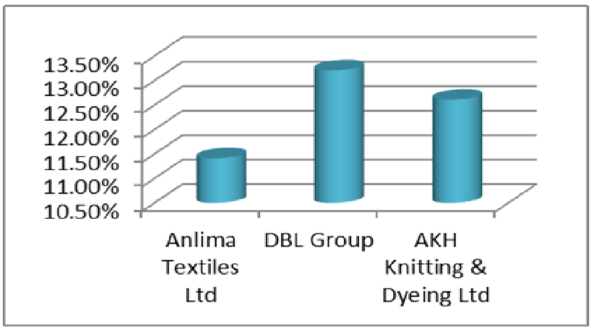


Figure 4: compare between the amount of uneven stitch percentage in different factories

From figure -4, uneven stitch founds from 11% to 13 % of all faults in knit garments.

Faults / factory name	Anlima	DBL	AKH
Broken stitch	10.33%	12.00%	14.34%
Skip stitch	20.92%	17.90%	16.90%
Puckering	29.89%	30.85%	28.39%
Uneven stitch	11.41%	13.21%	12.61%
Tension Bad	5.70%	2.17%	5.70%
Twisting	2.17%	0.00%	2.17%
Others (fabric fault)	18.48%	23.87%	19.89%

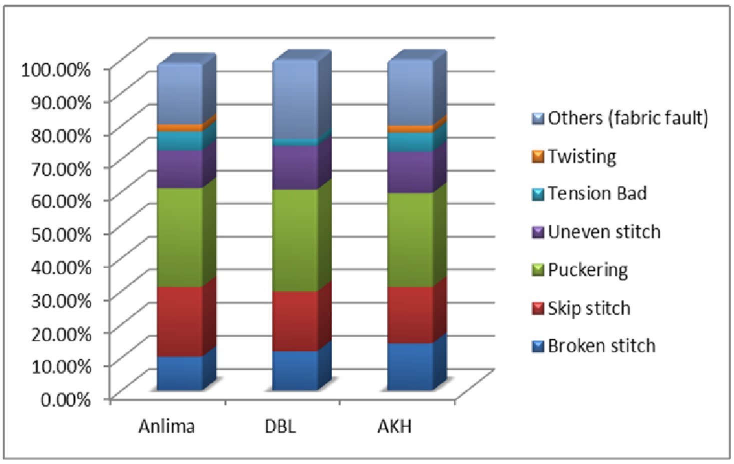


Figure 5: compare between the amount of fault percentage in different factories

From figure -5, puckering takes most area in all faults in knit garments. After then skip stitch is second major highest fault of the garments.

In knit garment, most of the faults covered by broken stitch, skip stitch, puckering and uneven stitch which is around 70% of total fault. And all those fault produce due to low quality of stitching and machine performance.

All those major fault can be alter which could reduce the rate of knit garments fault significately.

6. CONCLUSION

This paper shows that there is an option of increasing the productivity of quality knit garments and as well as a significant improvement of quality garment. The major percentages of fault garment produce due to sewing and quality machine performance. Also it seems that the major number of fault can be altering during knit garment production. 70% of total garment can be improved by altering.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

EXPERIMENTAL RESEARCH ON THE IMPACT FORCE NEEDLE - CAM - YARN

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Abstract: Research on and about the circular knitting machines with small diameter have developed spectacularly in recents years. In this paper we are exposed to new research on the impact force needle - cam – yarn for the small diameter knitting machine, Ange with Ø[3.75"] , K [14 E], 0- 300 n/rot/min.
It is necessary to to extend the service life of pieces of the machines and improve the technology of production of knits for reduce dynamic effects. [1]
The present research aims to measure the impact forces on the needle-cam-yarn system during the linear movement of the profile stitch cam. Have been investigated three different cam angles (40 ˚, 50 ˚, 55 ˚) and made measurements for two working speeds.
Impact force measurements were made in two cases with and without knitting yarn. Was found due to yarn of knitting voltage influence on the force of impact is negligible, being decisive cam angles and speed of the machine.
Key words: impact, force, needle, cam, yarn.

1. INTRODUCTION

Recently small diameter knitting machines pass through a qualitative change of base, be represented by introduction of electronic devices in all their operation and control elements. The yarn used for circular knitting machine with a small diameter must fulfill certain terms of elasticity, flexibility and regular physical-mechanical indices during processing is subjected to traction and friction stresses that these characteristics are of prime importance.

2. SYSTEM NEEDLE – CAM - YARN

An important point is an optimization of the impact force between sinker and cam.

The decisive role in the needles moving in those channels, after a certain path, belongs to the cam profile witch are forming the knitting systems, and the knowledge of the trajectory under the influence of stitching cam path can lead to a rigorous analysis of tension in the wire during the stitching and the formation of new stitch.

The main movement of the needle through which it participates in all phases of the knitting process, including the stitching phase and the formation of the new stitch, it is the translational movement along the channel of the cylinder, movement due to the action of knitting cams system.
In a knitting cycle, the needle movement takes place in two sequences:

- crescent movement, made under the action of lifting cams, raising, or lifting from stationary to stitching.
- descent movement , made under the action of stitching cam.

Regardless the cam witch produces the movement; the needle movement under the action of cam involves two distinct phases from the dynamic point of view:

- the impact phase between the needle butt and the cam profile, decisively influenced by the forces of inertia and the elasticity of bodies coming into contact.
- the phase of actual movement of the needle along the cam profile.

Dynamic tests were made on the the impact device designed for this purpose.

3. MEASUREMENTS OF THE IMPACT FORCE TO THE KNITTING MACHINES

During the measurement, is used a sinker having the height of a needle butt. This sinker is located in the channel of the needle cylinder (the needle rod recess) of the knitting machine. So to reduce friction, the channel is lubricated depending on machine operation.

During the measurements the sinker is lowered into the engaged position using the stitching cam. If the cylinder rotates, the needle butt falls off in the stitching cam position on a bridge. Four finesess tensions are stuck on the bridge and thus responding to any deformation. Then, this deformation is converted to the change of resistance.

The measurements depending on tension resistance of finesess is based on knowing the force witch made deformations on the body, this body is perpendicular to the direction of force. In order to provide increased strength of the impact forces, due to the increasing evolutions, we used 150 rpm, 200 rpm, 250 rpm and 300 rpm.

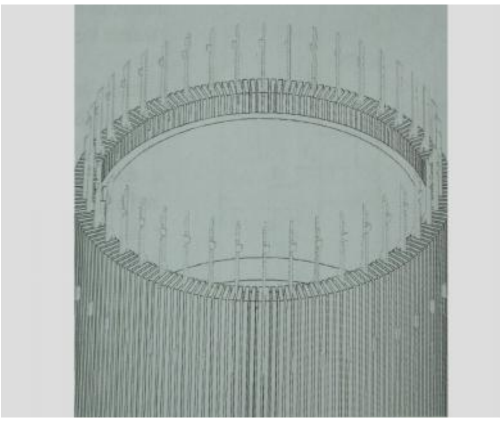

Fig. 1: Experimental cylinder knitting machine

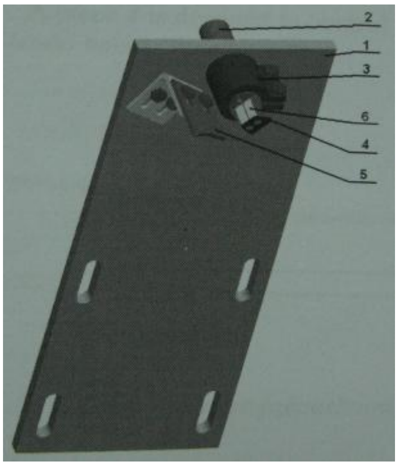

Fig. 2: The support for the stitch cam for measuring the impact of butt-cam

In figures 1 and 2 are presented cylinder of knitting machine that has been made the experiments and the support and the stitch cam to measure the impac butt – cam.

5. CHARTS OF VARIATION OF IMPACT FORCE DEPENDING ON THE CAM ANGLE AND SPEED OF CYLINDER

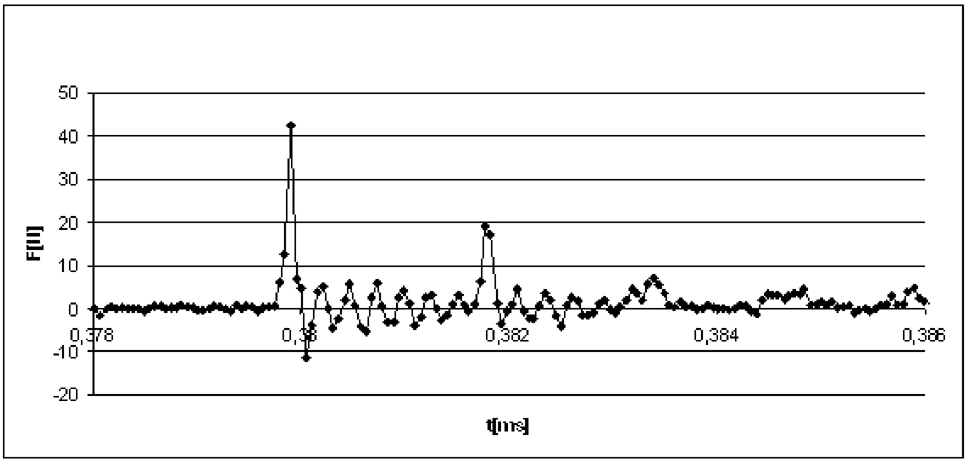

Fig. 3: The impact force for cam angle α= 40˚, n=200(r/min)

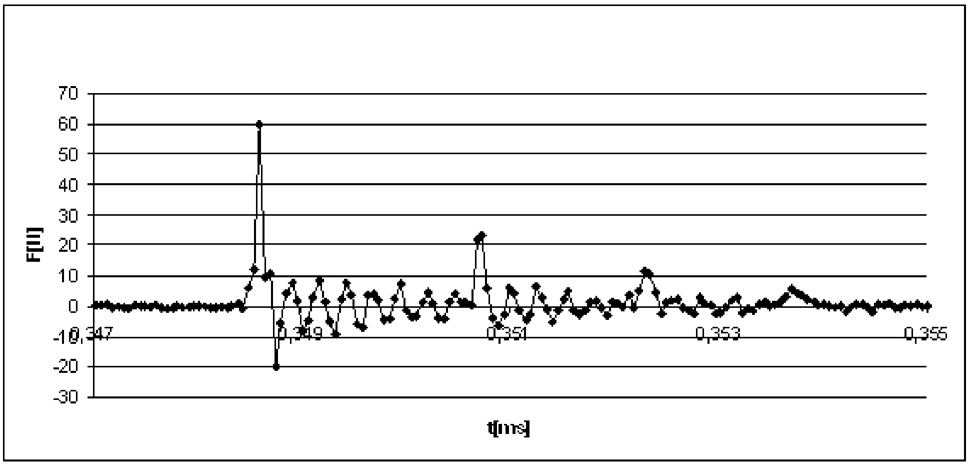

Fig. 4: The impact force for cam angle α= 40˚, n=250(r/min)

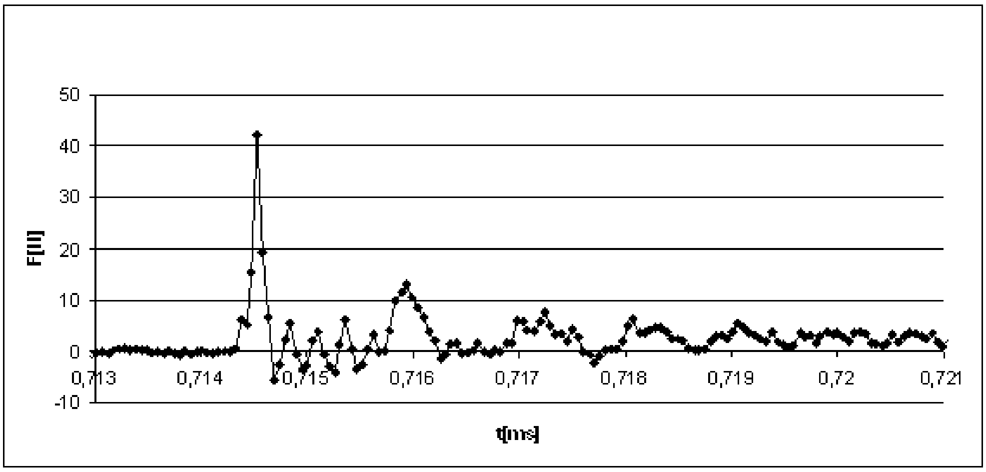

Fig. 5: The impact force for cam angle α= 50˚, n=150(r/min)

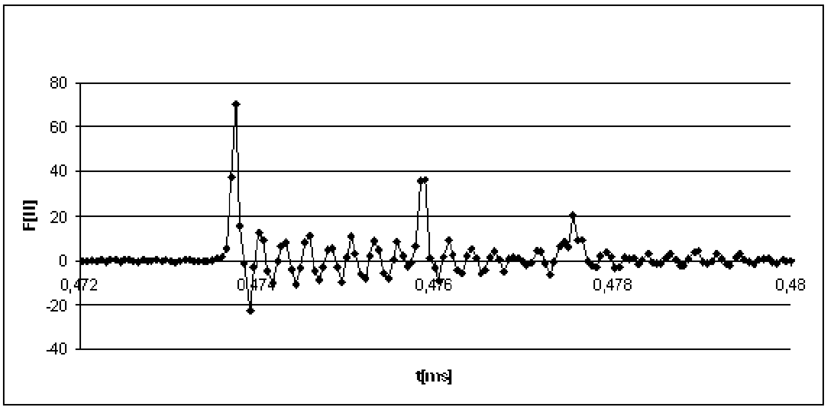

Fig. 6: The impact force for cam angle α= 50˚, n=200(r/min)

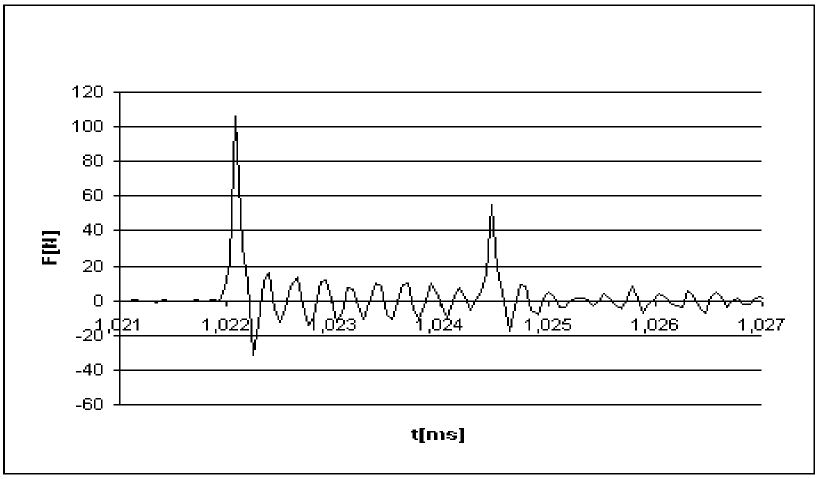

Fig. 7: The impact force for cam angle α= 55˚, n=250(r/min)

Figures (3, 4, 5,6, 7,8) are passed charts of variation of impact force for stitch cams, linear profile, where the angle is 40 ˚, 50 ˚, 55 ˚ and different rotations of the cylinder. It presents a detailed sequence varition the the impact force over a period of about one microsecond. Original chart (gross) obtained is a sequence of collisions between the butt, the stitch cam and auxiliary cam. Impact force measurements were made in two cases with and without knitting yarn. Was found due to yarn of knitting voltage influence on the force of impact is negligible, being decisive cam angles and speed of the machine.

6. CONCLUSIONS

Determination of the impact force by its components allows an absolute assessment necessary, since the design stage, the future behavior of the cam in the knitting process. In knitting machines with a small diameter there are cams with different angles, meaning 40˚, 50˚, 55˚, which are employed for patterning, depending on the fact where the needle is to be knitting and what type of knit is to be produced. [1]. The cams are divided into several types, depending upon the function they perform.

7. REFERENCES

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES-LEATHERWORK

RECENT CHANGES IN THE STRUCTURE AND STRATEGIES OF CLOTHING RETAILING ON THE EU MARKET

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Abstract: This dissertation presents the characteristics of clothing goods retail and the main changes in the format of this business on the EU market. It points out that in the last years clothing goods sales are growing in hypermarkets, specialized store chains and online stores, to the detriment of store departments and independent stores, and it discusses the factors that have led to these changes. Analyzing the recent developments in the textiles market in the EU enabled us to make a forecast regarding clothing goods retail: consumer spending in this market will be focused in two areas – specialty store chains and hypermarkets on one hand, and luxury, mono-brand boutiques on the other. We predict that alongside these, in most European countries outlet stores and online stores will also see growth.

Key words: clothing goods, hypermarkets, specialty store chains, internet, store departments

1. INTRODUCTION

Retailing acts as an interface that brings together producers and consumers, and that offers the latter access to a broad range of products and services. A single European market means consumers get to choose between products and services offered by any member state, the choice being based on price, quality etc.

Likewise, consumers can choose to shop in stores, outside of stores, on the internet, abroad, or by other means such as direct sales or limited sales. [1]

Most clothing goods retailers in Europe can be classified into at least one of six major categories: [2]

- **Non-specialty stores:** store departments, supermarkets and hypermarkets, retailers outside of organized stores;
- **Clothing goods specialty stores:** independent stores, specialty store chains

Regardless of where the consumer chooses to shop for goods or services, he is protected by the same rules and regulations, in effect in his country of origin as well as across the EU. Whatever country they are shopping in, whatever their choice of retailer or preferred type of sale, the European consumers can expect that their purchase is covered by a set of basic principles under common law to insure minimum consumer protection, otherwise they can contact the European Consumer Centers Network (ECC-Net) – which handles all the complaints filled by consumers in all member states. [3]

Most analysts agree that the creation of a single market and liberalization of services led to increased choices for the consumers and at the same time increased pressure on the producers to offer competitive prices, to the benefit of the consumers. [4]

The characteristics of the retail market vary amply from one member state to another, reflecting certain differences in shopping habits and lifestyle.

Thus, in the northern and eastern European countries, there is a relatively low density of retail units per number of consumers, compared to the much larger number found in southern Europe. This is an indication of the fact that in northern Europe the retail units are larger in size, and that consumers chose to shop in supermarkets and hypermarkets outside cities, or in large commercial centers within the cities. These tendencies could be the result of an easier access to means to transportation that allow larger amounts of goods to be carried (like automobiles) and the benefit of doing all the shopping in the same store (especially in areas with cold or wet weather).

In the southern and eastern parts of Europe, retail stores are generally smaller, independent stores. Shopping in Southern Europe is a frequent, practically daily activity, consumers usually visiting a number of retail stores grouped in the same area of the city. Eastern Europe is a bit different in that the retail market is not yet saturated and thus a number of local, national and international companies are trying to establish or expand their business.

On national markets, clothing goods retail has been traditionally served by local and national companies, but there is a trend towards the internationalization of retail, with the involvement of a small group of global retailers that have set up business in several EU countries and on other continents as well. [6]

2. THE MAJOR CHANGES IN CLOTHING RETAIL FORMAT ON THE EU MARKET ¶

The European market has quickly turned from collections of local groups of shops to a more and more integrated retail market. Some common tendencies seem to affect several markets, such as price stagnation, shorter product lifecycles, smaller budgets allocated by families for the purchase of clothing goods, etc. Besides, new concepts for retail are developing, advancing and reaching maturity in Europe.

According to a studies conducted by the French Fashion Institute across five major European markets, in the past fifteen years there has been a constant decline in the sales of independent retailers, while sales through specialty store chains, supermarkets and hypermarkets are on the rise. [6]

The evolution of the retail format for clothing goods in different EU countries is shown in table no. 1. A comparison of the retail forms in Europe indicates some fundamental differences between countries such as Great Britain or Germany, where the retail market is dominated by large stores and specialty store chains, and part of the market is controlled by hypermarkets and outlets, and other countries like Italy or Hungary, where the clothing goods retail market is dominated by small, independent businesses. While in some countries, such as France or Spain, there are large networks of hypermarkets and specialty stores, in other countries, like Poland or Czech Republic, these formats have only recently seen a fast growth. Mail order is still a significant distribution channel in some countries, like France and Germany, but its missing completely in many others – Italy being the best example.

Table no. 1. - Clothing distribution in Europe 1999-2005: market shares by retail format

Country	Year	Indep. stores	Specialty chains	Dep. & variety st.	Hyper and supermkts	Mail order	Others
Italy	1999 2005	55,7% 47,8%	14% 19,3%	- -	15% 18,4%	- -	15,3% 14,5%
France	2000 2005	24% 18,7%	34% 38,2%	6% 5,4%	16% 15,3%	8% 8,7%	12% 13,7%
Germany	2000 2005	39% 28%	26% 29%	13% 14%	8% 14%	14% 15%	- -
UK	1998 2003	11% 9%	25% 27,5%	31,5% 26,5%	10% 11,5%	8% 6%	14,5% 19,5%
Spain	1999 2005	43,1% 34%	18,9% 24%	15,8% 15%	14% 20%	1% 1%	7,2% 6%
Portugal	2000 2005	70% 75%	- -	3,6% 5%	12,5% 17%	2% 2%	11,9% 1%
Poland	2000 2006	45% 25%	38% 55%	4% 3%	10% 13%	3% 4%	- -
Hungary	2000 2003	35,1% 38,9%	- -	6% 5,5%	7,8% 9,8%	1,9% 1,6%	49,2% 44,2%

Source: *** *Business relations in the EU clothing chain: from industry to retail and distribution*, Bocconi University, ESSEC Business School, Baker & McKenzie, 2007, p. 29

Even so, comparing the percentages held by each retail format in 2000 (1999) to the ones in 2005, it is evident that some tendencies are common for several European markets, and can be considered the mirroring of a reconfiguration in the competition on the clothing goods retail market: a constant rise in the share held by hypermarkets and specialty stores to the detriment of store departments

The rise in the sales of clothing goods by hypermarkets was driven by the prices practiced and the discounts offered by them, which have recorded a much faster growth rate than other retail formats. In clothing goods retail, the drop in prices was also determined by the escalating competition, due to the removal of textile quotas.

Table no. 2. – The largest hypermarkets in Europe (total sales, food and non-food), in 2007

Pozitio in Europe	Pozition in top 250	Company	2007 retail sales (U.S.$ bilioane)	Country
1	2	Carrefour	112.6	France
2	3	Tesco	94.7	UK
3	4	Metro	87.6	Germany
4	7	Schwarz	69.3	Germany
5	10	Aldi	58.5	Germany
6	12	Rewe	51.9	Germany
7	14	Auchan	49.3	France
8	18	E. Leclerc	44.7	France
9	19	Edeka Zentrale	44.6	Germany
10	23	ITM (Intermarché)	40.7	France

Source: ****Feeling the squeeze Global Powers of Retailing 2009,* Deloitte Development LLC, 2009

Currently, hypermarkets are a danger to other garment retail formats for two main reasons:

- the share corresponding to clothing goods is growing;
- the share corresponding to private-label goods is growing.

The growing weight of these products is due to the fact that fresh and preserved foods show little variation in prices and it is difficult to create more added value to foods. Thus, hypermarkets are expanding their non-food sales, for increased profitability. Clothing goods are an important part of this approach, because they offer the highest profit margin (up to 20-25%, with an average of 15-18%). [7]
In Europe, for example, the Tesco store chain of Great Britain has been investing massively in garments and furniture since 2005. Another example is the French store chain Carrefour, which holds the highest share in clothing goods sales, thanks mainly to its own product line and brand, Tex. Private brands can be defined as exclusive products, available only at a particular store chain. The most notable thing about these brands is that they are not delimited geographically, and they are sold all across the European market. F&F, One Body, Elevation Show, Cherokee and Petite for Tesco, Tex and French Touch for Carrefour – are examples of retailers that succeeded over their competition.
A consequence of the constant growth of the market share held by the so-called “value retailers” is the expansion of the range of products sold by hypermarkets (for example underwear, knitwear, children’s clothing are found in all the retail formats) and private labels.

The main specialty store chains in Europe, and their evolution over the past few years, is shown in the following table:

Table no. 3. –The largest clothing specialty chains in Europe

Nr.	Company	Country	2007 retail sales (U.S.$mil)	5 yr retail sales CAGR% (local currency)
1	Inditex S.A.	Spain	12,929	20.1%
2	Hennes & Mauritz (H & M)	Sweden	11,559	11.5%
3	C&A Europe	Belgian	8,528	4.1%
4	Next plc	UK	6,227	8.4%
5	Deichmann Group	Germany	4,031	6.0%
6	Douglas Holding AG	Germany	3,989	6.1%
7	Arcadia Group Limited	UK	3,640	-1.3%

Source: ****Feeling the squeeze Global Powers of Retailing 2009,* Deloitte Development LLC, p. 5

One can see that, in most cases, there has been a significant increase in sales from 2002 to 2007, even if in some cases – such as those of Hennes & Mauritz (H&M) from Sweden and Inditex (Zara) of Spain – the offer was addressed to the same category of consumers.

Specialty literature suggests that this growth is due to the recent tendency shown by most specialty stores to 'verticalize' – to integrate the research and development needed for the production of the collections in their businesses. [8] Thus, specialty stores are taking over some of the functions traditionally held by the clothing industry – to the point where the term "retailers" will no longer be accurate in describing their activities.

The development of these vertical systems as part of the value chain of clothing goods is one of the most important changes that happened in the last decade to the clothing goods industry.

In many European countries, the store chains that adopted the vertical business model are capturing more and more of the market share held by the traditional players, like store departments and independent or family-owned stores. Indirectly, the proliferation of these chains is blocking access to the market for small and medium clothing goods producers, who rely on distributing their products through independent stores.

The unquestionable success of specialty store chains that are vertically developed seems to have pushed other players in the value chain – producers and retailers – to adopt business models based on similar concepts. These business models include different forms of risk and liability assumed by producers and retailers.

Recently, there has been talk of the so-called „fast fashion" strategy – a display of 5-6 collections per year instead of 2, limited, small productions, to inspire a sense of uniqueness and exclusivity to the consumer and to appeal to his desire to break out of the mundanity of the mass-market. [9] This strategy was adopted by specialty store managers, and is based on small orders, shorter product lifecycles and an increased efficiency of the supply chain which allows products to reach the store shelves faster. [10] European specialty stores that have adopted the „fast-fashion" model are reporting a rate of growth three – four times higher than the average rate of growth in the clothing goods industry as a whole – see the following table.

Table no. 4. - Total sales of fast fashion retailers: change from previous year (%)

	2001/ 2002	**2002/ 2003**	**2003/ 2004**	**2004/ 2005**	**2005/ 2006**	**2002/ 2007**
Hennes & Mauritz (H & M)	15%	6%	11%	14%	12%	11,5%
Inditex S.A.	22%	16%	23%	26%	22%	20,1%

Source: Annual Reports and Deloitte - *Feeling the squeeze Global Powers of Retailing 2009*

Consumers can choose to shop outside of stores as well, for a number of reasons: the store's positioning, its business hours or simply for lack of time to go shopping.

The development of these alternatives provided the consumers with more freedom. Some of the most popular forms of retail outside of stores are: electronic commerce, mail order, direct sales (such as door to door), open-air markets, or gas stations.

Electronic commerce or online sales of clothing goods and footwear are on an ascending trend, reaching 7.3 billion Euro in sales in 2007, this type of product being the second-best selling product in online sales. [11] This growth is explained by the ease with which consumers have access to products in fashion and the ability to order goods of any particular size and color. [12]

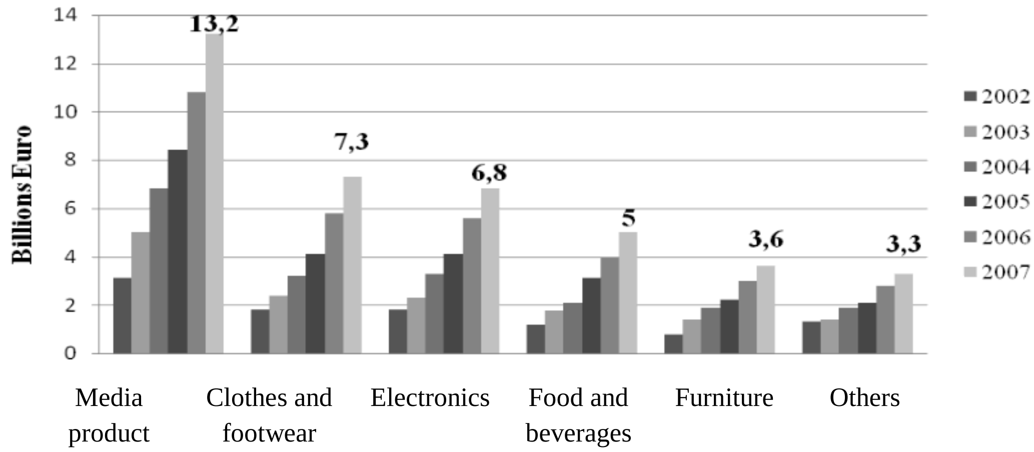

Fig. no. 1. - Online selling in UE, in 2002-2007

Also, according to FEDSA (the Federation of European Direct Selling Associations), in 2008, 3% of all clothing goods and accessories sales were direct sales.

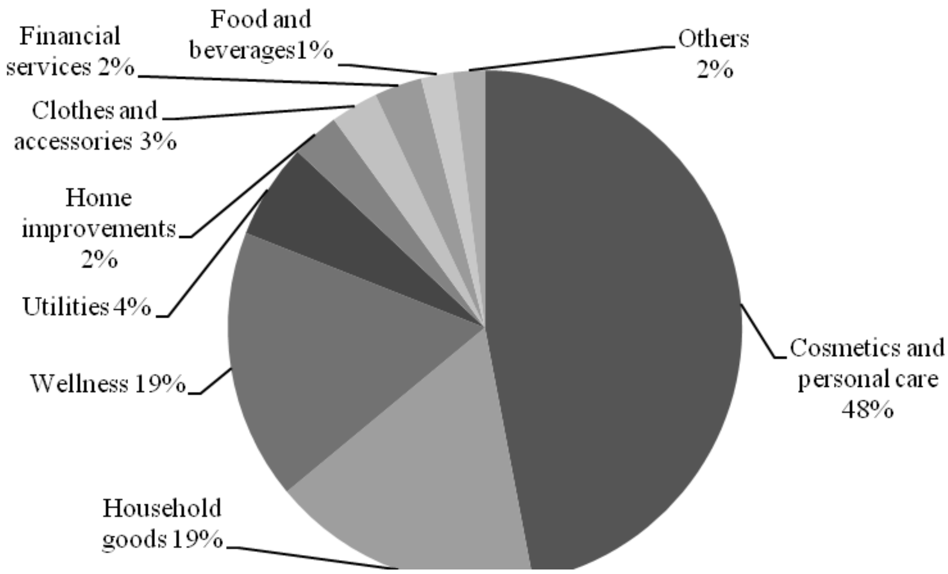

Fig. no. 2. – Direct selling, UE-27, in 2008 - % share of total value

Retailers, like La Redoute in France or Otto Versand in Germany, send products to their customers by mail. The buyer orders the desired goods over the phone or on an Internet site. Then, the products are usually delivered directly to the address provided by the customer, like a home address, or occasionally they may be delivered to a nearby location from where the customer can pick them up. This type of sale is an efficient way to send presents to someone at another location.

In 2008, in EU-27, the different forms of sales for clothing goods and footwear and the weight of each is shown in figure no. 3.

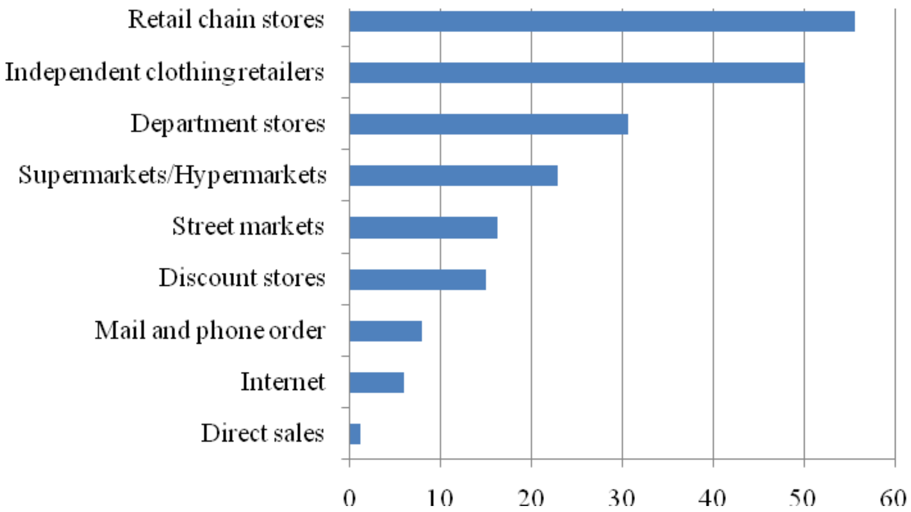

Fig. no. 3. - Different forms of sales for clothing goods and footwear and the weight of each in UE-27, in 2008

Source: data processing from *Consumers in Europe*, Office for Official Publications of the European Communities, 2009, p. 180

Everywhere in the world commerce in general and retail in particular has progressively become a very dynamic sector, the trade apparatus changing fundamentally on all levels: selling methods, supply chains, geographical distribution, enterprise management etc. It is apparent than this activity – retail – which is the last link in the chain that ties producers to consumers, is very sensitive and vulnerable to changes in the environment, but it's showing a remarkable capacity to adapt to new market conditions. [13]

3. CONCLUSIONS

The analysis of recent developments on the clothing goods market in the EU has led us to draw up a scenario as to how clothing goods might be sold in the future. From our point of view, spending on clothing items will evolve in two directions – specialty store chains and hypermarkets is one, and mono-brand luxury boutiques is the other. In this context, the survival of many small, independent stores will depend on their capacity to organize in small local store chains, to clearly position themselves on the market. Simultaneously, we forecast the development in all European countries of the outlet-type store – because this kind of stores offer known-brand products (sought after by many consumers, mainly because of their quality) at much lower prices compared to specialty stores and online stores (because currently time has a different value for most consumers).

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A COMPARATIVE STUDY CONCERNING THE POSSIBILITIES OF MINIMIZING OF POLUTION HAZARDS BY PHOTOCATALYTIC DEGRADATION OF TEXTILE DYEING WASTEWATER USING TITANIUM DIOXIDE AND ZINC OXIDE CONTAINED TEXTILE NANOCOMPOSITES

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Abstract: Our research was focused onto photodegradation of a real textile dyeing wastewater taken from a certain textile factory. Photocatalytic degradation was carried out over titanium dioxide and zinc oxide nanopowders contained fibrous substrates, under ultraviolet irradiation. Photodegradation percentage was followed spectrophometrically by the measurements of absorbance at kmax equal to 380 nm. The rate of photodegradation increased linearly with time of irradiation when titanium dioxide or zinc oxide was used. A maximum color removal of 86% was achieved after irradiation time of 2.5 hours when titanium dioxide used and 82% color reduction was observed when zinc oxide used for the same period.
Key words: Photocatalytic degradation, Titanium dioxide, Zinc oxide, UV light, Wastewater treatment, Textile industry

1. INTRODUCTION

In order to degrade organic pollutants in water to less harmful inorganic material, semiconductors is used [1]. There are a lot of researches carried out focusing on the decolorization of textile wastewater. Being a subject of major public health concern and scientific interest, the importance of these types of research has increased, recently.
Scientific literature [2] considered that the importance of color removal from wastewaters is often more important than the removal of other organic colorless chemicals. Due to its hazardous risks, the decolorization of effluent from textile dyeing and finishing industry was regarded extremely important [3].

Their good good photocatalytic properties, nominated titanium dioxide and zinc oxide to be promising substrates for photodegradation of water pollutants and show the appropriate activity in the range of solar radiation [4].
Recent studies aimed at the most important photocatalytic applications of titanium dioxide and zinc oxide. There have been reported, recently, the wide applications of titanium dioxide [5], meaning photodegradation of various pollutants [6 - 10], killing bacteria [11] and killing tumor cell in cancer treatments [12-13].

There are some benefits of the decolorization of textile industrial wastewater, including:

- Saving a huge amount of water, because textile industries are regarded as chemical intensive and water intensive [14], *i.e.* this type of industry is more pollutants and consumes a huge amount of water. The treated water may be recycled in the same factory or reused in other applications such as other industries or agriculture that require a less quality water. This is considered to be very excellent means for saving huge amounts of water, especially, in the countries which are suffered with water deficiency

The present work reports an investigation of photocatalytic decolorization of real textile wastewater of a Romanian textile company using TiO_2, and ZnO contained fibrous supports as photocatalysts with irradiation with UV-light.

2. EXPERIMENTAL

2.1 Materials and methods

In our research titanium dioxide form and zinc oxide nanopowders were synthesized in laboratory. Subsequently the nano-oxides were applied on linen fibrous substrates, using immersion method.

Afterwards 150 mg of titanium dioxide or zinc oxide contained nanocomposites are suspended in 30 cm^3 of the real textile dyeing wastewater which is placed in a photoreaction cell. The real textile wastewater was filtered to remove suspended particles the solution in the cell is kept homogeneous by stirring with magnetic stirrer.

The cell is fitted with ultraviolet radiation from a low pressure mercury lamp. A schematic representation of the reactor is shown in Figure 1.

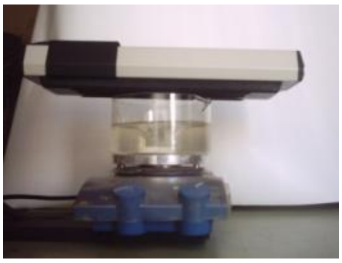

Fig. 1. Schematic diagram of the experimental apparatus for photocatalytic reaction.

Gradually, 2 cm^3 of irradiated samples were withdrawn by microsyringe and centrifuged to separate the solid catalyst and the absorbance of the supernatant liquid is measured at λ=380 nm using an UV-Visible Spectrophotometer. The absorbance at a given time was compared with a calibration curve. The calibrating plot was obtained by using a known percentage of colored real textile wastewater.

3. RESULTS AND DISCUSSIONS

Real wastewater from the dyeing process was effectively decolorized using titanium dioxide and zinc oxide contained fibrous substrates. The percentages of decolorization was achieved about 96 % by using TiO_2 and 82 % by using ZnO, under optimal conditions, the extent of. Figure 2 shows that photodecolorization of real textile industrial wastewater is directly proportional with the time of irradiation; $TiO_{2\ \text{fibrous nanocomposites}}$ were found more active than the one containg ZnO.

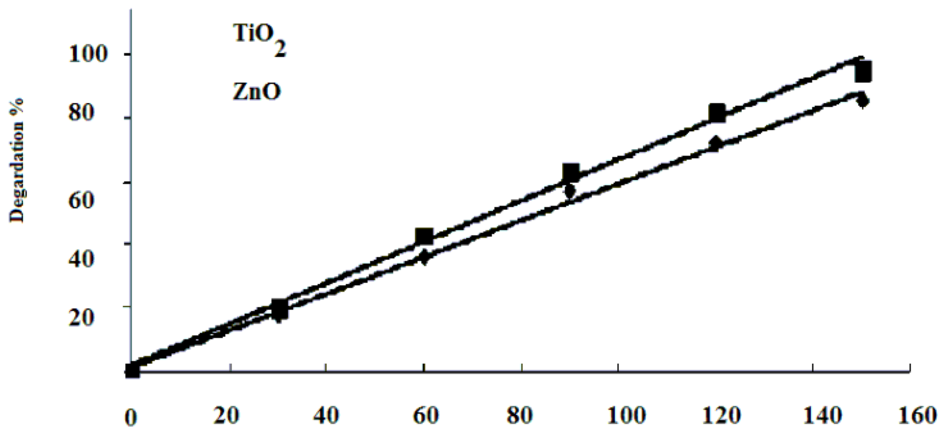

Fig. 2: Photocatalytic degaradation of textile industrial wastewater on titanium oxide and zinc oxide contained nanocomposites

A schematic representation for photo catalytic degradation of dye by U.V. radiation and/or visible radiation is shown in Figure. There are two different pathways followed in photodecolorization processes. The first pathway, where U.V irradiation is used in the photocatalytic reaction, electrons in the semiconductor are excited from the valence band to the conduction band leaving positive holes in the valance band. The electrons in the conduction band react with the adsorbed oxygen molecules to form O_2^- species, while the positive holes react with the adrsobed hydroxyl ions to form hydroxyl radicals. These processes could be represented in the following equations.

TiO_2 or ZnO + hv (energy > 3.2 e v) — e^- + h+ **(1)**

$e^- + O_{2\,(ads)} = {}^{\bullet}O_2^{-}{}_{(ads)}$ **(2)**

$h^+ + OH^-_{s} = {}^{\bullet}OH_{(s)}$ **(3)**

The highly reactive hydroxyl radicals oxidize the dye molecules as follows:

$^{\bullet}$OH + dye -------- ► degradation **(4)**

The occurrence of a photosensitization process is noticed in the second pathway where a solar radiation is used. In this process, the sensitizer (the dye) absorbs radiation in the visible range to yield an excited state of the sensitizer. The dye radicals inject electrons to the conduction band of the TiO_2 or ZnO and convert to dye' +. The electron transfer from the excited dye molecule to the conduction band of TiO_2 usually is too fast (in the range of tens of femtoseconds)[1718]. The formed species oxidize the dye molecules, as follows:

dye + visible light-----► dye$^{\bullet}$ **(5)**

dye + semiconductor-----► dye$^{\bullet+}$ + e^- (to CB) **(6)**

The formed dye$^{\bullet+}$ radical ions acts react with dye molecules in the same way of the reaction of hydroxyl radicals.

dye$^{\bullet+}$ + dye -----► degradation

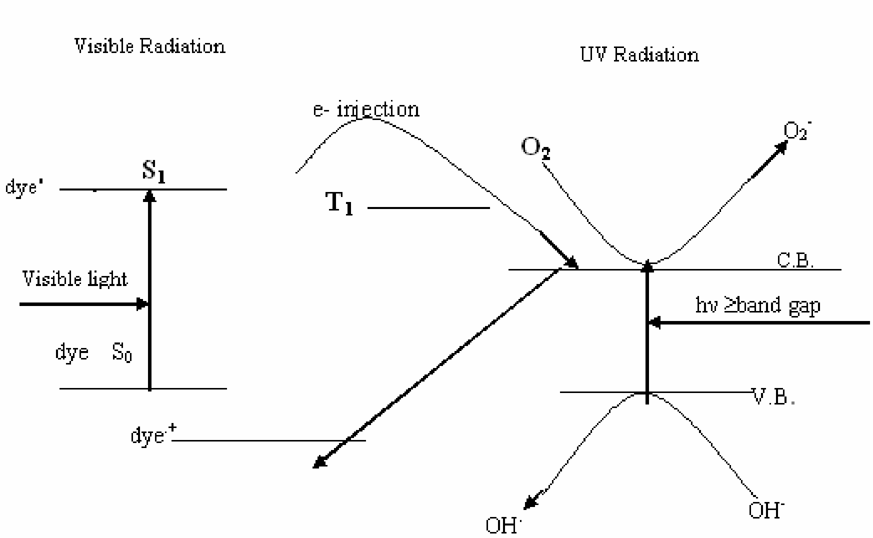

Figure 3. Schematic diagram for photocatalytic degradation of dye by U.V. radiation and/ or visible radiation reactions

4. CONCLUSIONS AND PERSPECTIVES

Titainum dioxide and zinc oxide contained fibrous nanocomposites could be used powerfully in photocatalytic degradation of textile industrial wastewater, where the extent of decolorization was achieved about 76 % by using TiO_2 and 72 % by using ZnO after 2.5 hours of irradiations.

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