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THE BODY TYPES CLASSIFICATION USED FOR E-SHOP

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Abstract: This work presents the benefits of using the body type classification in the virtual environment. The body segmentation objective is to find the best parameters that could characterize the body shape. The parameters are obtained by horizontal segmentation and are perimeters of the body. This morphotype classification is useful to shrink the body shape search area that could correspond to a real body. For 3D garment simulation on the virtual shop is important to have the 3D body (morphotype) perfectly appropriate to the buyer's body.
Key words: 3D body, morphotype, virtual, garment, segmentation, classification.

1. INTRODUCTION

The body shape classification method use a valid body's database [4]. It is necessary to have the parameters like chest, waist and hip that are determinant of the body shape form. Another scope is to identify the shape of the morphology type and to analyze with a simple geometrical method.

Many morphological types have been proposed by anthropologists. Different body shapes are prevalent in the human population like normal shape, rectangle, pyramid, inverse - pyramid, hourglass. The research is starts by using a sample database of 25 persons. The classification of the population is based in different parameters that can generate the different shapes. For that it is necessary to know the parameters of waist, hip, chest shape circumference, which is obtained by dividing the body with a horizontal plane remotely located ground-level point for hip, waist or chest position.

The difficulty for defining the boundaries for the morphotype may be attributed to the following reasons:

- Very diverse human population;
- Various human races bear different proportions;
- Lack of exhaustive compiled anthropometric data;
- Many possibilities or standards of classification.

2. THE BODY SHAPE SEGMENTATION PROCESS

For body shape morphotype classification, the body has to be horizontal segmented with a plane on the hip, waist and chest region (figure 1, 2, 3). This segmentation is doing by the software ScanWorX. This software is generating the .html file that contains all measurement that is required for body shape classification.

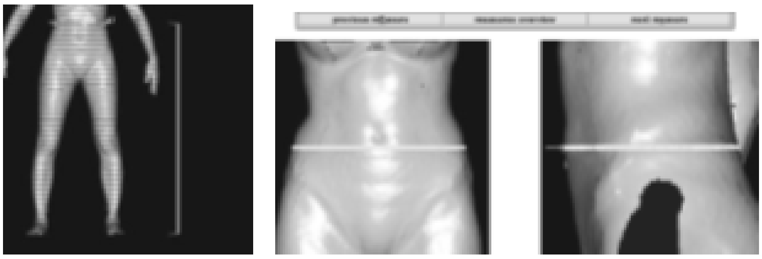

Fig. 1: Waist segmentation

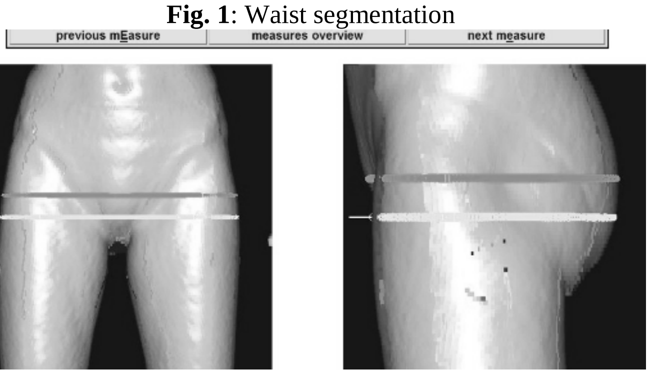

Fig. 2: Hip segmentation

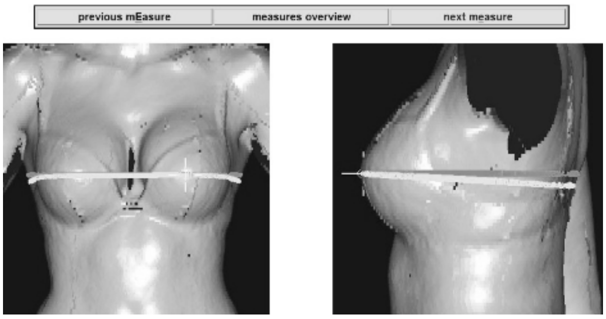

Fig. 3: Chest segmentation

3. THE BODY SHAPE OPTIMIZATION

For optimizing the body obtained from 3D Vitus scanner [5] it must use the images captured from all cameras. The second action is to align all scan images obtained. For garment simulation is necessary to have a valid body surface and it must filling holes that appear in the body mesh surface (figure 4).

The body capture from cameras it can create a full 3D image of the human body (figure 5), that still present different noises, holes.

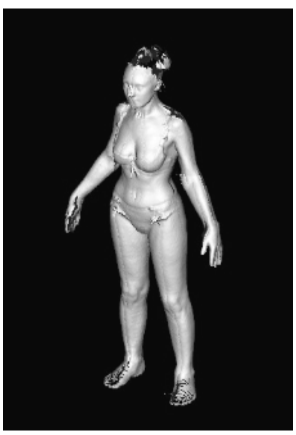

Fig. 4: Human body capture from 3D scanner

The perfect body shape validation is required to fill the holes, the 3D body redesign (figure 6). To improve the 3D body surface we can use the global remesh to retriangulate the faces [2].

At first we should edit the boundary and add the bridges to fill the holes and after the “noises” must be removed and optimized mesh data by using the re-triangulation or the decimate process [1]. By using rapidform solution it is possible to go from 3D scan data to a fully parametric CAD model.

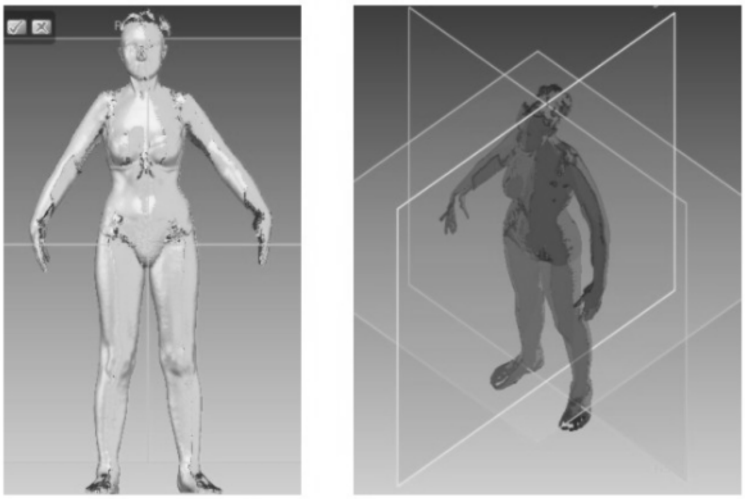

Fig. 5: Body capture – presenting noises areas

The perfect body shape validation is required to fill the holes, the 3D body redesign (figure 6). To improve the 3D body surface we can use the global remesh to retriangulate the faces [2].
At first we should edit the boundary and add the bridges to fill the holes and after the “noises” must be removed and optimized mesh data by using the re-triangulation or the decimate process [1]. By using rapidform solution it is possible to go from 3D scan data to a fully parametric CAD model.

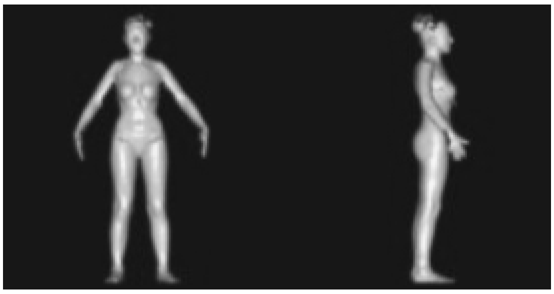

Fig. 6: Body shape redesign

4. THE BODY SHAPE CLASSIFICATION

The body shape classification goal is to divide the research body population area into different classes defined by names and attributes (figure 7). The classes’ names refers to the body shape like : normal shape, rectangle, pyramid, inverse - pyramid, hourglass. The classes’ attributes are the perimeters size for chest, waist and hip girth.

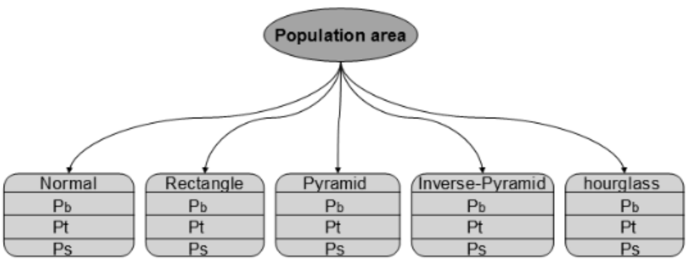

Fig. 7: Body classification

For shape classification it was developed an application that recognizes body shape reported in a normal body shape. The body scan comes with a protocol file that contains the parameters measured after intersection with the cutting plane [3].

The hip, chest, waist girth is the perimeters size given by the shape resulting from intersection horizontal plane – body.

By comparing parameters (figure 8) like chest, waist and hip girth, the algorithm gives the similar shape of the body represented by its parameters.

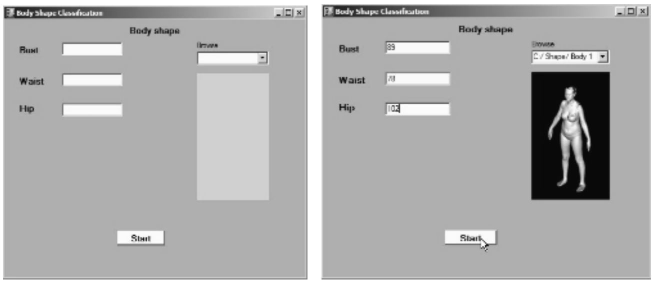

Fig. 8: Body shape parameters [3]

After comparing the three parameters, bust, waist and hips (figure 7), are evaluated and displayed as the result – the shape which belongs to the body (figure 9). To identify the body shape it will take account of the relationship waist / hip, bust / waist, torso / hip [3].

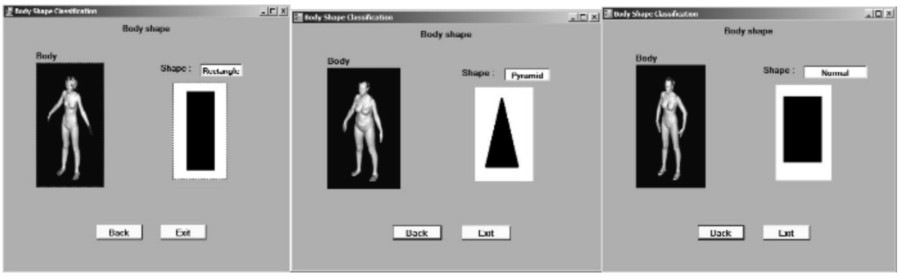

Fig. 9: Body shape identification [3]

5. CONCLUSIONS

The body shape classification advantages are:

- the selection of the perfect garment fit on the virtuak body, if the buyer knows whose morphotype belongs;
- quick classification of thousands of bodies;
- afisare, cautare rapida;
- time economy;
- Virtual store integration.

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QUALITY MANAGER RESPONSIBILITIES IN THE IMPLEMENTATION OF QUALITY STANDARDS

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Abstract: For an organization to achieve success in its work, should benefit from an inter-managerial approach, to implement and develop a management system directed towards continuous improvement. To achieve this objective, it is necessary to respect some conditions: defining systems and processes that need improvement, efficient and effective control processes and provides customer feedback indicators that characterize the organization, ensuring availability of resources, constant monitoring and review processes.
Key words: quality, quality management, manager, responsibility.

1. IMPLEMENTATION OF QUALITY MANAGEMENT

Implementation of quality management requires substantive steps [5], observing a certain order, depending on the optimal time for starting the activities.

Obtaining a commitment to change is the starting point, which consists of a general analysis of the organization and the transformation they require the management team. Based on this analysis, the initial commitment will be achieved.

2. HIRING MANAGEMENT IN QUALITY MANAGEMENT SYSTEM

Hiring management in developing effective quality management system is essential. Management's commitment is expressed in the policy statement by the company in quality management and disclosed to the organization through training and carefully maintained by its display in every department. Management at the highest level established quality policy and quality objectives by promoting them to increase awareness, motivation and involvement of all employees.

An important role of management is targeting the entire organization to ensure customer satisfaction and to implement appropriate processes to facilitate their meeting. Evaluating the achievement of the objectives is achieved through periodic reviews by management, which allows not only passive evaluation of information's, but required appropriate targets for assessing the scope of our business.

Quality Policy must meet the following objectives:

- needs to be adequate for the organization needs and its clients with the vision of the future organization;
- Includes the Director General's commitment to meet customer requirements and improve continuous effectiveness of quality management;
- Provides framework for setting its objectives and analysis;
- Is communicated and understood throughout the organization;
- It is always appropriate to be analyzed.

3. OBJECTIVES IN QUALITY

In quality objectives are conformable with quality policy and with the commitment to continuous improvement of performance, taking into account the findings of management analysis, the results and stakeholder satisfaction.

The set targets were expressed in quantifiable targets indicators enabling the progress of periodic evaluation by analysis of quality management system.

4. THE RESPONSIBILITY FOR QUALITY MANAGEMENT

Director General defines the organizational structure and personnel resources within this structure, called a representative for quality management and establishing its jurisdiction, determines the allocation of economic resources (material and human) for the quality needed to implement the policy adopted in quality.

Director General creates a work environment that encourages involvement and increase the professional staff, establishes measures for quality management and organizational quality management system functioning.

Management organization contributes to continuous improvement and achieving its policy organization, creates a positive attitude and aims to improve the processes.

5. QUALITY MANAGER RESPONSIBILITY

• ensure that processes needed for quality management system are established, implemented and maintained;

• provide information and data generation and collection, which form the basis for discussions of knowledge management analysis, including needs for improvement;

• ensure there is consciousness of quality in different functional areas of the organization;

• resolve issues related to quality of products and services and management system;

• ensure that the organization promoted awareness of customer requirements;

• ensure that risks to occupational health and safety and security of information are analyzed and evaluated at fixed intervals of time;

• maintain relationships with external parts in areas related to integrated management system;

• perform routine maintenance of supplied computers and when the situation requires an early operation will require overhaul;

• verify that all data on ensuring availability, confidentiality and integrity of commercial information to be protected;

• coordinate the development, distribution / removal, updating documents in a controlled SMI manner;

• coordinate and verify the maintenance of all quality records as objective evidence for internal purposes and empower customer demonstration / implementation and certification bodies for the functioning of information management system;

• coordinate the implementation of quality policy, occupational health and safety, security information defined by the Director General, verified by internal audits and other appropriate means of maintaining and continuous improvement of information management system implemented in the firm;

• scheduled internal audits and verifies completion of all actions of carrying out such audits;

• identify all the problems concerning the quality of products / services and quality management system status;

• identify internal training needs of staff in quality management and conduct / coordinate the conduct of such training;

• represent the company in quality problems in relations with suppliers, beneficiaries and non-governmental organizations involved with the certification of quality management system;

6. CONCLUSIONS

Continuous improvement of products offered by the organization is possible only if the processes system of the organization is constantly adapting to a changing environment imposed by both internally and externally. For that to work is necessary to promote measures: identification and assessment of departments that need improvement, promotion of prevention activities, the concern of staff to be focused on continuous improvement of processes and products, training of personnel in specific techniques and tools for quality management knowledge and use their staff to achieve the objectives of the assessment results to improve processes and products.

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CONSTRAINTS OF IMPLEMENTING BEZIER CURVES WHEN DEVELOPING FOOTWEAR DESIGN DEDICATED SOFTWARE

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Abstract: Bezier curves are used in shoe design applications for encoding the shoe parts contour. This paper presents different approaches for defining the Bezier curve, and when is recomanded one method or another, depending on the intended purpose. Also, here is presented a method for rendering the sPline interpolation based on the restrictive Bezier curve series, In the final chapters, all theoretical concepts are illustrated through a practical example of digitizing a shoe last and obtaining the digital contour of the last. Even more, the tools dedicated for curves drawing are managed inside a parametrial drawing routine to generate custom footwear design. This custom type footwear design is the only one of his kind, that is able to create a footwear family in less than few minutes. By appling the base rules of shoe design and using the fundamental concepts of Bezier curves rendering, the parametrical draw tool is able of modelling all footwear parts with minimum user interfere. and exporting them for gradind and parts detailing.
Key words: bezier curves, render, parametrical shoe design

1. BEZIER CURVES AND DIGITAL GEOMETRY

All specialized CAD applications have interactive tools that allows the user to manipulate the virtual objects from the canvas (*the drawing*). Even if some softwares are custom build for technical use, there are common parts that they share between each other. Generally, there are two types of CAD applications : *planar* and *dimensional*, or 2D and 3D.

Modeling inside this softwares is resumed to building and displaying objects, that are rendered on the screen through the laws of planar geometry or projections, when working inside a tridimesional virtual space.

The digital geometry is responsable for implementing the laws of geometry inside the computer software.

Bezier curves have appeared because of the need to create self-turning contours, or shapes.

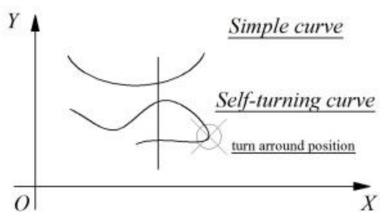

Fig. 1: Ilustration of a simple curve and of a self-turning curve

When drawing a curve inside an XOY axis system, that curve is considerer to be *simple*, if a paralel at OY intersects the curve in only one point, or none, through all it's domain. Otherwise, if there are more then 2 point, that curve is considered a *self-turning* one. The *turn arround position* is a point on this last type of curve, where the scroll direction of OX axis changes. [6]

Initially, this type of curves were rendered by finding the *turn arround position* and dividing the trajectory in simple curves. By this method, the turn arround position becames a *break position*. The problem with this solution was that each time that the image was rendered in a different XOY axis system, the turn arround position was changing, so there were needed extra routines for finding then new break position(s), and so, there was a *lost in the accuracy* of the application.

Bezier curves had been used to avoid this situation. They are defined parametrical, or by interpolation. Even if the final result is the same, there are several ways of defining a bezier curve, because of the different approaches through time.

1.1. Cubic Bezier Curves - Terminologies

A bezier curve is defined by :

- 2 head-end points (or positions) [A,B]- *this are the fizical points, between which the curve will be rendered*;
- 2 vectorial points [A',B']- *because through two points can be drawn an infinity of curves, with this vectorial points is defined an exact trajectory*.

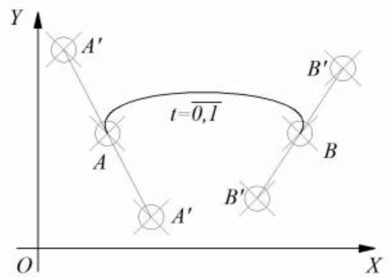

Fig. 2: Example of a Bezier Curve

(*) The *A'* and *B'* points may be symmetrical about the head-end points, depending of the defining mathematical formula.
(*) the *t* parameter knows values within the [0,1] range, and the extrem values are coresponding on the curve with the head-end points.

1.2. Cubic Bezier Curves - defining mathematical formulas

1.2.1. 3rd degree equations - analytical method

This type of equations describes the evolution of the curve among the axis of the XOY system.

Considering ***t=[0,1]***, the head-end points ***A(x1,y1), B(x2,y2)***, and the vectorial points ***P1(p1x, p1y)*** and ***P2(p2x, p2y)***, (just noted ***A'*** and ***B'***) , there can be considered two 3rd degree equations that describes the coordinates for each position (each value of ***t=[0,1]***).

For example, the coordinates of a point ***P(px,py)*** on the curve coresponding to a value of ***t=0.5***, are calculated by a substitute of the ***t*** value inside this 3rd degree equations.
The general 3rd degree equation is [2] :

$$f(x) = ax^3 + bx^2 + cx + d \tag{1}$$

For legibility, we will substitute the unknown ***x*** with ***v***, and so, we can consider the two 3rd degree equations that will describe the evolution of the bezier curve among the axis, as follows :

$$\begin{cases} f_x(v) = a_x v^3 + b_x v^2 + c_x v + d_x \\ f_y(v) = a_y v^3 + b_y v^2 + c_y v + d_y \end{cases} \tag{2}$$

The value of the above coefficients are :

$$\begin{cases} \begin{cases} d_x = x_1 \\ d_y = y_1 \end{cases} \\ \begin{cases} c_x = m(x_1 - p1_x) \\ c_y = m(y_1 - p1_y) \end{cases} \\ \begin{cases} b_x = -(x_2(m-3) + x_1(3+2m) - 2mp1_x - mp2_x) \\ b_y = -(y_2(m-3) + y_1(3+2m) - 2mp1_y - mp2_y) \end{cases} \\ \begin{cases} a_x = x_2 - (b_x + c_x + d_x) \\ a_y = y_2 - (b_y + c_y + d_y) \end{cases} \end{cases} \tag{3}$$

The ***m*** parameter is considered a shape factor. The recomanded value for ***m*** is ***3***.

1.2.2. Polynomial equations - analytical method

The polynomial equations are more reliable for using in digital geometry, because their expression is simpler and so, they are recomanded for implementing.
The polynomial equations is :

$$P(t,a,b,c,d) = (1-t)^3 a + 3(1-t)t(b(1-t)+ct) + t^3 d \quad \textbf{(4)}$$

Considering the head-end points ***P0(p0x,p0y), P3(p3x,p3y)***, (just noted ***A*** and ***B***) ,and the vectorial points ***P1(p1x, p1y)*** and ***P2(p2x, p2y)***, (just noted ***A'*** and ***B'***).

The expresion can be called for any ***t*** within ***[0,1]***, and the result will be a coordinate, on X or Y axis. For example :

P(t=0.5)=P(p$_x$,p$_y$)=(P[0.5, p0x, p1x, p2x, p3x], P([0.5, p0y, p1y, p2y, p3y]). **(5)**

(*) These methods allow finding the exact value for an given ***t***, but the precision is low when the formulas are used for calculating local directions (*tangents and normals*). That's why there was needed a new method for defining the Bezier curve : the geometrical (mechanical) methods.

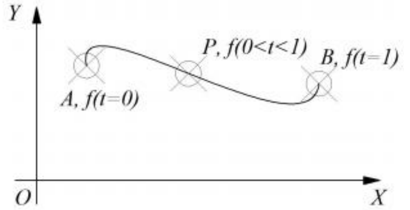

Fig. 3: Analytical calculation of the discrete positions

1.2.3. de Casteljau interpolation - mechanical method

This method is based on *linear interpolation*.

Considering **t=[0,1]** and two limit values, $\mathbf{lv_1}$ and $\mathbf{lv_2}$, the linear interpolation expression is :

$$f(t, lv_1, lv_2) = lv_1 + t(lv_2 - lv_1) \quad \textbf{(6)}$$

This formula can be integrated in planar geometry for finding an *procentual position* - ***P*** between two points (***A*** and ***B***).

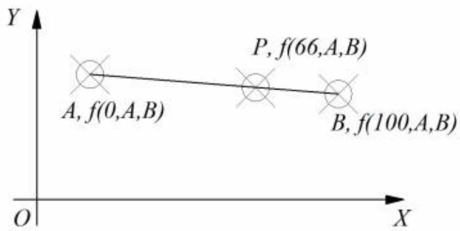

Fig. 4: Geometric application of the linear interpolation

P(px,py)=P(f [T,Ax,Bx] ,f [T,Ay,By]), where ***T = [0,100] % = 100t*** **(7)**

The *de Casteljau interpolation* involves using a row of interpolations for finding the discrete positions. [4]

Considering ***t=[0,1]***, the steps for finding Q***(t=0.5)*** e.g., are :

- the linear interpolation is applied to the outer polygon (AA'B'B) for finding the 1st series of points (M,N,P) :

$$\begin{cases} M(M_X, M_Y) = f(t, A, A') \\ N(N_X, N_Y) = f(t, A', B') \\ P(P_X, P_Y) = f(t, B', B) \end{cases} \quad \textbf{(8)}$$

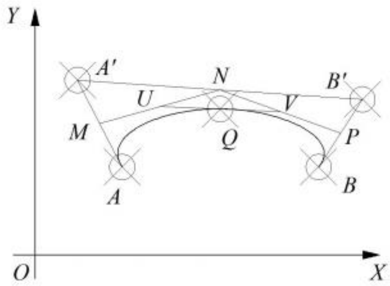

Fig. 5: Mechanical calculation of the discrete positions (de Casteljau interpolation)

- the segments determined by then new series of points are interpolated to find the 2nd series of points (U,V);
- finally, ***Q=f(t,U,V)*** **(9)**

(*) after each interpolation, the number of points decreases by 1, and so, the process continues until only one point remains.

(*) this method is not recomanded for implementing, because all six interpolations compute slower than the analytical equations, so it is rather to use *de Casteljau* for local directions, because the final segment ***UV*** is tangent to the Bezier curve.

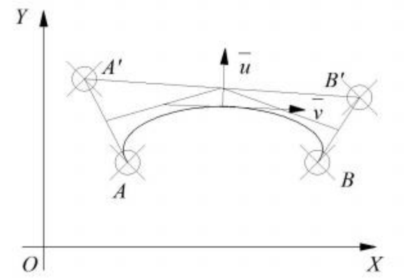

Fig. 6: *de Casteljau interpolation* provides the exact value for the local directions (normal and tangent)

2. ENCODING THE CONTOUR OF FLAT SHOES PARTS WITH SPLINE INTERPOLATION

When developing new models of footwear or editing existing ones is necesarry to load or create the desired model inside on the virtual canvas of the software. Within the work session is necessary to draw the contour of the footwear as needed. Sometimes parts of shoes or media copy of the last are imported from digitizing hardware. Mostly, their outer contour is rounded, but cannot be described by aproximation with circle or ellipses arches, but with sPlines.

Encoding the contour of shoes parts includes the following stages :

- digitizing the real contour through specialized hardware equipment;
- converting the data from the hardware to a specific file format for the software application;
- interpolating the points cloud with sPlines.

2.1. Reducing the "points cloud" with regression algorithms

The hardware used for digitizing generates a lot of points, that are grouped like a *cloud* (when the digitized object is planar) or like a *smoke* (when the digitized object is tridimensional).
It is necessary to keep only the points that fit the best arround the real object, and eliminate the extra points, that can be considered *parazite positions*. [3]

When difitizing planar parts, the final result is a matrix, containing preferential points inside. The dimension of the elementar field of the matrix is equal with the digitizing precision (scanning resolution). The precision is generally equal among both axis : ***dx=dy***.
By applying regression algorithms, the points cloud is reduced to a poligon, and the initial set of points are converted to vertices of the regression poligon. The lenght of the polygon sides can be imposed. The value for this lenght affects the fidelity of the final poligon to the real digitized object. Also, another imposed value reflects the maximal distance between a point from the *points cloud* and the theoretical line.The recomanded value is ***1.41*** ($\sqrt{2}$). Using higer values decreasses the accuracy of the algorithm, while lower values decreasses the performance of the computing machine.

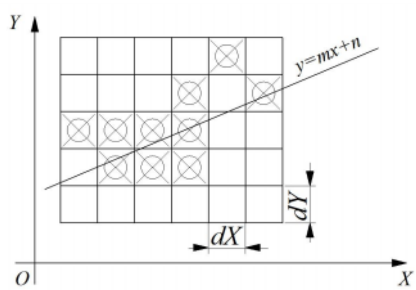

Fig. 7: Linear regression for approximating the *points cloud* generated by the digitizing hardware.

Fidelity classes

In some cases can be definded an *altered fidelity*, by decreasing the resolution of the *points cloud* (by enlarging the ***dx*** and ***dy*** dimensions of matrix). This is recomanded when the initial resolution is higher than the needed one. For example, if the sufficient precision for designing is 0.1mm, but the scanning resolution is 300 dpi=0.085 mm/point, the *correction coefficient* will be :

K=0.085/0.1=0.85 (85%) - So, an initial resolution of (300x85)%=255 dpi will be more than enough.

(*) Each fidelity class has one exact value for the *correction coefficient*, depending on the initial and the sufficient resolution.

2.2. sPline interpolation through the vertices of the regression polygon

Interpolating the vertices with a sPline means drawing a curve through them all. sPline curves are a sequence of Bezier lines, that are subject to some particular restrictions.

Interpolating the vertices with a sPline means drawing a curve through them all. sPline
Considering the vertices $P_i(x_i,y_i)$, $i=[1,n]$, there will be for each subinterval an associated Bezier curve $F_i(x)=A_ix^3+B_ix^2+C_ix+D_i$, $i=[1,n-1]$. The value for the coefficients (A_i, B_i, C_i, D_i) can be determined from the restrictions applied to the vertices. [1]
In each vertes $F_i(x)=yi$, ***or*** $P_i(x_i,y_i) = P_i(x_i, F_i(x))$. **(10)**
Because $F_i(x)$ is a 3rd degree equation, the 2nd order derivative has a linear form :

Fig. 8: Detail of sPline interpolation through a poly-line

$$\frac{F_i''(x)-F_i''(x_i)}{x-x_i}=\frac{F_i''(x_{i+1})-F_i''(x_i)}{x_{i+1}-x_i}\Rightarrow F_i''(x)=\frac{F_i''(x_{i+1})(x-x_i)+F_i''(x_i)(x_{i+1}-x)}{h_i} \quad \textbf{(11)}$$

Where $h_i = x_{i+1} - x_i$. **(12)**

By double integration the following equations are obtained :

$$F_i'(x)=\frac{F_i''(x_{i+1})(x-x_i)^2-F_i''(x_i)(x_{i+1}-x)^2}{2h_i}+C_i' \quad \textbf{(13)}$$

$$F_i(x)=\frac{F_i''(x_{i+1})(x-x_i)^3+F_i''(x_i)(x_{i+1}-x)^3}{6h_i}+C_i'x+C_i'' \quad \textbf{(14)}$$

The integration constants C_i' and C_i'' can be determined by introducing (10) in (14) :

$$\begin{cases}\dfrac{F_i''(x_i)h_i^2}{6}+C_i'x_i+C_i''=y_i\\[2ex]\dfrac{F_i''(x_{i+1})h_i^2}{6}+C_i'x_{i+1}+C_i''=y_{i+1}\end{cases}\Rightarrow\begin{cases}C_i'=\dfrac{y_{i+1}-y_i}{h_i}-\dfrac{(F_i''(x_{i+1})-F_i''(x_i))h_i}{6}\\[2ex]C_i''=\dfrac{x_{i+1}y_i-x_iy_{i+1}}{h_i}+\dfrac{(x_iF_i''(x_{i+1})-x_{i+1}F_i''(x_i))h_i}{6}\end{cases} \quad \textbf{(15)}$$

From (14) and (15) it's possible to determine the initial value for the coefficients (A_i, B_i, C_i, D_i) :

$$\begin{cases} A_i = \dfrac{F_i''(x_{i+1}) - F_i''(x_i)}{6h_i} \\ B_i = \dfrac{x_{i+1}F_i''(x_i) - x_i F_i''(x_{i+1})}{2h_i} \\ C_i = \dfrac{x_i^2 F_i''(x_{i+1}) - x_{i+1}^2 F_i''(x_i)}{2h_i} + \dfrac{y_{i+1} - y_i}{h_i} - A_i h_i^2 \\ D_i = \dfrac{x_{i+1}^3 F_i''(x_i) - x_i^3 F_i''(x_{i+1})}{6h_i} + \dfrac{y_i x_{i+1} - y_{i+1} x_i}{h_i} - \dfrac{B_i h_i^2}{3} \end{cases} \quad \textbf{(16)}$$

2.3. Example of last contour encoding using sPline interpolation

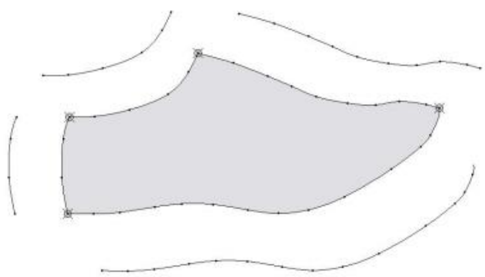

Fig. Last contour encoding with sPline curves

Before interpolating, the contour is divided in 4 parts, as specified with points in the figure above. It is important to interpolare independently this parts, because the contour is not continuous arround this positions. Once the average copy of the foot is digitized, there is needed to specify the positions of this 4 point manually. The interpolation process is instantaneous (*under 30 milliseconds*). [5]

Table 1: Coordinates of the interpolated Bezier curves

-	P0		P1		P2		P3	
	X	**Y**	**X**	**Y**	**X**	**Y**	**X**	**Y**
1	-438.27	42.67	-420.21	42.15	-402.15	41.63	-379.59	43.71
2	-379.59	43.71	-357.02	45.78	-329.94	50.46	-298.78	58.87
3	-298.78	58.87	-267.61	67.27	-232.36	79.41	-208.07	95.26
-	-	-	-	-	-	-	-	-
...	23.98	136.96	46.68	127.76	62.60	121.30	79.85	113.46

3. CONCLUSIONS

The Bezier curves for shoes parts contour encoding can be generated *automatically*, when the flat digitized objects must be imported on the application canvas, or can be used for *parametric drawing*, when certain types of footwear are generated only from the last medium copy.

Parametrical drawing is a custom shoe type design tool, that can generate in an instant a family of models, from only one last. This type of rendering uses Bezier

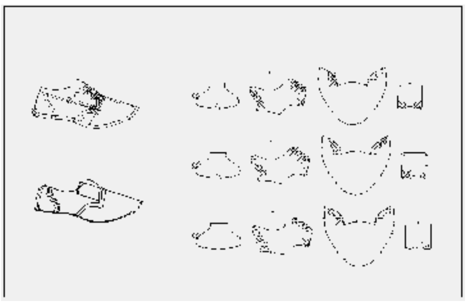

Fig. 10: *Parametric drawing* – obtaining *automatically* the base design, graduation and parts detailing from the last medium copy, in less than 1 minute.

curves for contout encoding and is the only one of this kind capable of obtaining the base design with minimum user interfere.

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THE RAPPORT OF CLOTHING'S PRODUCTS PROPORTIONS AND HUMAN BODY

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Abstract: The use of the effectuated studies in the domain of anthropometry sustains a fundamental element in the constructive design of clothing. The dimensions of the human body are used for particular characterization, as well as for establishing vital statistics upon the physiological evolution of mankind. The measurements ascertain the anthropometrical points on which it can be established usefull proportions in many areas of activity.In the current paper the authour studied the projection of clothing , discovering a proportioning method relyed on anthropometrical points.
Key words: : points, proportions , projection , anthropometrism, design

1. INTRODUCTION

Nowdays, the textile production has an important role in the mass consumption's sphere, on which it can be identified an active process of generating new production structures .Various firms, factories and companies have fulfilled clothes for the wide public, as well as for paticular purpose(miliraty equipments, uniforms and other) , certifying the existence of many specialized workshops that execute individual oders.The series production itself, along the retail market's requirements has entailed an advanced technology in the companies,the producers's attention was concentrated on making high quality products. These aspects have determined the use of a high qualifyed personnel for using the new technology, also to quicken creating .The harsh competition of this specific domain of clothing design strongly requires a high level criteria of the products , because of the many specialists that work in designing , engineering, chemistry, anthropometry.The character of the produsctis is diversified depending on their destination , the primary level in designing is to analyse the anthropometrical data base , the technic, aesthetic,qualitative details.The series production depends a lot on the fashion's fluctuations , reaction that impower designers in establishing their own production rhythm and the entire aspect af the clothes.The variety of clothing products is always diversifying owing to the new types of materials, technologies and , implicitly, modern aesthetic criteria.

2. THE DESIGN OF CLOTHING PRODUCTS BASED ON ANTHROPOMETRICAL POINTS

2.1 The proportioning of clothing on human figure (11 pt, bold)

The human figure has always been the main study object for different sciences, ever since ancient times . Over the decades these studies diversifyedin the rhythm of human society's evolution. The anthropometry science , as a branch of anthropology, beside anatomy and the proportion study, offers a substantial volume of knowledge in regarding the physiological evolution of human body.Its dimentions are used for individual characterisation , as well as for establishing statistics on the human race's evolution, classifyed on age and geographical sections.the measurements effectuated determine anthropometrical points on which it can be established usefull proportions in vaious domains of work. Understanding that these points mark the extremities of the muscles and of the articulations, using the anthropometrical studies consists a fundamental element in constructive desigh of clothing. From an aesthetic angle , the human characterisation is being realised through the study of proportions , through the relation between the different parts of the body with its unit. .(Fig.1a)

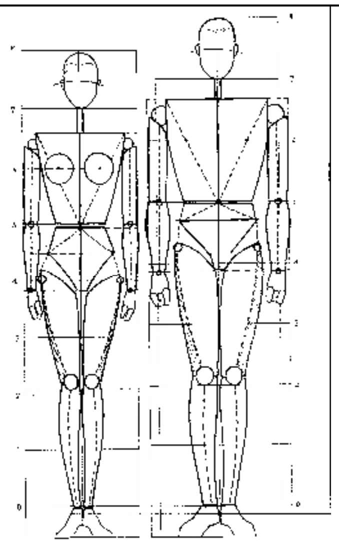


Fig1a. Proportioning the human body

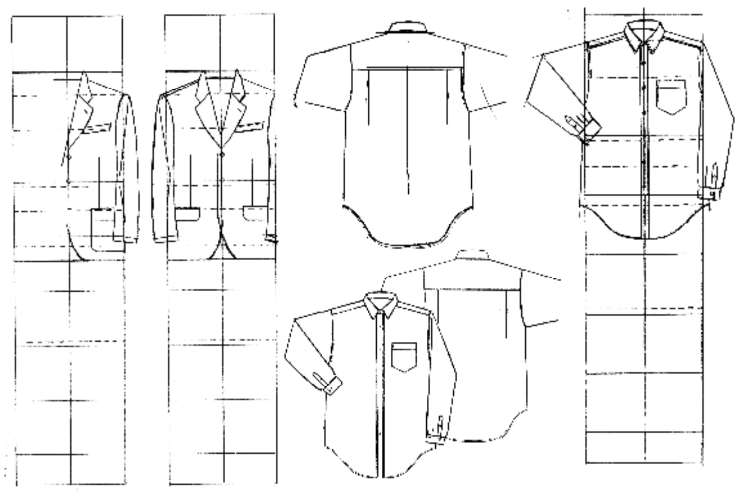


Fig.1b. Proportioning the clothes

In the domain of artistical creations had appeared over the time proportional systems and specific canons , which varies depending on the making technique . So , the Policlet's seven heads canon, the Praxiteles'seight heads , the Durer's canons or the Le Corbusier's *Modulator* , all these express different visions , used till today in many artistic compositions, architectural projects and clothing design (Fig.1b)

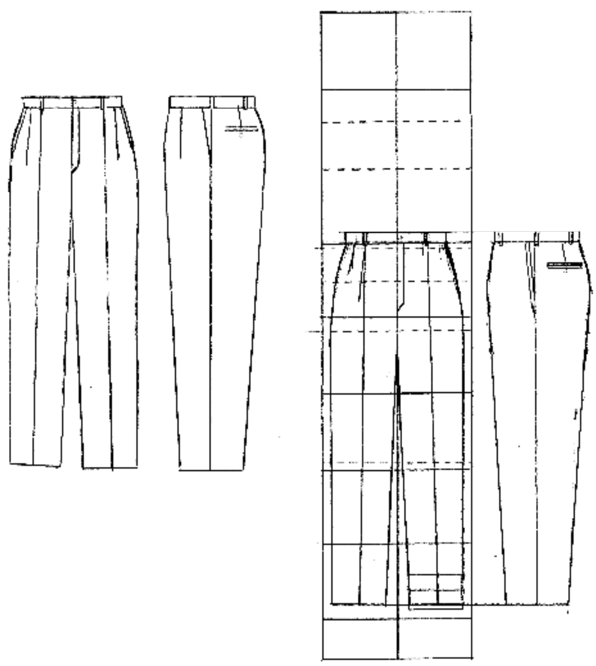


Fig.1c

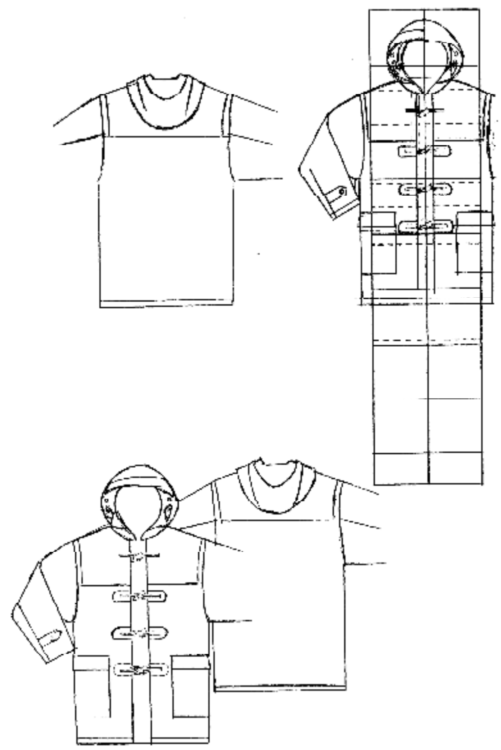


Fig.1 d

Beginning by proportioning the height of the body into eight equal segments,using as a module the height of the head,lines of the knee , the pelvis, waistline, breasts and shoulders will be underlined , all these are fundamental points in designing clothes, supporting the shoulders and the waistline.These exemples from the figures1b, 1c, 1d, 1e represent an elementary method of construction , the clothing's shapes and the sizes being established mainly by the confort factor.Using the given proportions , clothes are obtained whom dimentions varies by its destinations (Fig.1d , Fig.1e), also the particular aspects of the human body(Fig.1c- the length of the trousers). After that, a complex design is instaled , using the advanced study proportion , or simultaneitly different methods of construction.

Therefore, the assembly shape of the costume can correspond the human figure , as well as to many elements naturally and geometrically inspired , so the clothes could be classifyed into ,,sculptural,, and ,,decorative,, . The sculptural figures point out the shape of the human body , in this case are underlined the qualities and the anatomical disproportions .These figures are characterised through their volumetric expressivity and their lateral contour.The decorative figures hide the natural line of the human body , because of the optical deformations and the compositional details , which are completely detached from the figure. In this case the clothes will sustain the base on the shoulders.

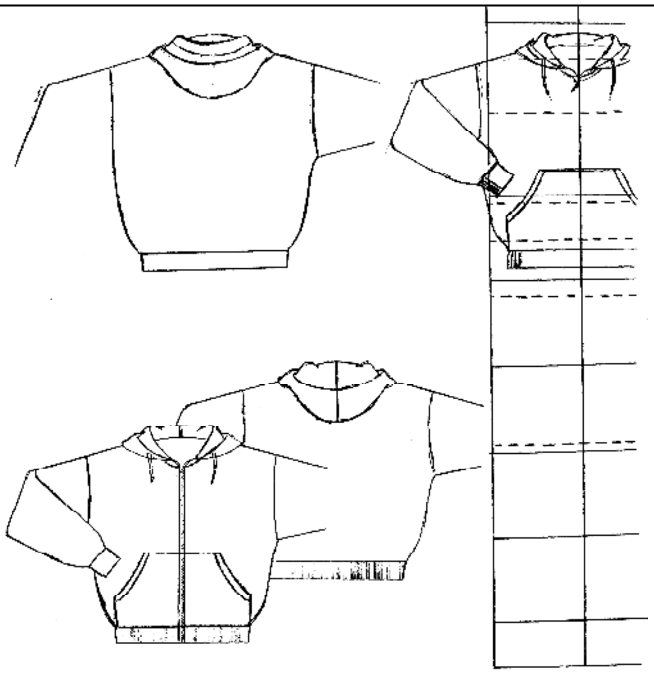


Fig.1e

The process of constructive design of clothing contains the final form of the assembly (the figure), the outline of the object's details as well as the achievement of the volumetric elements in the space and relating them with the \human figure .During this process the functionality and the resistance of the costume is very important, also the entire structure that reflects the scientific, technical and aesthetic level of the society.

2.2.Results and work methods

Designing clothes requires a real anthropometrical data base , which achieve the standardized dimensions of the design.Also, to sustain the aesthetic function of the designed objects, the artist uses proportions, geometrical compositions, various types of materials and accessories.By studying different proportion studies , we can notice the presence of the golden rapport in most of the relations between the human body's elements.This rapport, using Fechner's studies, presents a definition of the beauty , where its shapes and the sizes attract the attention of the eye, in the pleasant sense of the meaning,therefore man identifies the presence of the golden section everywhere in the nature , architecture, art , more or less conscious of this.Analysing the main anthropometrical points of the human figure(fig.2)proportions can be determined , to be applyed in designing clothes, therefore achieving parallels between the created object and the human figure.

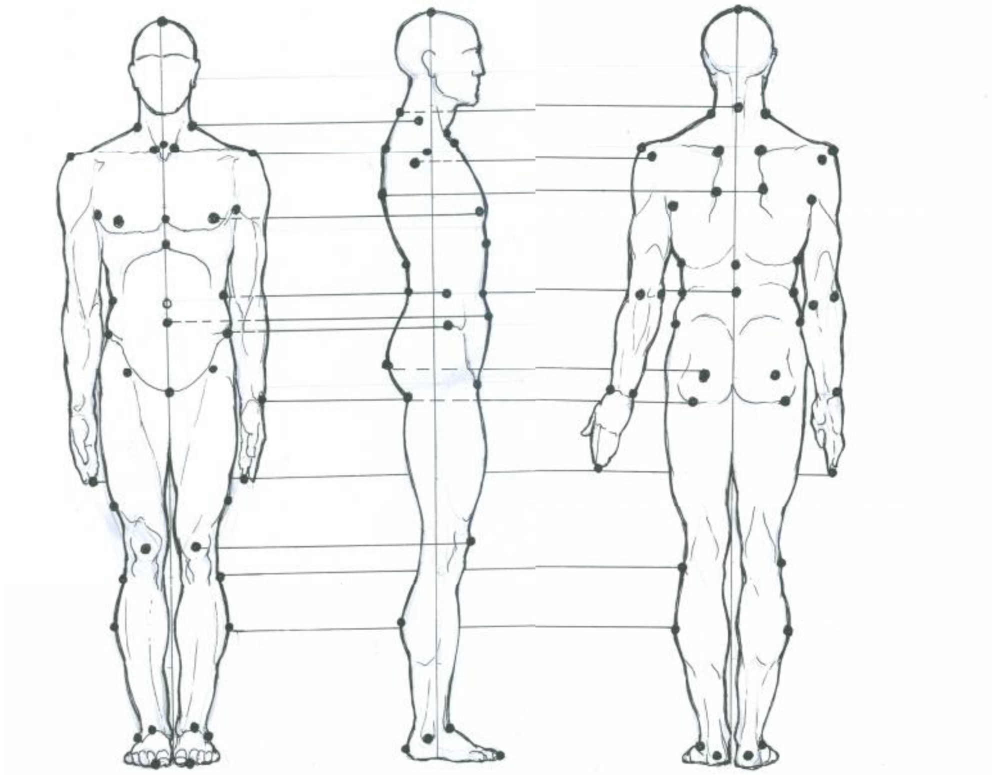
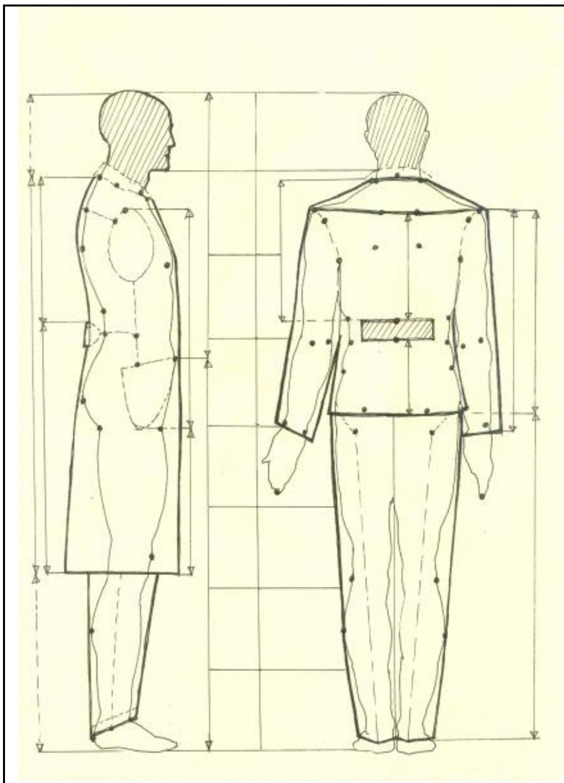


Fig.2. The main anthropometrical points of the human figure

To aesthetically obtain optimum results , the clothes projects themselves on the golden proportion . So, it can be opting for proportioning the piece of clothing in a relation with the body's entire height or for applying the golden rapport between different pieces of clothing and various of its elements. Certain anthropometrical points ascertain distances that connect in a golden rapport. Its corresponding points will be marked on the clothes with regular and staple buttons, or other accessories, to create interest spots into the composition of the costume.Also, certain distances and relevant segments used to express the golden section will be marked through stitches and handpockets .(Fig 3a ,Fig.3b, Fig.4) It is therefore established a method of projecting the clothing pieces, relyed on anthropometrical points of the human body, so the proportioning could be effectuated in the key of the golden rapport. For the costume expresivity , it is recommended to use various types of contrasts in its composition(line contrasts of the surfaces, volume, colour and structure), the harmony of the assembly being established by the practice of proportion knowledge. The model, the colours, the relations between the shapes, as well as finding naturally the proportional relations of various elements of the clothes depend directly on the talent and the liberty of each artist. This particular method has succeded to attenuate the use of the human body's elements , also obtained corresponding results of the artistical creations.

3.CONCLUSIONS

The technological and the scientific development of the textile production's field has conditioned the evolution of an interdisciplinary activity within the brotherhood of clothing designers, a task which requires solid knowledge from various domains of activity.The current paper analyses the resemblances between anthropometry and the study of proportions, making a contribution in the field of constructive design of clothing .The conclusions of the study will be used mostly in individual creations,intended for specialized workshops which fulfill few orders.In regarding the mass production the marking of anthropometrical points on clothing will disappear, for not corresponding to the dimensional standards. The golden proportions of the clothes will remain in use, to try idealizing the common human being.



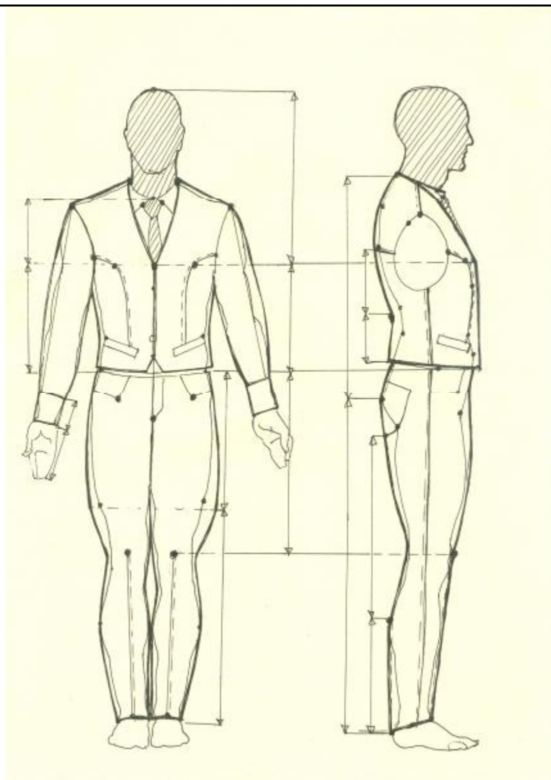


Fig.3a **Fig.3b** **Fig.4**

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ACHIEVEMENTS AND PROSPECTS IN COTTON PREPARATION SPINNING

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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.
Key words: cotton, spinning, equipment, modernization

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.AGGREGATING, AUTOMATION AND SPINNING OF COTTON-TYPE MACHINES ROBOTIZATION AGGREGATE MIXING - TEASING – CLEANING

Current trends in the aggregate mixing equipment, cleaning out the obvious disintegration-production growth, achieving a break-up combined with careful treatment of advanced fibers, process automation using computers and the widespread agregating cards blow room [1]. Therefore we can remember:

- automatic feeding of fibrous material in bales directly bataj lines (GBM - E 6044, Optomix, Rotomix, MO and Flemix Hergeth Hollingsworth, Unifloc Rieter, B 12 Marzoli, Blendomat BDT 013 BDT 019 and BDT 020 Trützschler) imposed on the some economic considerations, and on the other hand, achieving as homogeneous mixtures;
- making an effective cleaning and a dusting intensive (SecuROM, Dustex - Trützschler DX) in terms of using a raw material with high percentage of impurities, while saving fibers (AFC, 6 SRS, TRC Cleanomat CVT and Trützschler, Uniclean B 1 Unimix and Rieter ERM, MTO and MAC MasterClean Hergeth Hollingsworth, RC Crosrol 3);
- power Automation and control systems using microprocessors to control the fiber mixture, in order to maintain the required participation rates (MPM in June, and Mixcommander Blendcommander Trützschler, MAB and LCB Masterblend Hergeth Hollingsworth, 4 and 6 CB CB Crosrol)

- the use of flexible systems that can make in the same time, several mixtures on the same line;

- aggregating bataj lines by connecting them with cardele pneumatic systems and transportation system, which works in sync with cardele (533 FBK Exactafeed Trützschler, Aerofeed Rieter, Masterchute Hergeth Hollingsworth, CF Crosrol, Marzoli 138 B)

- providing all the facilities with recovery systems, cleaning and reintroduction of the fibers in the technological waste collected in the chambers and auxiliary equipment systems such as: fire installations (Securom About Trützschler), metal detectors and separators (EMA and Trützschler MRO), separating heavy particles (ASTA Trützschler)

- box to remove impurities and foreign particles (Securom SC and Uster OptiScan Trützschler), de-dusting installations (MAS, LTB, LTR, Dustex - DX Trützschler) etc.. which ensures a better protection of working bodies and an increase in equipment productivity;

- the automatic control unit of the aggregate and data collection combined with the centralization of their production for the entire line-teasing-cleaning mixing (-Blend, Mix, and Cleancommander Trützschler Card, Fiber Management System Hergeth Hollingsworth);

3. CARDS

Directions on cards upgrades related to the increasing quality and flexibility of their production [2].

- among the features of the new generation of card we can underline: generalization supply systems and improvement of cards with their flock, providing a uniform flow of raw material, enhancing the operation of carding and cleaning using various constructive solutions for additional carding fibers, having important tend to reduce the number of points on the line clean-teasing-cleaning outlets;

- extension points of intake of dust and lint to ensure environmental considerations, quality carding operation and the possibility of connection to a central system, equipped with devices for self cards fineness lane, shortening the required technological process;

- widespread introduction of electronic systems for tracking the work parameters of the machine as well as coordinating the process of carding, correlated with feeding bins and subsequent transport through the mill of the cups, installation on-line of devices which will realize the control of the semiproducts (Dynagraph HGM).

The above statements are supported by bibliographic information [3, 4]

- aggregating cardelor with mixing line - falling apart - clean, with favorable implications on production costs and quality blanks (FBK 533 - Trützschler, Aerofeed - Rieter, Masterchute - Hergeth Hollingsworth, CF - Crosrol).

- integration equipment system supply (Directfeed).

- using a sensor based system to uniform pressing the fibrous material fed (Sensofeed - Trützschler DK 803);.

- adjust the feed rate to reduce irregularity tape performed (Correctafeed-ICFD Cardcommander system).

- strong break with a fixed line mounted under taker-in roller and remove impurities by absorbing them into specially designed pipe;

- straightening and parallelization of fibers, combined with an advanced grade of saving with the help of a desintegration-cleaning system made of three cylinders equipped with 3 with different clothings (WEBFEED - Trützschler DK 803);

- installing before and after the carding zone of a fixed segments equipped with special seals (CZ 69 and CZ 0103 - Litmas, KDS Cardmaster 1000 and 2000 - Hollingsworth, MK - 5 Crosrol, TREX system - C50, CX - 400 Marzoli, Webclean - DK 760, DK 803);

- replacing mobile liniars with fixed ones to intensify the operations of dissolution, cleaning, straightening and parallelization of fibers (CCL Cleanmaster - Hergeth Hollingsworth, Marzoli CX 400);

- mobile lineal system with opposite directions: first, the opposite way of the drum and the second way in the same direction with it, increasing the carding surface;

- by two lineal systems which have the same sense of movement with the drum A system mounted above the drum and the other underneath drum;

- partial or total replacement of the mobile flats associated with special disposal systems and absorbing dirt, dust and short fibres ;

- using flaps for closing and opening the suction pipe, for adjusting the percentage of impurities depending on the degree cleaning fiber material processed;

- automatic polishing flats in operation (IGS - Rieter);

- veil continuous quality control by using a video camera, mounted under perietor, which is sending on - line information to a computer, details about the impurities content. (NCT-Trützschler Nepcontrol);

- posting veil and condensation in fibrous material - constantly controlling the thickness of a funnel formed band (Webspeed - DK 760, DK 803);

- the processing of shorter fibers is using two horizontal conveyor spare veil edges (Crosweb - Crosrol);

- automatically change the filled cups of a predetermined length of tape (KHC - Trützschler, CBA and CBF 3 - R - Rieter) ;

- automatic delivery of the filled cups (Canny - one Trützschler);

- systems using piecewise self long (UCC - L Uster, Correctacard Trützschler CCD), on the middle portions with the permanent control of the thickness of the fibrous material on the surface of the drum and adjust proper feeding speed (M Uster - Uster Controller, MST - Marzoli) and short portions (UCC - S Uster, CFD and ICFD Correctafeed Trützschler, Masterleveler Hollingsworth, ST - Marzoli).

It definitely required computer use in the management, control and monitoring cards[5, 6]. It may be mentioned:

• Trützschler Cardcommander system, which records all operational data and displays them on a display, the card can be connected to the computer system to coordinate TKN2 production data and system KIT (Sliver Information System), which records and graphs on production and quality data;

• using a computer for data processing on the content of impurities from the system NCT Nepcontrol

• The complete control system of mixing lines - falling apart - as well as cleaning cards, ABC - Rieter.

4. DRAWING FRAMES

Technical level drawing frames conditions and hence the quality of processed tapes made of yarn. Progress in building the mills are characterized by the following guidelines and trends [7, 8]:

- improving train rolling geometry (number of cylinders, tilt, gauges, diameters, etc..), while increasing pressure on the cylinder pressure and the presence of pressure bars to improve the control of processed fibers;
- Provide systems for self piecewise short, medium long length or density of the bands obtained (Rieter RSB 951, Draft Servo control system connected to the computer system and Sliver Draftcommander Trützschler KIT, HDC Howa, DYH DYH 500 and 800 Toyota, Cherry Hara DX 500, SV 810 AUC Alfamatex, 1548 Chemnitzer, SH1E, SH 802 SH 2 E and E - Vouk, Power Draft Zinser).
- presence of improved systems for absorption and removal of short fibers and lint (Ermen Howa) formed in the main work areas (train rolling, funnels capacitors, etc..);
- tape filing system with a rectangular section cups for more efficient use of storage space, but also unconventional supply OE spinning rotor (Cubican Rieter);
- aggregating drawing frames passage 1 with passage II and III via a closed circuit of cups (via Canlink Rieter " Pinny ");
- automatic devices to change the full cups at the deposit of predetermined bandwidth (AUC Alfamatex SV 810);
- rupture and windings signaling devices, which by their prompt action are reducing the idleing time, increasing the efficiency of use of the machine;
- introduction of electronic equipment and systems for process control, regulation of

working parameters and display data production, quality, operation and maintenance of the machine and draw appropriate graphs (Monitor Plus Rieter Sliver, Sliver Monitoring Howa, DYH Toyota, 810 SW AUC Alfamatex);
- increased cutting speeds up to 900 - 1000 m / min (Zinser 730, HS 900, HS 1000 and 1000 HSR Trützschler, Rieter RSB 951)
- timing Belt training mechanisms to achieve a constant movement and a low noise
- integrated suction cleaning and dust extraction;
- superior cylinders of the milling process fitted with collars attached by pressing with fine-grained surfaces;
- using hydraulic pressure to the pressure box train rolling;
- use power rack or drive roller with a meal replacement power rack and movable rollers (Rieter, Trützschler, Platt) to reduce as much false mills as possible;
- transport systems use the card at the mill cups;
- aggregatimg of the last mill passage with the unconventional OE spinning machine rotor (Servocan Rieter);
- aggregating the combing mill with the mixer drive (Rieter).

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MEDTEX PROJECT – DEVELOPMENT OF AN ELECTROTEXTILE PROPHYLACTIC TOOL TO PREVENT PRESSURE ULCERS

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Abstract: Pressure ulcers are skin lesions that seriously affect the patient's quality of life. This pathology is caused by low pressure application during a long period of time over a bone prominence or also due to high pressure application for a short period. This paper describes the initial prototype of a textile based technological solution to perform real time control of the anatomical position of bedridden patients suffering from pressure ulcers. For this purpose, the authors developed an electrotextile system with an integrated sensing system that captures the anatomical position of the body along time and communicates with a PC to inform healthcare personnel about the necessity of changing and relieving pressure.
Key words: Pressure ulcers; prophylaxis; Smart Textiles; Electrotextiles; Remote Sensing; Medical Textiles;

1. INTRODUCTION

Pressure ulcers (Hereafter, PU) come from local tissue ischemia caused by pain reflex change in patients with medulla injuries (tetraplegics, paraplegics or hemiplegics) or debilitated patients, elderly or chronically ill. In patients with medulla trauma there is an injury of the afferent nociceptive fibers, responsible for pain stimulus for decubitus change and, on the second patient group, these signs are ignored (1).

The pressure sores etiology is not yet completely enlightened, but it is well known that continuous pressure on the skin takes to ischemic phenomena associated to nutrients deficit and consequently tissue necrosis (4). PU can develop in areas where pressure is exerted over bone prominences like sacral, ischium, trochanter or less frequently calcaneus, occipital region, instep, malleolus and patella (2).

Studies indicate that pressures between 60 and 580 mmHg in a 1 to 6 hour period can cause PU. Besides pressure, shear and friction stresses can act in synergy on a wound development in malnourished, incontinent, bedridden or mentally disturbed patients.

PU can develop within 24 hours or take up to 5 days to arise. All medical professionals responsible for patients' monitoring should be familiar with the main risk factors. This way, it is vital to observe prophylactic measures in order to eliminate continuous pressure, shear or friction forces, preventing sores formation.

PU incidence in hospital environment is extremely high, with variations from 2.7% to a maximum of 29.5% (3). Tetraplegics (60%) and elderly with femur neck fracture (66%)(4) reach the highest rates of complications, followed by critically ill patients (33%). Generally, 40% of medulla injured patients that accomplish treatment will develop pressure sores (5). UP are direct causes of death in paraplegics, with 7 to 8% (6) incidence. The economic impact of pressure sores treatment is huge.

Recent treatment cost (clinic and surgical) estimates of PU have revealed a hospital average cost of US$21675. Besides, when femur neck fracture patients develop pressures sores, hospital expenses increase US$10986 average by patient (7). On surgical patients, the main internment cost impact seems to be the presence or not of postoperative complications, which can significantly change the internment period and consequently its costs [8].

2. METHODOLOGY

The innovation areas in which the authors intend to evolve (biomedical textiles) are the ones with greatest impact and business potential. Technologies and processes to be used are relatively recent and constitute relevant scientific advances, of wide application in many engineering areas. The present project introduces some innovative aspects (nationally and internationally) that should be highlighted, and may allow the development of function and optimization of textile structures with integration of electronic devices with both medical and human health application. It is important to underline the commitment and funding volume that the European Union has granted when financing transnational and national projects within this thematic, and has successively supported and incentivized through the 5th, 6th and 7th framework programmes, e.g. the Wealthy, WearIT@work, My Heart, Mermoth, Avalon, Biotex, Acteco, Proetex, Stella, Ofseth, Inteltex, Polytect projects, etc...
The research team has two entities from the public Portuguese Scientific System *UBI* working on all the textile solutions and *INOV-INESC* which will be dealing with the electronic and telecommunications issues. The *Centro Hospitalar da Cova da Beira* (Hospital) will be responsible for all the medical essays and clinical methodology.

The present research can be subdivided into two main phases: The electrotextile system development and the clinical study.

2.1 - Production and optimization of the electroactive textile structure

The electroactive textile system consists of a textile composite structure, with the same length, thickness and shape of a normal mattress. The textile material specifications were conceived in order to allow an easy industrial scalable product with reduced production costs. Of the several tested technological solutions we chose to develop a composite structure constituted by three layers. The first and third layers (external) were constructed with a nonwoven felt, 100% wool, mechanically consolidated. The intermediate layer (second) is the sensing layer, which also consists of the aggregation of three different layers: a vertically conductive layer, a separation layer (foam) and a horizontally conductive layer, as seen on figure 1. Woolen yarns and wool/inox yarns were used to produce the conductive layers. The integrated sensing system was placed in predetermined areas, corresponding to the great anatomic zones of the human body. The selected areas were: the torso, hip, legs, arms, neck and head zone.

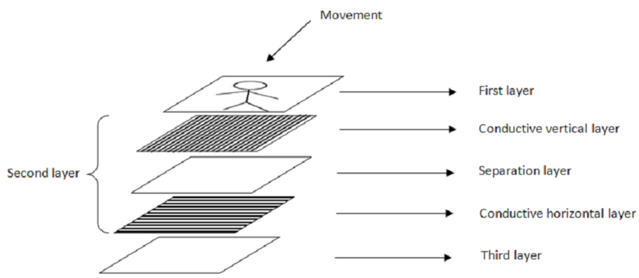

Fig. 1 – Schematic representation of the sensing layer

2.2 – Sensing and communication system

The overall system (electrotextile system) is constituted by a matrix of positioning sensors integrated into an electroactive textile structure and by a control centre (CC - Server). Each electrotextile device has an associated CPM (collection and processing module) as seen on figure 2, which allows data acquisition and wireless communication to the CC.

Fig. 2 – Ilustration of the collection and processing module

The sensing unit is comprised by a positioning sensor network (maximum of 64) and by a data unit (Data Collection Module – DCM) as seen on figure 3,) which reads the sensors status continuously and individually. The CPM is connected to the DCM which in its turn is connected to the electroactive textile system. The collected and processed data are sent to the CC. The CPM module also permits the generation of local alarms through light indicators or sound alarm. The communication module (CM) seen on figure 4, serves as the communication interface (wireless) between the CC and the electrotextile device.

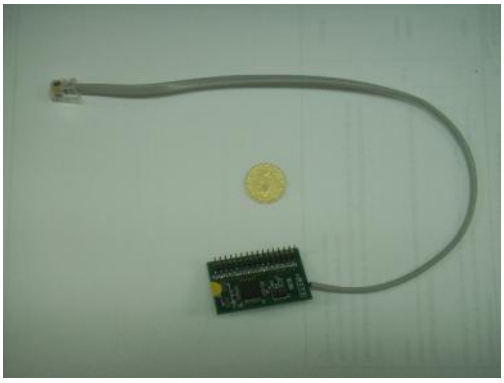

Fig. 3 - Ilustration of the Data Collection Module

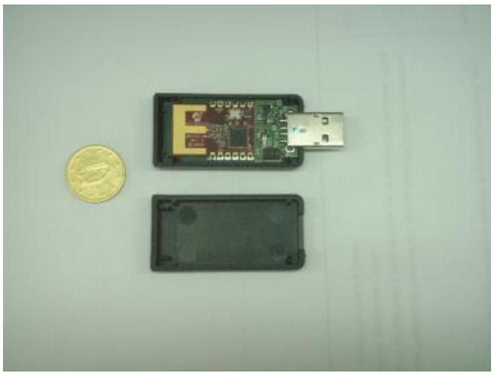

Fig. 4 - Ilustration of the communication module

The CPM is connected to the DCM which in its turn is connected to the electroactive textile system. The collected and processed data are sent to the CC. The CPM module also permits the generation of local alarms through light indicators or sound alarm. The communication module (CM) seen on figure 4, serves as the communication interface (wireless) between the CC and the electrotextile device.

2.3 – Clinical study

A normal control group of an age similar to that of the patient groups was selected from the CHCB. This normal control group is assessed by two Physicians in order to exclude other pathologies. A group of patients with pressure ulcers is also selected. Both groups are assessed by the physicians of the team in order to confirm the diagnosis and to evaluate the wound stage. Regarding the location of PU, the following regions will be evaluated: sacrum, ischium, trochanter, calcaneus, knee, occipital region, instep, ankle, shoulder, chest, leg, back and occipital region. The measurement of ulcers in their largest diameter (cm) will be jointly conducted. The treatment will be evaluated through the success rate and the rate of PU recurrence on the basis of the best practices with local presence / absence of the electrotextile device. In parallel, a survey to the professional nursing will be produced in order to investigate the advantages/disadvantages of this new technological solution. The survey will also deal with the degree of convenience and comfort that it might provide to patients under treatment. An inquiry about treatment quality will also be presented to the control and to the patients' groups.

3. RESULTS

The project MEDTEX has already carried out much of the predicted work so far. The electroactive textile structure is fully achieved, tested and validated, as seen on figure 5.

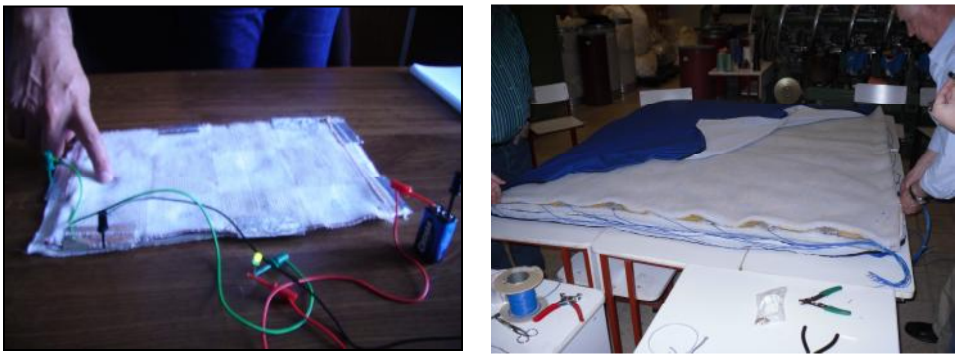

Fig. 5 – Sensing layer and prototype view

The developed electrotextile structure possesses a good breathing and water vapor permeability, and also excellent isolating and thermal regulation characteristics. The clinical study is an ongoing task. A prospective case-control study about the benefits of the electrotextile device usage is being prepared. The selection and characterization of the population under study, the preparation of standardized inquiries for wound assessment, the delivery and filling of the informed consent form, and the methodology definition have already been done, and the same applies to the process control software which has also been fully tested as shown on figure 6.

Fig. 6 – Control software -
View of a patient status

4. CONCLUSIONS

Based on initial results we may consider that the idea beyond this research work presents an elevated sucess potential. It is intended to prevent the progression of PU for more advanced stages and, consequently, diminishing hospitalization times and the resource to more expensive techniques such as the chirurgical treatment. We predict that the PU treatment costs will decrease dramatically. Simultaneously, the quality of life of the patients is significantly improved. Nursery care will also be facilitated. The second layer (sensing layer) will be patented at the end of this research work. This project has already been the object of 6 ongoing PhD thesis

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OPTIMIZING SYSTEMS FOR MEASURING AND MONITORING OF WATER METERS MOUNTED ON THE COLD WATER DISTRIBUTION NETWORKS TO BLOCK STAIRS

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Abstract: This paper presents the monitoring system of cold water meters, which are mounted on blocks in the city of Oradea. The collection and transmission of data reading system is made by Reed relay, two-wire electrical cable, electronic reader - integrator , electrical cable network - MBUS to central dispatcher. This operating system has its weaknesses, for which it will examine the collection and transmission system by radio. We have analyzed the multiple-reading and data transmission by cable, radio, wirelles and GSM. The most technically efficient and economical transmission system using radio waves.
Key words: water; water meters; water network; transmission; signal;

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.

If a pilot monitoring system adapted to the new technology will prove more reliable and more economical than the current one, it will be implemented throughout the city of Oradea.

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

1.1 Presentation of monitoring

Monitoring the consumption of cold water at the staircase for a group of blocks in Oradea is done through an integrated system consisting of:

i) meters of drinking water, specially equipped with relay REED for this action, which generates electrical signals to

ii) electronic reader integrator type or electronic integrator, which are connected to a

iii) M-BUS bus. This highway leads to a signal

iiii) industrial process computer and then

iiiii) the central dispatcher can track all network parameters and water meters by a dispatcher.

In figure 1 blocks are positioned monitored and displayed a sketch map of water consumption for a period determined for each block.

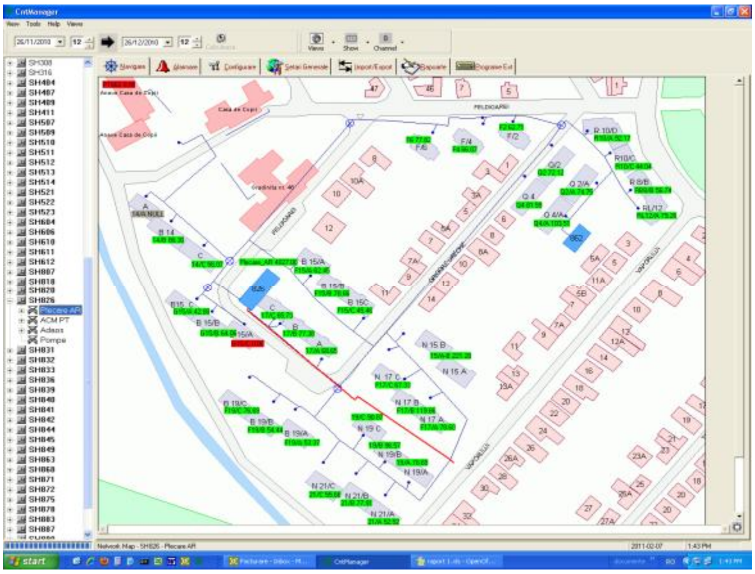

Fig. 1 Disposition scale map in a given area monitored blocks in Oradea

Water meters are equipped with REED relay distance transmission of very low intensity electric pulse signal of about 5mA. Depending on the type and diameter meter REED relay integrator transmits an electrical impulse to every 10 liters or 100 liters of water consumed. The integrator, based on the number of received pulses interprets and displays the information on processed water volume that passed through the meter.

This information is transmitted through the M-BUS bus which is connected to an industrial process computer. Transmission of the information in his memory by dispatching is done using a modem via a bus cable TV stations. The purpose of this monitoring is to save water consumption recorded by meters and use them in a billing program.

Monitoring successive query points as the electronic systems can be custom automatically at programmable time periods between 1 minute and 24 hours.Water consumption data read by REED relay can be displayed at any hour.

Center dispatcher inspects the physical quantities purchased by surveillance equipment by the operator control or automatic monitoring system at predetermined intervals. Inspected values are displayed on the operator and stored by the central computer server. The data can then be used in order to generate functional reports.

In figure 2 is shown how to provide data on water consumption read REED relay at an interval of 30 days. This data is used for invoices.

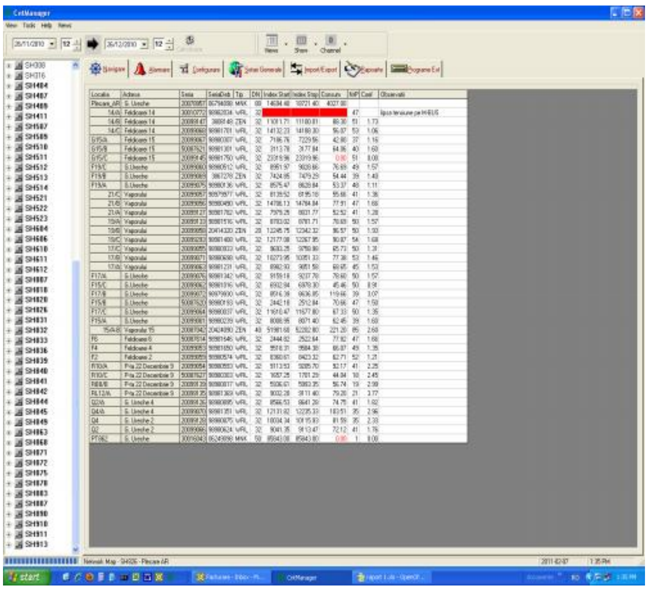

Fig. 2 Reading meters monitored for interval of 30 days

In figure 3 is graphically recorded consumption of water meter fitted to a block within 48 hours. In this chart we can see easily if water consumption hours of the night. If that night water consumption is higher at all times interrogate, this block are likely to be loss of water on the inner network.

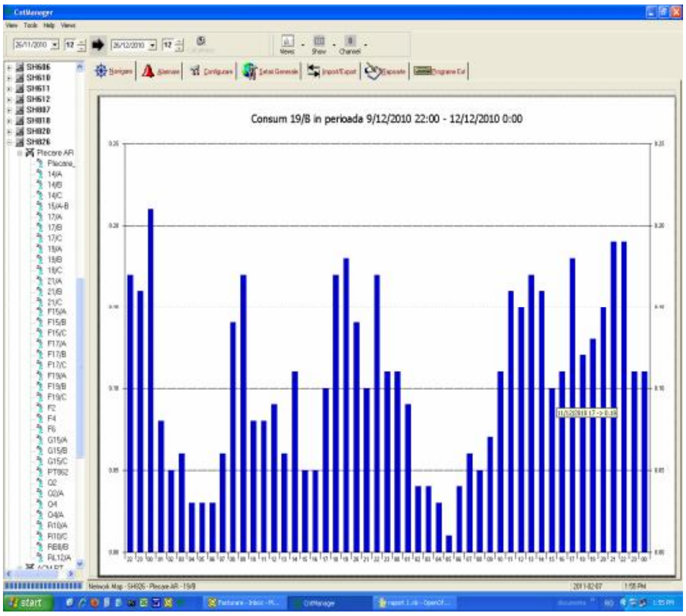

Fig. 3 Graph of water consumption every hour, at a block In a period of 48 hours

The main advantages of monitoring water consumption

It type of operation (communication) interface has become the standard for cold water meter reading systems, offering the main advantages:

- monitoring system allows automatic reading water consumption recorded by meters branching;
- allow-query and display the information acquired at predetermined intervals;
- all equipment used can be controlled at the dispatcher;
- this system can be automatically updated in the database and can generate periodic reports;
- an important function is fulfilled by this monitoring system is to alert dispatchers in case of extreme variations in track parameters;
- collecting data for the billing of water consumption for any selected time;
- monitoring system allows viewing of recorded history, water consumption by installing on each meter to date;

Observations on the functioning of the existing system

a. The systematic loss of electrical impulses along the central axis meter (REED relay) - integrator and computer that process industry, losses are caused by electrical contacts imperfect (wet oxidation environment because it works);
b. Electronic component failure (burning) because of electrical overloads cable networks, during rain showers accompanied by lightning, even if the system is not directly struck by lightning;
c. Short circuit or interruption due to cable because of various mechanical factors (land subsidence, mechanical excavation, the action of rodents, differences in temperature of the environment);
d. Failure of the remediation costs very high and long intervention works;

Research project objectives

Studying a new data transmission system to ensure electric transmission pulse signals more efficiently(without loss of signal)
Replacement type links "electric wire" between devices with a type "radio", thus eliminating damage due to oxidation of electric contacts, humidity, electrical overload, action rodents, vandalism, mechanical excavation, short circuits, etc..
Reduce system maintenance costs;
Reducing the initial cost of installation;

2. CONCLUSION

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 evolution in time to determine if this new way of data collection efficiency and introduce errors smaller than transmission system data 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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COTTON YELLOWING BY POLICARBOXILIC ACIDS

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Abstract: Policarboxylic acids are used as crosslinking agents in order to provide new properties to cotton fabrics with. But these acids can modify fabric´s colour being a disadvantage for white fabrics. This work is focused on studying the influence of the cotton fabric yellowing caused by carboxylic acids at different temperatures. Those temperatures are required for curing and produce the reaction between acid and cellulose. Cotton fabrics were impregnated with different policarboxylic acids using 4 and 8 g/L of concentration and cured at temperatures ranging from 140 to 200 ºC. A Minolta Spectrophotometer was used in order to analyze the cotton fabrics.
***Key words*:** Policarboxylic acids, cosslinking agents, whiteness index, spectrophotometer.

1. INTRODUCTION

Cellulosic textiles are finished in order to improve their properties, where dimensional stability and crease resistance play a very important role. These properties can be satisfactory achieved by crosslinking agents which react with hydroxyl groups of cellulose fibers [1]. Esterification between polycarboxylic acids and cotton cellulosic was investigated since 1960's [2,3] .

Finishing such as wrinkle-free, wrinkle-resistant and crease recorvery are very important properties for cotton fabrics market. Although dimethyloldroxylethyleneurea (DMDHEU) is effective to this type of textile finishing, this product can generate carcinogenic formaldehide [4]. In recent years, extensive efforts have been made to develop polycarboxylic acids as new crosslinking finishing agents for cotton fabrics to replace the traditional reagents [5,6].

In this research, we investigate cotton fabric yellowing caused by different carboxylic acids at elevated temperatures, using four acids 1,2,3,4-butane-tetracarboxilyc acid (BTCA), citric acid (CA), maleic acid (MA) and succinic acid (SA) and evaluated by Minolta spectrophotometer.

2. EXPERIMENTAL

2.1 Materials

A 100% bleached plain weave cotton fabric with the weight of 115 gr/m^2 was used.

The fabrics were impregnated with solutions containing the polycarboxylic acids, using 1,2,3,4-butane-tetracarboxilyc acid (BTCA), citric acid (CA), maleic acid (MA) and succinic acid (SA).

2.2 Crosslinking Procedure

The formulations with different acids and conditions of crosslinking are shown in Table 1.

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

Concentration Acid (g/L)	4, 8
Driying temperature (ºC)	85
Driying time (min)	4
Curing temperature (ºC)	140, 150, 160, 170, 180, 190, 200
Curing time (min)	2

The amount of applied acids is expressed as a weight percentage based on the original weight, so called wet pick-up.

Table 2.- Pick-up obtained to each sample

Acid	Concentration (g/L)	Pick-up (%)
A.M	4	125,5
	8	152,6
BTCA	4	148,3
	8	120,4
A.C	4	161,3
	8	159,3
A.S.	4	134,3
	8	129,7

2.3 Instrumental techniques

In order to compare objectively samples whiteness index an spectrophotometer MINOLTA CM-3600d was used, in the conditions that standards UNE-EN ISO 105 J02 said.

3. RESULTS AND DISCUSSION

Whiteness index for every sample is shown in figure 1:

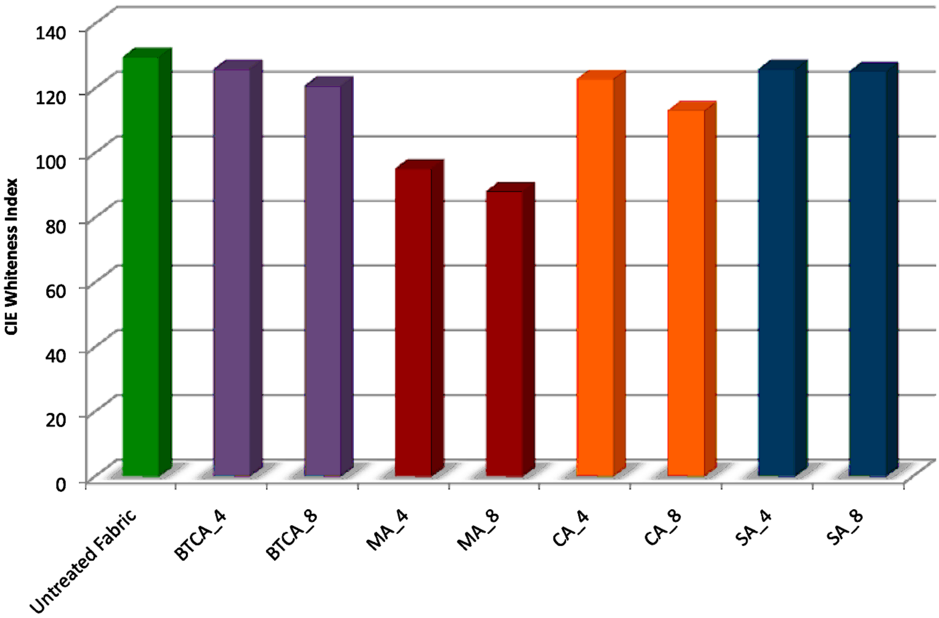

Fig. 1: Whiteness Index of samples treated with different carboxilycs acids

It can be observed the whiteness index (WI) for each treated sample with different concentrations and carboxilyc acids. If we compare results of treated samples with untreated fabric, all impregnated fabrics after dried at 85ºC obtain a WI lesser than untreated fabric. The treated samples with more concentration have more difference in colour. Furthermore, treatment fabrics with maleic acid (MA) are yellowing.

The effect of curing temperature on fabric yellowing caused by different acids used was studied. Whitness index changes were analyzed for every sample cured at different temperatures as expressed on table 1. Figure 2 presents the fabric whiteness index (WI) of the treated and untreated cotton fabric.

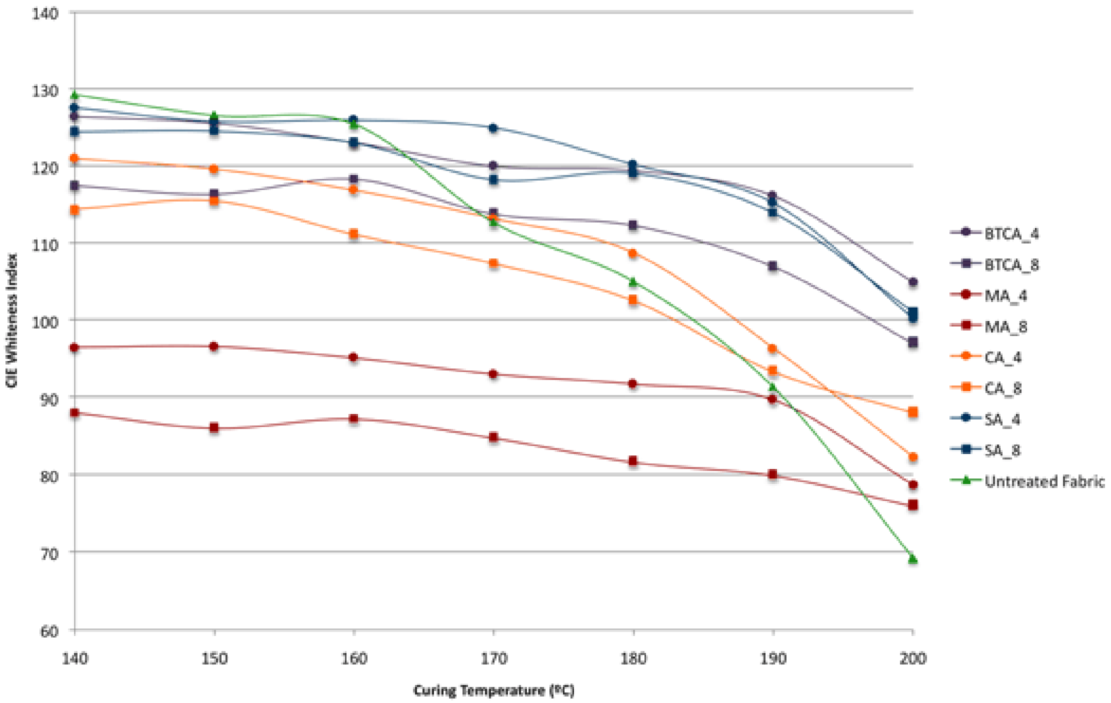

Fig. 2: Whiteness Index of cotton treated with different acids and concentrations and cured at ranging from 140-200 ºC for 2 minutes.

Treated fabrics show a gradual decrease in WI, whereas this index decrease exponentially for the untreated fabric as the curing temperature increase, especially when it reaches above 170 ºC. The cotton fabric shown the worst result at 200ºC.

The BTCA-treated and SA-treated obtain the best behaviour, being the acids with more WI in all temperatures. The MA-treated cotton fabric shows some yellowing after drying. The CA-treated fabric also get some yellowing, even at low curing temperatures. Obviously, the difference in the molecular structures of the acids causes different yellowing effects and yellowing caused by maleic acid can probably be attributed to the formation of unsaturated polycarboxylic acids [7].

Cotton samples were treated with each acid at concentrations 4 and 8 g/L, then cured at temperatures ranging from 140 to 200 ºC, and the WI decreased as the concentration is increased.

4. CONCLUSIONS

In this work we have impregnated with some carboxylic acids cotton fabrics, and we dried the samples at 85ºC, then these fabrics were cured at temperatures ranging from 140-200ºC. We could observe whiteness index differences which were compared with the untreated cotton fabric. We obtained different behaviour depending on the acid used.

Using carboxylic acids as a crosslinking agent for cotton causes fabric yellowing. This yellowing can be increased by the increase of curing temperature and acid concentration, but if BTCA and SA-treated cotton are used it can be obtained a gradual decrease in whiteness index. It could be noticed that while untreated sample decreases exponentially as the curing temperatures increases, BTCA and SA treatments show a reduction in yellowing at higher temperatures above at 170ºC.

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RESEARCHES REGARDING COATED YARNS

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***Abstract**:* The present research pursues the obtaining of coated yarns with natural polymer and the comparison between two types of yarns: fully drawn polyester yarns (FDY) coated with polyamide resin (thermo adhesive yarns) and fully drawn polyester yarns coated with natural polymer. These coated yarns were compared from the point of view of count, proportion of the polymer and tensile strength. Natural polymers are widely found in nature and they are from vegetable and animal origin polymers. Biodegradability is one of the most important features of the natural polymers, but also important are physiological tolerance and the possibility to break bonds by enzymatic degradation.

Keywords: natural polymer, biodegradability, ecological, polyamide resin, fully drawn polyester

1. INTRODUCTION

For many years, up until the 1930's, natural inorganic or organic substances were the most important raw materials for the production of adhesives. However, with the emergence of polymer chemistry and its rapid development, they were increasingly replaced by the synthetic products. The most important original raw materials, included pitch, bitumen and organic polymers obtained from bones, animal skin and casein [7].

When boiled with water to which acid has been added the collagen is converted into "bone glue" that disperses as a colloid. Further purification of the bone glue leads to the production of colourless gelatine, which has strong swelling capacity in aqueous media and jellifies upon cooling.

Today many researchers are focusing on producing composites materials from natural fibres and natural resins, like researchers from Sweden who prepared a thermoset composite using acrylate modified soybean oil resin and natural fibres and resulted that it's possible to produce composite with high mechanical properties without adding to the resin a reactive comonomer like styrene [2]. Hailin Lin , and Sundaram Gunasekaran obtained and adhesive using cow blood [4], and Keyur P. Somani, and Sujata S. Kansara used for wood bonding an polyurethane based on castor oil [5].

Animal polymers are protein colloid glues. Proteins are organic compounds made of amino acids arranged in a linear chain and folded into a globular form. The amino acids in a polymer chain are joined together by the peptide bonds between the carboxyl and amino groups of adjacent amino acid residues and colloid, a type of chemical mixture in which one substance is dispersed evenly throughout another [1]. The particles of the dispersed substance are only suspended in the mixture, unlike in a solution, in which they are completely dissolved. This occurs because the particles in a colloid are larger than in a solution - small enough to be dispersed evenly and maintain a homogeneous appearance, but large enough to scatter light and not dissolve [1].

The production conditions are design to break down the collagen but retain large molecules in the resulting soluble proteins. The resulting dilute protein solutions are concentrated by evaporation and then gelled by cooling [3].

Capable of performing at temperatures up to 370º C, thermoset polyamides are mainly used for advanced composite matrices. Thermoplastic polyamides readily release volatiles under heat and pressure, resulting in more void-free parts [7].

Major application areas for polyamide hot melt adhesive include shoe, automotive, packaging, electrical / electronic, and woodworking. Polyamide adhesives are available in a variety of forms including pellets, cylinders, film, rod, powder, and solution. [6,8].

2. EXPERIMENTAL PART

2.1. Manufacturing installation for the coated yarns

Coated yarn with natural polymer was produced using the installation presented in figure 1.

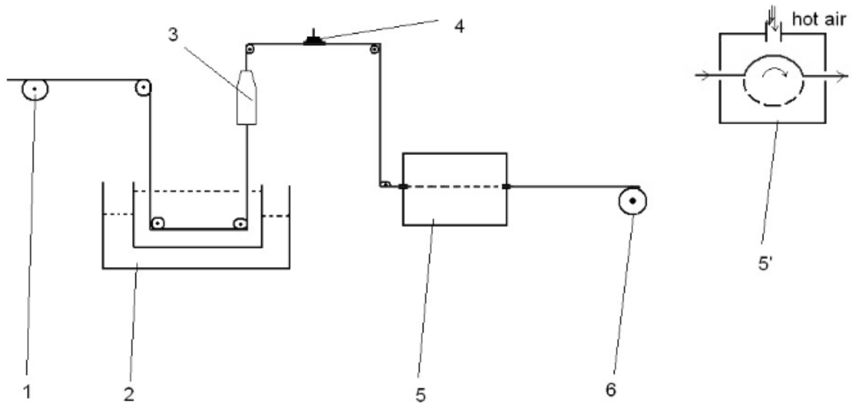

Fig. 1 - Layout of the installation to obtain coated yarns - 1: device to unwind the yarn from the coil; 2: thermostated bath; 3: drawing die; 4: device to tension the yarn; 5, 5': device for air-drying the yarns; 6: winding mechanism

The yarn is coated with natural polymer with the installation presented in Figure 1. The polyester yarn is unwind from the coil with the device (1), and with the help of the rolls is immersed in the thermostated bath (2), where the yarn is coated with natural polymer, on the thermostated bath we can adjust the temperature. After the yarn is coated enter the drawing die (3), where we can adjust the dimension of the yarn. The drawing die can be changed in conformity with the quantity of natural polymer and also with the thickness we want. The device (4) which is tensioning the yarn and on which can be adjusted the force thrust, assures the needed quantity of natural polymer. For drying the yarn is used an air-drying device (5,5') in which is blown hot air, and for the winding of the yarn is used an winding mechanism (6).

2.2. Experimental Conditions

The solution used for coating the yarn with natural polymer contained: 50 % natural polymer, 5 % glycerine, 45 % water. These components were mixed in a container placed on a thermostated bath; at. The solution obtained this way was used to coat the polyester yarn, using the installation presented in figure 1.

The temperature from the installation thermostated bath was 60^0 C with the purpose of maintaining the right temperature for the solution. The tension of the yarn 0.5 cN/tex, and the temperature for air-drying the yarn was 80^0 C.

2.3. Yarn Count and Weight

The count was determined for each type of yarn. The results are presented in Table 2.

Table 2. The count of coated yarns

Raw Material	Polyester + Polyamide	Polyester + Natural Polymer
Count Nm (m/g)	Nm 3	Nm 7

The quantity of each polymer deposited on the coated yarn was measured and the proportions are presented in Table 3.

Table 3. The proportion of the polymer on the coated yarns

Raw Material	Polyamide resin	Natural Polymer
Proportion of the polymer (%)	61	19

2.4. Tensile Strength

Table 4 presents the comparative values regarding the tensile behaviour between polyester - polyamide resin and polyester – natural polymer yarns.

Table 4. Tensile strength results for each yarn sample

	Polyester + Polyamide Resin			Polyester + Natural Polymer		
Characteristic	Breaking Force (N)	Elongation (mm)	Tenacity (cN/tex)	Breaking Force (N)	Elongation (mm)	Tenacity (cN/tex)
Average	102.1	64.8	30.63	92.31	53.45	64.62
CV%	3.21	5.94	----	10.32	7.38	

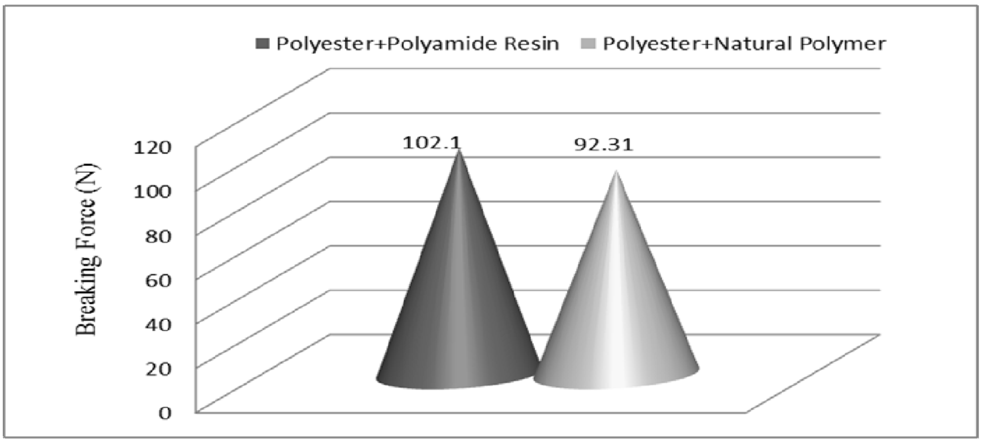

Fig. 2 - Comparison between breaking forces

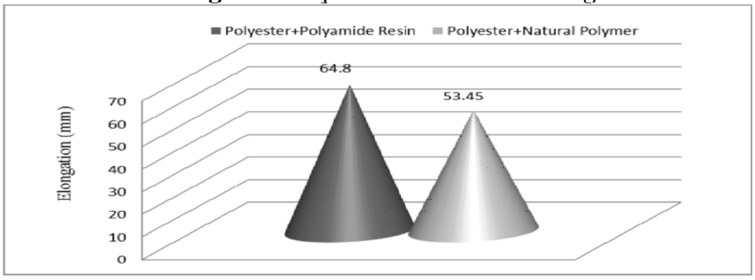

Fig. 3 - Comparison between elongations

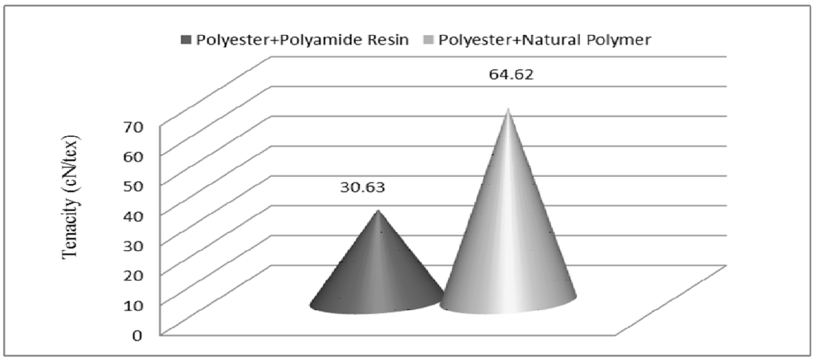

Fig. 4 - Comparison between tenacities

3. CONCLUSIONS

After producing the polyester yarn coated with natural polymer and analysing the polyester yarns coated with polyamide resin and the one with natural polymer some conclusion can be drawn:

1. The natural polymer is ecological and biodegradable compared to polyamide resin.
2. The yarns characteristics:

- The yarn from fully drawn polyester coated with polyamide resin is thicker because of the viscosity of the polyamide resin compared with the polyester yarn coated with natural polymer, resulting in a smaller quantity of natural polymer.
- Tenacity is bigger at the natural polymer yarn, because the fact that the natural polymer gets easier through the filaments of the yarn, better fixing the filaments in the yarn structure, instead of the polyamide resin which in general apply to the exterior of the yarn.
- The elongation is bigger at the yarn with polyamide resin that is explained by the fact that polyamide resin is more elastic that the natural polymer.

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THE DYNAMICS OF PROFESSIONS AND OCCUPATIONS IN THE CONTEMPORARY ECONOMY

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Abstract: The paper analyzes, based on literature and studies undertaken by specialists, the changes produced during the Romanian transition to a market economy, the content and structure of professions and occupations closely related to changes resulting from technical progress and the broad phenomenon of globalization, specifically epoch. The main changes to increase the share of occupations that require a high level of skill of those in service at the expense of primary and secondary professions, and training need through qualification procedures, the key skills - cross, such as: problem solving, critical thinking, communication skills, language skills, more generally, "non-routine skills. This requires profound changes in the structure of school curriculum to be consistent with labor market developments.
Keywords: professions, occupations, employment, key skills, employability

1. THE DEFINITION OF OCCUPATIONS AND PROFESSIONS

The occupation is valuable work, generating income, in cash or in kind, which carries a person in socio-economic unit and the source of income for employed people. It is noted that the same person can practice more occupations. The sociological analysis is given a high interest occupational status of persons with dual statements, like those of worker-farmer, ie a complex occupational structure [17]. The Labour Code stipulates the possibility to carry out, under certain conditions, several income generating activities, with several contracts of employment [20].

The profession is "specialty or craft that a person get after following a training period, the study and application variables are ratios. In other words, the profession is professional profile of a person, socially recognized " [8, 20final.doc www.ase.ro/upcpr/profesori/367/Ocupatii%]. In other works specialty occupation is defined as "a learned activity (eg school) and thus involves preparing (training), but in a specific intellectual context. Being in a profession is to be certified, formally or informally by someone from within or defined by a body within the profession. In addition, a profession involves a rule of social responsibility " [10].

. According to the International Labour Office (ILO) the definition accepted in the European Union by population occupied understand: "all persons aged 15 years and over who have held an economic activity producing goods or services for at least one hour during reference (one week) in order to get income in the form of wages, payment in kind or other benefits "(National Institute of Statistics, 2005, p.14). The ratio of the employed population and total population aged 15 and over is the rate of employment. As a percentage, the employment rate expresses quantitatively the amount of people who have held an employment or have worked in agriculture for a minimum period necessary, but says nothing about "intensity" of work [2, p.22].

The relationship between occupation and occupation is special and has some features that are implicitly or explicitly, frequently invoked:

- It is well known that socio-economic life, the whole system is more dynamic than institutions. Under these conditions, the variety of occupations, driven by the relentless transformation of socio-economic environment ahead of the list of professions that of designing and certifying institutions in the field;

- The adaptation process, by creating new occupations operative skills in training, training system, is much slower. Records confirmed that the period of the order are necessary for the design and implementation of new curricula (curricula and professions), the completion, in detail, appropriate programs and schedules, training of trainers, knowing that the educational system is one of the most conservative systems of society (giving priority to 2002). However, many areas are becoming increasingly professional practice that is more rapid upgrade, putting pressure on school technology that highlight the limits of adaptation of the traditional type of school;
- Building and maintaining a rigorous regulatory framework is the basic condition employment economy in structuring a viable market economy.

2. THE SOCIO-DEMOGRAPHIC STRUCTURE OF EMPLOYMENT IN ROMANIA

The labor market may be defined as socio-economic area, the meet and traded, freely, capital owners or their representatives, as buyers and holders of employment or their representatives, as sellers. The owners of capital demand for labor representatives, and owners are labor representatives of labor supply [6, p.90]. The knowledge of labor market requires addressing its demographic, work-related resources in Romania, highlighting the socio-demographic structure of the workforce, the dynamics (through root cause analysis, its determining factors), the links between demographic events (birth, mortality, migration , age structure, dependence, etc..) and employment. Succinctly, the Romanian transition period, the labor market has undergone some significant changes, among which we select [16; 3, pp.51-70]:

- reducing the labor force and employment, maintaining the relatively low unemployment rate. At the beginning of the transitional period, in 1990 the active population remains at high values of over 11 million people. In 2009 the active population has almost 10 million people, of whom 95.6% are working age group (15-64 years).
- men are dominant, both in relation to employment and in relation to the active population, 55.2% of employed persons are men. Until 2002, the share of employment was located in rural areas and, since 2003, this indicator favors urban areas, 54.4% respectively in 2009.
- The number of unemployed persons, defined according to the International Labour Office, was in 2009, 681 thousand, an increase in both the 2008 (18.4%) and compared to 2007 (6.2%) economic crisis phenomena. Those who have been affected by unemployment to a greater extent have been *men*, their share is 57.4% at the end of 2009 and people with low education level. The increase in employment in services in relation to that of primary and secondary sectors, although its share in the economy does not reach that of the developed European countries .
- In 2009, *the overall rate of activity of the working age population* (15-64 years) was 63.1%, with higher values for the rural population (64.6%) and male (70, 9%). Employment rate of population aged 20-64 years was 63.5% in 2009, at a distance of 11.5% to 75% target proposed for 2020 by Project Europe 2020.

3. THE TYPOLOGY OF PROFESSIONS

Specialty papers, particularly those in the sociology of work, made various types of professions. A typology of this kind, including [5, pp.118-119].

- *Breakdown professions*, which initiates the main directions of development, drawing on available and desirable future, spearheading the socio-professional structure. They require advance preparation, a broad perspective of time, starting with its policy of teacher education, which will be called on to prepare breakthroughs;
- *Promotion professions*, which generalizes the innovations created by the first group on the whole society. Professions promotion consists of all kinds of activities that produce a societal diffusion of innovation, resulting in the breakthrough, innovation and take turns in the practice of society;
-*Professions of support*, outlining the full range of those who take over as producer beneficiaries, innovation and ensure its immediate use. Such practice creates the possibility of changing jobs and economic modernization of a society, outlining a "market" for everything done the first two groups;
- *Obsolete professions* express those "areas" of the structure left behind in terms of socio their correspondence in relation to the overall modernization of labor. Backwardness of the whole

profession creates bottlenecks in the evolution of socio-professional structures, scientific-technological modernization work, the development of the whole society.

4. NEW PROFESSIONS AND OCCUPATIONS IN ROMANIA

The progress of science and technology, especially information technology, computers and the Internet has generated profound changes in work content, learning, the scope of occupations and skills. Currently, work is no longer conceived as an activity that is performed exclusively by adults, employment contracts, during the 30 or 40 years in one area of activity throughout life. The development of information and communication technology has created the grounds for the person who works to be perceived as not performing their activity at a desk, in an enterprise, but as a person using his work computer, communicating via the Internet information to space located at considerable distances beneficiaries, who spends most time on the plane, the same day participating in activities located thousands of miles away, etc.[9]. No significant changes appear in the position of the learner, which is no longer perceived solely as a child or young person, contained in a form of education, who takes notes of the bank, using notebooks and pencils, but as a person willing to learn all life, using the various sources [4, pp.249-255].

Following the technology boom, some occupations in particular industries, agriculture, manufacturing industry, have disappeared or were reduced in number, while defending the fields that did not exist before, requiring new occupations, but also new skills, required labor market.

According to a 2010 study by GFK Research Institute of Romania, citing the latest Barometer conducted in 19 European countries, that the Romanians began to capitalize again those professions had quite a reputation built before 1989 and conferred financial security and job stability. According to the GFK Trust Index 2010 [11] Rated among the top professions include: fireman: 91%; postman 89% military framework: 88%; teacher-priest, 86%; physician: 74%. In contrast, the worst valued profession, which, although ensuring financial stability, are considered unstable, are those of: politician: 11%, banker, 28%, company manager, 39%, lawyer, judge, 42% , specialist in marketing, 46%.

5. THE EMPLOYMENT PROSPECTS OF GRADUATES OF HIGHER EDUCATION

In early 2010, human resources specialists argued that the labor market in Romania is not yet ready to absorb new graduates, if they will accept to reduce their wage claims and demonstrate that they have the basic knowledge required for the position. Moreover, some recruit-eri advancing the following scenario: the companies prefer to hire people who have at least two years experience in entry-level positions rather than a fresh graduate, because it accepts the same salary they would receive and the student, but it brings know-how (knowledge). In this way employers pay the same amount for an experienced employee, relieving expenses for training programs (losers crisis - and young graduates with no work experience, article available on-street.ro www.wall).

In late 2009, one year after graduation, 33.6% of graduates who had sought a job were busy. Among university graduates had a job 60.9%, while the corresponding proportion of those with secondary education was 35.0% and 14.6% for those with low education level, 39 6% of urban residents had a job, compared to 26.3% for those in rural areas. Therefore disadvantaged in the course of employment on the labor market are people with low education level, mainly those residing in rural areas.

Direct contact with employers or those responsible for hiring (37.9%) and call the family, relatives and friends (37.5%) were the main search methods used by young people obtaining a first significant job. The labor market insertion rate of persons 15-34 years who have left education, regardless of when, prior to completion of additional survey was 24.4% at 6 months of leaving education and 33.6% one year after leaving education. The conclusion could be inferred from the study shows that can fit on a workstation in accordance with the training gained through academic studies is relatively low after a year of graduation only a third of the graduates managed to fit in one place suitable employment

6. THE EVOLUTION OF OCCUPATIONS IN EUROPE BY 2020

In 2008, the *European Centre for the Development of Vocational Training* (CEDEFOP) conducted a large study [13] following which presented a series of forecasts about the evolution of occupations by 2020.

The most important conclusion of this study is that by 2020 there will be approximately *100 million job opportunities*. Of these there will be 19.6 million new jobs, and *80.4 million jobs will be available after leaving the employment of those who occupy them*.

In terms of employment structure by sector, *more than three quarters of existing jobs will be in services*, particularly in sub-business, information technology, consulting and insurance. *In the primary sector* (agriculture) will lose about 2.9 million jobs while construction will stabilize after the crisis, and the number of jobs in this field will grow. The manufacturing industry will lose about 800,000 jobs.

In the next decade will *increase the need for highly qualified workforce*, adaptable to any conditions and multiple skills. The report prepared by CEDEFOP, states that:

- The share of jobs that will require a high level of education will increase from 25.1% (as it was in 2006) to 31.3% (2020). Of the new jobs will be created by 2020, and will require a high skill level, most will be in the areas of administrative, marketing, logistics, sales, information technology, technical etc.
- The share of jobs requiring a medium level of qualification will increase from 48.3% to 50.1%. Growth is not sufficiently important, because in the future based on media literacy tasks will be replaced by automation and computerization;
- Share of jobs requiring low qualifications will decline from 26.2% to 18.5%. Most of them will be in services - safety and security at home cleaning / housekeeping. As a conclusion, it is estimated that this fall will have an impact on gender inequality in the labor market, knowing that women, especially immigrants, working in such areas [18].

Most non-manual occupations will require highly skilled workers, workers with high skill will find more work in occupations that require manual skills. Even if the rates of participation in education will increase, however, only half of primary jobs will be filled by workers who have a lower educational level.

The services sector is a clear trend towards improvement of a portfolio of skills required at all professional levels, related to the tasks of "anti-routine." For example, those who work in information and communication technology will have to develop skills in marketing and management, service workers will need guidance to develop their skills and knowledge and customer choice in computing.

In many sectors, based knowledge intensive, will be placed on both managerial skills, and specific scientific knowledge. As an immediate consequence, increase the requirement for employers to employees who hold key cross-cutting skills in many areas, such as problem solving, critical thinking, communication skills, language skills, more generally, "non-routine skills" [19].

Key skills relate to knowledge, skills and attitudes that all young people have to acquire and develop them in education and training and that adults will be able to acquire and maintain them through continuous learning . European framework of reference for key competencies defined eight basic skills for learning throughout their lives: Communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, social and civic competence; " learning to learn "initiative and entrepreneurship; expression and cultural awareness.

In all EU countries, more than 35 occupations are mixed, the rest are specifically male or female specific occupations. Medium-term projections made by CEDEFOP reveal that among the female-specific occupations that will grow are mainly those related to professional services and sales, followed by those in primary occupations (which include workers with low qualification) and in professional occupations (including skilled workers, and nurses). For men, occupations whose number will be growing are those related to machinery or equipment operators, followed by the manager, legislator and skilled workers.

7.CONCLUSIONS:

• The study reveals that specific transformations of contemporary society generates profound changes in the content and structure of occupations and professions which require a more flexible attitude by training providers.

• The fact that only about a third of graduates with higher education in Romania managed to secure a job after one year of graduation is symptomatic of the current system of training adequacy to labor market requirements, both in terms of quantity, and the qualification structure.

• The data collected showed that in the future will increase the labor requirements for services at the expense of primary and secondary sectors. In all cases, says young people need to acquire key skills cross several areas, such as problem solving, critical thinking, communication skills, language skills, more generally, “non-routine skills”.

• Of the new jobs will be created by 2020 and will require a high skill level, most will be in the areas of administrative, marketing, logistics, sales, information technology, technical, etc., occupied men in particular and most places will require a low degree of preparedness, including lower salaries, there will be in services - safety and security at home cleaning / housework, mostly occupied by women and immigrants, which will maintain and even increase inequalities in the labor market.

• Romanian educational system should adapt to new demands of the labor market, aiming primarily to ensure increased opportunities for all young people to pursue careers as high school, on the one hand, and on the other hand, adapt the curriculum to ensure young professional skills and key skills cross necessary for a wide variety of professions and specializations.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

IMPROVING PERFORMANCE OF THE CUTTING SECTION APPLYING LEAN TOOL: A CASE STUDY OF A BANGLADESHI KNITWEAR COMPANY

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Abstract: The garments industries are facing fierce competition in the global market, where price is order qualifier whereas transparency in system, excellent service, high quality goods, and timely delivery are order winners. This has forced the garment manufacturers to increase productivity, reduce costs, adapt to demand cycle and improve quality. The study is related to cutting section of a renowned garments industry in Bangladesh. Cutting section of a factory is facing tremendous problems. This paper focuses on the application of lean tools such as 5S system, method engineering and general concepts of ergonomics on the cutting section to minimize the wastage as well as its cost of product. The objective of this work is to provide the case company with a methodology that allows them to improve the productivity.
Key words: Lean, 5S, ergonomics, productivity, cutting section.

1. INTRODUCTION

Today, the Bangladeshi garment industry is facing a fierce competition in global market, where price is order qualifier whereas transparency in system, excellent service, high quality goods, and timely delivery are order winners. This has forced the garment manufacturers to increase productivity, reduce costs, adapt to demand cycle and improve quality. Only those units will survive which are competitive and efficient in all respect. Apparel manufacturing comprises a variety of product categories, materials and styling, and having a complex process of manufacturing. As shown in figure-1, production process of garments is separated into four main phases: designing/sampling, laying/cutting, sewing, ironing and packing.

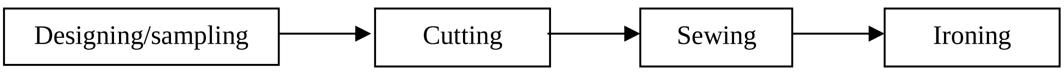

Fig. 1: Garments manufacturing Phases

Manufacturers and researchers mainly focus on productivity improvement of sewing section which may be regarded as the central process of garments manufacturing. But in reality, cutting sections facing enormous problems, and it has a terrific impact on productivity improvement, cost reduction and quality improvement issues. In analyzing the problems of cutting room, the major problem is the wastage (i.e., wastage in manpower, fabric, man-hour, floor space etc).

"Lean manufacturing" is a philosophy deals with elimination of wastage from the system. Lean is the set of "tools" that assist in the identification and steady elimination of waste from all aspects of an organization's operations. 5S is a tool of lean manufacturing system focuses work place organizations and standard procedures. The study has been done in a well-known garments manufacturer in Bangladesh (for sake of confidentiality the name of the company is not mentioned). Real data has been taken from this factory by analyzing and observing the present systems. In this paper we are focusing on the applying 5S in the cutting room of a knitwear factory in Bangladesh which gives a tremendous improvement.

2. LITERATURE REVIEW

Researchers and industrial practitioners are working toward the improvement of worse situation in the organization. Different tools, technique, methods such as work study, method engineering, and principles of ergonomics have been used in the industries for the improvement and standardization of methods, equipment, and working conditions [3]. 5S is the name of a workplace organization methodology that uses a list of five Japanese words which, transliterated and translated into English, start with the letter S. 5S simplifies work environment, reduces waste and non-value added activity while improving quality, efficiency and safety. It's sometimes referred to as a housekeeping methodology [2]; however this characterization can be misleading, as workplace organization goes beyond housekeeping. The contention of 5S is, by assigning everything (that is needed) a location, time is not wasted by looking for things. Additionally, it is quickly obvious when something is missing from its designated location. It also ensures to maximize utilization of horizontal and vertical space available in the company.

The 5S's are:

Phase 1 **- Seiri/Sorting:** Going through all the tools, materials, etc., in the plant and work area and keeping n only essential items. Everything else is stored or discarded.

Phase 2 – **Seiton/Straighten or Set in Order**: Focuses on efficiency. When we translate this to "Straighten or

Set in Order", it sounds like more sorting or sweeping, but the intent is to arrange the tools, equipment and parts in a manner that promotes work flow.

Phase 3 - **Seisō/Sweeping or Shining or Cleanliness**: Systematic Cleaning or the need to keep the workplace clean as well as neat. At the end of each shift, the work area is cleaned up and everything is restored to its place.

This makes it easy to know what goes where and have confidence that everything is where it should be. The key point is that maintaining cleanliness should be part of the daily work - not an occasional activity initiated when things get too messy.

Phase 4 – **Seiketsu/Standardizing**: Standardized work practices or operating in a consistent and standardized fashion. Everyone knows exactly what his or her responsibilities are to keep above 3S's.

Phase 5 – **Shitsuke/Sustaining the discipline**: Refers to maintaining and reviewing standards. Once the previous 4S's have been established, they become the new way to operate. Maintain the focus on this new way of operating, and do not allow a gradual decline back to the old ways of operating. However, when an issue arises such as a suggested improvement, a new way of working, a new tool or a new output requirement, then a review of the first 4S's is appropriate.[1,2]

3. PROBLEM ANALYSIS OF THE CUTTING ROOM

In analyzing of the cutting section, we found wastage of time, manpower and fabric in different stage of cutting operations. Some of problems discuss in brief:

3.1 Storage system:

The first stage of the workflow in the cutting section starts from the storage system. The fabrics are brought from the fabric storage and then stored in the sub-store. As the cutting finishes then there is also storage of finished fabrics.

In this section two types of fabrics are stored:

- Uncut fabrics
- Cut fabrics

Before cutting the sacks of fabrics are kept in a haphazard way here and there (as shown in figure-2). So when any fabric is scheduled to cut workers find the appropriate fabric from pile of sacks which wastes time. Besides, workers sometimes select wrong fabric and start cutting which results direct waste of fabric. It also causes wastage of time for searching proper fabric at store and needed more floor space.

Fig. 2: Temporary storage of fabric (before applying 5S)

After cutting the cut fabric are numbered and bundled into sacks again and are kept randomly. The input men of sewing section bear the cut fabrics to the sewing floor according to their sewing schedule. It was observed that nearly half of their time the input men pass in searching the particular sack of fabric.

3.2 Narrow floor space

Worker has to stop their work when they transport the fabric due to insufficient floor space.

3.3 Transferring Fabrics from Fabric Storage to Cutting Section

In the knitwear section, the fabric storage is on the 5th floor and the cutting section is on the 3rd floor. The sewing sections are in 2nd and 4th floor. Before cutting the fabrics have to be carried by the workers from the storage to cutting section. Extra manpower is used. Time wastage can also be said to be a concerning matter in this matter.

3.4 No standard time for performing every operations

3.5 Manpower wastage for fabric spreading:

It was observed that there is no definite rule for allocating workers in the operation of spreading lay. At present situation 4-5 worker set on the table at a side then 4 worker do the same at opposite.; thus 8-10 workers on the both sides of the fabric.

3.6 Dust:

Cutting section is dusty place. It may causes health hazards and worker feels uncomfortable in this environment. Uncomfortable environment will never gives the best performances of worker. the fabric quality may also be reduced or damaged by dust.

4. PROBABLE SUGGESTION FOR IMPROVING PERFORMANCE

Different concepts of Lean Manufacturing tools (such as 5s) are employed to assess current condition of cutting section and to improve the findings. For example, to emendate problems related to storage system, 5S methodology can be applied. We suggested for use of selves, which are arranged near the cutting table so that it can be arranged a systematic way. Fabrics maybe according to their cutting schedule and different shelves and sacks may be used for different colors for different buyers. Bin card may be to identify the exact fabric easily. The design of selves should be like as shown in the figure-3. When rack system would be started then this types of trolley would help to carry sack one stage to another of rack. We also suggested the shelves for finished fabrics which may significantly reduce the wastage of time.

The present spreading system can be upgraded as shown in figure-4. Advantages of new spreading table are-

- Less manpower need [only 4-5 man need to do this],
- Minimize spreading time.
- No need to throwing for that fabric wastage may control.

In case of the problem of transferring fabric from different floor, they can use any transferring equipment like mechanized conveyor or tunnel. This can reduce the manpower needed as well as the time needed for transfer. The working environment of cutting is dusty. Suction system may implement to reduce the dust. Exhaust fan is needed for suction. Perforated table would suck at minimum pressure as consider the fabric lay to suck the dusts which were not eliminated by chimney.

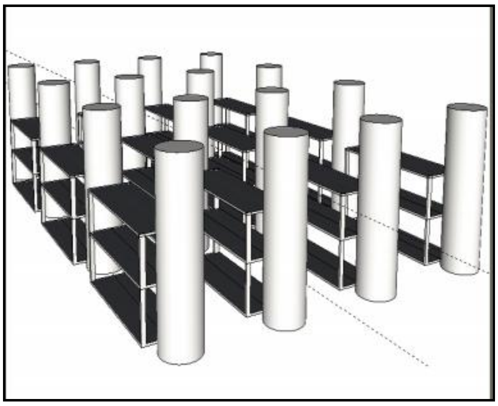

Fig. 3: Rack for Fabric store

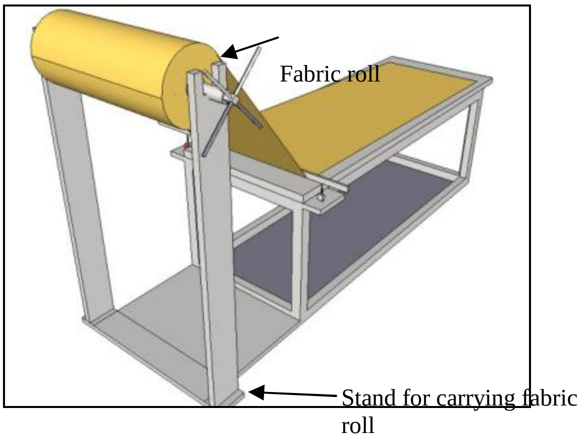

Fig.4: Proposed table design for spreading system

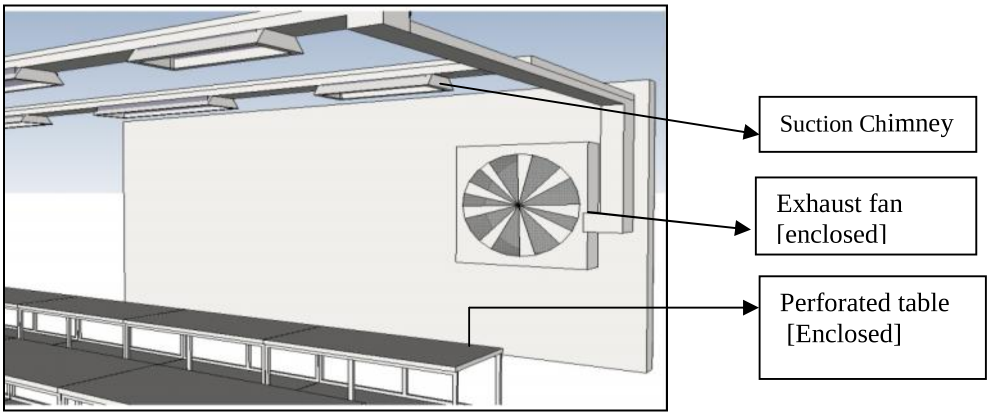

Fig. 5: Proposed design of Cutting room for reducing dust

5. CONCLUSION

Our target is to give a probable suggestion to emendate the existing worse situated faced by the company's cutting section. We highlighted fewer problems, more studies should be done in order to find the problems in this sector and cut out excess costs incurred in unnecessary steps keeping the quality high. However, the proposed system gives better results than the previous one. Company can able to utilize its manpower, time and space in better way and proceed toward reducing wastage and improve its productivity. The working condition is also improved which is an influential factor of workers' performance.

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RESEARCH REGARDING AIR PERMEABILITY OF KNITTED FABRIC

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Abstract: This paper presents a study on the air permeability of knitted fabric manufactured using the yarns of different raw materials. The air permeability of plain pure knits wool, cotton and wool was investigated. The variation in air permeability depending on the area density, linear density, loop length and thickness of yarns.
Keywords*: air permeability, knitted fabric, wool, cotton.*

1. INTRODUCTION

Air permeability is a vital quality in such end-use applications as sport garments, underwear products, t—shirts, socks and others. Air permeability, being a biophysical feature of textiles, determines the ability of a fabric to carry out gaseous substances significantly influences the thermal comfort of the human body and secures the support of proper body temperature.[2]

The air permeability decreases considerably after finishing operations due to the blocking up of the fabric's pores. A significant difference exists in the air permeability of different fabric softener treatments, fabric types and in the number of laundering cycles.[2]

Air permeability is characteristic of thin clothing and underwear. Is intended to ensure ventilation and management body heat released by the body to the outside environment. Air permeability is typical of knits and woven apparel with open pores.

2. METHOD, APPARATUS AND METHOD OF OPERATING.

2.1. Methods of test and calculations

Textiles property to let air pass through them is called air permeability.

If two sectors 1 and 2 of a pipe cross section is separated by the specimen (figure 1.), the air will pass through the specimen only if there is a pressure difference.[1]

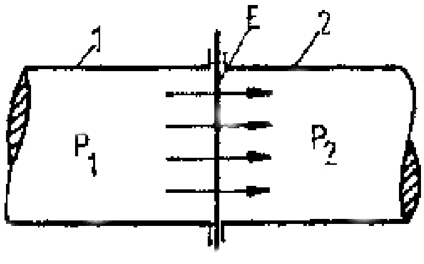

Fig. 1. Specimen [1]

Permeability to air at a pressure difference will be expressed depending on the ratio of proper air flow and pressure differential experienced by the specimen surface.[1]

Samples from this paper were made on the flat knitting machine Cotton - machine for producing knitted panel; knit structure is jersey and yarn used: wool (worsted) 32/2 Nm, wool (worsted) 40/2 Nm, cotton 50/2 Nm.

The airflow rate determines the air permeability of test specimens, hence after the tests, the values of air permeability were calculated using equation:

$$R = \frac{q_v}{A} \cdot 167 \tag{1}$$

Where:
R – Air permeability in Pa;
q_v – mean of airflow yield in l/min;
A – Specified area in cm^2.

The courses and wale density of the samples were calculated in the direction of the length and width of the knits at a 10 cm distance, and evaluated per cm. The area density of the samples was 100 cm^2 and 20 cm^2. The yarn count was estimated before knitting.
The stitch length l of a plain knitted was determined from the area density, which may be calculated using expression:

$$l = \frac{M \cdot A \cdot B}{T} \tag{2}$$

Where:

l – Stitch length in mm;
M – Area density of knitted sample in g/m^2;
A – Wale spacing of knitted sample in mm;
B – Course spacing of knitted sample in mm;
T – Linear density of yarns in tex title.

It is known that the majority of knit features depend on the loop length and yarn linear density. The tightness of knits was characterized by the tightness factor (*TF*)[3].

It is know that *TF* is a ratio of the area covered by the yarns in one loop to the area occupied by the loop [3]. It is also an indication of the relative looseness or tightness of the plain knitted weft structure. For determination of *TF* the following formula was used:

$$F = \frac{\sqrt{T}}{l} \tag{3}$$

Where:
T – The yarn linear density in tex;
l – The loop length of knitted samples in mm.

2.2. Apparatus

In this research air permeability tests of the knits investigated were conducted according to DIN EN ISO 9237[4]. The air permeability was measured using apparatus used called penetrometers. All types of devices currently used must ensure the creation of a differential pressure in the air suction holes, clogged the fabric specimen.

In this paper machine used was Static Air permeability TexTester FX 3300-III - Figure 2.

Fig. 2. Textest FX3300-III

2.3.Method of operating

- Samples for testing were conditioned 24 hours in standard atmosphere, 20° C and humidity of 65%. [4]
- Check the filter before starting the test and clean if necessary.
- Test area must be at least 20 cm^2. In this paper work
- Set pressure to 50 Pa.
- Set the unit in $l/dm^2/min$.
- Press down arm device, then set the measurement range; it fits in green, available with an 8-step scale.
- Reading the value after 5s.
- After reading device arm is pressed again, releasing the sample.
- It makes an average of values obtained. [5]

All experimental results are presented in Table 1.

3. RESULTS

Table 1 – Results

	Permeability (area 100cm², pressure 100Pa)		Permeability (area 20cm², pressure 100Pa)	
	Permeability knit - face up [l/dm²/min]	Permeability knit - face down [l/dm²/min]	Permeability knit - face up [l/dm²/min]	Permeability knit - face down [l/dm²/min]
Worsted - panel I 32/2 Nm	1310	1320	954	1080
	1410	1430	1040	1090
	1390	1420	1080	1050
	1330	1400	1040	1130
	1380	1390	1170	1080
Mean	**1364**	**1392**	**1057**	**1086**
Worsted - panel II 32/2 Nm	1300	1310	1110	1150
	1410	1430	1120	1180
	1470	1490	1140	1140
	1450	1470	1120	1200
	1440	1480	1110	1180
Mean	**1414**	**1436**	**1120**	**1170**
Worsted - panel I 40/2 Nm	737	758	678	707
	752	773	718	704
	803	813	710	650
	816	793	754	677
	785	812	750	706

Mean	**779**	**790**	**722**	**689**
Worsted - panel II 40/2 Nm	801	790	680	685
	812	780	668	680
	803	775	666	682
	808	800	687	655
	852	810	659	740
Mean	**815**	**791**	**672**	**688**
Cotton - panel I 50/2 Nm	506	515	407	383
	518	524	397	393
	532	528	391	414
	534	511	386	383
	511	490	366	368
Mean	**520**	**514**	**389**	**388**
Cotton - panel II 50/2 Nm	576	581	402	402
	542	571	504	433
	548	554	419	418
	560	569	432	393
	602	549	455	426
Mean	**566**	**565**	**442**	**414**

4. CONCLUSIONS

Regarding yarn fineness:

- From results we can see that cotton thread decreases air permeability much more than wool (worsted) – with 61,8 % than worsted 32/2 Nm and 33,2 % than worsted 40/2 Nm.
- For worsted panels, to an increase in fineness from 32/2 Nm to 40/2 Nm, air permeability decrease with 43 %, the same way for face up and face down.
- Regarding worsted panels 32/2 Nm, air permeability for face down increase with 2% than face up.
- Regarding worsted panels 40/2 Nm, air permeability for face down increase with 1,4 % than face up.
- Regarding cotton panels 50/2 Nm, air permeability for face down decrease with 1,2 % than face up.

Regarding testing area:

- For worsted panels 32/2 Nm, when decrease value of testing area from100cm^2 to 20cm^2 , air permeability decrease with 22,5 % face up and 22 % face down.
- For worsted panels 40/2 Nm, when decrease value of testing area from100cm^2 to 20cm^2 , air permeability decrease with 7,3 % face up and 12,8 % face down.
- For cotton panels 50/2 Nm, when decrease value of testing area from100cm^2 to 20cm^2 , air permeability decrease with 25 % face up and 24,5 % face down.

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KNITTING ELEMENTS – CONTINUE IMPROVEMENTS

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Abstract: Needles and sinkers, being ones of the most important work elements for knitting machines, suffer permanent improvements to better satisfy the work conditions and the functions they must answer, resulting in a higher quality of the knitted fabrics, the reduce of the production costs, the increase of the machine productivity., by higher speeds and less downtimes. The paper concerns the spring loaded latch needle and its advantages in the loop forming process, the steel composite needle for a higher productivity and maintenance-free of the knitting machine and special sinkers, with local increased hardness, to process abrasive yarns.
Key words: spring loaded latch needle, composite needle, sinker

1. INTRODUCTION

As work elements of knitting industries, needles and sinkers are the most important loop forming elements, because them direct implication in the knitting process reflected in the quality of the knitted fabrics, the level of knitting machines productivity and the production costs.

Depending the work conditions and the functions them must answer, needles and sinkers design is a permanent subject of innovations.

Among the developments, targeting these knitting elements, are included: a spring latch control - for knitwear needles, a new shank needle structure - for high speed machines, and special sinkers with local increased hardness.

2. THE SPRING LOADED LATCH NEEDLE

In some knitting machines it is advantageous for the needle latches to have a stable position close to their end position when in the open and closed positions.

For this purpose, a small specially shaped spring is inserted in the needle saw slot under the latch, that causes the needle latch to rise into a half-open position automatically in both the rear and the closing position rises the latch, witch is not strained by the tensile force applied by the loop, and holds it in the required positions (Fig. 1) [1].

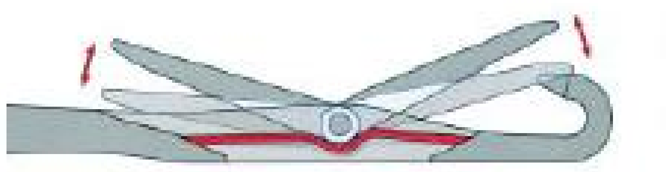

Fig. 1: The schematic positions of the latch needle under the spring action

The positions of the latch under the action of the spring result in the following advantages:

- guarantee a good formation of the new loop at the beginning of a new knitted fabric. On a needle without any old loop, to insert a thread in the hook, the latch must be open, generally by a brush, which can be attached, for example, on the carriage of the flat knitting machine. A spring loaded latch has the advantage that the latch provides an ideal contact surface for the brush, since it is slightly raised above the hook (Fig.2.a);

- there is now no need, as on the usual needle, to extend the tip of the latch over the hook so that the stitch can slide more easily over the closed head;
- prevents individual yarns, parts of a yarn or fibres to be pushed into or split by the latch tip. To form a loop, a hitch of yarn must be moved behind the latch in its open position by the outward movement of the needle. Once a new yarn has been inserted, this yarn loop closes the latch and forms a new loop. In multi-thread knitting and looping or when effect yarns are processed, the raised latch position, ensured by the spring prevents splitting of this kind of yarns (Fig.2.b);
- compared to needles without a spring loaded latch, where the high of the latch open position is designed so that splitting of this kind to be prevent, on a spring-loaded latch, this dimension can be smaller, helpful for the formation of small loops.

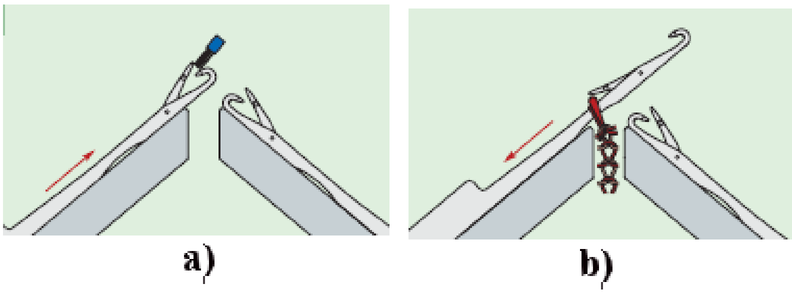

Fig. 2: Functional positions of a spring loaded latch

The spring loaded latch needles ensure a lot of advantages [2] in the loop forming process:

- o the stitch transfer process is facilitated thanks to the reliable opening of the needle latch;
- o no riding up of loose stitches in rear position;
- o no piercing or splitting of yarns or stitches;
- o problem-free processing of knops and loop yarns;
- o gentle knitting of the yarns with low take-off force;
- o reduction of needle consumption;
- o less downtime, resulting in higher productivity.

This king of needles is produced for flat and circular knitting machines up to 18gg, the necessary precision for the production in these dimensions, of such needles, representing a high challenge for the production technology. Even the spring loaded latch needles are offered by Groz-Beckert for a large area of machines (flat machines, large diameter circular stitch transfer machines, large diameter double cylinder machines, small diameter double cylinder sock knitting machines), they are mainly used in flat knitting machines which produce knitted goods for a variety of applications (clothing textile, technical, medical and three dimensional knitted fabrics).

The complex construction of a spring loaded latch needle requires a special care in machine maintenance:

- a frequent cleaning of the needle bed to avoid excessive dirt built up in the needle slot;
- controlled blowing of the needles only in the retracted position, to ensure that the spring latch do not blown out;
- controlled and, if necessary, separated yarn feeding in odder to reach an optimal yarn tension and feeding position;
- shorter lubrication intervals for the needles in the area of the slot and the use of a light non-resining and washable oil;
- optimal machine adjustments to avoid mechanical damage on the needles.

2. THE STEEL COMPOSITE NEEDLE

The shank, a large part of the needle, is very important from the point of view of productivity and maintenance.

Concerning the latch needles, for large circular knitting machines, in odder to satisfy the clients" requirements for high performance and maintenance-free properties, the shank of needle were improved, resulting the following variants (Fig. 3):

- full-shank needle (Fig.3.a);
- low-profile meander shape needle (Fig. 3.b);
- double low-profile needle (Fig. 3.c).

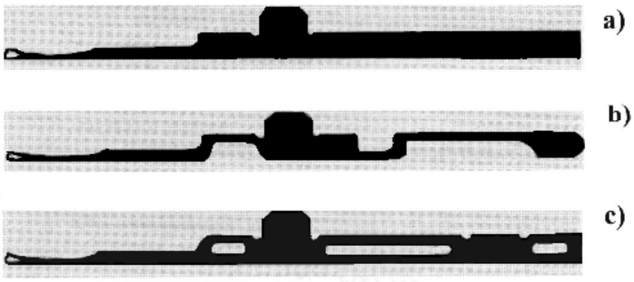

Fig. 3: Stages of development of needle shank
a) full-shank needle
b) low-profile meander shape needle
c) double low-profile needle

To answer to the clients” requirements, the shank of needle must ensure [3]:

- stability under load. During knitting, the needles are subject to substantial stress, because when approaching the cam part, the needle butt is given a shock which creates vibrations possible resulting in needle breakage. The shape of needle shank is directly responsible by the level of absorbing the impact.
- minimum needle contamination. During knitting, and in particular when processing spun yarns, a lot of fiber fly, dust and dirt will accumulate, resulting a contamination of the needle, which level is affected by the shape of the needle shank.

Analyzing the effect of different types of the needle shank, results:

a) *full-shank needle* can not support high stress, being used only on low speed machines, but it ensures an almost maintenance-free production, having the minimum contamination by fiber, dust and dirt (Fig. 4):

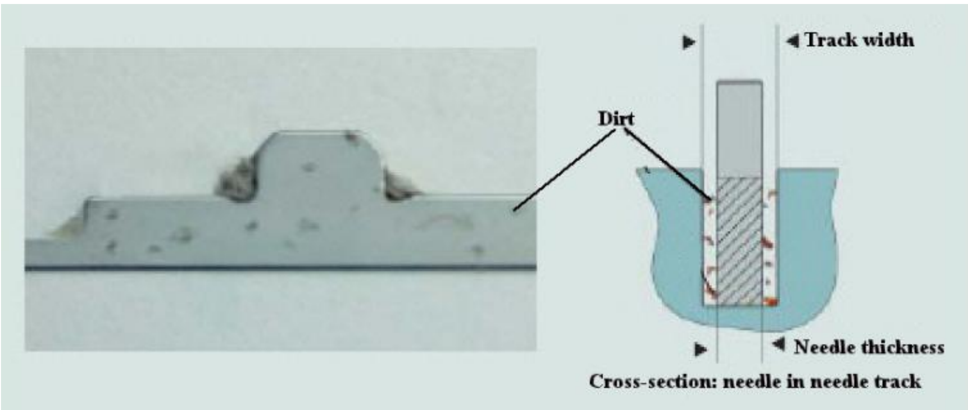

Fig. 4: Low contamination of the full-shank needle

b) *low-profile meander shape needle*

- by a side, it is particularly suitable for knitting machines with a higher number of feeds and revolutions, because its reduced weight and increased elasticity lead to support substantially higher stresses than the full-shank needle;
- by the other side, the cut-outs of the needle are susceptible to contaminations (Fig. 5).In time, the dust and dirt collect in needle cuts-outs and needle track, contaminated with oil and abraded metal fines [4], create a mixture that becomes compacted and securely lodged. The

build-up of contamination (Fig. 6) narrows the needle channel, reduces the width of the needle track and increases friction. The needles are slowed and lifted, with the result that they drag on the cams.

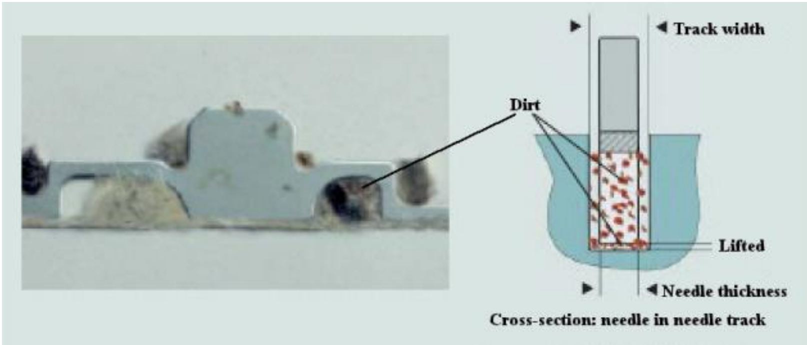

Fig. 5: Strong contamination of the low-profile meander-shape needle

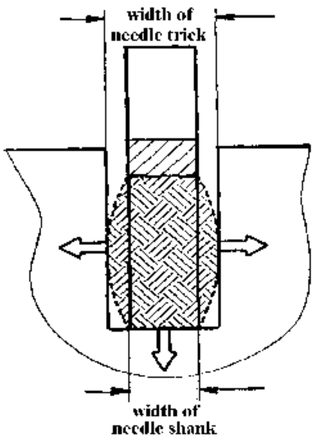

Fig. 6: Contamination of the low-profile meander-shape needle increase the width of the shank

The consequences of this contamination are:

- severe friction between needle and needle track, resulting in: needle and machine wear, damaged needles, high machine temperature and excessive energy consumption;
- varying degrees of frictions between needles and needle tracks, resulting in: lines in the knitted fabric and poor fabric quality;
- frequent machine cleaning – 4 to 8 times per year depending on the degree of contamination of the spun yarn - resulting in: machine stoppages, low productivity and higher manpower needs and costs.

Low-profile meander shape needle, due to their performance are, despite their disadvantages, now the standard needles for modern high speed machines.

c) *double low-profile needle* ensures low-maintenance production and higher productivity than a low-profile meander shape needle, due to them reduced weight. As example, single circular knitting machine Multisingle 5623/1 [5] has an increased knitting capacity of 25% compared to the type 5623, based on them different types of needles (Fig. 6).

full-shank needle
(type 5623)

double low-profile needle
(type 5623/1)

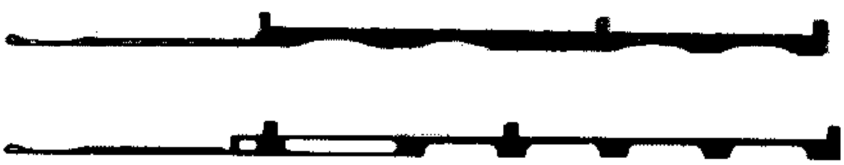

Fig. 6: Needles of two types of Multisingle knitting machines

By the analyze of these three variants of needle shanks, the solution, for both properties (high performance and maintenance-free), appears to be to combine the advantages of the double low-profile needle with those of the full-shank needle. So, the new resulted type of needle is a *steel and plastic composite needle* (Fig. 7), a double low-profile needle with cut-outs filled with plastic material.

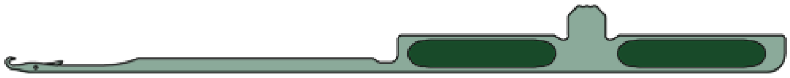

Fig. 7: Steel and plastic composite needle

This means that:

- there are not open areas where to collect the dirt (Fig. 8), eliminating the problem of contamination;
- the plastic having excellent shock-absorbing properties, the strain resistance of the needle is comparable to that of low profile needle, high speed of operation being possible.

The advantages ensured by the steel composite needles are:

- suitability for processing of both spun and filament yarns, no needle change being required when changing yarns and loop formation;
- high productivity;
- high operation reliability and improved product quality;
- reduced needle consumption and costs of machine maintenance;
- less needle and machine wear.

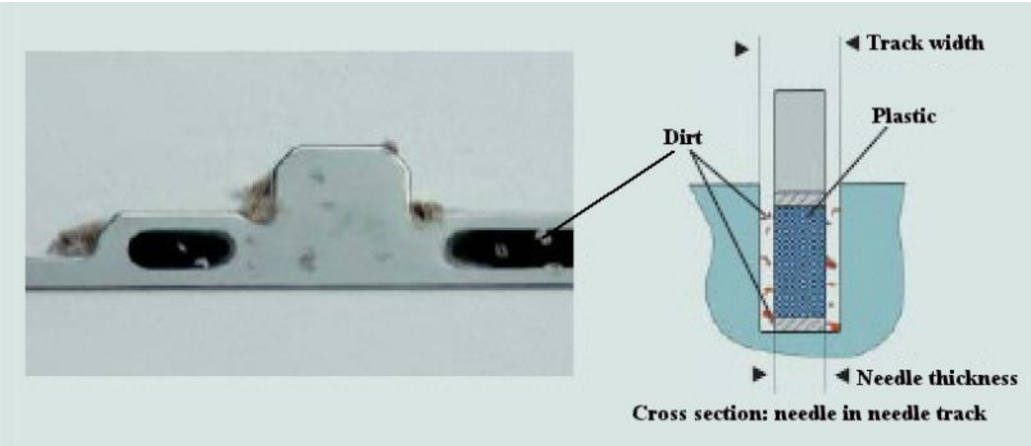

Fig. 8: Maintenance-free, steel-plastic composite needle

The steel composite needles require appropriate lubrication [6] with needle oils which are compatible with plastics, as are recommended for modern weft knitting machines with electronic needle selection, oils that must not have a chemical or thermal effect on the geometry and resistance of the plastic employed.

3. POLYESTER SINKERS

To suit the higher speeds and the control systems, of modern circular knitting machines, the design of sinkers developed in relation to shaping, material composition and surface treatment.
During knitting, sinkers are subject to a “hammer effect” due to repeated directional change of them movement [7], and to a “cutting effect” resulting when knitting abrasive yarns.

When processing abrasive yarns, such as polyester semidull or elastan, result serious problems for traditional standard sinkers, because they quickly cut into the sinker platform producing a deep groove (Fig. 9). Consequently, the quality of the fabric suffers enormously, classic errors such as lines in the fabric, uneven loop formation or even capillary breaks being unavoidable. As result, the

machine has to be completely overhauled at very short intervals, this increasing not only the costs for spare parts, but also downtimes and reducing the productivity.
Poliester sinkers (Fig.10), created by Kern-Liebers [8], represent the ideal solution to all these problems, by them considerably higher hardness degree on the sinker platform (Fig. 11), wich is extremely prone to wear.

Fig. 9: Deep groove cut in a very short time in sinker platform by abrasive yarns

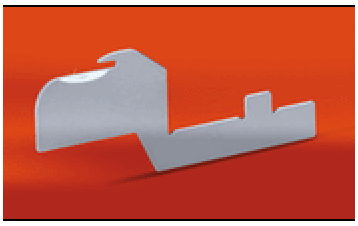

Fig. 10: "Polyester sinker"

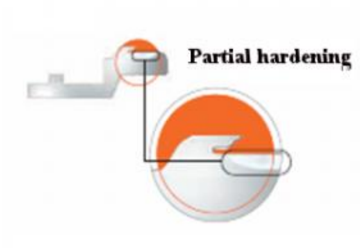

Fig. 11: Platform with increased hardness

Thus the life of the sinker can be prolonged significantly, even if abrasive yarns are processed.
The benefits of using "poliester sinkers" are:
- perfect loop quality
- less downtimes
- increase productivity
- reduced costs.

4. CONCLUSIONS

The spring loaded latch needle, mainly used in flat knitting machines, ensures a lot of advantages, as: a facilitated stitch transfer process - thanks to the reliable opening of the needle latch, problem-free processing of knops and loop yarns, no piercing or splitting of yarns or stitches. But, in the same time, the complex construction of a spring loaded latch needle requires a special care in machine maintenance.

Steel composite needle is the last answer to the requires of the large circular knitting machines producers, for higher speeds and maintenance-free, because it has excellent shock- absorbing properties and eliminates the problems of contamination by its cut-outs filled with plastic material. The use of such needles requires oils which are compatible with plastics that not affect chemical or thermal its geometry and resistance.

Polyester sinkers, special design with a higher hardness degree of the sinker platform, dispose the problems resulting when processing abrasive yarns, with benefits for knitted fabric quality, level of productivity and of costs.

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EXPERIMENTAL STUDIES APPLICATION OF THE ONE DIMENSIONAL NORMAL DISTRIBUTION ON MAJOR ANTHROPOMETRIC PARAMETERS FOR MALE (AGE GROUP 35...60 YEARS)

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Abstract: Organisational conditions of industrial manufacture not allow the execution of protective clothing for all typology specified in regulatory documents in force, which should include all morphotypological variants who meet with a population frequency of at least 0.1%. Thus, the paper proposes a one-dimensional statistical treatment to the dimensional characteristics of distribution applied to analyse distribution form and to establish statistical parameters that characterize anthropometric sizes investigated. For the study are used anthropometric measurements of a sample of 50 subjects among users of protective clothing to serve a number of public utilities in Moldova, representing men aged 35 - 60 years. The result is to obtain variability of anthropometric indicators in the selection of population level.

Key words: Anthropometric parameters, dimensional statistical processing, protective clothing, Gauss-Laplace distribution

1. INTRODUCTION

In designing the product of protective clothing are necessary information on the anatomical features of the human body and its exterior shape, data on size and variability of different segments of the body, reports of these. Such information shall be obtained by conducting anthropological research, adapted to the modern clothing industry. [1]

The typology should be determined on the basis characterization as accurate of the morphological differentiation order of types that are encountered among the population. Thus, for this purpose undertakes anthropometric surveys for a sample of subjects investigated among users of the protective clothing serving certain public utilities in the Republic of Moldova. Currently, the Republic of Moldova existing anthropometric standards required to design apparel products are obsolete.

The statistical data required for processing one-dimensional measurement was developed as a result of main dimensional characteristics I_c (body height), $P_{b\ III}$ (the third area of the torso), P_t (waist measurement) taken from a sample of 50 men aged 35-60 years.

2. METHODS USED, INTERPRETATION OF RESULTS

Dimensional statistical processing and presentation of experimental data consists of:

- consideration of critical data (data analysis in order to eliminate the individual errors and detect missing values);
- rounding the measured values of individual data (reducing the time required for data processing calculations);
- ordering in a row increasing and possible clustering of these data;
- tabular presentation of data;
- graphical presentation of data in the form of frequency polygons and histograms. [2.4]

The calculation of statistical indicators [1,3,4] needed to one-dimensional processing of anthropometric parameters investigated are shown in table 1.

Table 1: Parameter values of the trend and scattering index for anthropometric parameters

Indicators	Calculation of indicators	The indicator values		
		I_c	$P_{b\ III}$	P_t
Number of values, n	-	50	50	50
Number of classes, K	$k = 1 + 3,322 \lg n$	7	7	7
The group size range, a (cm)	$a = (X_{max} - X_{min})/(1 + 3,322 \lg n)$	5	6	6
The maximum poll value, cm	-	190	120	108
The minimum poll value, cm	-	158,4	84	72
True arithmetic average, M (cm)	$M = \frac{1}{n}\sum_{i=1}^{n} x_i$	173,24	101,14	89,88
True standard deviation, s	$s = \sqrt{s^2}$	± 7,27	± 8,99	± 8,86
True variation (the square dispersion), s^2	$s^2 = \frac{(x_1 - M)^2 + (x_2 - M)^2 + \ldots + (x_n - M)^2}{n}$	52,95	80,96	78,58

Based on data from table 1a variation strings are prepared for the main anthropometric parameters investigated, interpreting the results graphically (figure 1-4).

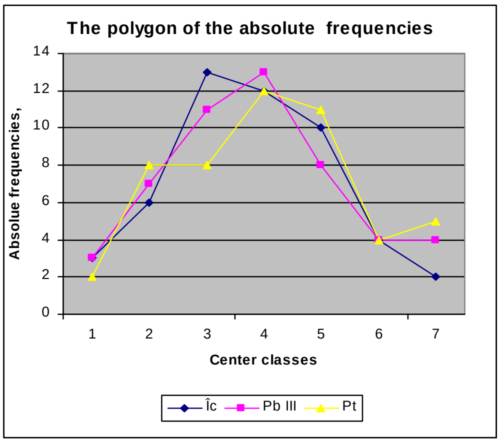

Fig. 1

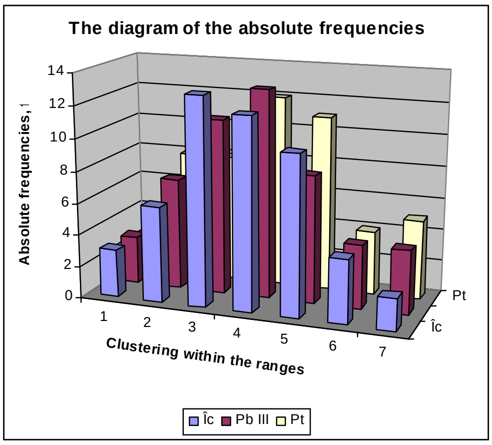

Fig. 2

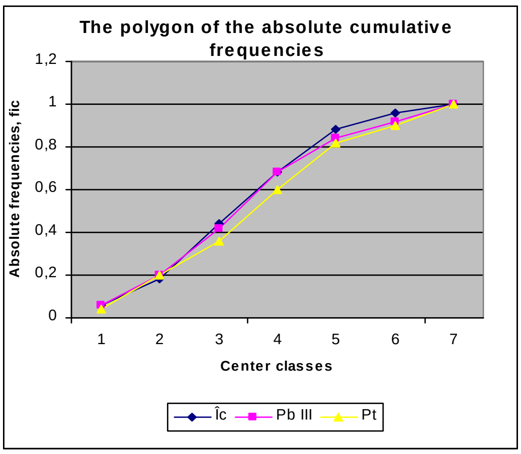

Fig. 3

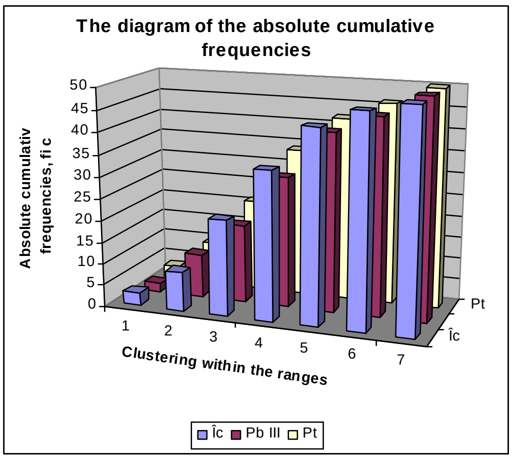

Fig. 4

Table 2: Curve calculation of the normal distribution under the normal curve ordinate I_c (body height)

Classes limits	Average class x_j, cm	The real number of subjects, n_r	$x_j - \bar{x}$	Standardized deviation $t = \frac{x_j - \bar{x}}{s}$	Uncluttered normal curve, $f(x_j)$	Theoretical number of subjects in the class, n_t
156,5-161,4	158,95	3	-15	-2,06	0,04780	2
161,5-166,4	163,95	6	-10	-1,37	0,15608	6
166,7-171,4	168,95	13	-5	-0,68	0,31659	11
171,5-176,4	173,95	12	0	0	0,39894	12
176,5-181,4	178,95	10	5	0,68	0,31659	11
181,5-186,4	183,95	4	10	1,37	0,15608	6
186,5-191,4	188,95	2	15	2,06	0,04780	2
	$\bar{x}$ =173,95	n_r =50				n_t =50

Table 3: Curve calculation of the normal distribution under the normal curve ordinate P_{bIII} (the third area of the torso)

Classes limits	Average class x_j, cm	The real number of subjects, n_r	$x_j - \bar{x}$	Standardized deviation $t = \frac{x_j - \bar{x}}{s}$	Uncluttered normal curve, $f(x_j)$	Theoretical number of subjects in the class, n_t
81-86,9	83,95	3	-18	-2,00	0,05399	2
87-92,9	89,95	7	-12	-1,33	0,16474	6
93-98,9	95,95	11	-6	-0,66	0,32086	11
99-104,9	101,95	13	0	0	0,39894	12
105-110,9	107,95	8	6	0,66	0,32086	11
111-116,9	113,95	4	12	1,33	0,16474	6
117-122,9	119,95	4	18	2,00	0,05399	2
	$\bar{x}$ = 104,5	n_r =50				n_t =50

Table 4: Curve calculation of the normal distribution under the normal curve ordinate P_t **(**waist measurement)

Classes limits	Average class x_j, cm	The real number of subjects, n_r	$x_j - \bar{x}$	Standardized deviation $t = \frac{x_j - \bar{x}}{s}$	Uncluttered normal curve, $f(x_j)$	Theoretical number of subjects in the class, n_t
69-74,9	71,95	2	-18	-2,03	0,05082	2
75-80,9	77,95	8	-12	-1,35	0,16038	6
81-86,9	83,95	8	-6	-0,67	0,31874	11
87-92.9	89,95	12	0	0	0,39894	12
93-98,9	95,95	11	6	0,67	0,31874	11
99-104,9	101,95	4	12	1,35	0,16038	6
105-110,9	107,95	5	18	2,03	0,05082	2
	$\bar{x}$ = 91,5	n_r =50				n_t =50

As data to develop normal distribution graph is using the results of calculations included in tables 2-4.

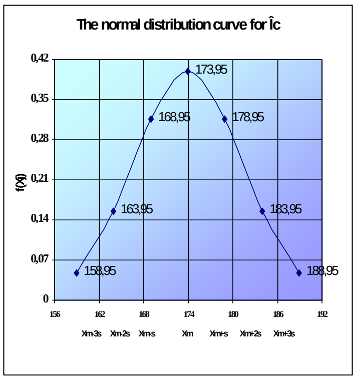

Fig. 5

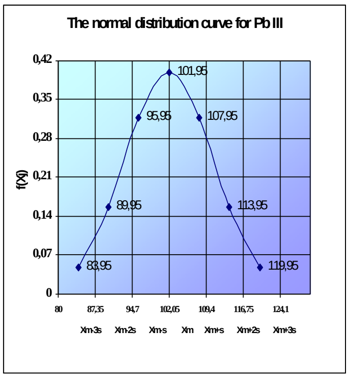

Fig. 6

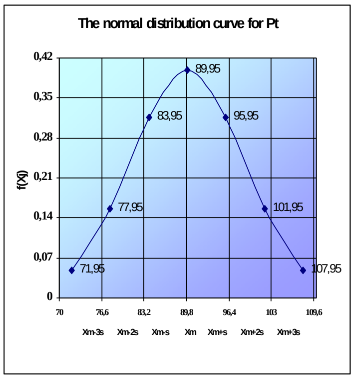

Fig. 7

3. CONCLUSIONS

Interpretation of graphical results in figure tracked 5-7 demonstrates that the main anthropometric parameters investigated I_c (oriented longitudinally), P_b III, P_t (cross-oriented) follows one-dimensional normal distribution law Gauss - Laplace. The values of trend and the scattering index of the main anthropometric parameters (Table 1) underlying bi-dimensional statistical processing, establish relations of interdependence between the main size $I_c – P_{b\ III}$ $I_c – P_t$, $P_{b\ III} – P_t$.

As a result of statistical processing one-dimensional main anthropometric parameters I_c, $P_{b\ III,}$ P_t (obtained as a result of measurement of a men sample aged 35-60 years) were obtained variability of anthropometric indicators to determine the dimensional types studied, which can be used to develop of protective clothing construction for operators serving a number of public utilities in the Republic of Moldova, considering the established dimensional typology of the population studied.

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APPLICATION EXPERIMENTAL STUDIES OF THE TWO-DIMENSIONAL NORMAL DISTRIBUTION ON ANTHROPOMETRIC PARAMETERS (AGE GROUP 35...60 YEARS)

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Abstract: This paper provides a study of two-dimensional normal distribution for three pairs of main anthropometric parameters I_c – $P_{b\ III}$ I_c – P_t, $P_{b\ III}$ – P_t on measurements obtained on a men sample aged 35-60 years, which allows to analyze the design of bi-dimensional distribution and establish statistical parameters that characterize the correlation between anthropometric sizes investigated, the interdependence of the parameters included in the study were determined by regression analysis. The results obtained in the paper, expressed by the function values F (x, y) can represent percentage values of the number of subjects, which in the global correlation dimensions I_c – $P_{b\ III}$ could be the basis for classification in some sizes, used for constructive design of protective clothing for operators serving certain public utilities in the Republic of Moldova.
Key words: Two-dimensional statistical processing, protective clothing, two-dimensional distribution

1. INTRODUCTION

Correlation study between two anthropometric parameters for each of the subjects included in the selection has to trace the distribution of experimental data, termed two-dimensional distribution. [1, 5]

It is known that the simultaneous distribution of two anthropometric sizes follows a normal distribution law (two-dimensional) only if each of the sizes studied independently taken comply the law of normal distribution Gauss - Laplace. [1]

Results of research related to processing one-dimensional statistical data used to prepare the necessary initial two-dimensional statistical processing, where is demonstrated that each of the three anthropometric parameters independent studied, I_c, $P_{b\ III,}$ P_t comply with the law of normal distribution. Thus the purpose of the study proposed in this paper is two-dimensional normal distribution for three pairs of anthropometric parameters:

- for anthropometric parameters of the human body with longitudinal and transverse oriented – I_c (body height) and $P_{b\ III}$ (the third area of the torso);
- for anthropometric parameters of the human body with longitudinal and transverse oriented I_c (body height) and P_t (waist perimeter);
- for anthropometric parameters with transversal oriented $P_{b\ III}$ (the third area of the torso) and P_t (waist perimeter).

The study included a sample of 50 male subjects aged 35- 60 years, representing the operators serving public utilities in Rep. of Moldova.

2. METHODS USED, INTERPRETATION OF RESULTS

The basis for calculating two-dimensional statistical interpretation, and to establish relations of interdependence between the secondary and main dimensions of the longitudinal and transversal direction is the trend and the values of the scattering index corresponding to the three main dimensions

I_c, $P_{b\ III}$, P_t obtained as result of one-dimensional statistical processing thereof, being presented in tables 1-3. [1,3]

Table 1: Baseline data needed for two-dimensional statistical processing of anthropometric parameters I_c, - $P_{b\ III}$

Body height, I_c	The third area of the torso, $P_{b\ III}$							Total
	83,95	89,95	95,95	101,95	107,95	113,95	119,95	
158,95		1		1	1			3
163,95		1	3	2				6
168,95	2	2	3	3	3			13
173,95	1	2	4	3	2		1	13
178,95		1	1	3	2	1	1	9
183,95				1		2	1	4
188,95						1	1	2
Total	3	7	11	13	8	4	4	n_r =50

Table 2: Baseline data needed for two-dimensional statistical processing of anthropometric parameters $Î_c$ - P_t

Body height, I_c	Waist measurement, P_t							Total
	71,95	77,95	83,95	89,95	95,95	101,95	107,95	
158,95			1		1	1		3
163,95			1	4	1			6
168,95	2	3	1	3	4			13
173,95		3	4	2	2		1	12
178,95		1	2	1	3	1	2	10
183,95				2		1	1	4
188,95						1	1	2
Total	2	7	9	12	11	4	5	n_r =50

Table 3: Baseline data needed for two-dimensional statistical processing of anthropometric parameters $P_{b\ III}$ - P_t

The third area of the torso, $P_{b\ III}$	Waist measurement, P_t							Total
	71,95	77,95	83,95	89,95	95,95	101,95	107,95	
83,95	2	1						3
89,95		5	2					7
95,95		2	5	3				10
101,95			2	7	4	1		14
107,95					7		1	8
113,95				1		3		4
119,95							4	4
Total	2	8	9	11	11	4	5	n_r =50

As shown in tables 1 -3, the density of subjects with a particular waist appropriate to certain anthropometric parameter is enclosed in an ellipse of bell base Gauss - Laplace, the way of orientation of the main axis of the ellipse for all three variants being specific to linear direct correlation (positive) between the two anthropometric parameters of the pairs included in the survey. Thus, when a parameter increases and other anthropometric parameters increases.

The probability density verification based on analytical is achieved by applying two-dimensional normal distribution law of the form:

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

where: *F(x,y)* – a function which is the number of subjects which fall within a certain sizes;
x_i – particular values of the parameters in columns;
y_i - particular values of parameters on the strings;
$\bar{x}$, $\bar{y}$ - the weighted arithmetic of two variables;

s_x, s_y – quadratic standard deviation of the two variables. [1,3]

The results of applying equation (1) for pairs of anthropometrical parameters included in the study are centralized in tables 4-6.

Table 4: Two-dimensional distribution and theoretical number of subjects determined on the basis of function values $F(\hat{I}_{c-Pb\,III})$

Body height, I_c	The third area of the torso, $P_{b\,III}$							Theoretical number of subjects, n_t
	83,95	89,95	95,95	101,95	107,95	113,95	119,95	
158,95		1	1					2
163,95	1	2	1	1	1			6
168,95	1	1	3	3	2	1		11
173,95		1	3	4	3	1		12
178,95		1	2	3	3	1	1	11
183,95			1	1	1	2	1	6
188,95					1	1		2
Total	2	6	11	12	11	6	2	n_t =50

Table 5: Two-dimensional distribution and theoretical number of subjects determined on the basis of function values $F(\hat{I}_{c-Pt})$

Body height, I_c	Waist measurement, P_t							Theoretical number of subjects, n_t
	71,95	77,95	83,95	89,95	95,95	101,95	107,95	
158,95		1	1					2
163,95	1	1	2	1	1			6
168,95	1	2	3	3	1	1		11
173,95		1	3	4	3	1		12
178,95		1	1	3	3	2	1	11
183,95			1	1	2	1	1	6
188,95					1	1		2
Total	2	6	11	12	11	6	2	n_t =50

Table 6: Two-dimensional distribution and theoretical number of subjects determined on the basis of function values $F(_{Pb\,III-Pt})$

The third area of the torso, $P_{b\,III}$	Waist measurement, P_t							Theoretical number of subjects, n_t
	71,95	77,95	83,95	89,95	95,95	101,95	107,95	
83,95	1	1						2
89,95	1	3	2					6
95,95		2	6	3				11
101,95			3	6	3			12
107,95				3	6	2		11
113,95					2	3	1	6
119,95						1	1	2
Total	2	6	11	12	11	6	2	n_t =50

Analyzing the results from the tables 4 - 6 it can be concluded that the density variations are the same for subjects studied ($I_c - P_{b\,III}$ $I_c - P_t$, $P_{b\,III} - P_t$), and for any intersection from tables, which confirms certainty the correctness of calculations.

Two-dimensional normal distribution can be expressed graphically in the form of Gauss - Laplace bell, who represents the area of two-dimensional normal distribution (fig. 1-3).

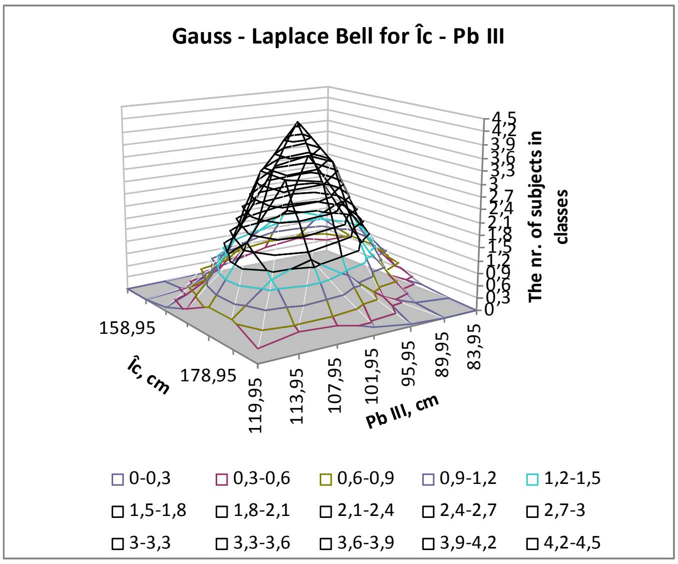


Fig. 1

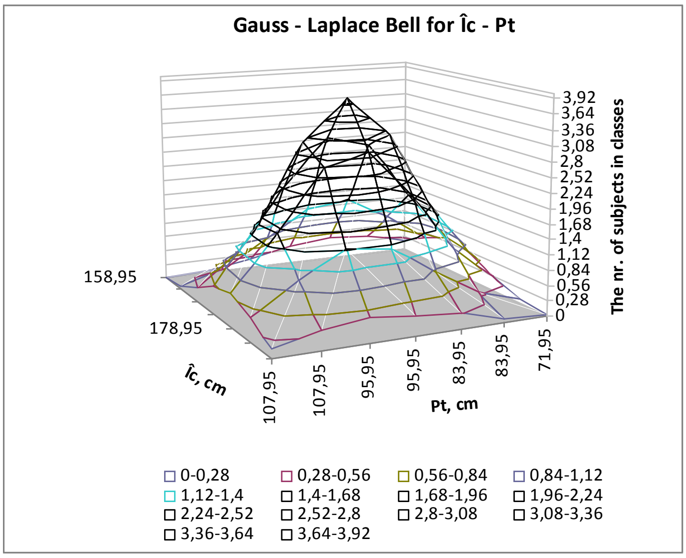


Fig. 2

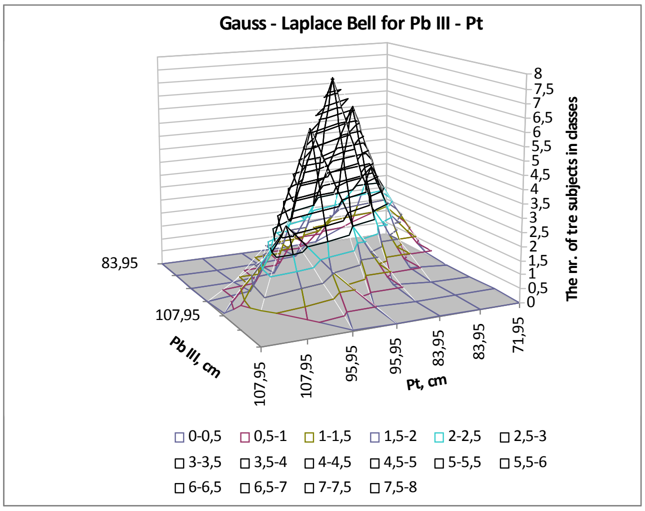


Fig. 3

Theoretical number of subjects F(x,y) calculated in accordance with the relation (1) was determined in conformity with the calculation of correlation coefficient for the three pairs of anthropometric parameters taken in the study by applying the formula:

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

where: n_i – all individual values;
s_x, s_y – squared standard deviation of the two variables. [1,3]
To verify the analytical calculations of correlation coefficients, it recourse to moments method proposed by C. Pirson, using the formula:

$$\upsilon_{1\cdot1} = \frac{\sum m_y\, f m_y m_x}{n}; \qquad \textbf{(3)}$$

$$r_m = \frac{\upsilon_{1\cdot1} - \upsilon_{1x}\upsilon_{1y}}{s'_x s'_y}, \qquad \textbf{(4)}$$

where: $\upsilon_{1\cdot1}$ - joint moment;
$\upsilon_{1x}\ \upsilon_{1y}$ – initial moments product of the first degree for each of the parameters;
$s'_x\ s'_y$ – the product of squared standard deviation without their multiplying to value class intervals. [1,3]

The correlation coefficient values calculated by the analytical method and the method of moments (table 7) are close, which confirms the correctness of calculations made.

Table 7: The correlation coefficient values calculated by the analytical method and the method of moments

Nr.crt.	Variant	Correlation coefficient, r	
		the analytical method	the method of moments
1	I_c - $P_{b\ III}$	0,54	0,47
2	I_c - P_t	0,302	0,31
3	$P_{b\ III}$ - P_t	0,903	0,903

The calculations on the correlation between variables of the main anthropometric parameters is realising using Regression procedure, one of the most complex of Excel statistical processing package, considering y_i - dependent variables ($P_{b\ III}$, P_t) and x_i - independent variables (I_c) (predictive model).
Regression equation is linear mathematical model:

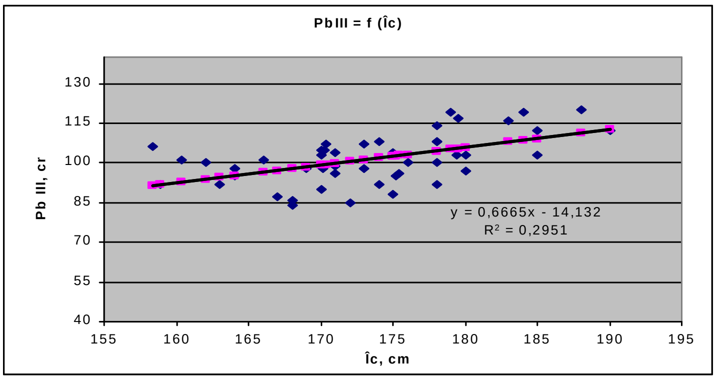
$$y_i = f(/x_i) = b_0 + b_x + \varepsilon, \qquad \textbf{(5)}$$

where: y – dependent variable;
x – independent variable;
ε – deviation of y from the regression line. [2]

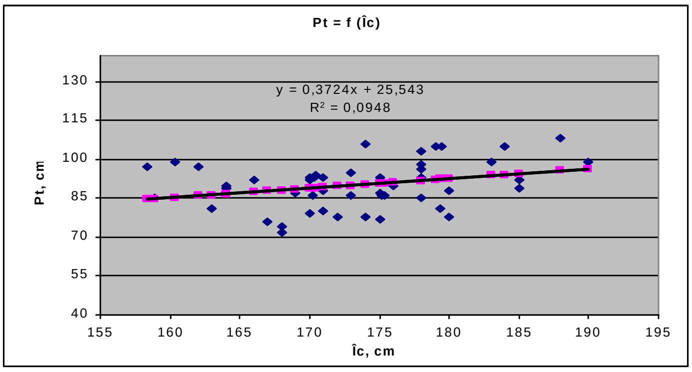
As result were obtained the following linear regression equations:

1) $y_1\ (P_{b\ III}) = f\ (x_1) = -14{,}13249 + 0{,}666481 \times x_1\ (\hat{I}_c);$
2) $y_2\ (P_t) = f\ (x_2) = 25{,}54328 + 0{,}372374 \times x_2\ (\hat{I}_c)$

For the interpretation of data obtained by applying linear regression on anthropometric parameters investigated exercise graphical representation of the function distribution (fig. 4 a, b).



a)



b)

Fig. 4: Distribution function diagram of the anthropometric parameters pair

3. CONCLUSIONS

Upon completion of processing of two-dimensional pairs of main anthropometric parameters take in the study (I_c – $P_{b\ III}$ I_c – P_t, $P_{b\ III}$ – P_t) was analyzed as two-dimensional distribution form and determined the statistical parameters that characterize the correlation between anthropometric sizes investigated. Tabular and graphical representation of the results shows that the distribution of simultaneous processing of two anthropometric sizes follows a normal distribution law (two-dimensional).

Applying linear regression analysis, regression equations were obtained for pairs of main anthropometric parameters I_c – $P_{b\ III}$ I_c – P_t, Distribution function charts (fig. 4-5) confirms the form of direct dependence between dependent and independent variables, expressed by uniformly increase of the regression function with increasing anthropometric parameters. The results obtained in the paper, expressed by the function values *F(x,y)* represent percentage values of the number of subjects, could be the basis for classification in some sizes, used for structural design of protective clothing.

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A STUDY ON THE EFFECT OF STITCH LENGTH AND KNIT STRUCTURES ON THE WIDTH AND AREA WEIGHT OF WEFT KNITTED SINGLE JERSEY FABRICS

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Abstract: A series of experiments help to determine the effect of stitch length and knit structures on the width and area weight of weft knitted Single Jersey fabrics. The result of studies show that Stitch length and knit structures are principle factors in changing width and area weight(GSM).In this work single jersey plain, polo pique, single lacoste and double lacoste fabrics with stitch length of 2.65mm, 2.75mm and 2.90mm have been knitted, dyed, finished and observed. Largest width and GSM have been found in double lacoste structure with reasonable shrinkage.
Key words: Knit structures, stitch length, GSM, width of knit fabric and shrinkage.

1. INTRODUCTION

Knitting is frequently used method for fabric production. Knitted fabric is unique in structure that it possesses a high order of elasticity and recovery. In other word, unlike woven or bonded fabrics which possess a low degree of elongation, knitted fabric can be stretched to considerable length and will gradually return to its original shape. The dimensional stability of knit fabrics is an important area of the knitting industry. There are various factors influencing the dimensional stability as well as the shrinkage of the knitted fabrics. Dimensional changes occur during production or washing or wearing. Processing efficiency and product performance are crucially dependent upon the quality of yarn which is used; care should be taken both to identify and to obtain the most appropriate quality.

Compaction is the use of compressive forces to shorten the fabric to reduce the length shrinkage. During compaction, static friction is overcome by physical force. This is achieved by heated roll and shoe compactors or compressive belt systems to force the length of the loop in a knit to become not only shorter, but also more round in configuration thereby resulting in lower length shrinkage values.

Specification methods of knitted fabrics, usually, include loop density, width of the fabric, weight per square meter and the loop length. Flexibility exists at the various stages of wet processing in terms of process machinery and methods followed by calendaring or compacting which is often, the final operation prior to the packaging step.

2. MATERIALS AND METHODS

2.1.1 Yarn type: 100% Cotton Combed yarn, Ring-spun.

2.1.2 Yarn count: 30/1 Ne, CSP-2618, TPI-18.9, CV%-1.27.

2.1.3 Machines, Tools and Equipments

2.1.4 Machinery used :
1)Single jersey circular Knitting machine **2)** Inspection machine **3)**Batching Machine **4)**Sample dyeing machine **5)**Squeezing machine **6)**Dryer and **7)**Compactor

2.1.5 Machinery used in laboratory: 1) Washing machine and **2)** Tumble drier

2.1.6 Tools and equipments used :

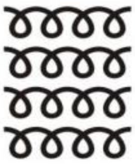
1)GSM cutter **2)**Electronic balance **3)**Inspection table **4)**Course length tester **5)**Adjustable wrench **6)**Double head spanner **7)**Single head spanner and **8)**T-type wrench

2.2 Working Procedure:
Total 21 kgs fabrics of four vital single jersey weft knitted structures have been produced in a single jersey circular knitting machine of **24 gauge, 18" diameter, and 54 feeders** with **30Ne cotton combed yarn** in stitch lengths **of 2.65mm, 2.75mm and 2.90 mm.** After that these fabrics have been dyed, finished and tested in the best way.

<u>2.3 DETAILS ON PRODUCED FABRIC</u>

<u>2.3.1 Cam arrangement & needle set out:</u>

<u>Plain</u> — **Cam** — **Needle Set-out**



K K K K
K K K K

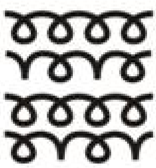
1 1
2 2

<u>Polo Pique</u>

K K T T
T T K K

1 1
2 2

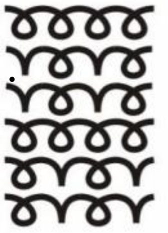
<u>Single Lacoste</u>:



K T K K
K K K T

1 1
2 2

Double Lacoste:



K T T K K K 1 1
K K K K T T 2 2

3. RESULTS AND DISCUSSION

TABLE- A (OBSERVATIONS)

Fabric Type	Stitch Length mm	Yarn Count Ne	Grey State		Finished State	
			Width (inch)	GSM	Width (inch)	GSM
Plain	2.65	30/1	20	135	16	153
Polo Pique			23	158	21	170
Single Lacoste			21	138	20	163
Double Lacoste			23	163	22	185

TABLE- B (OBSERVATIONS)

Fabric Type	Stitch Length Mm	Yarn Count Ne	Grey State		Finished State	
			Width (inch)	GSM	Width (inch)	GSM
Plain	2.75	30/1	21	125	16.8	144
Polo Pique			23.5	151	21.5	158
Single Lacoste			22.5	134	20.5	156
Double Lacoste			23.5	159	22.5	180

TABLE- C (OBSERVATIONS)

Fabric Type	Stitch Length Mm	Yarn Count Ne	Grey State		Finished State	
			Width (inch)	GSM	Width (inch)	GSM
Plain	2.90	30/1	21.5	120	18	135
Polo Pique			23	148	22	155
Single Lacoste			22.5	132	21	150
Double Lacoste			23.5	152	23	171

TABLE- D (OBSERVATIONS)

Fabric Type	Stitch Length mm	Shrinkage (calculation with length & width)					
						Shrinkage	
		Initial length cm	Shrinked length cm	Initial width cm	Shrinked width cm	Length%	Width%
Plain	2.65	50	42.5	40	38	15	5
Polo Pique		50	43	45	45	14	0
Single Lacoste		50	41	40	39.5	18	1.25
Double Lacoste		50	42.5	50	48.5	17	3

TABLE- E (OBSERVATIONS)

Fabric Type	Stitch Length mm	Shrinkage (calculation with length & width)					
		Initial length cm	Shrinked length cm	Initial width cm	Shrinked width cm	Shrinkage	
						Length%	Width%
Plain	2.75	50	43.8	43	40	12.4	7.5
Polo Pique		50	42.5	50	46	14	8
Single Lacoste		50	41.5	45	44	17	2
Double Lacoste		50	42.5	50	51	15	+2

TABLE- F (OBSERVATIONS)

Fabric Type	Stitch Length mm	Shrinkage (calculation with length & width)					
		Initial length cm	Shrinked length cm	Initial width cm	Shrinked width cm	Shrinkage	
						Length %	Width%
Plain	2.90	50	42.5	44	42	15	4.5
Polo Pique		50	42.5	45	45.5	15	+1.1
Single Lacoste		45	36.8	45	44.5	18.2	1.11
Double Lacoste		50	43.5	50	50	13	0

4. GRAPHICAL REPRESENTATION

Table-01

Structures	Stitch length(mm)	Grey GSM	Finished GSM
Plain	2.65	135	153
Polo pique		158	170
Single lacoste		138	163
Double lacoste		163	185

Fig-01

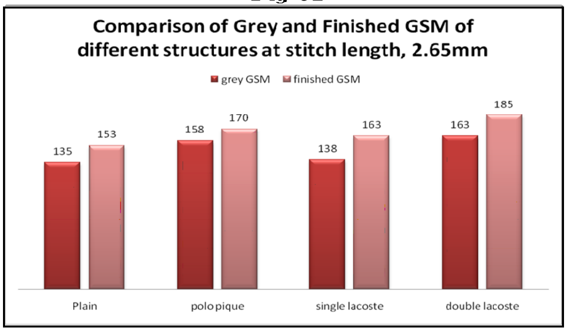


Table-02

Structures	Stitch length (mm)	Grey Width (inch)	Finished width(inch)
Plain	2.65	20	16
Polo pique		23	21
Single lacoste		21	20
Double lacoste		23	22

Fig-02

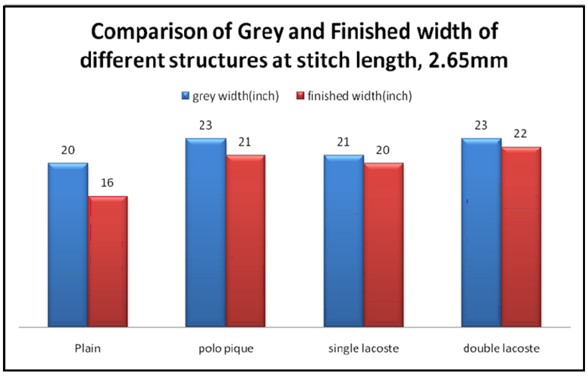


Table- 03

Structures	Stitch length (mm)	Finished width (inch)	Finished GSM	Length shrinkage %	Width shrinkage %
Plain	2.65	16	153	15	5
Polo pique		21	170	14	0
Single lacoste		20	163	18	1.25
Double lacoste		**22**	**185**	17	3

Fig- 03

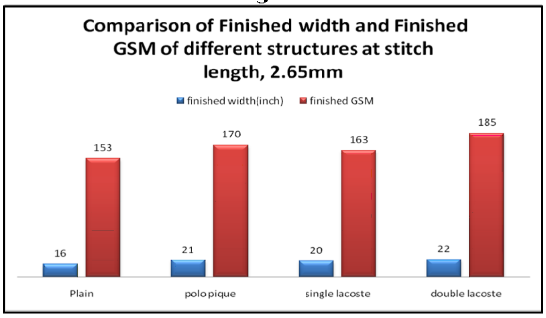


Table- 04

Structures	Stitch length(mm)	Grey width(inch)	Finished width(inch)
Plain	2.75	21	16.8
Polo pique		23.5	21.5
Single lacoste		22.5	20.5
Double lacoste		23.5	22.5

Fig-04

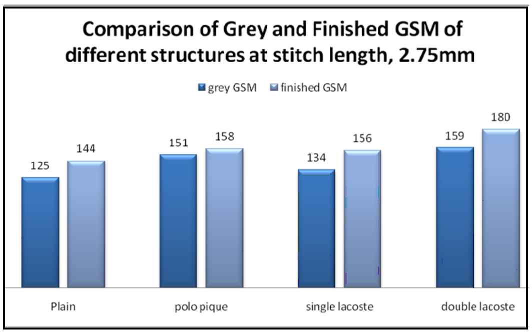


Table- 05

Structures	Stitch Length (mm)	Grey width (inch)	Finished width(inch)
Plain	2.75	21	16.8
Polo pique		23.5	21.5
Single lacoste		22.5	20.5
Double lacoste		23.5	22.5

Fig-05

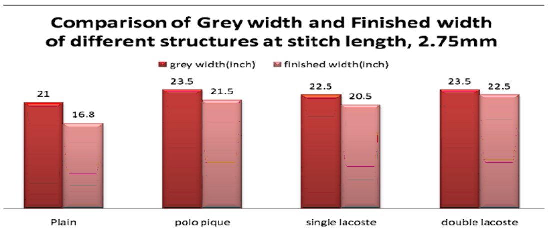


Table- 06

Structures	Stitch Length (mm)	Finished Width (inch)	Finished GSM	Length shrinkage %	Width shrinkage %
Plain	2.75	16.8	144	12.4	7.5
Polo pique		21.5	158	14	8
Single lacoste		20.5	156	17	2
Double lacoste		**22.5**	**180**	15	+2

Fig-06

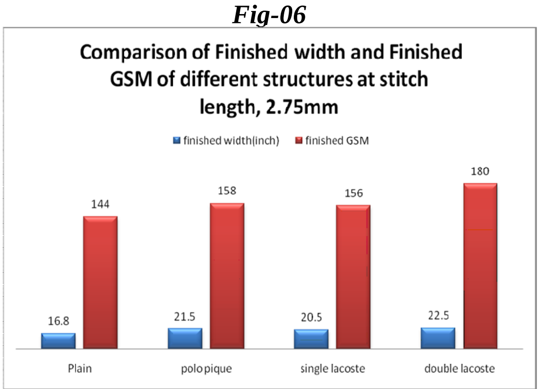


Table- 07

Structures	Stitch length(mm)	Grey GSM	Finished GSM
Plain	2.90	120	135
Polo pique		148	155
Single lacoste		132	150
Double lacoste		152	171

Fig-07

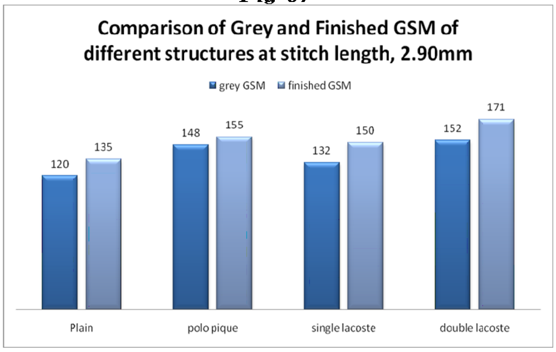
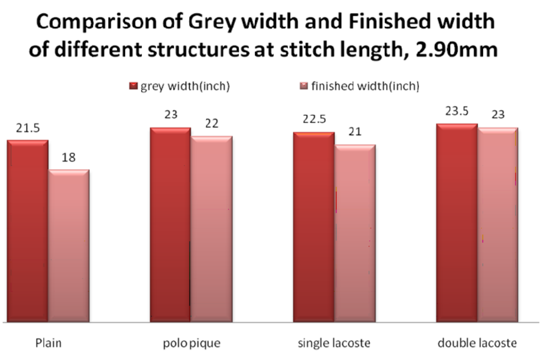


Table- 08

Structures	Stitch length(mm)	Grey width(inch)	Finished width(inch)
Plain	2.90	21.5	18
Polo pique		23	22
Single lacoste		22.5	21
Double lacoste		23.5	23

Fig-08



4. MAJOR FINDINGS

The results indicate that in the same stitch length, grey and finished width and GSM vary with the variation of the fabric structure. It has been observed from obtained data and graphs that knit structures have the great effect on fabric width and weight. Finishing routs have also the great influences on the Width and GSM of weft knitted fabrics. Fabric width and GSM can be controlled within the range by changing shrinkage value in the mechanical compaction.

5. CONCLUSION

The results of this research show that fabric weight (GSM) and width are directly related to the stitch length an knitted structure. We have found that finished GSM is higher than grey GSM in all cases and wider fabric are produced with larger stitch length. It has also been identified that finished GSM and width of **Double lacoste** is higher than other structure with reasonable shrinkage and lowest finished GSM and width have been observed in **plain knitted structure.**

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THE INFLUENCE OF COMPETITIVE MARKETS ON INDUSTRIAL CORPORATIONS STRUCTURE

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Abstract The supporters of classical school of management considered the structure as an essential element of organizational efficiency. Even though the modern tendency, embraced by the conjectural movement supporters, does not confer the structure the same great importance, it accepts still the fact that this represents one of the key variables which should be taken into consideration when projecting an organization.
Projecting the structure's organization is on of the major priorities of any managerial team. The fact that the structure is designed by managers will make it reflect the managerial interests and values rather than the others'who have interests in the respective corporations. Another important aspect to be mentioned is thet the structure will promote the corporational interests, rather than the individual or the sub-group ones. Thirdly, any structure will not be considered permanent, its continuous adaptation to the needed changes and requirements is absolutely necessary. The division on functions is a disintegration process, which, when it is combined with the subsequent processes of coordination and integration, will generate a constant source of tension inside the organization, very difficult to be avoided. In this paper these aspects are analyzed, together with the types of organizational structures with their advantages and disadvantages.
Key words: organizational efficiency, organization's structure, corporation, functions .

1. INTRODUCTION

Advocates of the classic school of management considered structure to be the crucial element in organization efficiency. Even thought modern perspective, backed by enthusiasts of the conjectural model, doesn't place as much importance on structure anymore, it accepts that it is one of the key variables that must be taken into account when designing an organization. The ssues on structure are not only important to theoreticians, but to practitioners as well.

Designing the structure of the organization is one of the major priorities of any management team. Because the structure is designed by managers will cause it to mirror management's values and interests rather than those of other parties that hold interest in a particular organization (employees, clients, share holders).

Another important aspect is that the structure will promote corporate interests rather than individual or sub-group ones.

Thirdly, no structure can be considered permanent, its continuous adaptation to changes and external pressures being very necessary. With the exception of small firms, where the owner controls all the major tasks (production, financial etc.), organizations need a certain degree of specialization, division based on functions. Separation by functions is initially achieved by grouping key activities (production, provisioning, accounting, sales, marketing, human resources, etc.) followed by defining responsabilities, which, grouped based on certain criteria, will be assigned to employees as jobs.
In essence, division by functions is a disintegration process which, when combined with subsequent processes of coordination and integration, will constitute a constant, difficult to avoid source of discord within the organization.

H. Mintzberg has made a major contribution to the ideas regarding organizational structure, ideas that will be expanded on bellow.

2. FUNDAMENTAL CHARACTERISTICS OF ORGANIZATIONAL STRUCTURE.

The fundamental characteristics of organizational structure are denoted by four basic aspects: the basis of the organization, design parameters of the organization, conjectural factors, and structural configurations.

The basis of the organization – include the basis components, coordination mechanisms and flow system.

The basic components, the essential parts of the organization, are:

- the strategic apex, which includes directors, executives, the group formed by those with management positions within the organization,
- the middle line, meaning the operations managers,
- the operational centre, formed by operators and the directly productive employees,
- techno-structure, the specialized personnel, including human resource specialists,
- assisting personnel, who provide direct services to operational lines.

The coordination mechanisms, which the company uses in operating its structure, are:

- mutual adjustment, the mechanism that insures work coordination through the simple process of informal communication,
- direct supervision, where coordination is done by employees specially assigned to this task, in accordance to classic management,
- standardization of work processes, where coordination is intrinsic to the different work activities, also in accordance to classic principles of management,
- standardization of work results, where coordination is achieved by means of demanding that objectives and requirements are met on term,
- standardization of professional competencies, where coordination is done by teaching and training employees in clearly delimited fields.

  Mintzberg maintains that the simple organization can achieve coordination just by mutual adjustment, but, as its size increases, a higher degree of specialization is required, direct supervision being absolutely necessary. As the operations get more complex, direct supervision becomes insufficient and standardization needs to be implemented, first in work processes, that results. Specialized training will be the next step, standardizing personnel as well.

The flow systems in organizations are four, according to Mintzberg:

- authority flows, assigning official authority within management structures,
- material flows, the regulated circuits of materials necessary to the production processes,
- information flows, mainly official communication flows but which also contain several unofficial elements of communication,
- decisional flows, which contain the collection of decisional processes.

Design parameters are, according to Mintzberg:

- job specialization,
- behavior formation,
- professional training and “indoctrination” (the professional knowledge and competence required by the organization, attained through previous training or within the organization and the process by which employees absorb norms, organizational culture),
- division into units,
- the size of the units,
- planning and control systems,
- instruments for coordination and control, specific coordination jobs in a matrix type organization,
- vertical decentralization, transferring decision-making capabilities to the inferior part of the organizational “pyramid”,
- horizontal decentralization, transferring power to the specialists within the techno-structure and auxiliary services.

Conjectural factors, the four of them, according to Mintzberg, are factors of a constant presence, whatever the approach to an organization's structure.

The age and size of an organization (older and larger organizations tend to be a lot more formal than younger, smaller ones, which leads to the conclusion that with age and growth comes a tendency towards structural modifications, but a tendency which will rarely occur in a linear manner).

The technical system, with an important impact on the operational center of the organization, from the coordination point of view (the operator technical control system, which, as it grows, will impose a more bureaucratic structure) and the technical complexity point of view (which, as the degree of complexity rises, will create an accentuated dependency on the coordination instruments and a tendency which will rarely occur in a linear manner).

The environment, which represents the external side of the company's existence and which shows four characteristics, considered essential by Mintzberg: degree of stability (ranging from stable to unpredictable), degree of complexity (from simple to complex), degree of market diversity (from a single product/single clinet-integrated-to multiple products/global market-diversity) and degree of hostility (from a kind to a hostile environment).

The power, considered to be the exercise of control over decision –making by groups or individuals. Control of the decision-making process in organizations tends to be influenced either by external groups (share holders, owners, governments), by members of the organization (especially top management) or by the cultural evolution occurring in the external environment.

The conclusions of Mintzberg's research materialize in five types of configurations for organizational structures, which reduce the number of distinct influences exercised by design parameters, of circumstantial factors and of other key characteristics of the organization to a set of concepts essential to dealing with organizations.

The types of configurations are summarized in the following table:

Tabel 1. Configurations of organizational structure and their characteristics (according to Mintzberg)

Structural configuration	Coordination mechanism	Organizational component key	Main design parameters	Conjectural Factors
Simple structure	Direct supervision	Strategic apex	Centralization, Organic system	Seniority:reduced Technical system:simple Environment: simple
Mechanical bureaucracy	Standardizing work processes	Techno-structure	Behaviour formation	Seniority:high Size:big Technical system:simple/established Environment: stable
Professional bureaucracy	Professional Competences standardization	Operational nucleus	Training Horizontal specialization Decentralization	Environment:complex Technical system:simple/not established
Divisionary form	Results standardization	Middle line	Markets grouping Performance control	Environment:diversified markets Seniority/size:high/big
Adhocracy	Mutual adjustment	Auxiliary personnel Operational nucleus	Coordination instruments Organic system Functional units	Seniority:reduced Technical system:automated Environment:complex/dynamic

3. CONCLUSIONS

Structural configurations of contemporary organizations are extremely complex, as they are mainly adapted to the purposes of their existence and to the markets they act on. But there are a number of – standard- structures which, combined, can practically produce any operational structure.

The function-based managerial structure

Structural organization based on functions is the most used form of organization structure. With it, activity assignment, coordination and control is job category. Thus, the entirety of production activities will be placed under the leadership of a manager specialized in this kind of activity. One of this structure types is presented in the following diagram:

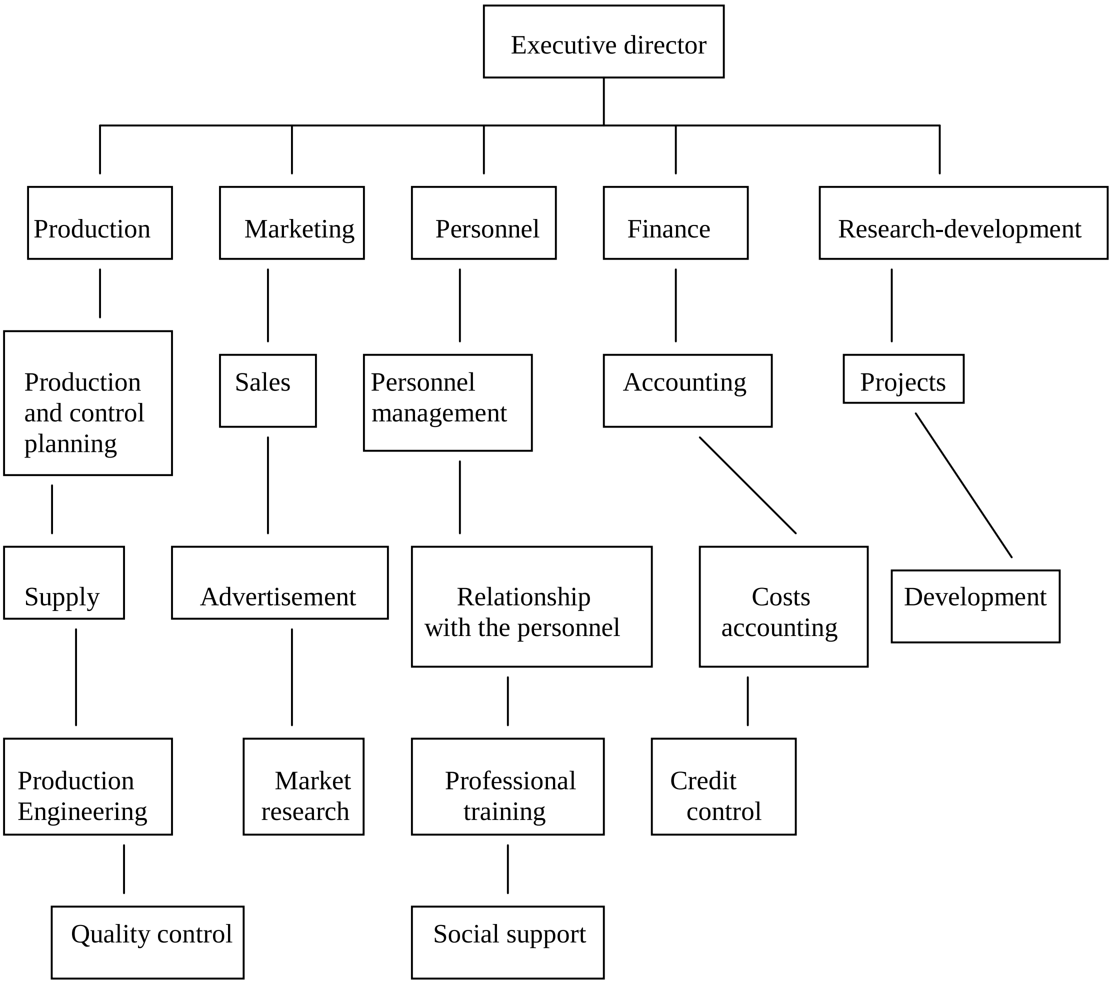

Fig. 1. Organization structure by functions

The advantages of a structure based on functions:

- The employees are grouped in departments according to their competencies and abilities, allowing them to gain experience and high level training;
- The employees can use their abilities to the maximum in their particular department, and so promoting and career management are easier for each of them;
- Activity coordination and control of functions can be done in a centralized manner, with a high degree of uniformity;
- Exercise of authority is facilitated by the existence of a function-based chain management.

Disavantages of function –based structures:

- Organization by functions, since it is specialized, tends to encourage the formation of fragmented group interests, different most of the times from the interests of the organization as a whole;
- Horizontal collaboration between functions is hampered, because the assigned responsabilities are consistent only within the functions;
- The control and coordination efforts of top management for the entire organization will be quite big, since descentralization is difficult due to the developed pyramidal structure.

Organizational structure based on product

In an organization activities can be structured by grouping them around the products or services offered, each group having its own functions at an operational level. Each product division will pursuit its own goals, having specialized managers for each function, thus being double-subordinated at organization level, to the division manager as to the specialization manager. Senior specialization managers will be responsible for the strategy and overall policy of the organization, establishing the limits for action at product division level and insuring the coordination and control of specialized activities carried out at this level. An example of product-based structure would be:

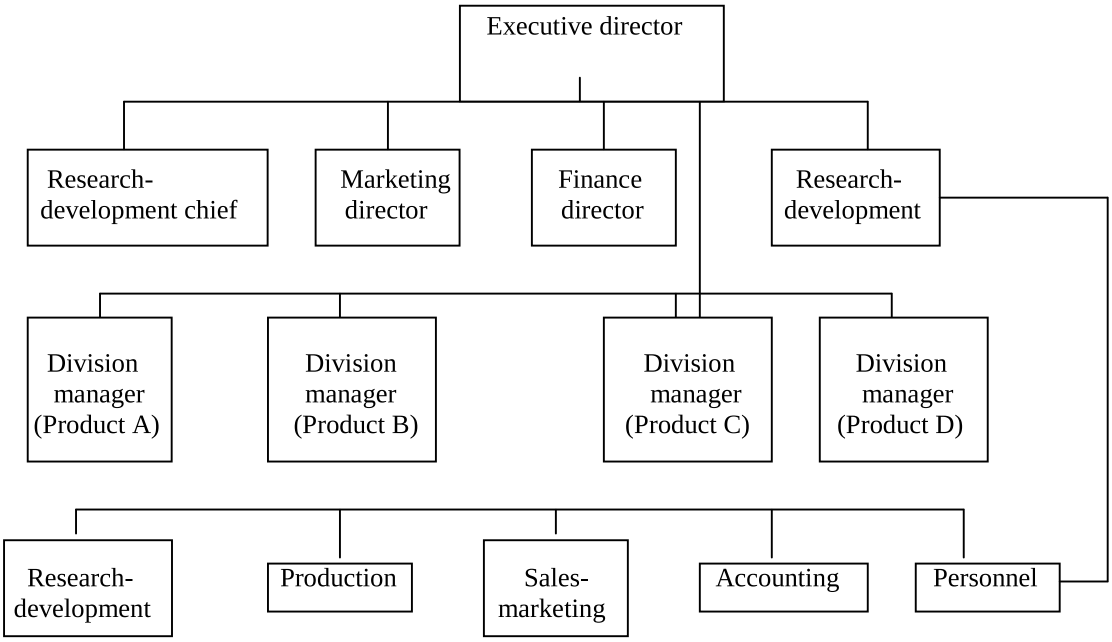

Fig. 2 Product – based organization structure

This type of structure will provide line managers with a very strong position in the organization, being directly subordinated only to the executive officer.

Advantages of product-based structure:

- Organizational independence for the major product groups in the organization, allowing them to focus on their own priorities, within the boundaries of the overall strategy;
- The chance for product groups to internally structure their specialized functions, according to their own interests and priorities, these being only distantly subordinated to their respective specialization department at organization level;
- Upper-level management can focus exclusively on general matters, company policy and strategy, leaving the management of mundane issues to the managers at product group levels.

Disadvantage of product-based structure:

- There is a change that each group will promote its own interests, most of the times to the detriment of the corporate interests.

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SEWING MACHINES USED FOR ASSEMBLING LEATHER GOODS

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Abstract: Leather goods industry uses, among the general usual stitching machines (flat-bed, vertical post-bed and cylinder arm), semi automatic and automatic stitching machines. Work productivity may increase if special devices are used such as for limitating or bending the border (simple or doubled), edging, an automatic thread cutter, as well as specific devices (zipper application or edge pipping). The devices attached to sewing machines may improve the sewing quality, may provide ergonomic solutions for the working place and increase the equipments' sewing flexibility.
The paper presents a series of developments concerning the sewing machines used for leather goods manufacture as well as various device types that may be atached to these machines as to increase work productivity and stitch quality.
Key words: leather goods, flat-bed sewing machine, post-bed sewing machine, cylinder arm sewing machine

1. INTRODUCTION

Sewing machines used for assembling leather goods components differentiate through the stitch type, the stitching bed and the level of technical equipment. Among the stitches types one can distinguish: lock stitch, chain stitch, binding stitch [5].

The sewing machines are classified according to bed type: flat bed, vertical post bed and cylindrical arm orientated to left or right. Considering their technical level there can be differentiated the following types: general purpose, semi- automatic and automatic sewing machines [3,4].
Sewing quality can be improved when using special devices for limiting or bending the border (simple or doubled), border edging, an automatic thread cutter, as well as specific devices (zipper application or piping) [6].

2. GENERAL PURPOSE SEWING MACHINES

The category of general purpose sewing machines includes: classical fast sewing machines, classical sewing machines with basic technical equipment and fast sewing machines. These sewing machines are differentiated as it follows: flat-bed, vertical post-bed and cylinder arm sewing machine.
Flat-bed sewing machines are used both for joining stitches, figure 1, and for ornamental stitches. In order to obtain decorative stitches two, three and four needles sewing machines may be used.

The zig-zag sewing machine is flatbed type, with a single needle and it forms the lockstitch no. 304, fig.2.

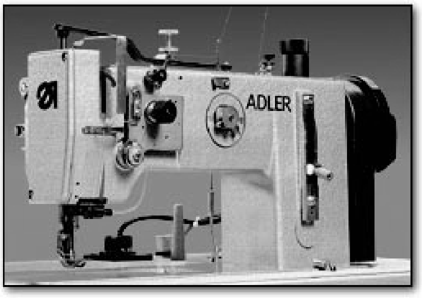


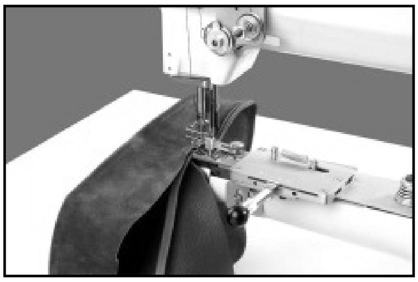
Fig. 1: Flat bed sewing machine

Fig. 2: Zig-zag sewing machine

The cylinder arm sewing machines are the most used in the leather goods industry, figure 3 a. From construction and operating points of view these machines resemble the vertical post-bed sewing machines.

a)

b)



c)

d)

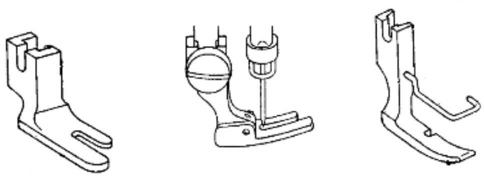
Fig. 3: Horizontal sewing machine: a- general view, b, c and d – stitching examples when using limiting devices and devices for piping edges

The cylinder arm of the machine can be set on the left or on the right side, being shorter in the case of the machines used for sewing small leather goods. The arm includes a clutch mechanism and a carrying device. Mostly the cylinder arm assures sewing of different patterns in order to confer the right shape, fig. 3b, 3c and 3d.

The presser foot has various constructive forms, fig.4, and the user's choice is in function of the different types of material. For example for sewing straight seams, a regular, standard presser foot is preferred.

Modern sewing machines, figure 5, include several additional equipments for:

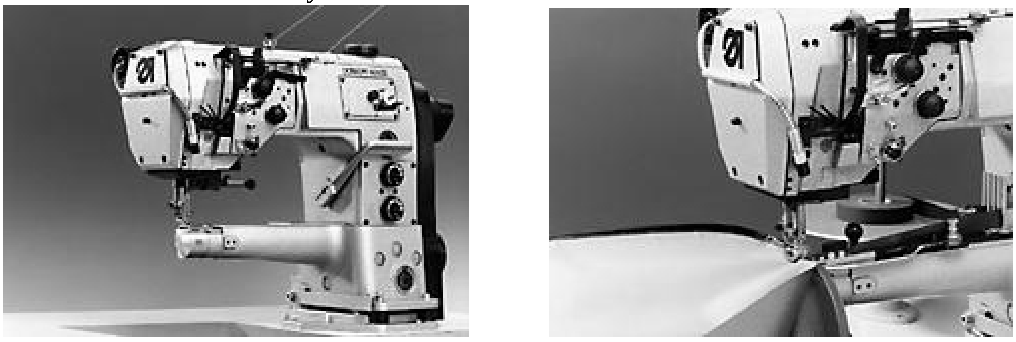
- automatic elevation and descent of the presser foot;
- automatic thread trimmer;
- automatic reinforcement of the stitch



a) b) c)

Fig. 4: Various constructive forms of the presser foot

at its extremity etc.



a) b)

Fig. 5: Cylindrical arm sewing machine: a-general view; b-stitching

In the leather goods industry the arm-type rotary sewing machine is used for edgings and profiling, fig.6

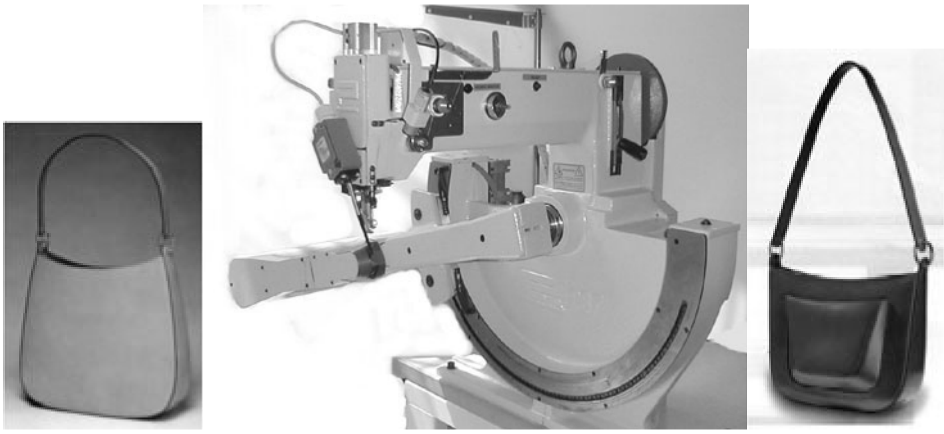


Fig. 6: Arm-type rotary sewing machine

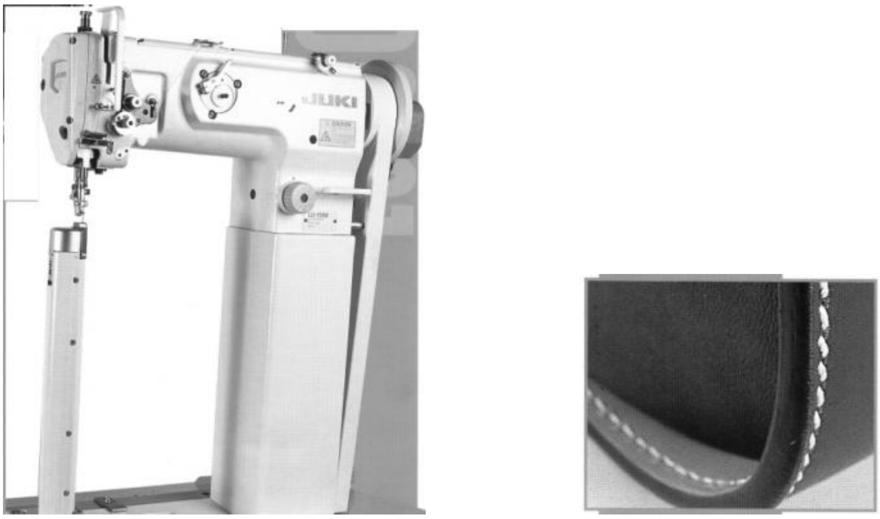
Vertical post bed and cylindrical arm sewing machines can join different patterns as to obtain a three-dimensional shape of the product, figure 7a and 7b.
In order to strengthen stitches two needle sewing machines may be used, fig.7c.

a) *b)* *c)*

Fig. 7: Post-bed sewing machine: a, b – sewing a bag;
c- reinforcement at a two needle sewing machine

The vertical post bed machines are used for joints that do not allow the arrangement of patterns on the bed. Patterns can be easily handled during stitching through the vertical post-bed.

The vertical post-bed of the sewing machine can be higher in the case of stitching bigger products (hand bags, suitcases). Thus the sewing machine presented in fig.8 is a special sewing machine for large leather goods and especially for difficult edging, the vertical post-bed has a height of 42 cm.



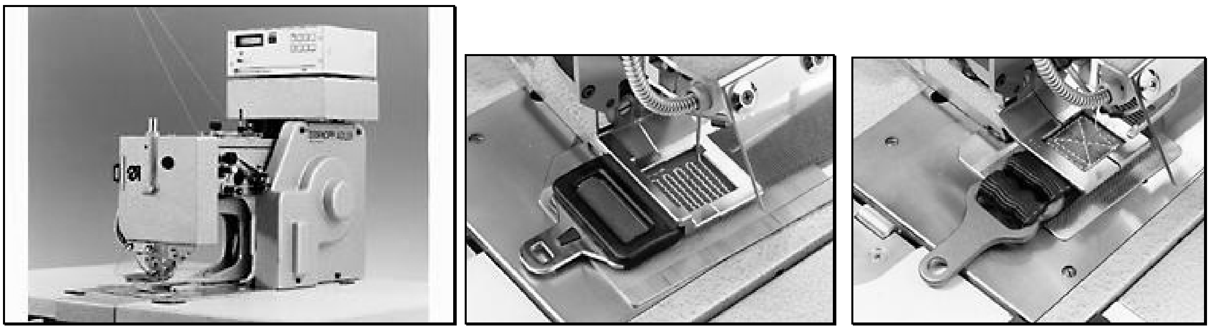
a) b)

Fig. 8: The vertical post bed machines

Moreover the vertical post bed sewing machine stitches in difficult angles, in places not easily accessible, fig. 8b.

3. SEMI-AUTOMATIC AND AUTOMATIC SEWING MACHINES

In the case of semi-automatic sewing machines, figure 9, the operator is required for starting the machine, as to feed semi- fabricates and to dispose the sewed semi fabricates.



a) b) c)

Fig. 9: Semi-automatic sewing machine: a-whole view; b and c–reinforcement stitch

These machines are used for a relative small number of stitches, respectively for reinforcement stitches.

In figure 10 there is presented a sewing machine for stitching small leather goods, such as a pocket book.

The key-board sewing machine allows the operator to choose the keys that perform:

- start-up reinforcement stitching;
- ending reinforcement stitching;
- pre-established length of the stitch –between 1 and 99 stitch length;
- programmed stitching of rectangular shapes;
- thread trimming.

The automatic sewing machines present a higher degree of versatility [2], the operator has to be present only at the start of the operation, figure 11.

These machines have also special devices that can tell when a thread tears or devices that cool down the needle. Also, after stitching the presser foot can be automatically elevated.

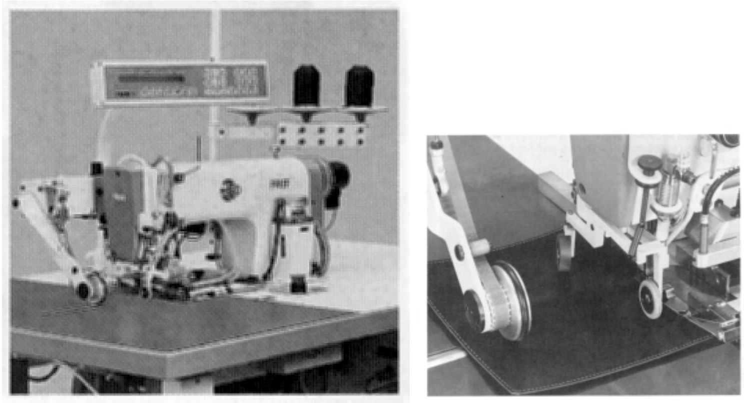


Fig. 10: Sewing machine for small leather goods

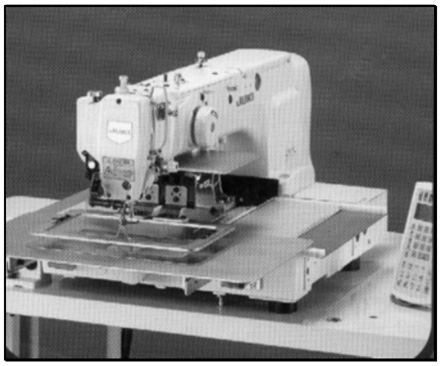


Fig. 11: Automatic sewing machine

4. DEVICES ATTACHED TO SEWING MACHINES

The devices, according to their technological destination, are grouped hereby:

- limiting devices, used for leading and maintaining a constant distance to the edge or to previous stitches;
- edge bending device (simple or double);
- edging device;
- thread trimmer device ;
- special devices (zip, binding, plastic edge piping) ;
- mix devices.

These devices can be positioned as it follows: on the bed of machine, figure 12, on the presser foot or on the stitching device.

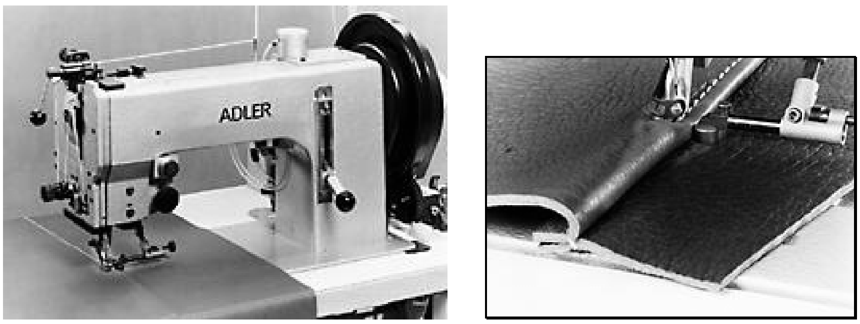
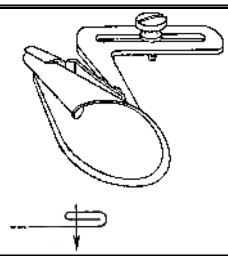
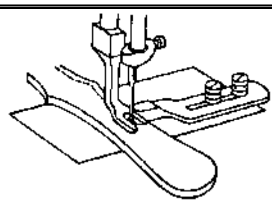
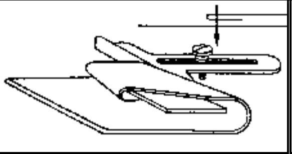
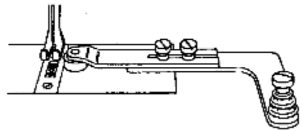
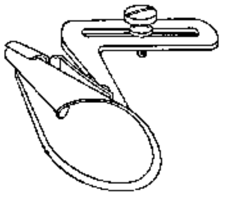
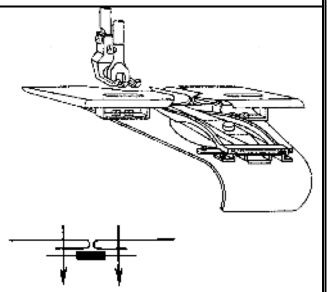
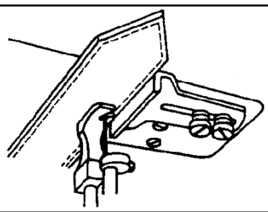
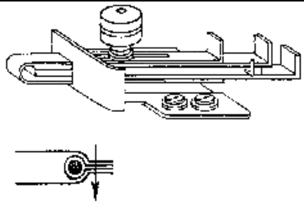
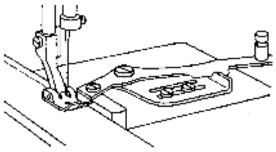
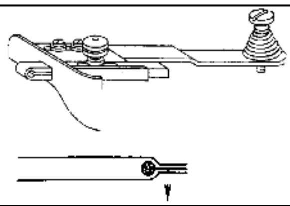


Fig. 12: Restriction device fixed on the machine bed

Table 1 present various types of devices: both bending and restriction devices and also special ones, for example for applying a zip or plastic edge piping [1].

Table 1: Devices attached to sewing machines

No. crt.	The name of the device	Representation	No. crt.	Device name	Representation
1.			6.	Restriction device	

2.	Bending devices		7.		
3.			8.	Device for zip application	
4.	Restriction devices		9.	Bending device	
5.			10.	Device for plastic edge piping	

5. CONCLUSIONS

The devices attached to sewing machines present a series of advantages such as:

- a growth of work productivity at sewing operations without essential modifications of the main equipment;
- an improvement of the operation’s quality;
- an ergonomic solutions for the working place;
- an increase of equipments’ sewing flexibility.

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RUPTURE BEHAVIOUR OF CORE-SPUN YARNS

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Abstract: The paper presents an insight into the mechanism of breakage of core-spun yarns and the contribution of the components to the yarn breaking strength. The study was made on cotton covered/nylon filament core yarn of 25 tex linear density produced at different twists. The load-extension curves showed three types of breakages. At low twist, the fibers slip along the filament core and mainly the filament yarn supports the effort. The breakage of this nature was named high elongation breakage. At medium twist, the sheath destroys first, and then the core filament breakage occurs too. The breakage of this nature was named structural breakage. At high twists, a simultaneous breakage of cotton fibers and nylon multifilament occurs.
Key words: core-spun yarn, filament core, sheath fibers, yarn breakage, load-extension curve

1. INTRODUCTION

Simple and inexpensive modification of the ring frame in the creel and the drafting zone allow the production of yarns having surface characteristics similar to ring-spun yarns, but different structure and properties [1, 3, 7]. Such yarns are described in the literature as core-spun yarns and consist of a filament core and a staple fiber sheath.

The yarn assortment is diverse depending on the nature and characteristics of the components (filament and fibers), the core-sheath ratio, the twist factor and so on. The filament improves yarn strength, elasticity, durability, and evenness and also permits the use of lower twist level, while the sheath provides the staple fiber yarn appearance and surface physical properties.

Many researches concerning the obtaining and study of cotton covered/polyester and nylon textured multifilament core yarns allowed the following conclusions [2, 4, 6, 8]:

- Core-spun yarns can be spun under normal technological conditions using different core/sheath ratios (15 – 31 % core component), different sorts of cotton (short, long, carded, combed) and even low twist that cannot be use for spinning of similar all cotton yarns;
- The surface appearance of core-spun yarns is similar to the appearance of all cotton yarns;
- Core-spun yarns have a better uniformity of linear density;
- In comparison with all cotton yarns, the breaking strength of core-spun yarns is higher depending on the quality of sheath fibers, the core-sheath ratio and twist;
- Core-spun yarn breaking elongation is higher than the breaking elongation of all-cotton yarn;
- The breakage of core-spun yarns occurs completely different when compared to breakage of ring-spun yarns.

The paper presents an insight into the mechanism of breakage of core-spun yarns and the contribution of the components to the yarn breaking strength.

2. METHODS AND MATERIALS

The principle of producing core-spun yarns consists in simultaneous feeding of roving and filament yarn into the drafting zone. The combining of the two components takes place before the nip of the front rollers of the ring spinning frame. The twisting action produced by the spinning spindle causes the drafted strands to spin around the filament core, and thus the core-spun yarn is obtained (see Figure 1). The filament is taken from a supply package around suitable guides and fed to the drafted strand at the front nip. The filament guiding device consists of two collapsible levers, each of them having at the end a central grooved roller mounted on a ball bearing. During spinning the guiding rollers lean against the top front rollers and are driven by friction. When it is necessary the levers can be lifted and folded backward.

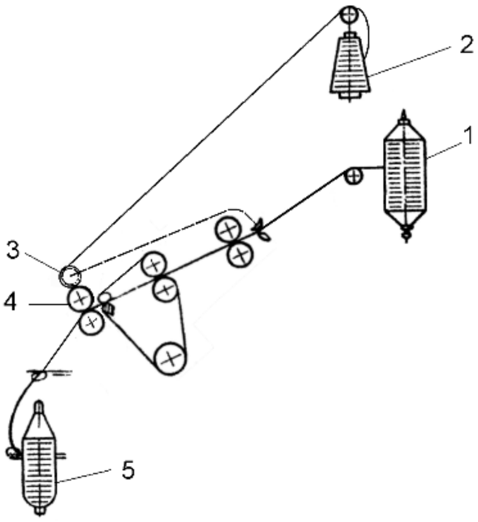

Fig.1: Core spinning principle
1-cotton roving; 2-filament yarn; 3-central grooved guiding roller;
4-front rollers; 5-core-spun yarn bobbin

In order to obtain a proper yarn structure, it is very important to position the filament yarn right in the middle of the drafted strand.

To understand the mechanism by which the core yarn is ruptured, the process of breakage was examined on the MESDAN tensile tester. The study was made on cotton covered/nylon filament core yarn of 25 tex linear density. The core yarn was spun to a three level of twist coefficient: $\alpha_m = 70$, $\alpha_m = 100$, and $\alpha_m = 130$. The core/sheath ratio was 17,6 % / 82,4 %, for a filament yarn linear density of 44 dtex/12 filaments. Some typical load–extension curves depicting the process of breakage were registered.

3. RESULTS

As a result of differences between the elongations at break of fibers and filament, the breakage of core-spun yarns occurs in three different ways:

1. At low twist, the sheath fibers are not fixed into the yarn structure. When core yarn is stressed the fibers slip along the filament core and mainly the filament yarn supports the effort. In this case the breaking strength and the elongation at break of core-spun yarn are very close to those of the filament yarn a small contribution being added by the frictional forces between fibers and between fibers and filament. The breakage of this nature was named high elongation breakage (see Figure 2).
2. At medium twist, some of the fibers are fixed into the yarn structure, the yarn breakage taking place in two steps. First, the sheath destroys by slippage and/or breakage of fibers, and then the core filament breakage occurs too. At the first break a sharp fall in the load takes places, this being followed by stepwise breaks while the elongation increases. The stepwise rise and fall of load was due to the multiple breaks in the staple-fiber component and the stick-slip frictional effects [1, 5]. Finally, the yarn breakage occurs at higher elongation than that corresponding to the sheath failure, but without reaching the breaking elongation of filament yarn. The breakage of this nature was named structural breakage. Technological importance presents the tensile characteristics corresponding to sheath failure and not to yarn breakage.
3. At high twist, most of the sheath fibers are fixed into yarn structure and the tensile behavior of core-spun yarn is similar to that of ring-spun yarn. The core-spun yarn structure destroys by simultaneous breakage of the two components. In this case, at the first break due to high

enough inter-fiber cohesive forces between filament and staple-fiber material the load in the yarn is higher all along the length of yarn except for the place of breaking. This causes an instantaneous spread of the break right across the section. The breakages that took place after this mechanism were named simultaneous breakages.

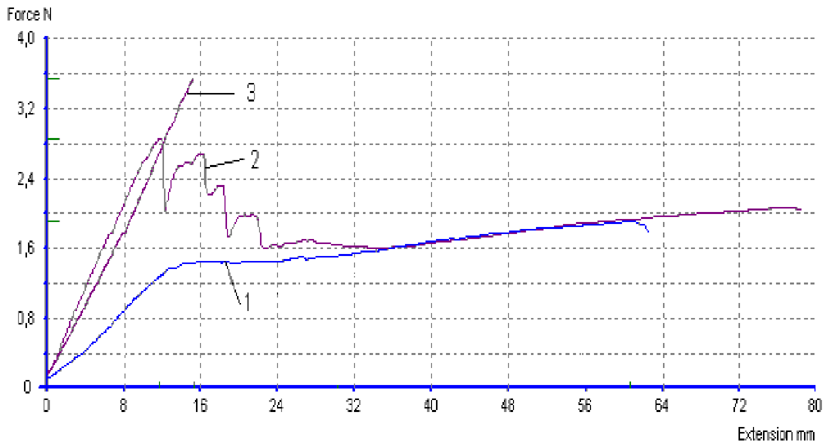

Fig. 2: Load-extension curves of core-spun yarns
1 - high elongation breakage; 2 - structural breakage; 3 - simultaneous breakage

Theoretically it may be assumed that at low twists only high elongation breakages occur. As twist increases, structural breakages appear and their frequency increases instead of frequency of high elongation breakages. As twist increases further, simultaneous breakages appear and their frequency increases instead of frequency of structural breakages. The ideal variation of frequency of core yarn breakage types depending on twist is presented in Figure 3.

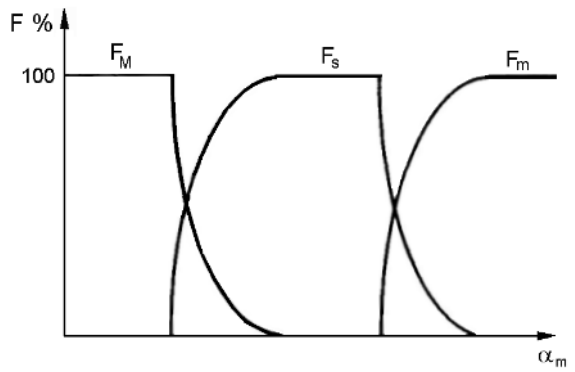

Fig. 3: The ideal variation of frequency of core-spun yarn breakage types depending on twist
F_M - frequency of high elongation breakages; F_s- frequency of structural breakages; 3- frequency of simultaneous breakages

In fact, due to unevenness of sheath fibers characteristics, their distribution along the yarn, and yarn twist, the three types of breakages can coexist. A more accurate representation of the variation of frequency of core yarns breakage types depending on twist is presented in Figure 4.
From the observation taken during testing one can state that if high elongation breakages prevail the core yarns do not have structural stability because the staple fiber sheath may slip along the filament when being pulled to pass over or being rubbed by machine parts during further mechanical processing. The core yarns showing mainly structural breakages have structural stability and can be processed without any problem in the subsequent stages. When the simultaneous breakages prevail the behavior of core yarns is similar to the behavior of conventional yarns.

As regards the breaking strength of core yarns, as can be seen from load – extension curves as twist increases the yarn breaking strength increases due to the increase of inter-fiber frictional forces that allow better fiber strength exploitation.

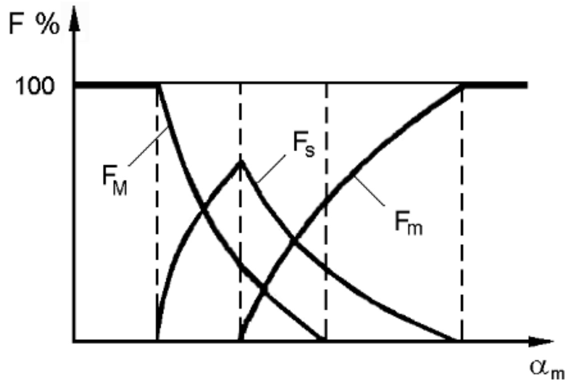

Fig. 4: The real variation of frequency of core-spun yarn breakage types depending on twist
F_M - frequency of breakages at high elongation; F_s- frequency of structural breakages; 3- frequency of simultaneous breakages

4. CONCLUSIONS

The results of this study highlight that a core yarn show three kinds of breakages:

- breakage at high elongation, where sheath fiber slippage occur in the yarn during extension - specific to low twists;
- structural breakage, where a first break that causes a sharp fall in the load is followed by multiple stepwise breaks while the elongation increases - specific to intermediate twists;
- simultaneous breakage, where the cotton fibers and the nylon multifilament break at the same time – specific to high twists.

The yarns showing breakage at high elongation are not suitable for further processing because of the possibility of staple fiber sheath to slip along the filament. Structural stability to abrasive actions of the machine parts during subsequent processing present the core yarns whereon only structural and simultaneous breakages exist.

As with conventional yarns as twist increases the breaking strength of core yarns improves due to a better fiber strength exploitation.

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STUDY ON INFLUENCE OF SOME PARAMETERS ON THE BREAKAGE TYPE OF CORE-SPUN YARNS

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Abstract: The paper presents the effect of twist, fiber characteristics and core/sheath ratio on the breakage types of core-spun yarns. The core yarns were spun on a modified ring spinning frame with a double-apron drafting system using five twist coefficients (αm): 70, 85, 100, 115, and 130. There were used three different varieties of carded cotton as sheath material and 44 dtex/12 filaments nylon textured multifilament as core material. The core/sheath ratio was modified by spinning core yarns of different linear densities (25 tex, 20 tex, and 16.66 tex). In order to ensure good core coverage, the core ratio did not exceed 30 %.
Key words: core-spun yarn, cotton sheath, nylon core, simultaneous breakage, structural breakage.

1. INTRODUCTION

Yarn producers are continuously interested in developing new products in order to meet the customers' demand and to face the increasing competition in the textile market. The permanent search for an ideal all-purpose yarn resulted in the development of many new methods of spinning, as is core-spinning technology. Among the techniques that can produce core-spun yarns, the core spinning on the ring frame is highly used because the ring frame dominates in commercial use. Because very few modifications are necessary to accommodate the packages and guides of filament yarn, ring spinning is an inexpensive method of producing core yarns on common spinning equipment.

In core spinning a staple fiber sheath covers a continuous-filament core in order to take advantages of the different properties of these two components. The spinning of core-yarns has aimed at [1, 4, 5]:

- Upgrading weaker fibers into finer counts;
- Obtaining of high resilience products;
- Obtaining of products with high strength and surface characteristics similar to those of natural fibers.

The properties of core-spun yarns recommend their usage for specific applications such as: industrial textiles (tarpaulins, tentage, hose, conveyor belts, V-belts); military and protective clothing; light weight apparel fabrics; medical textiles; socks; sewing thread.

Due to the differences between the elongations at break of the two components (fibers and filament), the core-spun yarn behavior undergoing strain is completely different when compared to ring-spun yarn. While ring-spun yarns exhibit single sharp breaks the core-spun yarns show three different types of breakages: high elongation breakages, structural breakages and simultaneous breakages [2, 3].

The paper presents the effect of twist, fiber characteristics and core/sheath ratio on the breakage types of core-spun yarns.

2. METHODS AND MATERIALS

A modified ring spinning frame with a double-apron drafting system was used to produce core-spun yarn. The method of producing core-spun yarns consists in introducing the core filament during the spinning of staple fiber at the front nip.

The core material was a 44 dtex/12 filaments nylon textured multifilament (see Table 1) and the sheath fiber material was three different varieties of carded cotton (see Table 2).

Table 1: Characteristics of nylon multifilament yarn

Characteristics	Value
Breaking strength, cN	170.8
CV of breaking strength, %	3.76
Tenacity, cN/tex	39.2
Breaking elongation, %	32
CV of breaking elongation, %	12,1

Table 2: Characteristics of sheath cotton fibers

Characteristics	Cotton variety		
	A	B	C
Fineness (Nm)	7411	6521	4497
Linear density (tex)	0.1349	0.1533	0.2224
Tenacity (cN/tex)	28.9	26.8	21.14
Staple length (mm)	35.18	31.24	30.39
Mean length (mm)	28.56	25.23	23.26
CV of length (%)	24.75	23.91	28.06
Short fibers (< 15.5 mm) (%)	7.98	10.22	19.73

Core-spun yarns with three levels of core/sheath ratio and five twist coefficient levels were spun from the filament and cotton materials on the ring frame. The choosing of the levels of core sheath/ratio took into consideration the recommendation that when core-spun yarns are produced for clothing application, in order to ensure good core coverage, the core ratio must not exceed 30 %. The filament ratio influences not only the core coverage degree but also the core yarn tenacity. Thus, a decrease in filament core ratio improves the coverage degree but worsens the core-spun yarn tenacity. In our experiment, because the filament was the same, the three core/sheath ratio corresponded to core yarns of different linear densities (see Table 3).

Table 3: Core/sheath ratios and core yarns linear densities

Component	Characteristics	Yarn linear density, tex (Nm)		
		25 (40)	20 (50)	16.66 (60)
Core filament	Linear density (tex)	4.4	4.4	4.4
	Ratio (%)	17.6	22	26.4
Sheath fibers	Linear density (tex)	20.6	15.8	12.26
	Ratio (%)	82.4	78	73.6

The core yarns were spun using five twist coefficients (α_m): 70, 85, 100, 115, and 130.

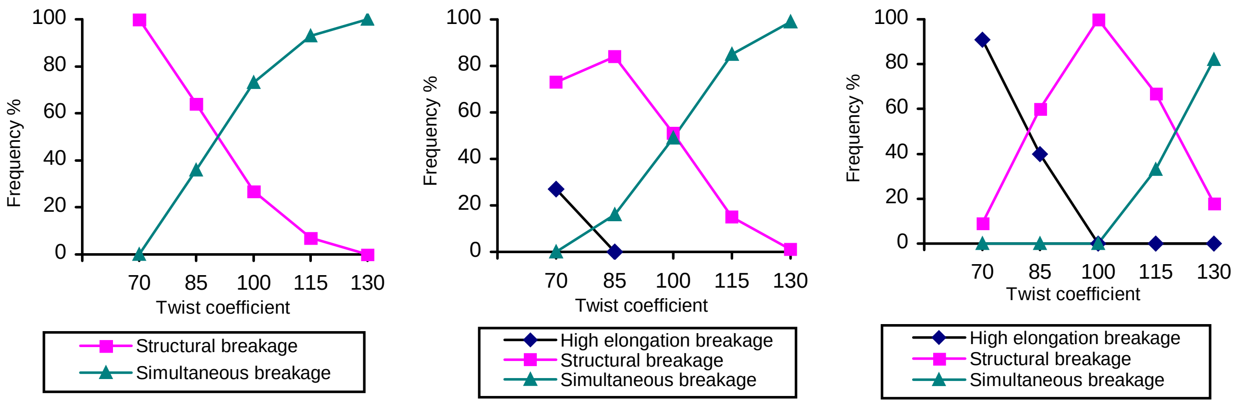
The tensile behavior of core-spun yarns was assessed on a MESDAN tensile tester using 500 mm test specimen length.

3. RESULTS

3.1. Influence of twist coefficient on the breakage type of core yarns

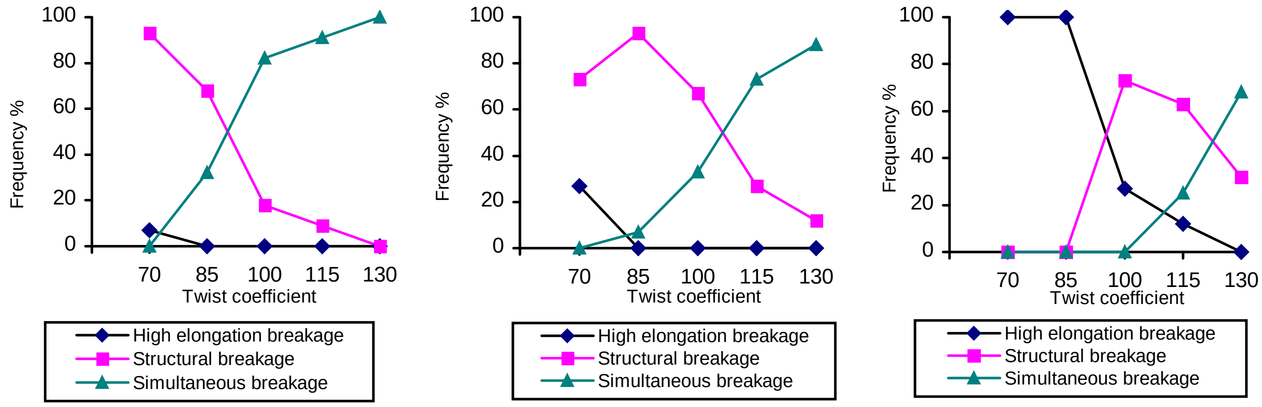
The Figures 1, 2, and 3 present the frequency of breakage types depending on twist coefficient for all the core yarns under study.

As can be seen from Figures 1, 2, and 3, for a certain core yarn can coexist two or in the most cases all three types of breakage. Thus, at low twist coefficient (α_m = 70 and α_m = 85) an important share have high elongation breakages or structural breakages (depending on the sheath fibers quality and core/sheath ratio). As twist increases and the sheath fibers strength is better exploited, the frequency of structural breakages increases and simultaneous breakages start to be registered. A further increase in twist leads to an increase of simultaneous breakage frequency instead of the other two, and thus at high twist coefficient (α_m = 115 and α_m = 130) the simultaneous breakages prevail.



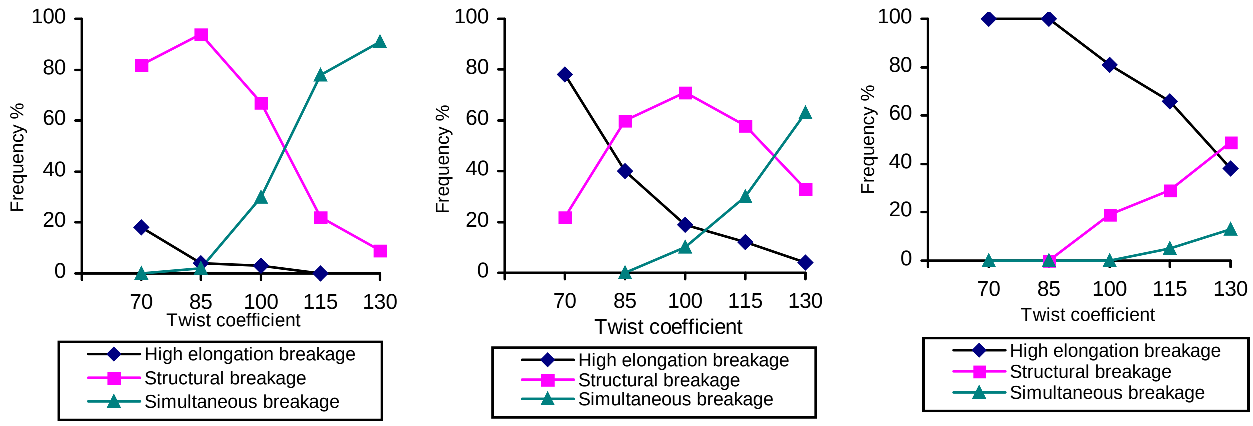
a b c

Figure 1: The frequency of breakage types of 25 tex core yarns depending on twist coefficient
a – A cotton sheath fibers ; b – B cotton sheath fibers; c- C cotton sheath fibers



a b c

Figure 2: The frequency of breakage types of 20 tex core yarns depending on twist coefficient
a – A cotton sheath fibers ; b – B cotton sheath fibers; c- C cotton sheath fibers



a b c

Figure 3: The frequency of breakage types of 16.6 tex core yarns depending on twist coefficient
a – A cotton sheath fibers ; b – B cotton sheath fibers; c- C cotton sheath fibers

3.2. Influence of core/sheath ratio on the breakage type of core yarns

Analyzing the Figures 1, 2, and 3, it could be found that keeping constant the cotton variety and the twist coefficient, as sheath fiber ratio increases from 73.6 % to 82.4 %, the frequency of structural breakages increases instead of high elongation breakage frequency and the frequency of simultaneous breakages increases instead of the other two. An increase in fiber sheath ratio leads to a better fiber strength exploitation and to a reduction of fibers slipping tendency along the core during subsequent processing. Also it can be notice that an increase in sheath ratio (coarser core yarns) permits a reduction of twist coefficient without affecting core yarn structural stability. For example, in the case of B cotton sheath core yarns, at a sheath ratio of 73.6 % (16.6 tex core yarn) the core yarn structural stability is reached at α_m = 115-130, while at a sheath ratio of 82.4 % (25 tex core yarn) the core yarn structural stability is reached starting with α_m = 85.

3.3. Influence of fiber characteristics on the breakage type of core yarns

With ring-spun yarns, the longer and finer the fibers are the better strength exploitation is and a lower twist coefficient can be used. This behavior is also expected for core-spun yarns.

In order to analyze the influence of sheath fiber characteristics on the breakage type of core yarns three varieties of carded cotton (A, B, C) were used for spinning core yarns of 25 tex , 20 tex, and 16.6 tex. For a given twist coefficient and core/sheath ratio, the values of frequencies of each type of breakage (see Figures 1, 2, 3) lead to the following conclusions:

- when C cotton variety is used as sheath (short and coarse fibers, high content of short fibers), the high elongation breakages prevail, that means unstable structure of core yarns;
- when B cotton variety is used as sheath (longer and finer fibers and less short fiber content than C cotton variety), the frequency of structural breakages increases instead of high elongation breakages, and simultaneous breakages appear at lower twist coefficient;
- using A cotton variety as sheath (the longest, the finest fibers, and the lowest short fiber content of all cottons) lead to a better fixing of fibers into yarn structure so that the frequency of high elongation breakages is negligible even at low twist coefficient regardless the core/sheath ratio.

4. CONCLUSIONS

From this investigation the following results were concluded:

- As twist increases, the adhesion of sheath fibers to the core increases and the core yarns show structural and simultaneous breakages, and thus a better structural stability.
- An increase in fiber sheath ratio leads to a better fixing of fibers into yarn structure and to a reduction of slipping tendency of fibers along the core during subsequent processing. Also, an increase in fiber sheath ratio permits a reduction of twist coefficient without affecting core yarn structural stability.
- When long and fine fibers are used in sheath, the simultaneous and structural breakages (that characterize stable structures) prevail regardless the component ratios. When using short and coarse fibers in sheath, these types of breakage appear only at high coefficient twist and high sheath ratio.

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THE SPATIAL SHAPE OF THE SHOE SOLES AND THE BODY EQUILIBRIUM

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Abstract: The lower ensemble of the footwear, the sole and the heel, constitutes a diversification criteria next to the upper ensemble. The diversification of sole models is obtained acting on the heel profile, on the link between the heel and forefoot, on the sole thickness, on the weld height and width, on the tip shape, on the anti-skid relief, on the side surface of the sole, etc. The design of the sole models is done respecting a set of precise rules. The spatial shape and the anti-skid relief affects directly the quality of the bonding between the sole and the upper part of the footwear, the foot equilibrium while wearing footwear both in statics and dynamics, the foot effort while walking, etc. In this paper are presented some aspects regarding the influence of the sole spatial shape on the body equilibrium, both in statics and dynamics.
Key words: footwear, soles, biomechanics.

1. INTRODUCTION

The footwear model diversification is achieved acting in the same measure on both the upper ensemble and the lower ensemble. The soles are parts of the lower ensemble that have contact directly with the support plane. There are multiple diversification modalities for the shoe soles. The diversifications can be obtained acting on the height and shape of the heel, on the link between the heel and forefoot, the thickness and weld of the sole, the anti-skid relief, on the side surface shape, the tip shape, the polimeric blend used, on the colours and number of colours used, etc. It can be stated that the model diversification of the soles formed in moulds is inexhaustible. All this diversification possibilities require a thorough analysis. The studies on the footwear soles highlights that their spatial shapes affects the bonding process with the upper ensemble, the foot effort while walking, the body equilibrium in statics and dynamics, etc. This paper presents a set of specifications that emphasize the influence of the spatial shapes of the soles on the body equilibrium in statics and dynamics.

2. THE SOLE AND THE BODY EQUILIBRIUM

2.1 The classification of the soles according to their spatial shape

In terms of profile and spatialization, the soles formed in moulds can be flat, partially spatialized and spatialized [2].

The flat soles are designed for footwear types with heel height between 0-30 mm. These soles are assembled with the upper by gluing, sewing or by combining the sewing and gluing, and are taking the spatial shape of the shoe last due to the properties of the polymer used for fabrication.

The partially spatialized soles have the spatial shape of the last from the rear to the bending line of the toes and a flat shape from the bending line to the tip. These soles are made of flexible polymers that allow the bending in the toes articulations zone and the assembling by gluing or sewing on the spatial shoe last forepart.

The spatialized soles have the spatial shape of the last on the assembling zone with the upper.

The footwear soles, whatever their spatial shape, are produced as monoliths with the heel included in the sole body, or as separated soles without the heel.

The monolithic soles usually have heel heights under 40 mm and their sections are designed to avoid the heel deformation on impact. These soles are designed especially for low heel footwear. In the case of monolithic soles, the heel is obtained from the same material as the sole, being formed in the same time, whatever the polymer or the mould forming method. The use of monolithic soles has the advantage of avoiding the heel mounting operation. The monolithic soles with heel heights of over 40 mm are obtained of rigid polymer blends. These soles don't allow the bending of the foot on the toes articulations zone, and because of this these soles are designed with higher tip heights.

For soles with higher heels or heels of 30-40mm height but with a small heel surface, the preferred construction is the one with the sole with separated heel. The soles with separated heel are made of similar blends and procedures as the monolith soles. The heels are made of rigid plastics with low deformability to compression and bending. The assembling of the heels on the soles is done by classical operations.

2.2. The consequences of the sole spatialization over the body equilibrium

While walking the foot has a permanent tendency to skid in specific directions and to unbalance the body [4,5]. The skid tendencies are higher on impact and propulsion when the contact time between the foot and the support plan is shorter and on a smaller surface.

On impact, the heel has an important role on the body equilibrium by its shape, height, contact surface with the support plane and bending resistance [3,6].

The heel shape and dimension must be analysed in relation with its role in the different gait stages.

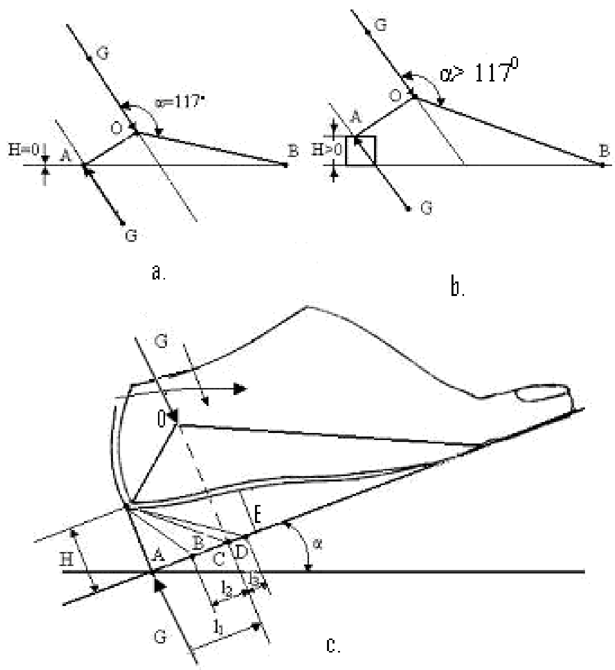

Fig. 1: Heel position in static and dynamic

In figure 1a [2,3] is presented the foot position on a heelless sole; in this case the heel height (H) is zero and the α angle formed by the tibia axis and the astragals axis is 117^0. In figure 1b is presented the foot position on a sole with a heel height H > 0; in this case $\alpha>117^0$. The studies [1,6] demonstrated that in bilateral orthostatic position of the foot on a heelless sole (H=0), the body equilibrium is accomplished with effort by overloading the elastic components in the foot anatomy. By raising the bottom surface on a heel with height of 10-30 mm this overload is removed. Increasing the heel height over 30 mm leads to a supplemental load on the elastic components of the foot in static.

The heel shape and height affects significantly the body equilibrium in dynamic on impact.

In figure 1c is presented the impact moment of the foot on a heel with the height H. Are presented the situations when the heel has a cylindrical shape with a heel cap length equal with the AD segment and a conical shape when the heel cap length is equal with the segments BE, CE and DE. In figure 1c is shown that in the impact moment the heel of height H comes in contact with the support plane in point A. The torque formed by the G forces, equal but of opposite directions, that act in the points A and O determine a rotation moment. The value of the rotation moment is calculated with the relation (1).

$$M = G \cdot l_1 \text{, [Nm]} \tag{1}$$

Under the action of this moment the bottom surface rotates moving the tibia in the directions showed by the arrows, fitting perfectly in the body horizontal movement. Changing the cylindrical shape of the heel such as the impact is done in the points B, C or D brings modifications on the rotation moment. The values of the rotation moment in the points B, C and D are determined with the relations (2), (3) and (4).

$$M_B = G \cdot l_2 \text{, [Nm]} \tag{2}$$

$$M_C = G \cdot 0 = 0 \tag{3}$$

$$M_D = G \cdot l_3 \text{, [Nm]} \tag{4}$$

From the relations (1), (2), (3) and (4) comes the conclusion [2,3] that a conical shape of the heel will the rotation moment on the A-C zone. On the C point, which coincides with the heel center, the rotation moment value is zero. Beyond the heel center, on the CD segment, the rotation moment will have negative values. Therefore, the position of the B point must be limited and implicitly the conic shape of the heel, in such a way that it will permit the rotation of the foot bottom part in the tibia-astragal joint and, in the same time, to not unbalance the foot in the different gait phases.

The contact surface between the heel and the support plan has a significant role on the body equilibrium [2,3]. In figure 2, are presented the situations in which the contact surface is at its maximum, defined by the contour AEF, and at its minimum, defined by the contour $A^{'}E^{''}F^{''}$. Between the two contours, the number of intermediate contours is infinite. The C point represents the heel center position. Respecting the static equilibrium rules, the vertical in the center of the tibia-astragal articulation, respectively the C pint, must be on the support surface, the surface of the heel tap [3,4].

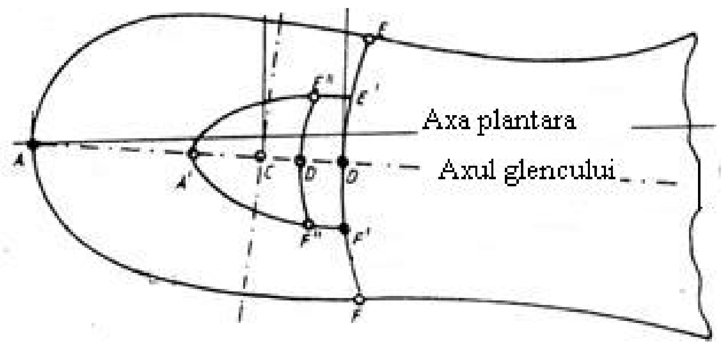

Fig. 2: The minimum and maximum surface of the heel tap

Another aspect that can generate the unbalancing of the foot is the bending of the heel [2,3]. To avoid the heel bending is needed to adopt a heel height and section shape in correlation with the elasticity module of the polymer used to make the heel.

Considering the heel as a particular case of an articulated bar resting on the plane, subjected to a force P_f, can appear a bending deformation which pulls the bar from the equilibrium position [2,3], as in figure 3.

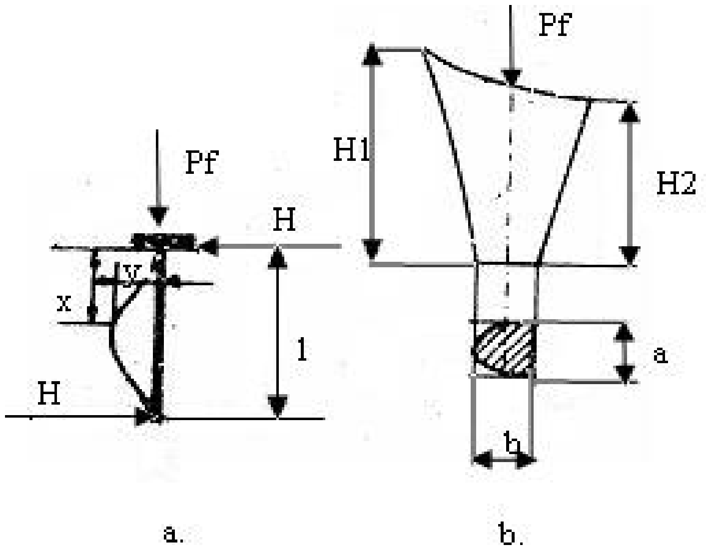

Fig. 3: Manifestation of the heel bending

The value of the bending force, respectively the force under which the rod leaves the vertical position, is given by the relation (5)**Error! Reference source not found.**:

$$P_f = \frac{EI_{\min}}{4l^2}, [N] \quad \textbf{(5)}$$

where: E - elasticity module; I_{min} - the minimum inertial moment.

Replacing in the relation **Error! Reference source not found.** (5) the sizes of the heel from the figure 3 the obtain relation is (6): **Error! Reference source not found.**

$$P_f = \frac{E\frac{ba^3}{12}}{4\left(\frac{H_1+H_2}{2}\right)^2} = \frac{Eba^3}{48H_m^2}, [N] \quad \textbf{(6)}$$

where: b - heel tap length, [m]; a - heel tap width, [m]; H_1 - heel anterior height, [m]; H_2 - heel posterior height, [m]; H_m - the average value between H_1 and H_2.

The section with the sides contained in the rectangle of sides a and b is considered the minimum heel section.

The elasticity module value of the polimeric blends used to make the soles is about 20 daN/cm^2, to ensure the sole flexibility in the flexing area. In this case, of the monolith soles, the heel height must be limited to 20-30 mm. For greater heel heights the heels are enforced by inserting in their mass metallic rods or the heels will be made of high rigidity plastics, with elasticity module greater than 100 daN/cm^2.

Also it is necessary to correlate the heel height with the heel surface which comes in contact with the upper [2,3], (A_s) and with the heel surface that comes in contact with the support plane, A_1). In the case of monolithic sole is recommended that the rapport between the two surfaces to be anywhere between 0.5 and 1.

Considering the shape of the heel in the shankpiece area results that this area can have any position in the sole construction, starting with the γ angle value of 90^0 to the value of 180^0 [3,6]. In the figure 4 are marked with the lines 0-4 four sectors of the γ angle. This allows appreciating the shape of the linking area between the heel and the foot forepart.

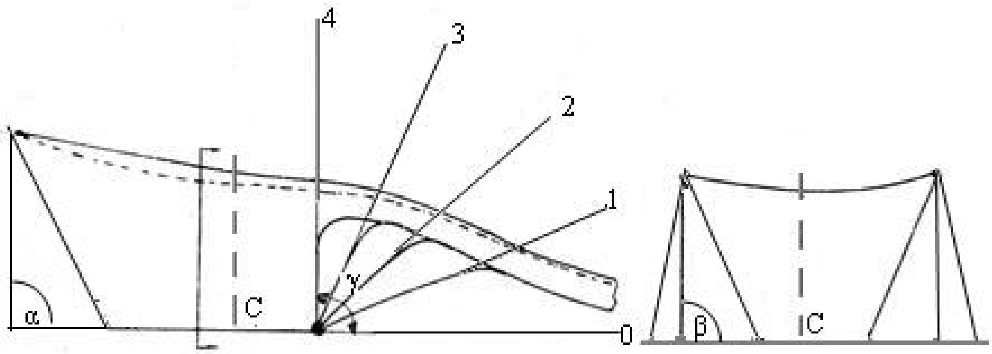

Fig. 4: Dividing the sole in sectors in the shankpiece area

The heel front contour can have any position between the lines 4 and 0. Results that the weight of the sole will increase if the distance between the front line of the heel and the line 4 increases. To avoid the increasing of the weight, in the case that the heel line has another position than line 4, it is necessary to reduce the volume in this area. A solution consists in shaping the heel as the base of a cone in this area to increase the β angle. Increasing this angle will reduce the contact surface between the heel and the support plan. In the same time, the modification of the β angle must be correlated with the modification of the α angle. Analysing the problem from this point of view, results that the angles α, β and γ and the heel height must be correlated. In the same time, the condition regarding the rapport between the two contact surfaces of the heel, A_i/A_s, must be respected.

In the case the γ angle value of the heel is greater than 90^o, it is necessary to design weight removal cavities inside the heel, as in figure 5. Using the weight removal cavities must be correlated with the solid cross-sections of the heel to avoid the deformation by flatting or bending. To avoid the deformation, the interior walls thickness δ″ will be of 2-4 mm, when the exterior wall thicknesses δ and $\delta^{\prime}$ are maintained between 10-15 mm.

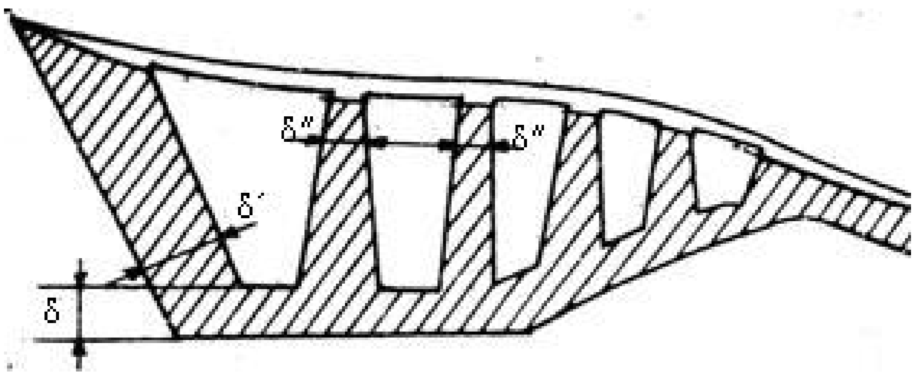

Fig. 5: Heel with weight removal cavities

In the propulsion fase, figure 6, the foot skid and the unbalance of the body [4,5] is possible when the tibia rotates in the tibia-astragalus articulation and the center of gravity of the body moves forward. In this moment, the body weight is supported by a single foot, the othe foot being in oscilation fase. Because of the small contact surface between the sole and the support plan, avoiding the skid and the unbalancing of the body is assured by the anti-skid relief.

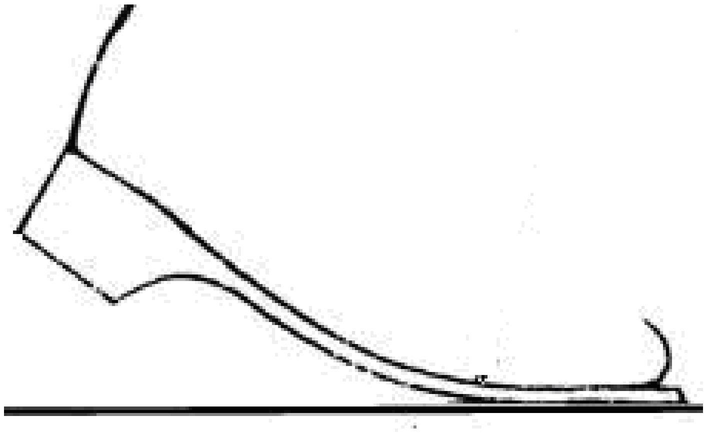

Fig. 6: **Propulsion faze**

3. CONCLUSIONS

- The spatial shape of the footwear soles has an important influence over the body equilibrium both in static and dynamic.
- While walking the sole can contribute to unbalancing the body mainly in impact faze and propulsion faze.
- The heels can have various shapes: cylindrical, conical base, flared, etc. The conditions to ensure the body equilibrium in static and dynamic require some minimal and maximal limits regarding the shape, height, contact surface with the support plan and bending resistance of the heel.
- In the propulsion faze, because of the small contact surface with the suport plan, avoiding the skid and body unbalance is acomplished by using anti-skid relief.

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VALUE ANALYSIS OF WOVEN FABRICS IN RELATION WITH CUSTOMER SATISFACTION

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Abstract: Customer satisfaction is a key factor for establishing the development strategy in any company. Customer satisfaction means a mixed feelings of the person who uses the product, not of the person who buys it. Also it is known that "satisfaction" is a short-term attitude that can be changed quickly. Dissatisfaction remains longer in user's mind than satisfaction. Because of this reason, textile companies analyze regularly the satisfaction level and make great efforts to improve it continuously.
Value Analysis is a good method for redesigning textile products depending on the perceived performances. The higher customer satisfaction means higher level of quality of perceived product. This paper presents a study of functional analysis (first part of Value Analysis) for woven fabrics manufactured from worsted yarns, which were obtained from 100% wool and 45%wool, 55% polyester blends.

Key words: customer satisfaction, woven fabric, value analysis, functional analysis, technical dimension.

1. INTRODUCTION

Customer satisfaction is a hot topic for top management, in any kind of business, no matter what country or continent. The definition of customer satisfaction found in ISO 9000:2008 is the following: *"customer perception as to whether the organisation has met customer requirements"*. This means more than a simple monitoring of customer complains. It is about developing customer confidence and building a long term customer loyalty (figure 1).

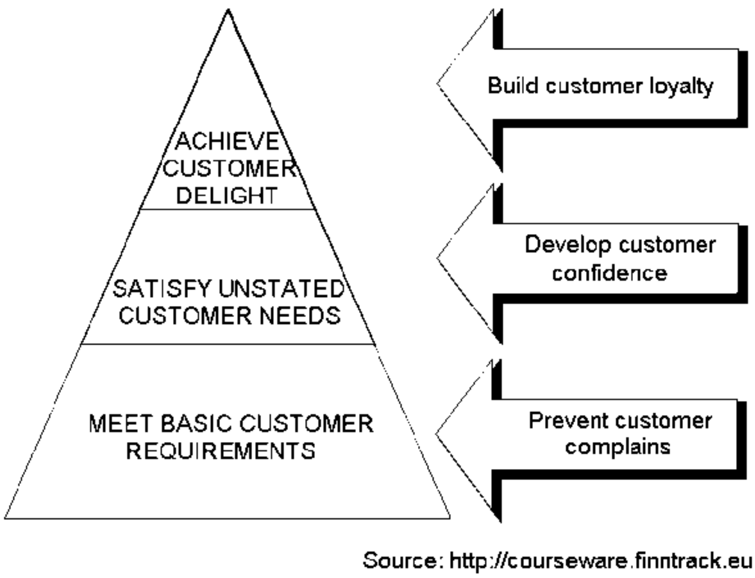

Fig. 1: Customer satisfaction model

One of the possible methods for achieving customer delight is Value Analysis. "Value" can be generally defined as a ratio of function to cost. The Value Analysis is focused to improve the VALUE of products by examination of their functions and by optimization of the manufacturing costs. This paper presents only the first part of Value Analysis named **Functional Analysis** [2]:

- Creating the list of functions;
- Setting the relative level of importance for each function;
- Establishing the technical dimensions for basic functions.

2. THE FUNCTIONAL ANALYSIS FOR WOVEN FABRICS

Value Analysis establishes a correlation between functions, their participation quota in total usage value of the product and the manufacturing costs. The main idea is to design and produce only goods very close to the *ideal quality model* with minimum costs. This ideal quality model is created by asking customers about the perceived performances of the real product.
There were studied woven fabrics made from worsted yarns (100% wool and 45% wool, 55% polyester). All fabrics are designed to be used for men's suits.

2.1 The list of functions

There are two types of functions: basic functions (or primary functions) and secondary functions (or supporting functions). A basic function is related to a property that makes the product suitable for use. This type of function cannot be changed because it affects the quality of the product [4]. A secondary function describes the manner in which the basic functions were implemented. This type of functions can be modified or eliminated to reduce product manufacturing cost.

For creating the list of functions must be followed the principles:

- All functions must be distinctive;
- One function cannot be decomposed in other functions;
- One function is not a result of another function.

In the table 1 there are presented the basic functions of the woven fabrics resulted from the study, their codes, their importance for the clothing producer and their importance for the end user. These functions show *what* is necessary to be accomplished, and not *how* it is done.

Table 1: Functions for woven fabrics made from worsted yarns

Name of the function	Code	Importance for the clothing producer	Importance for the end user
Gives aesthetic aspect	F1	YES	YES
Creates sensorial comfort	F2	YES	YES
Ensures the ability to recover after wrinkling	F3	YES	YES
Moisture transfer to outside environment	F4	YES	YES
Ensures the stability of next technological effects	F5	YES	YES
Ensures thermal insulation	F6	YES	YES
Protection from outside moisture	F7	YES	YES
Ensures the resistance to pilling formation	F8	*NO*	YES
Ensures the friction resistance	F9	YES	YES
Ensures the mechanical resistance	F10	*NO*	YES
Ensures the colour resistance to thermal treatments, moisture and chemical agents	F11	YES	YES
Ensures the eco-friendly behaviour of clothing	F12	YES	YES
Ensures the easy-care of wool garments	F13	*NO*	YES

The thirteen functions are coded from F1 to F13 and they determine the worth of the textile product. The basic functions must be maintained and must not be changed, but the way how these functions are implemented is open to innovative thinking. The only limitation is technology.
Secondary functions are incorporated in the textile product (they support and enhance the basic functions) and help selling process. Because they are not very important to the customer, eliminating them will not affect the worth of the perceived woven fabric type wool.

2.2 The level of importance

The next phase of the Functional Analysis is to set the relative importance level for the basic functions. It was created a *questionnaire* and it was sent to engineers from textile companies, academic staff, professors from the high schools and students from the Textile Faculty of Iasi. They were asked to give marks from 13 (most important function) to 1 (less important function), a certain mark had to be used only once in the same questionnaire. The total number of replies was 60, distributed in four age groups. In table 2 there are shown the results of this research.

Table 2: Relative importance level for the primary functions of woven fabrics

Age group	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**F13**
20-29	11.86	9.91	8.52	7.38	4.57	6.62	5.57	8.29	8.00	5.52	5.95	3.52	8.05
30-39	12.40	8.80	9.90	5.00	6.40	7.40	2.50	9.40	6.80	5.40	6.00	3.80	7.20
40-49	11.83	8.67	10.25	5.67	6.58	6.67	4.25	8.33	7.17	5.67	6.83	2.75	6.83
over 50	11.89	9.11	9.56	7.33	3.89	8.11	4.89	7.56	6.89	4.67	5.78	3.67	8.00
Arithmetic mean	12.00	9.12	9.56	6.35	5.36	7.20	4.30	8.40	7.22	5.32	6.14	3.44	7.52
Standard deviation	0.27	0.56	0.75	1.20	1.34	0.70	1.32	0.76	0.55	0.44	0.47	0.47	0.60
Coeff. of variation (%)	2.26	6.10	7.81	18.88	24.93	9.77	30.61	9.03	7.57	8.35	7.65	13.71	8.01
Weight (%)	**13.05**	**9.93**	**10.40**	**6.90**	**5.83**	**7.83**	**4.68**	**9.13**	**7.85**	**5.78**	**6.68**	**3.74**	**8.18**
Level of importance	1	3	2	8	10	7	12	4	6	11	9	13	5

For each function there were computed arithmetic mean, standard deviation and coefficient of variation; for processing numerical data it was used Microsoft Excel program. Also it was computed the weight of the average score obtained by every function because this indicator determines the level of importance. Figure 2 shows the hierarchy of all 13 functions after their importance level.

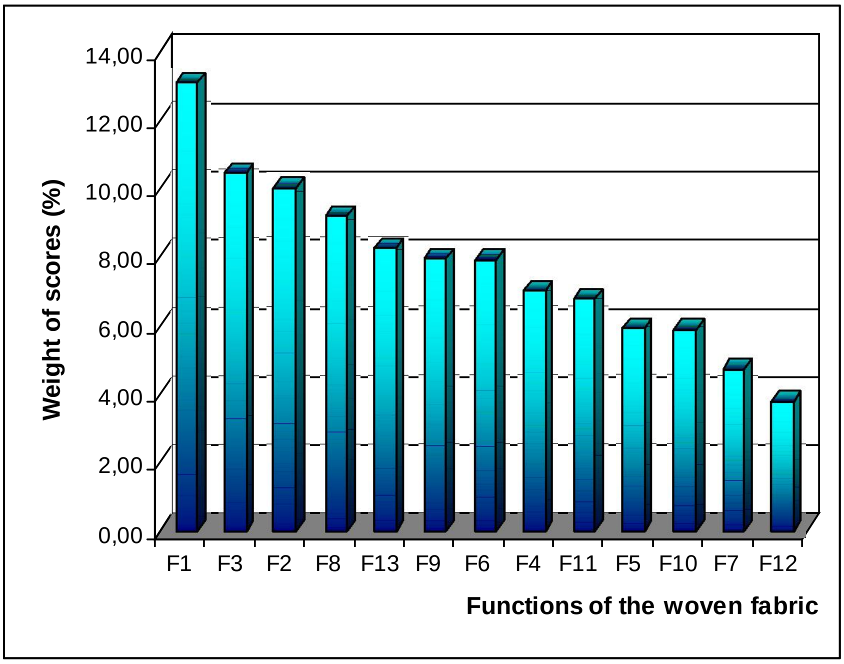

Fig. 2: The final hierarchy of primary functions

It is noticed that the first six functions in the hierarchy (F1, F3, F2, F8, F13 and F9), cumulated together, determine 60% of the total worth of the woven fabrics.

In figure 3 there are presented the hierarchies of functions depending of the age of the respondents. There were taken in consideration four groups of ages. It is seen that F1 is always placed on the first place, F3 is placed on the second place (with the exception of people between 20-29 years) and F2 is placed on the third place (same exception). This means that the producer of woven fabrics must pay attention especially to aesthetic aspect, wear comfort and recovery after wrinkling.

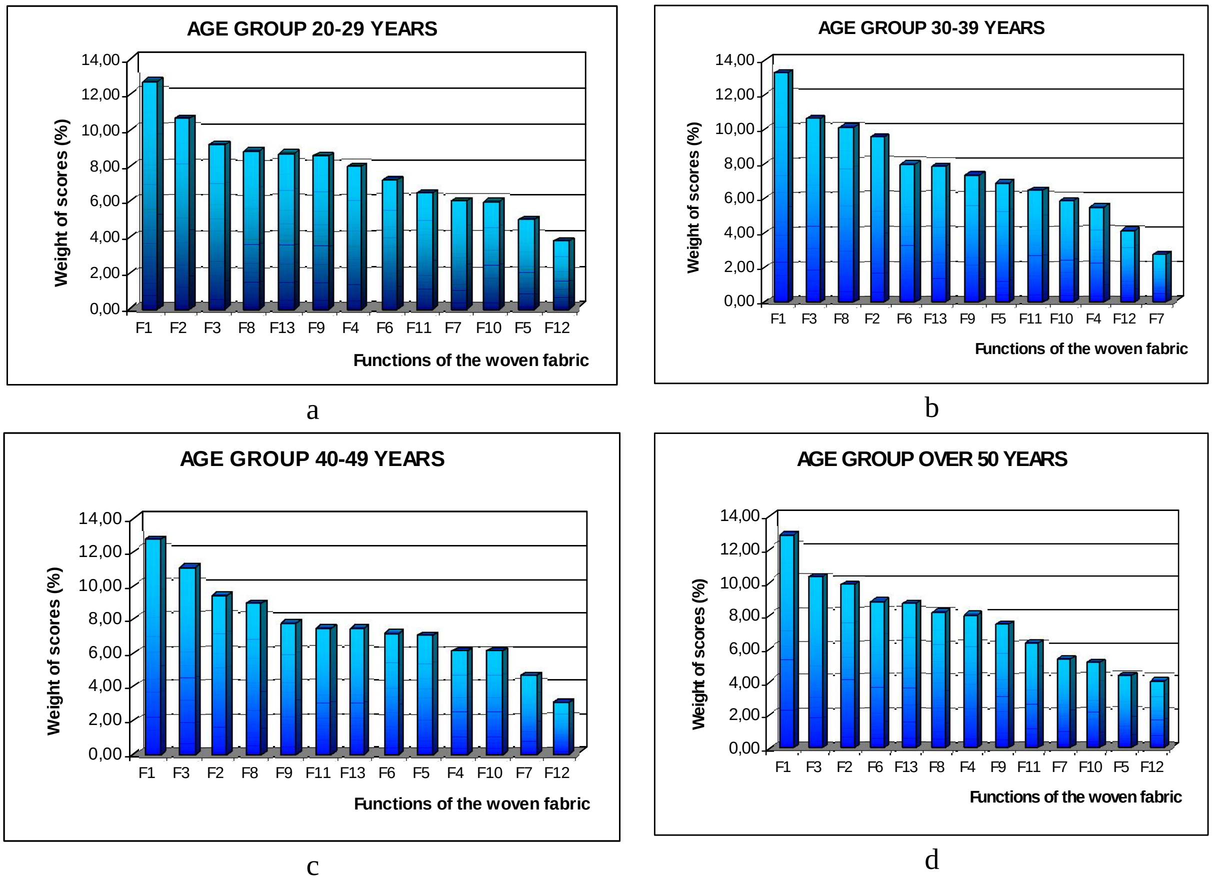

Fig. 3: The hierarchy of basic functions depending on the age group
a – age group 20-29 ; b – age group 30-39 ; c – age group 40-49 ; d – age group over 50 years.

2.3 Technical dimension of functions

Each function has a technical dimension given by one or more properties. Value Analysis stipulates that the time dependence between one function variation and its technical dimension variation is linear [4]. This principle is taken in consideration when the company wants to redesign the woven fabrics for a better customer satisfaction.

In this paper there are analyzed the first three functions (F1, F3 and F2) which give much satisfaction to customer. If one of these functions are not accomplished, there are possible two different situations:

- producer might receive complaints after selling the product;
- the textile product might not be sold to the customer.

➢ <u>Technical dimension of F1</u>

Aesthetics is a very important function for customer satisfaction. It is determined by the finishing method and by the formability of the woven fabric.

Lindberg and his colleagues analyzed the theory of formability because this feature can be used as technical dimension for the physical aspect. Formability is ability of woven fabric to have a suitable behaviour during cutting and sewing, but also to form lines and shapes in the final apparel [3].

Mahar studied the practical aspects related to formability in the warp and weft directions for wool woven fabrics (100% wool, different blends of wool and polyester). His results were correlated to the subjective observations made by a team of Japanese experts. In the first phase experts analyzed the physical aspect of the fabric, for each blend, and they gave rates as: satisfactory, good, and very good. In the second phase the woven fabrics were tested in the laboratory from the formability point of view. They were compressed into warp and weft direction, by measuring the limit till the fabric is compressed without folding. These two sets of results were correlated. The value 20.10^{-4} mm^2 is the limit between “good” and “very good” physical aspect [2].

Other technical dimensions of F1 are: number of visible defects, luster of the textile surface, and general drape coefficient.

- Technical dimension of F3

The ability to recover after wrinkling of the woven fabrics generates a lot of dissatisfaction for the user if it is low. Most of the complaints received by the textile producer are related to the fact of non- recovering the initial form of the certain parts of the men’s suits.

Studies concerning recovery after wrinkling showed three types of factors:

- factors depending on raw material: types of fibres, bending behaviour, twisting behaviour, cross section shape, curling degree, diameter, friction coefficient fibre-fibre, structural changes because of some technological treatments;
- factors depending on yarns: twisted degree, waving in the woven structure, flexibility, linear density, internal structure;
- factors depending on woven fabric: type of weave, thickness, weight per surface unit, degree of shreding, compactness, chemical and mechanical finishing.

Researches show that wool fibres have a special stress strain relation in the longitudinal direction. This means that tensile and compression properties are symmetric.

Smuts and his colleagues analyzed parameters of yarns and parameters of woven fabrics in relation with recovery after wrinkling. In 60’s *Chapman* established a model for 100% recovery of fabric after the deformation forces end their action [5]. He showed that internal friction is slowing down the recovery of textile surface. In 70’s other specialists investigated the influence of cross section shape of fibres upon the wrinkling. They discovered that a circular section resists better to wrinkling than other shapes (for example star section). It was also proved that diagonal weave of fabric gives a better recovery after wrinkling than plain weave for the same warp and weft densities.

Flexibility of the woven fabric is determined by the low tensile forces inside fibres which create yarns which enter in the structure of the woven structure. More flexibility means a good resistance to wrinkling because the elements inside the structure can move more easily one against another. Decreasing the internal forces is achieved by finishing treatment.

The technical dimensions of F3 are: resistance to repeated flexion, bending resistance and angle of recovery after wrinkling.

- Technical dimension of F2

Wear comfort is one of the most important functions of a men’s suit. The sensorial comfort (or thermophysiological comfort) is linked by the moisture sensation in clothing and handle of the fabric. Wear comfort can be measured in the laboratory by means of the Skin Model and skin sensorial test apparatus then validated by wearer trials with human test subjects [1].

As technical dimensions for the moisture sensation can be considered air permeability and steam permeability of fabric.

The fabric handle makes the difference between the same type of wovens with the same destination. Wool fabrics are highly appreciated because of their soft touch. *Kawabata* and his team studied men’s suits made from wool (subjective methods). Then he tried to evaluate hand objectively, by measuring 16 surface properties: fabric bending, shearing, tensile and compressive stiffness, as well as the smoothness and frictional resistance of the textile surface. This set of methods is called “Kawabata Evaluating System” (KES). The system has five highly sensitive instruments and it is used for hand prediction of the textile fabrics [5].

3. CONCLUSIONS

In a competitive environment, every textile producer must be focused to customer satisfaction and reach the ultimate goal: customer delight. The development strategy must put on the first place the information obtained periodically when researching what customer think about perceived quality of the textile product (in this case men’s suit).

There were studied woven fabrics made from worsted yarns (100% wool and 45% wool, 55% polyester). The methodology is named Value Analysis but this study presents only the first part:

"functional analysis".

The final list of basic functions contains 13 functions. In the next step customers were asked to reply to a questionnaire and give marks to each function from 1 (less important) to 13 (the most important in their opinion). These results were statistical processed and there were established the levels of importance. All four age groups have chosen aesthetic aspect as the first function as level of importance. On the second place, young people (20-29 years old) want a wool fabric that gives wear comfort, all other three age groups want a fabric which offers a good recovery after wrinkling.

In the last phase, for the top three functions - with codes F1, F3 and F2 – were set the technical dimensions accordingly to the researches conducted in many laboratories around the world:

- for F1: formability, number of defects on the textile surface, luster, general drape coefficient;
- for F3: resistance to repeated flexion, bending resistance and angle of recovery after wrinkling;
- for F2: air permeability, steam permeability and handle.

This study can be a starting point for thinking a strategy when there is needed a redesign process for woven fabrics. The Functional Analysis can be a useful tool for managers if it is used on regular basis.

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DETERMINING THE CAPABILITY OF THE KNITTING PROCESS THROUGH SPECIFIC INDICATORS

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Abstract: The knitting process quality, on the interface between the production quality characteristics and the product quality characteristics is established depending on the technical level of the machinery, on the process organization and management modality, on the qualification degree and professional competence etc. Insuring the process quality implicates a constant evaluation of the factors that impact on the projects adequacy level, or on the appointed application specifications, as well as an ensemble of analysis and control methods. The later has the role of preventing, adjusting and correcting the process parameters, in order to maintain them in the technological established variation intervals. The final purpose of these actions is obtaining successive product (knitwear) lots with pre-established characteristics and high uniformity.
Determining the knitting process capability falls under the group of actions that certify obtaining high quality products, if the requirements are met.
This paper presents the mode of determining the capability of the knitting process in a profile commercial society.
Key words: Capability, knitting, process, quality, indicators.

1. THEORETICAL CONSIDERATIONS

The insurance of a knitting process quality can be regarded from two points of view: technical and managerial.

The technical approach of a process quality implies on one hand the existence of adequate technical conditions (high technical level machinery, trained personnel and optimal working condition according to effectual standards) and on the other hand a correct and precise adjustment of knitting process parameters as well as keeping them under control.

According to ISO 8402 the managerial approach of quality contains a set of planed and systematic actions needed to ensure the correspondent trust that a product will satisfy the required quality conditions.

In order to be efficient, insuring quality in general and particular to the process, implicates a constant evaluation of the factors that impact on the projects adequacy level, or on the appointed application specifications, as well as an ensemble of analysis and control methods. The later has the role of preventing, adjusting and correcting the process parameters, in order to maintain them in the technological established variation intervals. The final purpose of these actions is obtaining successive product (knitwear) lots with pre-established characteristics and high uniformity.

Determining the knitting process capability falls under the group of actions that certify obtaining high quality products, if the requirements are met.

Process capability expresses its capacity to come under specified limits and is determined by comparing the technically admissible variation intervals for technological parameter measured experimentally with their technological variation intervals.

Technically admissible variation intervals represent fields corresponding to statistical population (characterised through random type variability) which include the vast majority of process parameters values.

Instead technological variation intervals represent ranges of values (obtained through measurement in a large test sample) in which one parameter or a process characteristic can fluctuate. These intervals are defined by their centres (Tc) and their inferior and superior limits (Ti, Ts).

2. KNITTING PROCESS CAPABILITY

The capability indicators of a knitting process are Cp and Cpk.

2.1 Determining the capability of a knitting process in which rib structures are created, through the Cp coefficient

The **Cp coefficient** reflects the fitting (or unfitting) in the technological variation intervals (It), in the technical admitted variation intervals (Iat), determined by the equation (1):

$$Cp = \frac{T}{6\sigma} \qquad \textbf{(1)}$$

where: T – represents the amplitude of technical admissible variation intervals;
σ – mean square deviation of a normally allocated population.
In figures 1 and 2 are presented the cases of a non-capable process and a capable one:

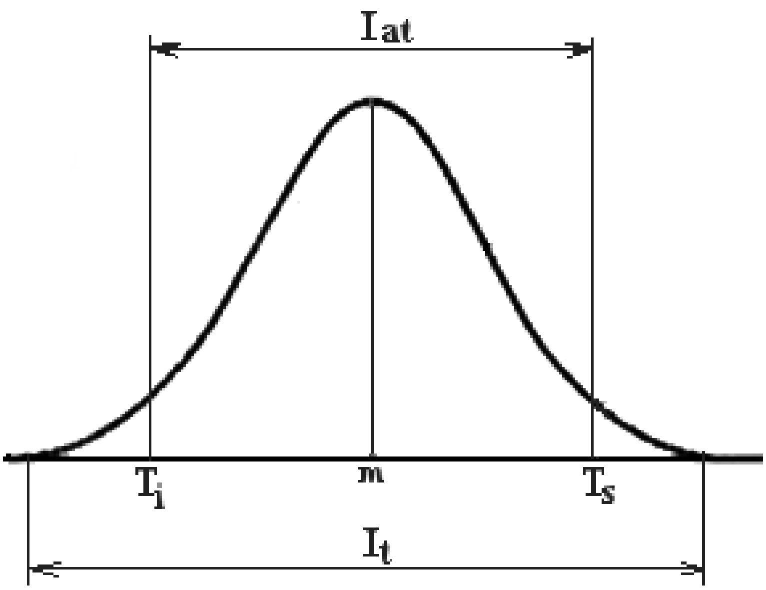

Fig. 1 Representation of a non-capable process

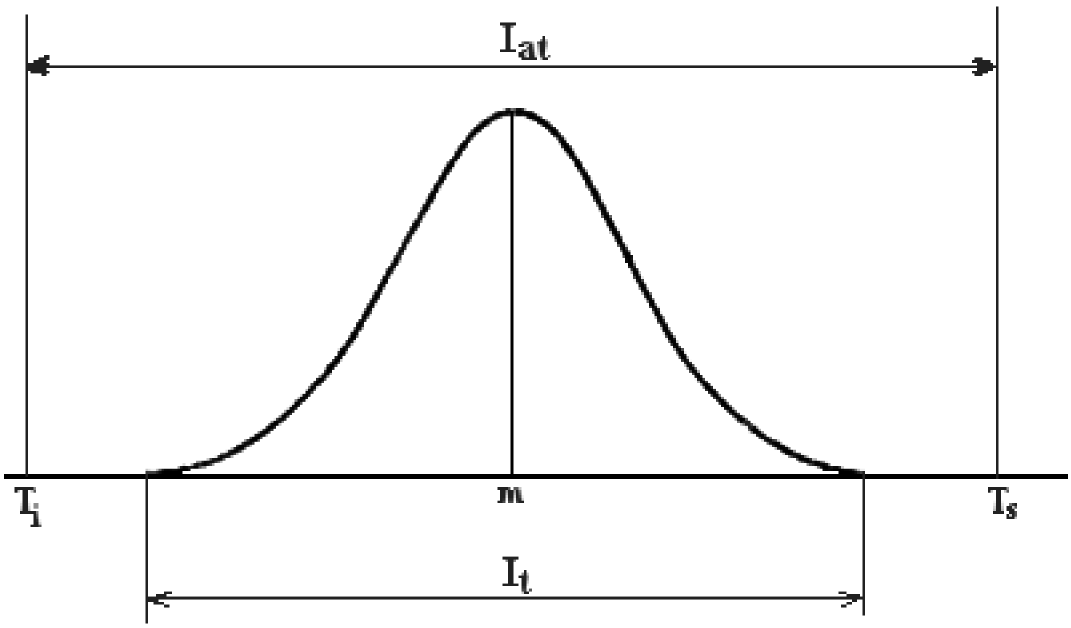

Fig. 2 Representation of a capable process

A non-capable process will lead to products inaccurate to the specifications, while a capable process will insure the fitting of the products characteristics in the pre-established intervals.
Because the value of mean square deviation (σ) in equation (1) can not be correctly appreciated as a result of high variability of specific knitting process characteristics, in this paper a similar concept will be defined and utilized: the technical exploitation coefficient **(Cte)**. This represents the percentage quantity expression of the comparison between the technological and the technically admissible variations intervals and can be calculated with the following equation (2):

$$Cte = \frac{Ri}{R} \cdot 100 \qquad \textbf{(2)}$$

where: Ri – represents the technological variation intervals amplitude;
R – the technically admissible variation intervals amplitude

Experimentally in a knitting process that creates rib structures on circular Metin machines, the technically admitted variation interval, the technological variation intervals as well as Cvt technical exploitation coefficients were determined for two essential technological parameters (**yarn feed speed Fs** – table 1, and **yarn consumption length Lc** – table 2).

¶ (10 pt)

Table 1: Comparison between the technically admissible and the technological variation intervals, for yarn feed speed

Structure	Knitting speed n (rot/min)	Technically admissible intervals			Technological variation intervals			Cte
		Ti	Ts	R	Ti	Ts	Ri	
Rib 1:1	8,5	85,34	160,65	75,31	93,59	94,61	1,02	1,35
	10	100,41	189,00	88,59	108,50	109,70	1,20	1,35
Rib 2:2	11	51,21	96,39	45,18	90,40	91,40	1,00	2,21

Table 2: Comparison between the admitted and the technological variation intervals, for yarn consumption length

Structure	Knitting speed n (rot/min)	Technically admissible intervals			Technological variation intervals			Cte
		Ti	Ts	R	Ti	Ts	Ri	
Rib 1:1	8,5	1004,05	1889,97	885,92	1102,11	1111,89	9,78	1,10
	10				1086,08	1096,11	10,03	1,13
Rib 2:2	11	465,50	876,26	410,76	822,02	830,05	8,03	1,96

Data analysis reveals that:

- in rib structures 1:1 realized on Metin machines (equipped with exchangeable wheels with 17/45 teeth), for the two analyses parameter, the technological intervals are placed near the inferior limit of technically admitted intervals;
- in rib structures 2:2 realized on Metin machines (equipped with exchangeable wheels with 22/27 teeth), the technological intervals are placed near the superior limit of technically admitted intervals;
- there are significant differences between the technically admitted and the technological interval, in the sense that the later are much lower; as a result a insufficient exploitation of the intervals set by the machine built may take place. Concrete, **on rib structures 1:1 the exploitation will be 1,35% while on rib structures 2:2 the exploitation of technically admitted interval is 2,21%.**
- the insufficient exploitation of the technical potential of the machine can be explained in this case through:
    - restrictions imposed on manufacturing of cotton yarns characterized by low resistance;

- the relatively large pallet of yarns and counts that can be processed on these machines;
- the variety of structures that can be knitted using Metin circular machines, seeing that they are part of the universal machines group;
- the necessity of large amplitudes of technically admitted interval for the technological parameters in order for the machines to be able to process a large variety of knitted articles.

2.2 Determining the capability of a knitting process in which rib structures are created, through the Cpk coefficient

Determining the capability through the **Cpk coefficient** we can compare the technological variation interval with the limits of the technically admissible variation intervals (figure 3).

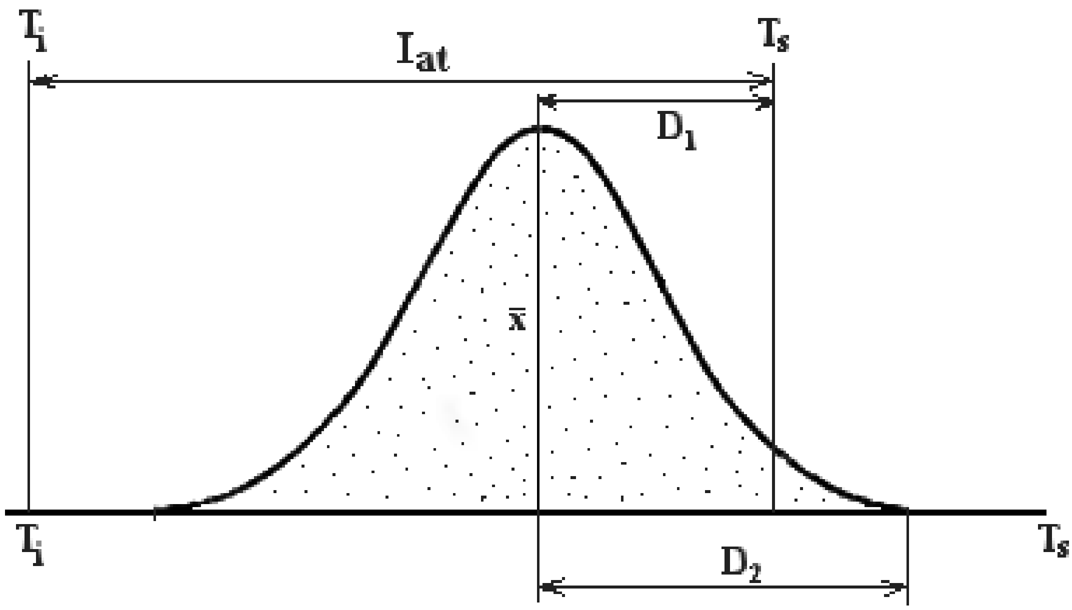

Fig. 3. Interpretation of Cpk coefficient

The symbols used in figure 3 have the following meaning:

- $D_1 = Ts - \bar{x}$, representing the deviation of the average values of the analysed parameter, in relation to the superior limit of the technically admissible intervals (determined when the mismatching manifests at the superior limit of the interval);
- $D_1 = \bar{x} - Ti$, the deviation of the average in relation to the inferior limit of the interval, calculated when the mismatching manifests at the inferior limit;
- $D_2 = 3\sigma$ – half of the technological variation interval, where $\sigma \approx S$.

The Cpk coefficient can be calculated with various equations depending on the spot where the mismatching takes place. Therefore, when the derangement appears at the superior limit of the admissible interval we will use equation (3), while if the derangement is at the inferior limit we will use equation (4).

$$Cpk = \frac{Ts - \bar{x}}{3\sigma} \tag{3}$$

$$Cpk = \frac{\bar{x} - Ti}{3\sigma} \tag{4}$$

The process is capable if the values of $Cpk \geq 1$ [2].

In the case of Metin machines that produce rib structured knitted, for the experimentally determined technological parameters (yarn feed speed Fs, and yarn consumption length Lc) Cpk coefficient values were determined and centralised in table 3:

Table 3 The Cpk coefficient values

Knitted structure	Yarn count Nm	Knitting speed n (rot/min)	Parameter for which the Cpk value was calculated	Technically admissible variation interval	Midpoint of technological variation interval	σ	Cpk
Rib 1:1	**40/1**	**10**	**Yarn feed speed Fs**	Ti = 100,410 Ts = 189,000 Tc = 144,700	109,10	0,29	10,06
			Consumption length Lc	Ti =1004,05 Ts=1889,98 Tc =1447,02	1091,10	2,56	11,33
Rib 1:1	**58/1**	**8,5**	**Yarn feed speed Fs**	Ti = 85,3400 Ts =160,650 Tc = 123,000	94,10	0,261	11,20
			Consumption length Lc	Ti = 1004,05 Ts =1889,98 Tc =1447,02	1107,0	2,50	13,73
Rib 2:2	**40/1**	**11**	**Yarn feed speed Fs**	Ti = 51,2100 Ts = 96,3900 Tc = 73,8000	90,9	0,271	6,75
			Consumption length Lc	Ti = 465,500 Ts = 876,260 Tc = 670,880	826,03	2,05	8,17

We can observe **that on both rib structures**, produced on Metin machines, for the studied technological parameters, **the values of Cpk coefficient are over 1**, as such the conclusion is that the **process is capable** (machines are well adjusted).

Practically, for testing the capability of a knitting machine ready to produce a knitted structure for which tolerance limits of the length consumption (Lc) are set, we will proceed as following:

- Adjust the technological parameters: feed speed and tension (Va, Ta), take-down speed and tension (Vt, Tt), E gauge, so that the consumption length values Lc are situated between the set tolerance limits;
- On a large test sample (n≥100), it is verified if the consumption length values distribution is concordantly with the normal distribution and we estimate the field centre (Tc), the mean square deviation (σ) and the tolerance range limits (Ts, Ti);
- Through the process, successive determinations will be made on consumption length with specific devices and the average for Lc values will be calculated;
- Determinate the capability coefficients and results interpretation;
- If the Cpk coefficients have values under 1, is considered that the knitting process doesn't ensure the quality of the knitted fabric obtained (consumption length won't fit in the tolerance interval limits).

6. CONCLUSIONS

The capability of a knitting machine is the function that has the highest percentage in ensuring quality.

Knowledge of capability coefficients values accentuates the performance of the analysed process, allowing a dialogue on real bases between the producers and the customers.

Determining the capability of a process is part of an ensemble of systematic and planned actions meant to offer the necessary trust that the process will meet the quality standard and result in high quality products.

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EFFECTS OF STITCH LENGTH AND YARN COUNT VARIATION ON ABRASION RESISTANCE OF PLAIN KNITTED GREY FABRIC.

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Abstract: Textile fabrics are manufactured for many different end uses, each of which has different performance requirements. The chemical and physical structures of textile fabric determine how it will perform, and ultimately whether it is acceptable for a particular use. Fabric testing plays a crucial role in gauging product quality, ensuring regulatory compliance and assessing the performance of textile materials. It provides information about the physical or structural, chemical and performance properties of the fabrics. It is very important to predict the textile fabric's performance by testing. Fashion merchandisers, apparel designers, interior designers and textile scientists who have an understanding of textile properties and testing are equipped to make decisions that will benefit their clients and enhance profits for their businesses. Knowledge of fabric testing and its performance analysis can be contributed to efficiency in solving consumer problems with textile products and to the development of products that perform acceptably for consumers.
Key words: Abrasion resistance, stitch length, yarn count, carded yarn, plain knitted grey fabric.

1. INTRODUCTION

Abrasion is defined as the wearing away of any part of the fabric by rubbing against another surface. Fabrics are subjected to abrasion during their lifetimes and this may result in wear, deterioration, damage and a loss of performance. However, the abrasion resistance is only one of several factors contributing to wear performance or durability. Abrasion can occur in many ways and can include fabric to fabric rubbing when sitting, fabric to ground abrasion during crawling, and sand being rubbed into upholstery fabric, and with laboratory tests. This may explain the reason why there are many different types of abrasion testing machines, abradants, testing conditions, testing procedures, methods of evaluation of abrasion resistance and interpretation of results. [1]

The evidence concerning the various factors that influence the abrasion resistance of fabrics is contradictory. This is because the experiments have been carried out under widely different conditions in particular using different modes of abrasion. Therefore the results are not comparable and often opposing results have been reported. The factors that have been found to affect abrasion as follows:- Fibre type and fibre properties, yarn twist and yarn count, the construction and thickness of the fabrics, and the type and amount of finishing material added to the fibres.[1] [2]

2. TYPES OF ABRASION

Abrasion may be classified as follows:-
Plane or flat abrasion –A flat area of material is abraded.
Edge abrasion- This kind of abrasion is occurs at collars and folds.
Flex abrasion- In this case rubbing is accompanied by flexing and bending. [3]
In the experiment plane or flat type abrasion was used.

3. MATERIALS & METHODS

3.1 Test method

The experiment was carried out by following EN ISO 12947 method. The method consists of three parts as follows:

EN ISO 12947-1:1998, Textiles- Determination of the abrasion resistance of fabrics by the Martindale method-Part 1: Martindale abrasion testing apparatus.

EN ISO 12947-2:1998, Textiles- Determination of the abrasion resistance of fabrics by the Martindale mehod-Part 2: Determination of specimen breakdown.

EN ISO 12947-3:1998, Textiles- Determination of the abrasion resistance of fabrics by the Martindale mehod-Part 3: Determination of mass loss.

3.2 Apparatus and materials used in the experiment

Martindale Abrasion and Pilling Tester
Model:-M235
Company's name:-Shirley Development Ltd.
Origin: - U.K.
The diameter of the test specimens were 38±5 mm.
The dimensions of the abradant were at least 140 mm in diameter or length and width.
The diameter of the specimen holder underlay foam backing was 38±5 mm.
The standard temperature & atmosphere for conditioning and testing (20±2)°C and relative humidity of (65±5)% were maintained .
In addition to the test apparatus and auxiliary materials specified in ISO 12947-1, a balance, having an accuracy of 1 mg, was used. [4]

3.3 Testing Principle

A circular specimen is mounted in a specimen holder and subjected to a defined load, is rubbed against an abrasive medium (standard fabric) in a translational movement tracing a Lissajous figure, the specimen holder being additionally freely rotatable around its own axis perpendicular to the plane of the specimen. The evaluation of the abrasion resistance of the textile fabric is determined from the inspection interval to breakdown of the specimens & from the mass loss of the test specimens.

The specimens are mounted in the specimen holders with foam backing. The total effective mass of the abrasion load (i.e the mass of the specimen holder assembly and the appropriate loading piece) is (595±7) g for apparel and household textiles, excluding upholstery and bed linen (nominal pressure of 9 KPa).The mass loss of the test specimen is determined for each of the established numbers of rubs according to the number of rubs at which specimen breakdown occurs. [5][6]

3.4 Abrasion test procedure

The number of rubs was preselected according to the relevant test series for the abrasion test previously determined by ISO 12947-2. After completation of the preparatory treatment of the specimens, the abrasion tester was started.

For ISO 12947-2, the test was continued until a breakdown was observed.

For ISO 12947-3, the required numbers of specimens of known mass to each of the selected test intervals in the chosen test series were abraded.

To determine the mass loss of the test specimens carefully the test specimens were removed from the specimen holder, holded by forceps and the abraded material (fibre debris) was removed from both sides with a soft brush, without touching the test specimens with the fingers. The mass of each test specimen to the nearest 1 mg after conditioning in the standard atmosphere was determined. [5][6]

4. RESULTS

4.1 Analysis of abrasion resistance by specimen breakdown.

Table 1

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.7	Carded	24/1	38500
2.9	Carded	24/1	36000
2.92	Carded	24/1	34500
2.95	Carded	24/1	33000

Table 2

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.7	Carded	26/1	36000
2.9	Carded	26/1	33500
2.92	Carded	26/1	31200
2.95	Carded	26/1	29500

Table 3

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.7	Carded	28/1	34500
2.9	Carded	28/1	31500
2.92	Carded	28/1	29250
2.95	Carded	28/1	27000

From the result, we found for 24/1 Ne, 26/1, 28/1 Ne yarn, higher the stitch length make lower the abrasion resistance.

Table 4

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.7	Carded	24/1	38500
2.7	Carded	26/1	36000
2.7	Carded	28/1	34500

Table 5

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.9	Carded	24/1	36000
2.9	Carded	26/1	33500
2.9	Carded	28/1	31500

Table 6

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.92	Carded	24/1	34500
2.92	Carded	26/1	31200
2.92	Carded	28/1	29250

Table 7

Stitch length (mm)	Type of yarn	Count (Ne)	No. of cycles/no. of rubs
2.95	Carded	24/1	33000
2.95	Carded	26/1	29500
2.95	Carded	28/1	27000

From table 4, 5, 6, 7, it is found that for same stitch length, higher yarn count makes lower abrasion resistance.

4.2 Analysis of abrasion resistance by mass loss.

For each test specimen the mass loss to the nearest 1 mg from the difference between the mass of the test specimen before testing and the mass of the specimen after testing was determined. [6]

Table 8

Count (Ne)	Type of yarn	Stitch length (mm)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
24/1	Carded	2.70	211.8	1.0 2.0 3.0	210.8 209.8 208.8	300 900 1450
24/1	Carded	2.90	188.8	1.0 2.0 3.0	187.8 186.8 185.8	250 750 1250
24/1	Carded	2.92	183.4	1.0 2.0 3.0	182.4 181.4 180.4	200 700 1150
24/1	Carded	2.95	177.1	1.0 2.0 3.0	176.1 175.1 174.1	150 650 1050

Table 9

Count (Ne)	Type of yarn	Stitch length (mm)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
26/1	Carded	2.70	193.7	1.0 2.0 3.0	192.7 191.7 190.7	250 850 1350
26/1	Carded	2.90	170.2	1.0 2.0 3.0	169.2 168.2 167.2	200 700 1050
26/1	Carded	2.92	165.6	1.0 2.0 3.0	164.6 163.6 162.6	150 600 950
26/1	Carded	2.95	158.1	1.0 2.0 3.0	157.1 156.1 155.1	100 500 850

Table 10

Count (Ne)	Type of yarn	Stitch length (mm)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
28/1	Carded	2.63	181.4	1.0 2.0 3.0	180.4 179.4 178.4	250 900 1250
28/1	Carded	2.70	174.3	1.0 2.0 3.0	173.3 172.3 171.3	200 800 1150
28/1	Carded	2.75	168.6	1.0 2.0 3.0	167.6 166.6 165.6	150 700 1050
28/1	Carded	2.90	152.1	1.0 2.0 3.0	151.1 150.1 149.1	100 600 900
28/1	Carded	2.95	145.7	1.0 2.0 3.0	144.7 143.7 142.7	100 450 800

From the above data, we found that for yarn count 24/1 Ne, 26/1 Ne, 28/1 Ne with the increase of stitch length abrasion resistance of the fabric decreases.

Table 11

Stitch length (mm)	Type of yarn	Count (Ne)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
2.7	Carded	24/1	211.8	1.0 2.0 3.0	210.8 209.8 208.8	300 900 1450
2.7	Carded	26/1	193.7	1.0 2.0 3.0	192.7 191.7 190.7	250 850 1350
2.7	Carded	28/1	174.3	1.0 2.0 3.0	173.3 172.3 171.3	200 800 1150
2.7	Carded	30/1	158.3	1.0 2.0 3.0	157.3 156.3 155.3	150 650 1000

.

Table 12

Stitch length (mm)	Type of yarn	Count (Ne)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
2.9	Carded	24/1	188.8	1.0 2.0 3.0	187.8 186.8 185.8	250 750 1250
2.9	Carded	26/1	170.2	1.0 2.0 3.0	169.2 168.2 167.2	200 700 1050
2.9	Carded	28/1	152.1	1.0 2.0 3.0	151.1 150.1 149.1	100 600 900

Table 13

Stitch length (mm)	Type of yarn	Count (Ne)	Mass before abrasion (mg)	Mass loss (mg)	Mass after abrasion (mg)	No. of cycles/no. of rubs
2.95	Carded	24/1	177.1	1.0 2.0 3.0	176.1 175.1 174.1	150 650 1050
2.95	Carded	26/1	158.1	1.0 2.0 3.0	157.1 156.1 155.1	100 500 850
2.95	Carded	28/1	145.7	1.0 2.0 3.0	144.7 143.7 142.7	100 450 800

For stitch length 2.7 mm, 2.9 mm & 2.95 mm, we found that abrasion quality become poor with the increase of yarn fineness.

5. DISCUSSION

From the above data, it is found that for same yarn count with the increase of stitch length, abrasion resistance of plain knitted fabric decreases. And for same stitch length with the increase of yarn fineness abrasion resistance also decreases.

For same yarn count, if stitch length increases fabric becomes loose structure, as a result lower GSM fabric is obtained. And for same stitch length, if yarn fineness increases, then the fabric becomes loose structure & also lower GSM fabric is obtained. And a loose structure can not tolerate much abrasive force. That is why when a structure becomes loose, its abrasion quality becomes poor.

6. CONCLUSION

In this experiment, the effects of yarn count and stitch length variation on abrasion resistance of plain knitted grey fabric were identified.

From the study, it was observed that maximum abrasion resistance can be obtained by using lower count yarn at minimum stitch length and vice versa. Though the work was carried out for plain knitted fabric but similar behavior may be found in other knit structures.

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RECENT ADVANCES IN CIRCULAR WEFT KNITTING FABRIC MACHINES-A REVIEW

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Abstract: Circular knitting machine technology is undergoing rapid changes due to keen competition in the machine market. The machine builders have no alternative but to adapt the ever-growing requirements of knit industry-more efficient knitting, improved fabric appearance, fewer knitting faults, easier maintenance and more straightforward machine. Knitting machinery manufacturers offer a range of technologies to answer the needs of end product manufacturers'constructions.The paper deals some very recent developments found in circular weft knitting fabric machines over the last few years.
Key words: Gauge, Positive Feed, Lint, Circular Weft Knitting, Float Plating, ITMA

1. INTRODUCTION:

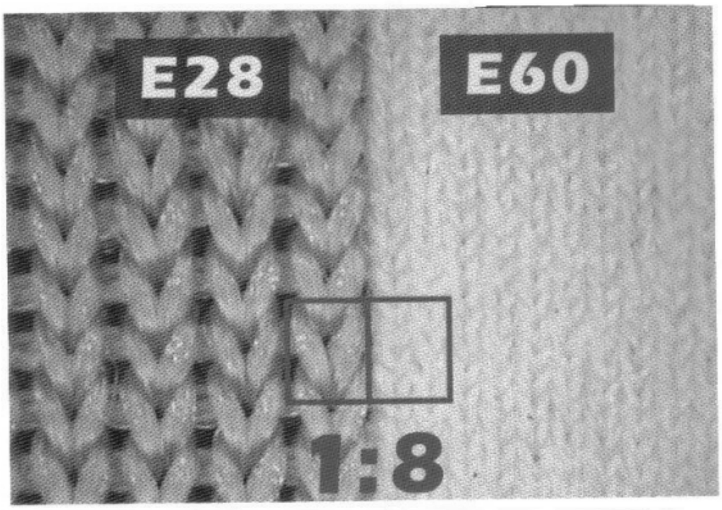
Circular knitting technologies are the most productive methods in the knitting industry to produce knit fabric in yardgoods form.Renowned machinery companies have been developing such fabric machines with user-friendly technology, high efficiency production rate and the ability to create special properties in the produced fabrics. As a new day dawns, yesterday's latest ultra-new development may become already old news. Both machine builders and fabric manufacturers should be aware of the latest developments to meet the growing challenge of the competitive market.

2. RECENT PROGRESSES:

Knitting machinery builders have come up with various ways to develop the existing technology for production perfection overcoming the technological barriers. The most significant improvements are discussed below.

2.1. Super fine gauge:

The evolution of ultra fine gauge fabric machines has been quite rapid in the last few years. The first leap was from 28/32gg to 40gg, the 44gg to 50gg, 52gg, 54gg and lastly 60gg. At ITMA 2007, Germany-based SMC GmbH exhibited a 66-gauge cylinder at Germany –based Groz-Beckert KG's booth, a world record of fine gauge, which requires the highest precision integration of knitting cylinder, sinker and needle to complete the knitting head. The needles have the thickness of only 0.2 mm. The fabric surface is incomparably smooth with more than 2,600 loops per sq.cm. and minimum weight per area of below 50gm/ sq.m. Single loops are almost no longer visible to the human eye [1].



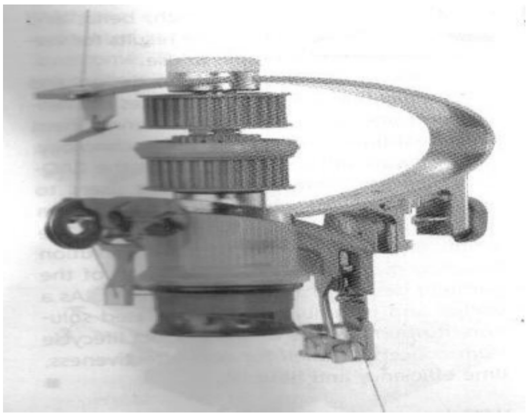
Knitters can optimize their margins due to better prices when marketing these fabrics having excellent handle, feel and draping qualities. Fabric widths are increased in tendency in these finegauges and therefore improve the cost advantages of the consumer.The latest ultra fine gauge reported is E68 from Groz-Beckert.Other models like Mirandsai (MV 4-3.2IIE60), Havertex (BSM2100 E62), Mayer&Cie (MV 4-3.2 II E60 single, IG 3.2QC E44 double) are also ultrafine.Speeds upto 1.3m/s in these type of machine (with 3.2 feeders per inch) have been reached [2].

2.2 Sinkerless fine gauge single jersey machine

Sinkers in circular weft knitting machine enable producing improved structure at higher knitting speeds.Sometimes the mechanical movement of sinkers results in distorted stitches.Machine manufacturers were trying to replace sinkers due to the risk of possible vertical lines.Some machine builders like Santoni S.p.A., Orizio introduced special sinkers or some other holding down elements which involve moving parts.Italian circular knitting machine builder Pilotelli exhibited a new sinkerless single jersey machine at ITMA Asia + CITME 2010, which is ‘true sinkerless’ with no added elements[5].The patented ‘sinkerless’ technology is believed to incorporate a ring which holds down stitches, replacing sinkers. The machine consumes 50% less oil and uses much less energy due to the fact that it has fewer moving parts.It is suitable for the production of Single Jersey fabric without the risk of vertical line, with or without elastane[4].According to Pilotelli, other advantages of the new sinkerless SL model include excellent visibilityand access to the knitting elements, reduced maintenance time and costs and reduced consumption of electricity, air, oil and longer needle life.Suitable for gauge 18 to 60.

2.3. Positive feeder MPF P:

MPF P is the latest generation of the renowned MPF Memminger positive feeders.The totally redesigned unit underlines the unit tradition for positive ,unhindered yarn feed to ensure consistent quality and faultless production with higher process safety, better monitoring and easier threading.



Innovations are:

1. New contact less stop motion system which guarantees an immediate and reliable machine stoppage in the event of yarn breakages.

2. Fast and easy threading due to a reduction in the number of yarn guide elements and the use of open eyelets.

3. Self-cleaning vibrating yarn tensioner (tension ring vibrates against the yarn direction and this prevents the build up of dirt.).No false stoppage to ensure higher production rates.

4. Integrated anti-filamentation unit on the yarn outfeed.

5. Interchangeable feed wheel where rod and yarn separation winding reels are available as options when working with single filament or fine gauge yarn.

6. Yarn outfeed tension down to 0.8 cN.

Another version of MPF, MPF PF has been designed from the MPF P series for use with constant and variable yarn consumption application.The MPF P guarantees the optimum production of faultless fabric on large diameter circular knitting machines [2].

2.4. Improved open width frame:

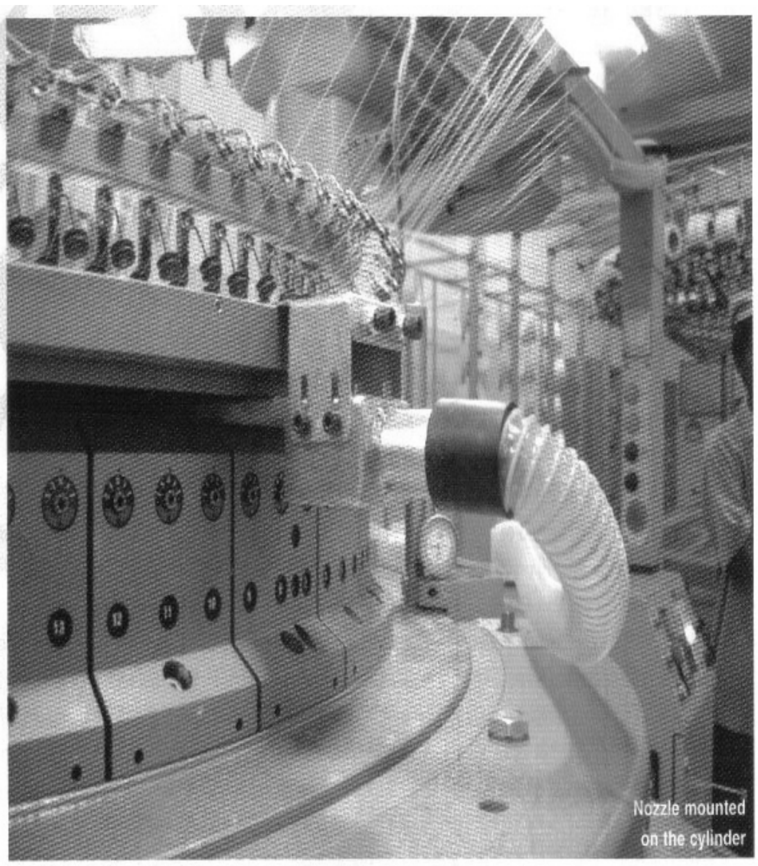
Many machine manufacturers now offer textile companies the option of slitting the fabric open on the knitting machine to prepare an open-width roll of fabric. This approach eliminates the center crease in the fabric that often is visible even after finishing. The open-width device is especially useful for manufacturers working with fiber types and knit structures that are prone to imparting a semi- permeable crease or set in the fabric. Elimination of crease also can represent an overall savings of fabric as the product manufacturers can use a large percentage of the finished fabric. Orizio S.p.A, a renowned circular knitting machine manufacturer, showed a completely renewed frame at ITMA 2007 for easy accessibility and better roll expulsion with improved ergonomics and

functionality. Reinforced, lowered and with inclined legs make it possible to access to the knitting head without opening the gates. With the new fabric takedown, perfect fabric alignment can be achieved plus the elimination of curling distortions and side creases. The new takedown system has the latest fabric stretching and guiding technology which gives a more uniform tension. The two spiral rollers with optimal programmable speeds enable the knitted fabric to be tensioned perfectly and wound on the roll without creases or wrinkles [2].

2.5. Advanced lint extraction technology:

Lint is the single biggest threat to the productive efficiency of circular knitting machinery and to the quality of fabric being produced.Lint gets into the cam boxes and into the needle tricks on the cylinder. Lint, dust and oil combine to form an undesirable substance, which eventually clogs the stitch forming parts. The needles are forced out of the needle tricks causing needle lines, bent needles; knitted-in-lint causes holes in fabric etc.Whenever lint is knitted into a fabric, it picks up oil from the machine causing oil-stained fabric.Every knitter is familiar with the inconvenience of problems associated with needle lines and cost of associated defective fabric produced annually.Studies in circular knitting have concluded that up to 55% of the lint is generated within the creel, 20% at the positive feed units and or storage devices and the balance 25% at the yarn feeders on the knitting head.

Cleantech technology has developed a commercially viable lint extraction system which successfully removes lint generated at the circular knitting machine, which constitutes 45% of the total lint generated.The system consists of nozzles which are placed on the tricks of the rotating cylinder, a lint collection box with dual filters and a powerful vacuum generator based on maintenance free side channel regenerative blower technology.Lint is sucked out and removed into the lint collection box before the lint can get into the cam systems or the cylinder needle tricks. The design of the extraction system is said to avoid extraction of circulating lubricating oil in the machine.The downtime of the knitting machine for cleaning is reduced to less than 1/3rd. The resulting fabric is also devoid of needle lones, knitted-in-oil-stained lint and other oil marks. There is a marked improvement in the overall quality of fabric and a substantial reduction in the quantity downgraded or rejected fabric.



The lint extraction system by Cleantech Technology was first commercially installed in 2005 and the renowned Mayer&Cie company has already adapted this system for their knitting machinery[2].

2.6. Innovative float plating technology

Float plaing produces an open-work mesh structure in single jersey and involves feeding two yarns in a plating relationship to needles having forward hooks.Circular knitting machine manufacturer Pai Lung has introduced an innovative Float Plating Technology in its PL-KSFP four-track single jersey machine which can produce knit fabrics that look like wovens and has applications for denims,suiting and corduroy fabrics.Pai Lung developed and patented the structure using knit and fpoat,using knit cams and sinker cams as well as sinkers to do a knit on one side of the fabric and a very tight float on the other.The float gives the woven effect.Depending on the cylinder cam arrangement,the machine has the ability to do one-, two- and three-needle floats.According to Pai Lung the float plated fabric either matches or excels beyond the woven fabric for tests like air penetration,sewing strength recovery rates,durability and pilling[3].

3.CONCLUSION :

The innovations and developments on circular weft knitting machines in recent years are quite encouraging for knit industries. Besides mechanical improvement, many machine systems are offered with user-friendly software solutions, which can be integrated to the company network or internet. The production speeds of the machines have increased significantly. Extended machine configurations in all knitting related fields are also noticeable. In particular constructive/technological developments in combination with a wide use electronic drives and controlling systems enhance the flexibility of machines and the quality of products. The functioning of the machine and the fabric quality now can be controlled through integrated monitoring system. The trend of development continues steadily to fulfill the growing need of knit industry.

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EFFECT OF YARN COUNT ON PILLING FOR PLAIN SINGLE JERSEY WEFT KNITTED FABRIC

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Abstract: Knitted fabric experiences various types of physical forces during its different stages of usage. These forces are applied by various ways. Abrasion is one type of physical force that is applied on fabric and causes pilling on the fabric surface. Pilling is one type of damages that is occurred in the fabric especially knitted fabric due to abrasion. Under the influence of the rubbing action, the loose fibers develop into small spherical bundles anchored to the fabric by a few unbroken fibers.Yarn Count is a parameter of knitted fabric that determines various important properties of it. ASTM D 4970-02 was followed as the testing standard. This paper shows the relationship between fabrics produced from different yarn count and their effects on pilling.
Key words: Yarn count, pilling, stitch length, abrasion, abradant.

1. INTRODUCTION

Among all the weft knitted structures, plain single jersey structure is the most common and widely used weft knitted fabric structures [1]. Among many problems faced by this fabric, pilling is one. Pilling is a condition that arises in wear due to the formation of little 'pills' of entangled fiber clinging to the fabric surface giving it an unsightly appearance. Pills are formed by a rubbing action on loose fibers which are present on the fabric surface [4]. As pills form due to the migration of fibers from the constituent yarns in the fabric, so the reduction or prevention of pilling may be effected by reducing this migratory tendency [2]. Yarn count is a major parameter of knitted fabrics. A yarn count number indicates the linear density i.e. yarn fineness to which that particular yarn has been produced. The count influences the cost, weight, opacity, handle and drapability of the resultant structure [5]. 15 samples were taken for the experiments. The samples were of different yarn count and stitch length. All the samples used for the experiment were at their grey state or untreated state.

2. MATERIALS AND METHOD

Plain single jersey tubular fabric was produced in small diameter knitting machine having a diameter of 4 inch with 132 needles. Machine settings were changed to produce fabric of different stitch lengths from different yarn count. The different stitch lengths of the fabric were 5.1 mm, 6.3 mm, and 7.6 mm. 5 different yarn counts were used. The yarn counts were of 20/1 X 2 Ne, 24/1 X 2 Ne, 26/1 X 2 Ne, 30/1 X 2 Ne, 32/1 X 2 Ne. As the yarn count is numbered in indirect system, the yarn gets finer with increment of yarn count number [3]. The sample diameter for pilling test was of 90mm. All the samples were in grey state.

Martindale Abrasion and Pilling Tester, (Manufacturer: SDL Atlas Ltd., UK, Model No.-M235) was used to determine the pilling of the specimen. It is used to determine the abrasion and pilling resistance of all kinds of textile structures. Samples are rubbed against abradant at low pressures and the amount of pilling or abrasion is compared against standard parameters.

A choice of loading weights and pressing weight is there to ensure correct loading weights and pressing weight to ensure correct loading of the abradant fabric.

Machine Setting for Pilling are as follows:

Total stroke of the outer peg	24.0+/-0.5mm
Total stroke of the inner peg	24+/-0.5mm
Abrasion area of the specimen holder	64 sq cm
Mass of specimen holder and spindle (For knitted fabrics)	163g+/-7g

3. EXPERIMENTAL PROCEDURE

After the production of the fabrics, the required numbers of samples were cut from the test specimen. The samples were of 90 mm diameter. A rubber specimen holder ring was placed around the outside of this device.

A 140mm disc of specimen was placed on top of the loading device, allowing the excess material to drape over the edge. A 90mm disc was placed in the recessed top of the loading device. A specimen holder was inverted and placed on top of the felt. The rubber ring was rolled up the loading block until it locates in the groove. The specimen holder was removed. Swiss pilling kit without the pilling weight (0.25 KPa) was used as abradant since the specimen was of knitted fabric.

This process was repeated for all specimen holders and abrading tables. It was ensured that all counters were showing the reading zero, and then the test was started.

4. EVALUATION STANDARD

The degree of fabric pilling is evaluated by comparing the tested specimens with the visual standards, which may be actual fabrics or photographs of fabrics, showing a range of pilling resistance [2]. The abraded sample obtained from the machine was compared to evaluate the amount of pilling. The degree of pilling was assessed using the following 5 point scale from the photographic pilling standard (W_2):
5 - No pilling or only very slight pilling
4- Slight pilling
3- Moderate pilling
2- Severe pilling
1- Very severe pilling

5. DATA ANALYSIS

The yarn counts used for the experiments were of:
20/1 X 2 Ne, 24/1 X 2 Ne, 26/1 X 2 Ne, 30/1 X 2 Ne, 32/1 X 2 Ne.

Each count was used to produce sample fabrics of three different stitch lengths, i.e. 5.1 mm, 6.3 mm, and 7.6 mm. All the samples were of Plain single jersey weft knitted structure.

Each sample was rubbed for 2000 cycles. A total of 15 samples were taken for experiment.

Table 1

Sample No.	Stitch length (mm)	Yarn count (Ne)	Pilling rating
01	5.1	20/1 X 2	1
02	5.1	24/1 X 2	2
03	5.1	26/1 X 2	2
04	5.1	30/1 X 2	3
05	5.1	32/1 X 2	3

Table 2

Sample No.	Stitch length (mm)	Yarn count (Ne)	Pilling rating
06	6.3	20/1 X 2	2
07	6.3	24/1 X 2	3
08	6.3	26/1 X 2	3
09	6.3	30/1 X 2	4
10	6.3	32/1 X 2	4

Table 3

Sample No.	Stitch length (mm)	Yarn count (Ne)	Pilling rating
11	7.6	20/1 X 2	3
12	7.6	24/1 X 2	4
13	7.6	26/1 X 2	4
14	7.6	30/1 X 2	5
15	7.6	32/1 X 2	5

6. RESULTS AND DISCUSSION

Yarn Count (Ne)	Pilling Rating
20 X 2	1
24 X 2	2
26 X 2	2
30 X 2	3
32 X 2	3

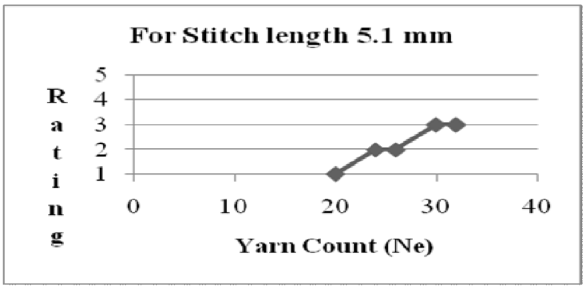

Fig. 1: Relationship between yarn count and pilling for a stitch length of 5.1 mm

From Table 1, it is observed that pilling shows a decreasing trend when the yarn count is increased for the fabric of stitch length 5.1 mm. As the yarn count gets finer, the amount of pill formation decreases.

Yarn Count (Ne)	Pilling Rating
20 X 2	2
24 X 2	3
26 X 2	3
30 X 2	4
32 X 2	4

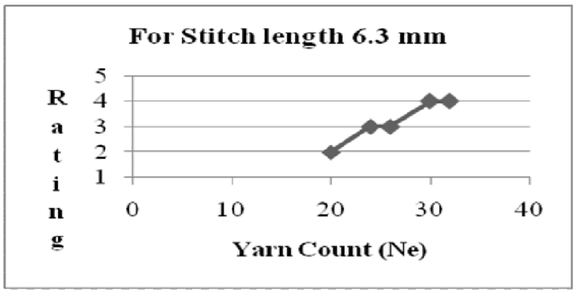

Fig. 2: Relationship between yarn count and pilling for a stitch length of 6.3 mm

From Table 2, it is observed that pilling shows a decreasing trend when the yarn count is increased for the fabric of stitch length 6.3 mm. As the yarn count gets finer, the amount of pill formation decreases.

Yarn Count (Ne)	Pilling Rating
20 X 2	3
24 X 2	4
26 X 2	4
30 X 2	5
32 X 2	5

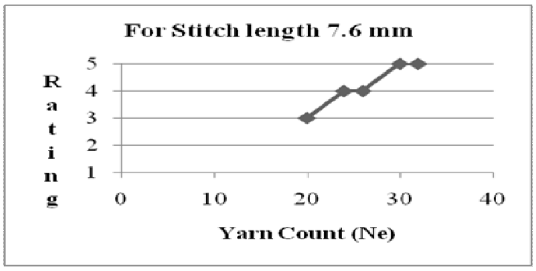

Fig. 3: Relationship between yarn count and pilling for a stitch length of 7.6 mm

From Table 3, it is observed that pilling shows a decreasing trend when the yarn count is increased for the fabric of stitch length 7.6 mm. As the yarn count gets finer, the amount of pill formation decreases.

In all the experiments, it is clearly observed that there is a clear relationship between yarn count used in the fabric and the pilling rating. Pilling is decreased in all the cases as the yarn gets finer. But when the change of yarn count is minor or little, then the pilling change does not occur.

7. CONCLUSION

The experiment was carried out with the plain single jersey weft knitted fabric at its untreated state. The results suggest that as the finer yarns are used to produce plain single jersey weft knitted fabric, the pilling on the fabric surface decreases when the stitch length of the fabric is constant. The results in all the tests are consistent and show a similar trend.

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STUDY ON THE DEGREE OF COMPACTNESS OF THE FABRIC DENSITY INFLUENCED THE LENGTH OF THE WIRES

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Abstract: The degree of compactness, regarded as the most comprehensive index contains all the parameters characterizing the basic fabric and structure techniques including wire-length density plays an important role.
The paper presents the meaning and intensity of linear density influence on the degree of compactness and the possibilities they offer for getting striped fabric with homogeneous internal structure.
Key words:. basic fabric, linear density

1. INTRODUCTION

Besides density and connection, the fineness of yarn systems is the third basic parameter that defines the internal structure of the fabric.

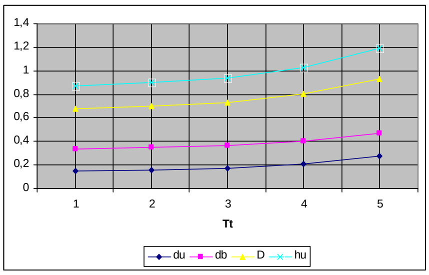
Length density is an important factor influencing the degree of compactness of the fabric.

To determine the direction and intensity influence components that define the internal structure of the fabric is necessary for their sizing to be expressed in units that measure their actual shape of the fabric. The wires are one of these components.

2. GENERAL INFORMATION

It is known that by convention the unit of yarn fineness is the number of metric and / or length density. They are derived units or indirect. Direct measure of the fineness of thread can be found whose diameter is proportional to the size of their thinness.

Therefore to study the influence of yarn fineness on the compactness degree, their diameter was used because it is a measure the physical form of the threads in the fabric.
Behind this procedure of data analysis from the table and graph in Figure 1 are compared the two measuring methods of yarn fineness: the length density and diameter. The variation of linear density from 14.28 tex and 50 tex the linear density percentage increase is 350%. Diameter of wire, for the same period is increased by only 86.8% fineness.



Ttu	du	db	D	hu
14,28	0,1458	0,193	0,3388	0,1902
16,67	0,1574	0,193	0,3504	0,1967
20	0,1726	0,193	0,3656	0,2052
29,5	0,2093	0,193	0,4023	0,2259
50	0,2729	0,193	0,4659	0,2616
350	86,8		37,5	37,5

Fig.1. Correlation between yarn fineness expressed in tex, Tt, and in diameter d.

From the same figure 1 shows that increasing the diameter of warp yarn with 86.8% the diameter sum D=du + db is increased to 37.5% db for the weft yarn diameter remains constant.
Also the wave height **hu** to calculate variable element which is the sum of diameters is normal and to let it grow, in the same proportion with the sum of diameters.This expresses the real state of the embedded wires in the fabric structure.Hence the need for comparative analysis of the characteristic size of the internal structure of the fabric determines the state to operate the units that measure their size and status as the real fabric. In the analysis of yarn fineness is measured by diameter and length rather than density.The degree of compactness according to the yarn fineness in diameter and expressed as a contact with floating average was calculated with the equation:

$$K_u = \frac{P_u\left[d_u\left(Fb-1\right)+D\cos\beta\right]}{Fb} \tag{1}$$

$$Kb = \frac{P_d\left[db\left(Fu-1\right)+D\cos\alpha\right]}{Fu} \tag{2}$$

Study the influence of the fineness yarns, the degree of compactness was done on a fabric having the following characteristics: warp yarns density Pu = 320wire/10cm, weft yarn density Pb = 250 wire/10cm, density of the weft yarn length TTB = 25tex and warp yarns density varies between TTU = 14.28 and TTU = 50 tex.

The study was also conducted in conjunction with floating medium variation between F1 and F4. Table 1 presents the results of the study, which notes how, and the intensity of linear density influence on the degree of compactness of the two systems of threads of the fabric.

Table 1. The influence of linear density on the compactness degree

rând	Ttu	du	F=1			F=2		
			Ku	Kb	Kt	Ku	Kb	Kt
0	1	2	3	4	5	6	7	8
1	14,28	0,1458	89,71	76,11	82,91	68,19	62,18	65,19
2	16,67	0,1574	92,8	78,73	85,77	71,58	63,49	67,54
3	20	0,1726	96,85	82,16	89,51	76,04	65,2	70,62
4	29,5	0,2093	106,52	90,4	98,46	86,75	69,32	78,04
5	50	0,2729	123,4	104,7	114,05	105,36	76,47	90,91
$\frac{rand5-rand1}{rand1}\cdot 100$			37,6	37,6	37,6	54,5	23	39,4
rând	Ttu	du	F=3			F=4		
			Ku	Kb	Kt	Ku	Kb	Kt
0	1	2						
1	14,28	0,1458	60,99	57,52	59,26	57,41	55,2	56,31
2	16,67	0,1574	64,49	58,39	61,44	60,96	55,86	58,41
3	20	0,1726	69,08	59,53	64,31	65,62	56,71	61,17
4	29,5	0,2093	80,14	62,28	71,21	76,85	58,77	67,81
5	50	0,2729	99,32	67,03	83,18	96,32	62,34	79,33
$\frac{rand5-rand1}{rand1}\cdot 100$			62,8	16,5	40,5	67,8	12,9	40,9

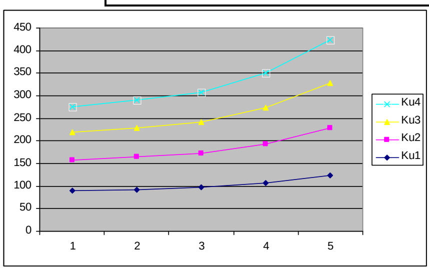
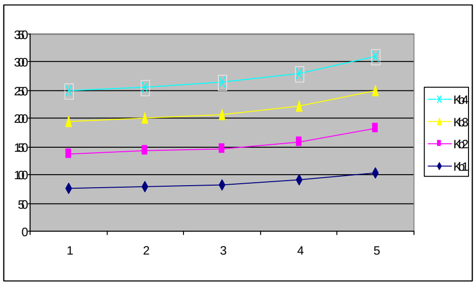


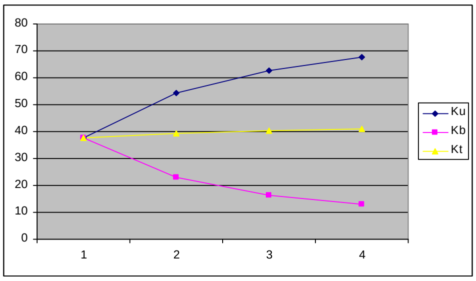
Fig.2. Ku compactness degree variation depending on the length density in correlation TTU with the flotation F

Ttu	Ku1	Ku2	Ku3	Ku4
14,28	89,71	68,19	60,99	57,41
16,67	92,8	71,58	64,49	60,96
20	96,85	76,04	69,08	65,62
29,5	106,52	86,75	80,14	76,85
50	123,4	105,36	99,32	96,32



Ttu	Ku1	Ku2	Ku3	Ku4
14,28	89,71	68,19	60,99	57,41
16,67	92,8	71,58	64,49	60,96
20	96,85	76,04	69,08	65,62
29,5	106,52	86,75	80,14	76,85
50	123,4	105,36	99,32	96,32

Fig.3. Kb compactness degree of variation depending on the length density TTU in correlation with the flotation F



F	Ku	Kb	Kt
1	37,6	37,6	37,6
2	54,5	23	39,4
3	62,8	16,5	40,5
4	67,8	12,9	40,9

Fig.4. Percentage variation of the compactness degree of Ku, Kb, Kt depending on the length density of TTU in correlation with an average flotation F

Length density influence the compactness degree in that yarn diameter increases with increasing the degree of compactness.

The study was made variable element on the diameter of warp yarns. The analysis of obtained data shows that the variation diameter of a wires system (in the analyzed case was warp) influence the compactness degree of threads on both systems but with different intensities.

As diameter increased by 87% the degree of compactness increased with 37% for F = 1 and 67.8 for F = 4 fig.2. At the same time the degree of compactness of the system increased by 37.6% weft for F = 1 and only 12.9% for F = 4 ¤ fig.3.

If one compares the compactness degree on the growth dynamics of the two systems of threads, it appears that the growing medium floating, the degree of compactness of the warp yarns from 37.6% to F = 67.8 to F = 4, increase the degree of compactness of the yarn B decreases to 37.6% from F = 13% to F = 4 fig.4.

Their sum remains approximately constant so that the compactness of the fence fabric shall be maintained at the same level (with minor changes) for all mean floating values.

It appears that the length density influence the compactness degree with a lower intensity increasing thread diameter.

The analysis of obtained data from study of the influence on the compactness degree thread diameter is found that for areas with floating bonds on average F = 1 ... F2, frequently encountered in practice, the percentage of increasing compactness is half the diameter growth rate wires.

It follows that to change the degree of compactness of a wires system, the length density is a possibility that can be used to improve the homogeneity of the structure of longitudinal striped fabrics obtained by associating groups of warp threads of different links and finesse.

3.CONCLUSIONS

To study the influence of linear density on the degree of compactness is required fineness to be expressed as diameter, representing the physical size (actual), under which is found in fabric.

Increasing the linear density of a system of wire diameter influence the degree of compactness of its upside but also influences the system to increase the compactness of the partner system.

The link influences the increasing of compactness density-length product. At the same density of wire length as flotation system average increase in diameter as compactness of the system increases, while the opposite degree of compactness of the system decreases.

Thus if the degree of compactness of the system is increased by 67.8% in the warp range F) 1, F = 4, degree of compactness of the corn system falls from 37.6% for F = 1 to 12.9 for F = 4.

Length density influence the degree of compactness with a lower intensity increasing thread diameter, so for F = 1 and F = 2 (the most common combinations of links) percentage increase of the degree of compactness is half the rate of increase in yarn diameter.

Length density is a possibility that can be used to improve the homogeneity of longitudinal stripes woven structure obtained by associating groups of warp threads of different links.

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THE ANALYSIS OF MACHINES FOR THE FOOTWEAR PULL ON BOOT TREE

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Abstract: The ways of manufacturing of footwear have undergone a long evolutionary way, beginning with the manual work and finishing with the automated. The first sewing machine that had come to help the man appeared in XVIII century. The Industrial progress of development and of the equipment it is possible to divide conditionally into three stages: from 60 till 90th years where it is attempt the two-operational power engine; from 90 till 2000 two machines were applied to an inhaling; and the modern period when inhaling process allows using less machines. The new machines had new patented system that allows the operator to put the position for preparation of the top of footwear according to the design of model that is applied to each size of footwear. The system provides an automatic centering of a narrow site of footwear that by means of a following beam of light the operator could guarantee each time exact width of capture of a long edge in beam parts of preparation of top. In a similar way the system provides exact positioning of the sample in toe cap footwear parts. Except the equipment by the modern electronic devices, the new machines have fashionable design, in particular, the polished black panel and the automated tray for the footwear, covered with genuine leather. The appointment of these machines is universal: on them it is possible to carry out process of an inhaling for various types of footwear (boots, low shoes, shoes, etc.) both as daily socks as model sports. Thus the footwear can be various groups of people– man, female, and children.
Key words: equipment, machines, lasting, lasting margin.

1. INTRODUCTION

The historical way of development of technology of footwear can be divided into three stages conditionally. In the beginning footwear produced manually (the period of house and craft manufacture). Then mechanical manufacture arises and develops, on change to which automation of shoe manufacture comes.

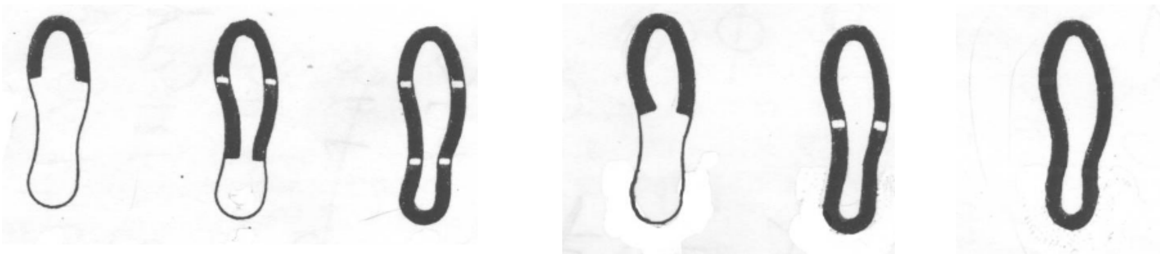
By house and craft manufacture the footwear design is elementary simple also all processes were carried out manually by means of tools. Industrial revolution from 18th century marks a definitive victory over a house method of manufacturing of footwear. There were sewing-machines, machines for a sole attachment in the various ways: screw, wood-drilled, filler, welt, etc. and in 1876 for the first time there was a prolonged machine [1].

2. THE FIRST PULL MACHINE

The development of machines has started in the middle of 60th years for footwear. Definitive formation of preparations of top of footwear on stocks demanded an application of three machines which are consistently carrying out technological operations of a glutinous pull separately forefoot, bigfoot and hide foot parts of preparations (fig. 1.a.) [2]. Forefoot parts were applied to a pull such machines, as ZV, 3В-1, 3В-1-О, 3В-2-О, 3В-3-О, 3НК-2М-О, 3НК-3-О (Russia), for bigfoot– 02087/P1 (Czech), 3КГ-2-О (Russia), for hide foot– 3ПК-4-О (Russia), semiautomatic devices 02038/P1, 02038/P2, 02146/P1, 02146/P2, 02146/P3 (Czech) [3].

3. THE MODERNIZED PULL MACHINES

In the 90th years the main stream of formation and a pull of top of footwear were working out of the two pull machines which are a transitive step to automation of this process (fig. 1.b.). Such firms as БУСМК (Great Britain), "Ralfe", "Shen" and "Menus" (Germany), "Forward" (Russia), УСМ (USA), "Cherim" and "Molina Bjanki" (Italy), have already started release of the equipment for formation and a pull forefoot and hide foot parts of preparation of top of footwear. So, for example, firm USM has developed and has made machines of mark DVUZ-RA for covering and a pull forefoot and bigfoot parts. By the machines №4-A15 firms BUMSK with a pneumatic drive the pull on footwear with the melt-glue welt and doppelny fastening methods are possible. The machines 63DHL and 63DHLG firms Shen with a hydraulic drive provides a qualitative glutinous pull forefoot part of preparations of all kinds of footwear. The machines 63DHLG have the adaptation for pull bigfoot parts that gives the chance to apply it to two-machine system of a pull. The machine is automatically reconstructed for a pull of the left and right semi pair, in it automatic drawing of glue is provided. Firm "Cherim" car K68SZP tightens footwear of heavy type, including with metal toe. The one-section the machine of mark ЗНК-3-О with floating pincers and a hydraulic drive is intended for covering and a pull forefoot to a part of preparations of all kinds of footwear with simultaneous drawing of thermoplastic glue on an insole [3].



a b c

Fig. 1: Stages of a pull of footwear on stock: application of three machines; application of two machines; application of one machine.

4. THE AUTOMATED PULL MACHINE

However a following stage in development of the shoe industry is occurrence of the long cars operated microprocessors that allows to lower complexity of performance of the given operation considerably. So, the Italian firm CERIM develops new model K200 Gold of the machine for operations of covering and a pull of preparation of top of footwear (fig. 1.c.). Model K200 Gold represents last generation of the computerized pull machines has programmed and automatically carried out change of position of pincers. It allows to bring in memory of the machine more than the data and, hence, to carry out pull process big quantities of models of footwear. Except traditional devices, model K200 Gold is supplied by the new devices providing some advantages. One of these advantages of the given model is the programmed reflected light signal (fig. 2.).

In the machine, from each side and the new patented system that allows the operator to place the preparation of top of footwear in pincers precisely, according to a design of model that is applied to each size of footwear. The system provides an automatic centering of a narrow site of footwear, caliber behind caliber so that by means of a following beam of light the operator could guarantee each time exact width of capture of a long edge in beam part of preparation of top. In a similar way the system provides exact position of the sample in toe cap footwear parts. Except equipment by the modern electronic devices, the given model has fashionable design, in particular, the polished black panel and the automated tray for the footwear, covered with genuine leather.

Appointment of the given machine is the universal: on it is possible to carry out process of a pull for various types of footwear (boots, boots, low shoes, shoes, etc.) as daily socks as model sports. Thus the footwear can be used by various groups of people– man, female, and children [5].

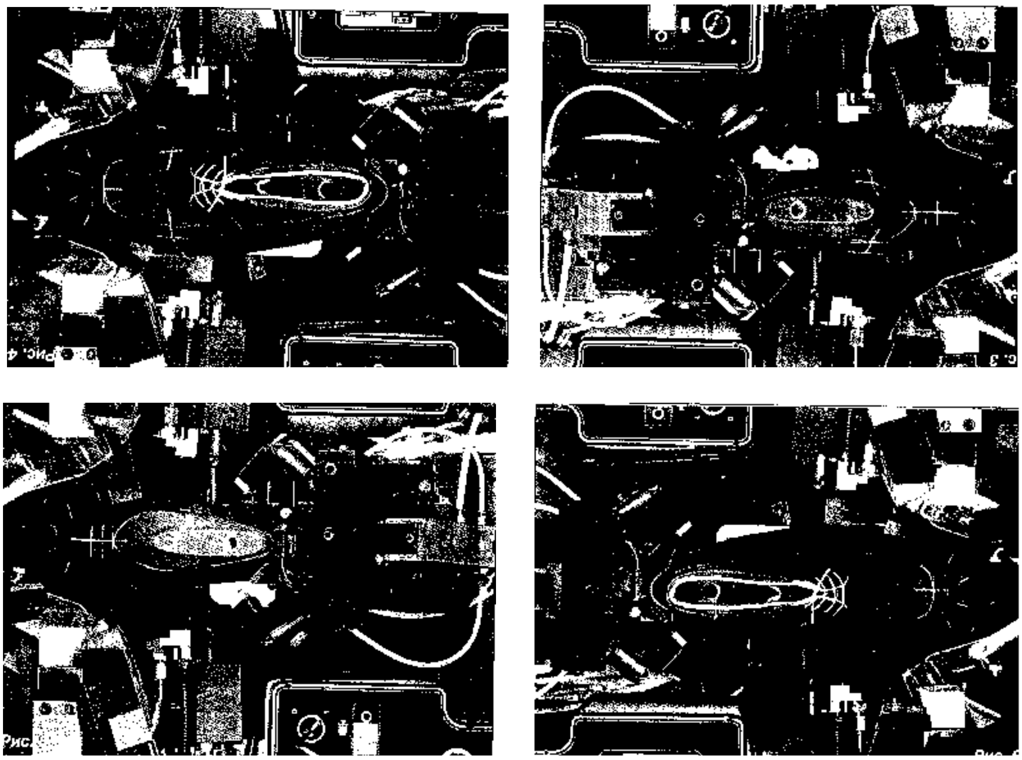


Fig.2: The reflected light signal for various types of footwear

In table 1 Machines and their basic characteristics changing in development of manufacture.

Table 1: The basic characteristics of machines

Model of machines	The cores of characteristics					
	Overall dimensions, mm	Net weig ht	The capacity of machine, Kw	Capacity of the engine, Kw	Number of turns of the main shaft	The number of pairs (cycles)/ch
1	2	3	4	5	6	7
3В-3-О [3] (Russian)	720/950/1850	320	-	0.55	-	80
3НК 2М О [3] (Russian)	1050/1150/1800	1050	4.86	-	-	130
02146 P2 [3] (Czech)	810/890/1380	1270	2	-	44	До 400
02146 P3 [7] (Czech)	805/880/1890	1230	2	0.18	44	До 480
CK 23SZ [7] (Italy)	800/1200/2050	1300	-	-	-	200-250
K 73E [4] (Italy)	1080/1870/1890	1300	5.5	2.2	-	350

Continue table 1.

1	2	3	4	5	6	7
K78 SZ [6] (Italy)	1230/1660/1900	1350	5.48	3.8	-	-
K124 [6] (Italy)	1600/1650/2100	1590	4.5	2.2	-	160/200
K100 Silber [5] (Italy)	960/1635/1850	1440	5.8	2.2	-	350
K200 Gold [5] (Italy)	960/1635/1850	1440	5.8	2.2	-	350

5. CONCLUSIONS

During the analysis of the existing equipment for footwear pull, it is possible to confirm that fact that machines have undergone considerable evolution. The first machines carried out only narrow operation, and there was a necessity for use of three machines. Among the modern equipment there are such cars as K200 Gold which, during gradual modernization, allows simplifying pull process on stock to one operation. The appointment of the given car the universal: on it is possible to carry out process of an inhaling for various types of footwear (boots, low shoes, shoes, etc.) as daily socks as model sports. Thus the footwear can be various groups of people – man, female, and children.

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CONCEPTUAL MODELING CONSIDERATIONS ON A FUNCTION OF INSURANCE OF COMFORT CLOTHES

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Abstract: : Ensuring the safety and comfort parameters for clothing products is subject to sustained study and research. In this paper, some aspects are treated to state the comfort indices for clothing products and structures, with special purpose. It treats the problem of ensuring the tightness of the regulation of heat transfer, the problem of electromagnetic radiation shielding capacity or communication function.
Key words: comfort clothing, air permeability, vapor permeability, thermal insulation, heat transfer.

1. INTRODUCTION

An important feature of special purpose clothing is the protection of the human body against harmful factors of environment in which they operate.

Every type of protection product, corresponds to specific conditions and specific requirements, according to its terms of use.

Comfort and protection requirements are often contradictory and the role of the designer and the technologist is to achieve a protective garment to provide the highest protection and the best comfort while wearing.

2. CONCEPTUAL MODELLING

2.1 Conceptual modeling function to ensure tightness

At the level of protective equipment, the tightness is ensured by:
- Waterproof layers (base layer or an intermediate one);
- The actual tightness of the joints.

Impermeability is defined as a property of material that can not be crossed by a fluid. In terms of ability to reject the liquid two groups of materials can be highlighted:

1. Simple macroscopic materials, macroscopic established at a single basic component;
2. Composite material consisting of at least two distinct components.

Depending on the macroscopic structure of textile composite materials are:

a) composite matrix - dispersed phase (Supplementary material is dispersed in the matrix);
b) composite laminated (additional material is disposed on the array surface, which in this case you can call support);
c) Double - composite (material obtained by laminating, in turn, complementary composite materials)

2.1.1. Structural Models of the materials covered by stratified

In terms of relative orientation in the garment, composite materials can be obtained by layering:

• the coating to the outside - this group are representative of skin substitutes. This material shows high capacity for decontamination and / or purification and is recommended for antiparticle and antichemical protection
• the coating to the inside - especially for products used against weathering.

In terms of number of layers can highlight:

• simple layered materials - are composed of two layers, one of which is used as a backing fabric. In this group most materials are coated on one side (excluding those with complex coating, obtained by combining several individual layers) and the laminate of two layers (2L). Structural variants are presented in the schematic apparel products that are used in laminated materials 2L. They can be used as base material, the intermediate layer between the base material and the lining or as a lining.
• multilayer material consisting of at least three distinct layers. In this regard two types are highlighted:

a) 3L laminate material structure "sandwich" (Fig. 1) technique used especially for clothing (PPE Fire) and utility (military uniforms for police, industrial).

b) complex coated materials, undertaken on the principle of double materials - composites. Schematic structure is shown in fig.2, ENTRE GII material impervious to water / air and vapor permeable, in whose structure can highlight layers with a different configuration of the pores.

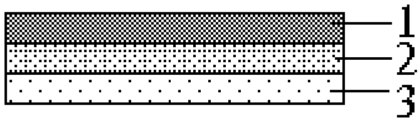

Fig. 1. Laminated material. 1 – principal material; 2 –laminated polyester; 3 – lining**.**

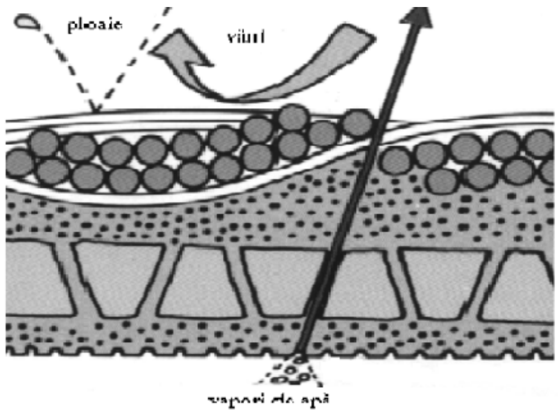

Fig. 2. Schematic structure of the material ENTRANT GII

2.1.2. Sealing Technology Models

2.1.3. Tightness of joints is the ability to not allow passage of fluids. Depending on the characteristics of raw materials and technical equipment can put out two models of the joints tight manufacturing technology:

2.1.4. Treatment with sealant, in order to cover the perforations on the surface that result in the process of sewing.

The basic condition for carrying out welding process is the presence in the assembly of at least one thermoplastic polymer which in the presence of thermal field becomes fluid - viscid, which facilitates mobility and diffusion of macromolecular chains with the restoration of new links

The primary difference however is in the behaviour of materials undergoing heating, completion of the operation is largely determined by the geometry of the working bodies and their mode of action.

2.2. Conceptual modeling of active control function of heat transfer

2.2.1. Protective clothing for the environment that are too hot

The physical environment faced by firefighters is one of the most complex and they risk exposure to different type and large quantity of thermal energy and long duration of heat exposure. Thus, the type of thermal risk may be: thermal radiation, opened fire with sparks, hot surfaces, molten substances.

Radiant heat flux is expressed as a sum of three components:

$$q_{rad} = \sigma \cdot \varepsilon_g \cdot T_g^4 - \sigma \cdot \varepsilon_m F_a (1-\varepsilon_g)(T_m^4 - T_a^4) + \frac{\sigma F_a (1-\varepsilon_g (T_f^4 - T_m^4))}{1 + F_f (1-\varepsilon_g)\left(\frac{1-\varepsilon_m}{\varepsilon_m} + \frac{A_m}{A_f}\frac{1-\varepsilon_f}{\varepsilon_f}\right)} \quad \textbf{(1)}$$

where : σ – is the Stefan-Boltzmann constant, g ε , ε m , and ε f - are hot gas emissivity, the material and the head of the fire burning, Tg, Tm, Ta and Tf - hot gas temperatures, the material (the outer exposed to fire), air and fire in the burner head, Fa and Ff - factors which take into account the geometry of the material and characterize the air and fire, I and Af - material surface areas and that the burner head.

Obtain a physical model for analyzing system behavior under fire clothing.

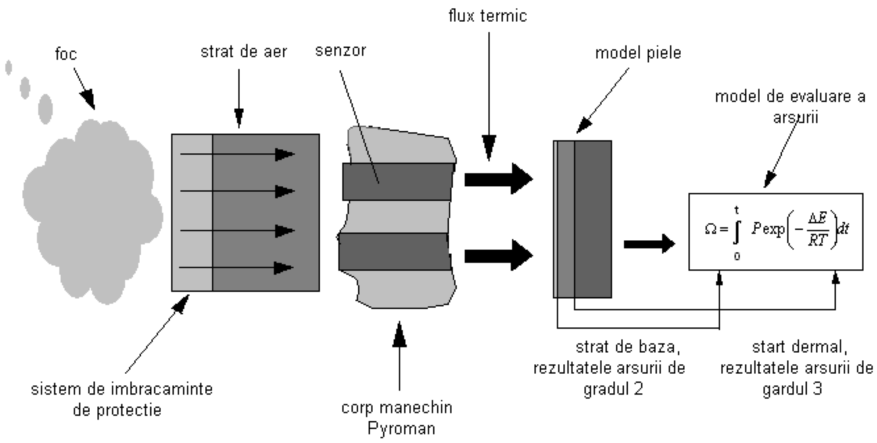

Fig. 3. Heat transfer and evaluation process of the burn with instrumented manikin

2.2.2. Protective clothing against cold

Cold is a risk to human health, it can affect physiological functions, work performance and welfare.

Body heat balance can be described by the equation:

$$S = M - \frac{t_p - t_e}{I_t} - \frac{p_p - p_e}{R_e} - \mathrm{Re}\, s \quad \textbf{(2)}$$

and is considered attained when S is zero.

The equation of total thermal insulation correction that takes into account wind speed and air permeability of the layers of material is:

$$I_{t,r} = I_{t,static} \cdot e^{\left[-0{,}0512(v-0{,}4)+0{,}794\cdot 10^{-3}(v-0{,}4)^2-0{,}0639\cdot w\right]P_a^{\,0{,}1434}} \quad \textbf{(3)}$$

where: It, r is the real total thermal insulation, corrected
It, static - total thermal insulation under static conditions
v - wind speed, m / s
w-speed movement of individual m / s
Pa - air permeability, l/m2s.

2.2.3. The thermal and stress model

There are two ways to transfer an analysis of temperatures of heat (stationary or transient) in a model of stress: the " direct "when the model of heat and tension are the same, and the method" indirect "when there are a number of differences between the two models.

The model is developed using finite element.

In the thermal analysis of textile composites a number of four finite element models were created to model the following situations that come true:

- In severe cold (negative temperature values between -30 and -40 ° C):
  a). model comprising two layers: 4.9 mm and 4.1 mm air-textile material
  b). model comprising two layers: 8.2 mm and 6.8 mm air-textile material
- Under severe heat (positive temperature values between 35 and 45 ° C):
  c). model comprising two layers: the textile material 3mm and 2.5 mm air
  d). model comprising two layers: 4.9 mm and 4.1 mm air-textile material

From these considerations have been obtained four models that include a number of three-dimensional finite element type 2928 "brick" and 4396 nodes. These finite elements have been divided into two groups: Group 1 - green - materializes the air - we have a number of 1464 elements, Group 2 - red - materializes textile material with a number of 1464 elements.

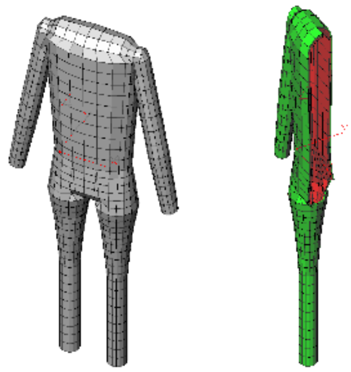

Fig. 4. Presentation made with finite element models

2.2.4. Modelling of heating a shape memory element using bond-graph

The bond-graph of the warming of a shape memory element is built using bond-graph of three elements: first element is an ideal source temperature that is shaping the fluid surrounding the shape memory element and provides temperature T1 = BP, the second element is a capacitive element that stores heat, with heat capacity [J / K], where m [kg] is the mass and shape memory element and cp [J / KGK] specific heat at constant pressure element shape memory, and the third element is a resistive element R that models the boundary layer around the shape memory element having heat resistance, where convective heat transfer coefficient and SA is the surface shape memory element. Based on this graph a schematic block is represented.

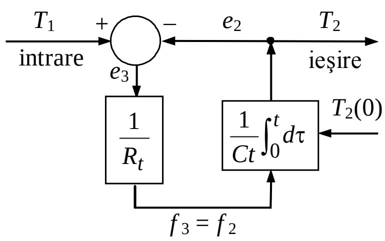

Fig. 5. Block diagram

Finally reaching a block diagram can be drawn directly into Simulink simulations where different values for the parameters is done very simply by a simple change of numerical values. For example to set a numerical example corresponding to a shape memory element in the form of an arch. The construction allows the study of the influence of all parameters in order to take the most appropriate decisions for the design element.

2.3. . Conceptual modeling of the function of shielding against electromagnetic radiation

2.3.1. Study of the influence of nature and thickness of the coating: oxidic, polymeric or composite in shielding against electromagnetic radiation

Dependence of coefficients of reflection and transmission coefficients of devices made from composite fibers were measured as a function of frequency of electromagnetic radiation. They studied the shielding properties of the fibers synthesized using Pd activation method of chemoabsorbtion, materials made of fibers containing Co and EMR absorbing multilayer structures.

Shielding properties of fiber composites are investigated in a wide range of frequencies. It was determined that the shielding effectiveness of composite fiber containing material increases with frequency of electromagnetic radiation. The material showed a higher Ni stop EMR reflectivity due to electrical component of the wave. High reflective ability of the conductive composite material is controlled by the difference in the gap resistance and shielding device.

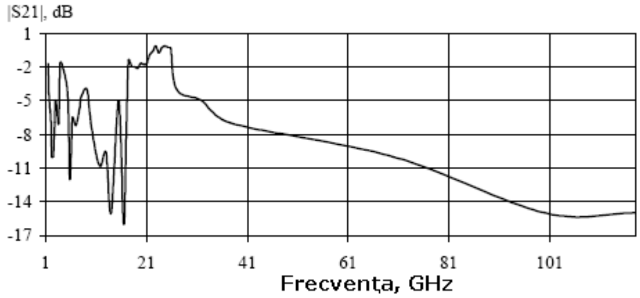

Fig. 6. Transmission coefficient of the fiber composite material composed of Co clusters based on the frequency EMR

Ni containing materials have a reflectance higher than the composite material prepared by chemoabsorbtion. Shielding effectiveness of materials containing Ni is typically over 20 dB in the frequency range 20 -118 GHz. Co-containing materials have a lower shielding effectiveness than those containing Ni, but are better adapted to the free space (reflection coefficient is less). The reflectance of these materials shall not exceed 10 dB and nonresonant behavior in the microwave. It was shown that by using fibers containing Co as adaptation layer (matching) EMR absorbing structures, shielding effectiveness increases to 79 dB

2.4. Conceptual modelling of communication functions (reception, transmission, monitoring)

2.4..1. Conceptual models of the function of vision (increased visibility)

Models that use Reflections

The figure below illustrates the principle of retroreflexion with reflective surfaces using geometric optical model. The reference axis is perpendicular to the line projected on the reflecting surface, which is used to determine the entry angle β and angle of α. Observation angle α is defined as the angle between the axis of light (light beam) and the observation axis (line between the vehicle and the reflecting surface). Reflective surface brightness depends on the angle of α.

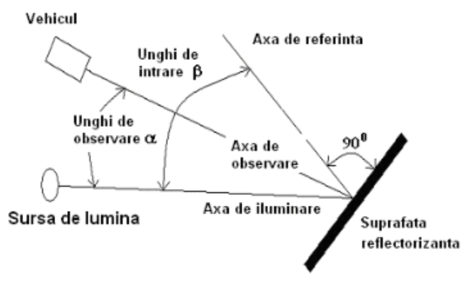

Fig. 7. Geometric principle of operation of reflective surfaces

Models that use the phenomenon of luminescence

Operation luminescence phenomena is achieved by using radiation propagation along the fiber core to excite molecules and crystals issuing external irradiation or natural fibers with UV radiation. Polymers with luminescent / fluorescent macromolecular compounds are a class of intensive and extensive study of its properties. Strategies for incorporating polymer photovoltaic open various possibilities to smart textiles and encourage creative competition.

The category of conductive polymers for applications in textile industry and those properties are part of organic field effect transistors (OFET), polymers that have been intensively studied over the past 15 years due to excellent mechanical properties of semiconductors, which make them attractive to the industry of flexible electronics. They are fibrillary or even transparent OFET based on flexible, transparent polyester film which not only supports the device, but also provides insulation for the entire structure of OFET.

A good example in the study and other conducting polymers for applications in the field of textiles that emit in the UV-Vis spectrum. is the polar supramolecular luminescent films (1-3) with complex structures. It was shown that films with thicknesses of 20 and 110 μ m, retain overall polarity and exhibited a strong photoluminescence when excited with UV radiation with a wavelength of 365 nm.

2.4.2. Conceptual models of the function of vision (reduced visibility)

The proposed model uses carbon nano tubes and is based on squid behavior, which changes its skin color to avoid detection by potential predators.

Camouflage can mimic the appearance of environmental signals by altering the carbon nano tubes that change the picture. Optical sensors can download a wallpaper from the nano tubes processors by choosing a preset similar image if there is one,or creating a pattern that is similar to the background.

Through connections in a flexible substrate or using a wireless network connection, the nanotubes can be linked with sensors, processors and color devices.

3. CONCLUSION

Smart textiles are used increasingly in industry by the protective clothing manufacturers.

For the textile industry the combination between the textile field and the computer science field determines a huge potential of almost infinite possibilities.

Thus intelligent garments can be used for safety in extreme conditions and for military uniforms without any types of exception.

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DEPENDENCE BETWEEN TEMPERATURE AND WATER VAPOR PASSING THROUGH POLYMER MEMBRANES

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Abstract: The paper contains information on the usefulness of the membrane layers laminated, waterproof, wind resistant but water vapor permeable. It highlights the dependence between temperature and vapor flow for various types of membranes, in comparison. It describes a method of making physiological measurements, using thermal manikin. This, because of its internal structure, equipped with heat sensors, can be heated at a constant temperature, each area of the body. Measurement results are represented by diagrams, corresponding to various body parts.
Key words: vapor transmission, resistance to the passage of water vapor, indices of comfort clothing, Gore - tex, SMP, Dermizax.

1. INTRODUCTION

Waterproof is seen as opposed to material property of passage of air and water, so as a safeguard against factors such as air. Technical textiles include, in a variant of definition, the use of premium high-tech materials or advanced production technologies. Specialists consider that a relatively small percentage of technical textiles (3-4%) require the use of so-called high-tech fiber (para-and meta-aramid carbon fiber steel, high density polyethylene), maximum weight being held by polymers. A current technique for changing the properties of initial combinations of polymers is combining them on a macroscopic scale, resulting in different composite fabrics. There are few cases in which the impermeability is ensured through the structure, most often special treatment is required. Since impermeability is a requirement imposed mainly by environmental factors (weather), some considerations regarding the behavior of textile materials against liquid water must be presented.

Absolute waterproofing in both directions (medium body and medium body) is only accepted in case of the risk of the action of potential high risk factors (chemical, biological, nuclear). New generation of waterproof materials were suggestively called "material breathing "is putting out in this way a behaviour that manifests impermeability only from the environment to the body, the coating behaving as a selective membrane.

2.DEPENDENCE BETWEEN TEMPERATURE AND WATER VAPOR PASSING TROUGH POLIMER MEMBRANES. COMPARISON BETWEEN SEVERAL TYPES OF MEMBRANES

The U.S. Army evaluated the use of breathable waterproof membrane for various environmental applications. Standard material used in rainy weather protection (army Gore-Tex membrane) consists of three laminated layers. The U.S. Army has recently evaluated the performance of a class of materials known as "shape memory polymers, SMP (Shape Memory Polymers). SMP's are polyurethane films that have a transition temperature Tg adapted for a certain interval between ambient temperature and body. When a fabric is rolled it becomes waterproof and windproof and allows passage of water vapor.

SMP's allegedly suffering a transition when they near the transition temperature, leading to increased water vapor permeability of polyurethane membrane materials due to consolidation - also called Brownian motion. SMP materials evaluated in this study include the Mitsubishi Diaplex polyurethane membranes, and membranes from Toray Dermizax polyurethane. Dermizax also includes a rolling membrane incorporated into commercial called "Membrain" of Marmot Mountain.

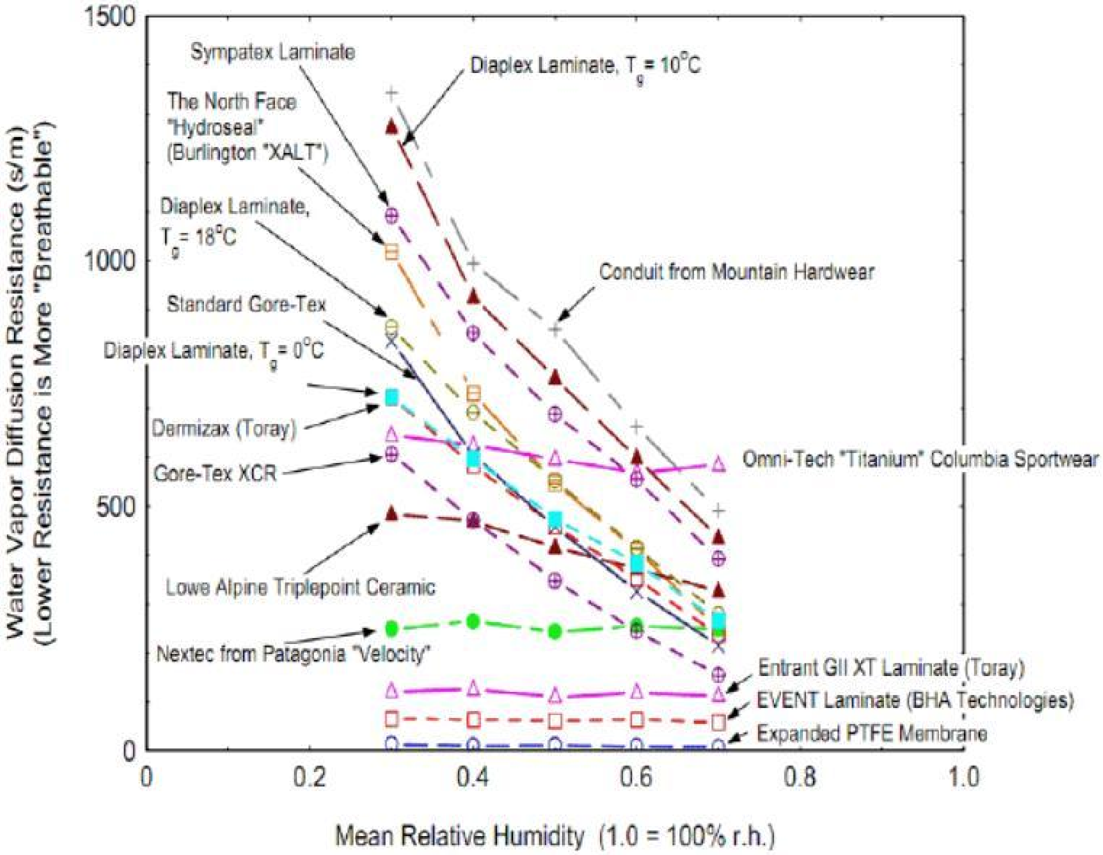

Fig.1 The base line of water vapor diffusion resistance for a variety of breathable materials and laminates

The materials that have less resistance are more "breathable". Testing was performed at 30 ° C. The test method was specifically used to allow separation of concentration-dependent permeability from temperature dependent permeability.

Figure 2 presents the flow of water vapor with temperature for some materials in Figure 1. In the temperature range between 5°C and 40°C, the membrane expanded polytetrafluoroethylene (ePTFE) is the most breathable, followed by membrane EVENT (it is a laminated ePTFE) and then GORE-TEX XCR. Many of the materials are equivalent, which include: GORE-TEX, Standard DIAPLEX laminate, DERMIZAX etc. The laminate and SMP materials which are less breathable were SYMPATEX and DIAPLEX with a transition temperature of 10 ° C. The results are plotted in a log to assist in presenting the permeability transition which is expected to produce rolled SMP membranes. If there were water vapor permeability transition at a certain temperature, it will be seen best in the next drawing (Figure 1).

None of the materials tested showed to be more or less permeable depending on the temperature. Water vapor flux simply increases proportional to the pressure of water vapor as temperature rises. Slope increasing of all materials is solely due to water vapor pressure temperature, and not to any change in membrane permeability or laminate. A possible explanation for the erroneous interpretation of temperature –dependent permeability in SMP's is evident in experimental procedures mentioned in the graphs of temperature dependant permeability. Testing methodology defects, combined with a failure of standard or control test of SMP materials have apparently led to misunderstanding the curve of vapor pressure in experimental results presented in the current changes in the permeability of polymers at different temperatures. An example of the type of terrain that is often confused with the temperature dependence of permeability is shown in Figure 3, which belongs to a part of the material submitted in Figure2. Temperature effects are much less important than the effects of concentration-dependent hydrophilic polymer membrane laminate, most of which are based on water vapor permeable polyurethane. Changes observed in the flow of water vapor at different temperatures are mainly due to the relationship between temperature and saturation vapor pressure of water and not intrinsic changes in polymer permeability. SMP films show no special increase in permeability compared with other impermeable breathable material . SMP laminate is comparable to GORE-TEX in that they are quite functional in time to be "breathable" but they have no unique behavior of the permeability at different temperatures.

Figure 2 - Water vapor flux with temperature for the SMP sites compared with various laminates and laminated breathable membrane. Less is more "breathable". Testing was performed at 30 ° C. The test method was specifically used to allow separation of concentration-dependent permeability from temperature dependent permeability.

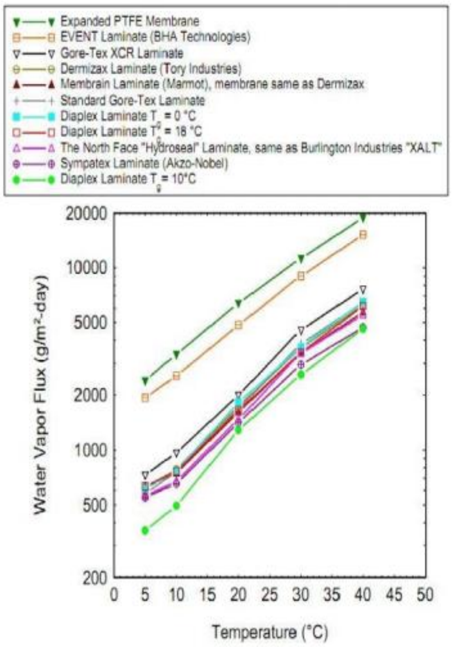

Fig. 2. - Water vapor flux with temperature for the SMP sites compared with various laminates and laminated breathable membrane

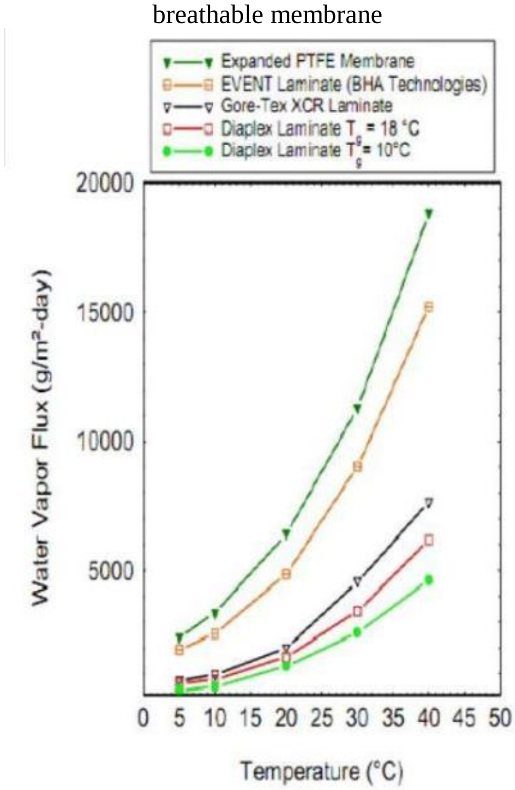

Fig. 3. - A possible explanation for the misinterpretation of temperatures dependence on water vapor permeability.

3. PHISIOLOGICAL MEASUREMENTS USING THERMAL MANIKIN

3.1. Measurements

The system was tested on the thermal manikin and was conducted on the behavior of four rain jackets (1 - 100% Nylon, 2 - 100% Nylon laminated with GORE-TEX ePTFE membrane, 3 - 100% nylon with 20,000 mm impermeability. and 20.0 breath / m/24 h, 4 - 60% polyamide + 40% polyurethane), moisture, in a time arranged in two stages.

Throughout the measurements were recorded continuously, especially the power of the heating surface temperature and developing weight. The tests were divided into phase 1 of acclimatization and phase two of acclimatization with physical activity to simulate a situation as close to reality as possible.

3.2. Tests developed by SAM

SAM is an anatomical model of a man with body size of the average adult stature, which has legs that can move and has the ability to sweat.

SAM inner skeleton is suspended from a weighing system, it is covered with 26 pieces that are attached to the dummy frame, each of which is heated separately and have their own temperature sensor on the surface. In this way the body surface of each part can be heated at a constant temperature or constant power. Distributed on the surface of whole body are 125 sweat points which are supplied from a reservoir with distilled water. Using internal microvalves, vapor perspiration and liquid perspiration can be simulated either on the whole body or on different parts of the body, with varying amounts of sweat between 0 and 1 l/m2h.

The highest value corresponds to a person who goes through great physical effort.

The shoulder joints, elbows, hips and knees allow SAM to be articulated. Wrists and ankles are connected to external driving assemblies; they can be moved on different curves with a computer. Based on kinetic data, realistic movements for walking, climbing and running can be scheduled with variable speeds up to 2.5 km / h.

All sectors are heated. Active sections (red) have the ability to sweat and inactive areas (green) are unable to sweat.

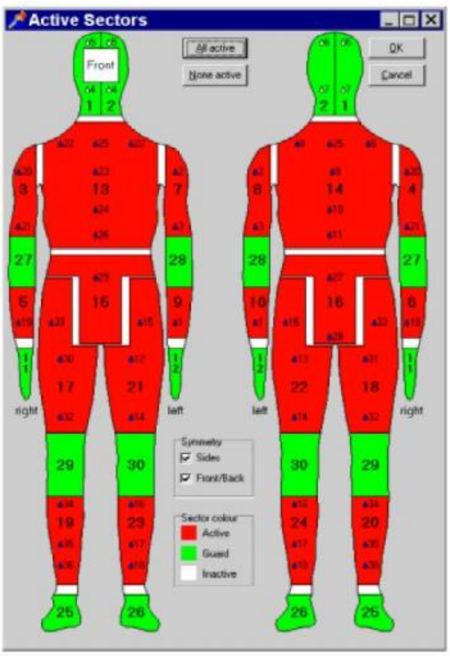

Fig. 4.

The test was conducted in two phases: Phase 1 (acclimatization phase): 60 minutes at a constant temperature surface SAM 34 ° C (with variable heating power) without sweating and power wind of 0.4 m / s.

Phase 2 (sweat, no movement):): 60 minutes at a constant temperature SAM surface at 34 ° C (with variable heating power) with a sweat 220 g/hm2 power and wind 0.4 m / s.

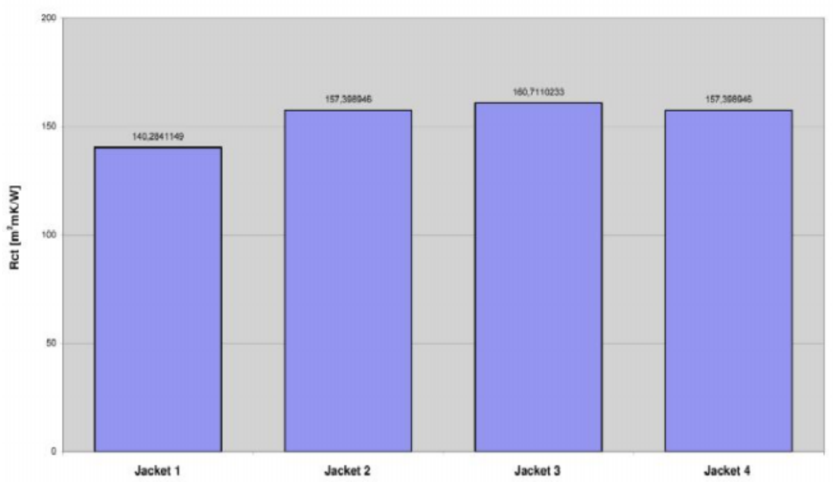

Fig. 5. (Chart)   Thermal resistance of 3-10 and 13-16 parts (arms, chest, back and abdomen)

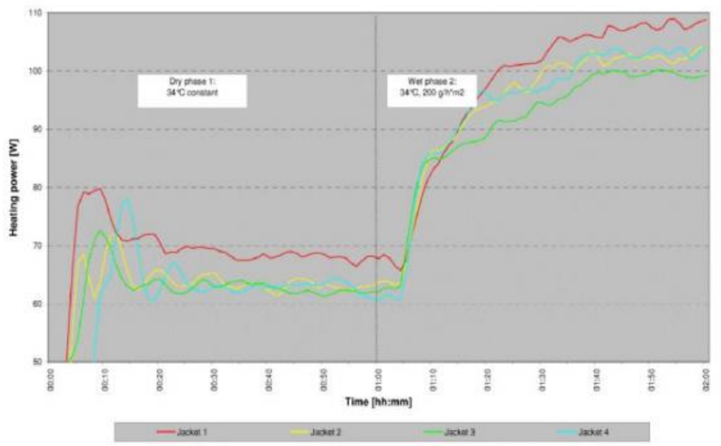

Fig. 6. Heating power - hands hands and torso.Chest, back and stomach

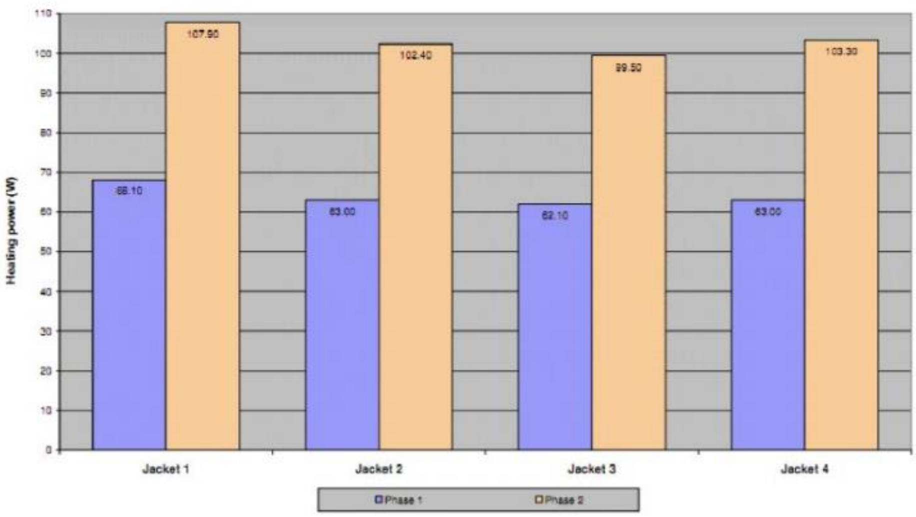

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Fig. 7.   Heating power - average values at the end of phase 1 .- last 20 min., and at the end of phase 2 – the last 10 min.

4. CONCLUSION

Only data on the trunk, consisting of chest, back, hip, upper and lower limbs were considered. Therefore the analysis and calculations were made for Sectors 3 - 10:13 -16.

Thermal resistance of all samples is close to the value of 0.23 m2K / W with a slightly lower value for sample 1. Although the thermal resistance is given not only by the jacket itself, but also by the layer of skin between the jacket and SAM, the sample 1 probably has a smaller value or has a certain elasticity of the material.

Heating power for all 4 samples increases due to release of sweat from the beginning of the 2nd phase, from 60 to 100W. With higher heating power, the samples can be better evaluated and may have a more efficient cooling by vapor. All four samples present more or less an increase in power of heating. Maximum heating power at the end of the sweating phase shows that sample 1 has the lowest thermal resistance value. The difference in heating power of phase 2 (end of phase 2), minus power in phase 1 shows the heating stage evaporative cooling efficiency. The most efficient cooling is shown by sample 4 with evaporation of 40.3 W and is very close to samples 1 and 2 with 39.8 and 39.4 W. The third sample evaporation is reduced by 8%.

Condensation at the end of phase 2. The lower the condensation of evaporated moisture the better the subjective assessment of the wearer. The lowest amount of waste water at the end of phase 2 was in samples 2 and 4, which had a total weight of about 30g of residual water.

Samples 1 and 4 have the best evaporative cooling efficiency, showing a larger quantity of water eliminated in the VENOSAN layer. Sample 3 has a smaller vapor cooling efficiency but has a smaller quantity of water in the VENOSAN layer.

Sample 2 has a high efficiency evaporative cooling efficiency and a relatively low rate of condensation and provides a slight advantage to the other samples which also show very good exercise behavior.

All four samples are very similar in their thermal behavior and sweat removed.

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ALGORITHM FOR DESIGNING THE CROSS-STRIPED FABRICS WITH MASS MODIFIED THROUGH THE METHOD OF LENGTHWISE DENSITY

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Abstract: Redesigning the cross-striped fabrics obtained through the association of weft yarns with different weave and/or lengthwise density 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 yarn setting.
The mass modification is obtained only by using yarns with different lengthwise density, depending on the design theme.
The proposed method offers the possibility to obtain, on the same warp, a diversity of cross-striped fabrics with different lengthwise density, weave or length (width).
Key words: weave, cross stripes, yarn setting, lengthwise density, and mass.

1. INTRODUCTION

Modification of the mass of cross-striped fabrics obtained through the association of weft yarns with different lengthwise density on the cross stripes, has the peculiarity that it can be executed just by modifying the lengthwise density of the weft yarns, without modifying the warp yarn system, such that one can obtain several variants of cross-striped fabrics with the same warp beam. This is also motivated by the fact that at the cross-striped fabrics, the weft yarns have the highest weight in the fabric mass. The warp yarns only play a secondary part, serving as support for the weft yarns which provide the cross stripe aspect through the variation of their lengthwise density or weave.

2. METHOD OF LENGTHWISE DENSITY FOR THE MASS MODIFICATION OF THE CROSS-STRIPED FABRICS

Method of lengthwise density for redesigning the cross-striped fabrics with modified (imposed) mass is based on the following principles:

- The warp yarn system preserves its characteristics in terms of yarn setting and lengthwise density from the reference fabric.
- The mass modification is performed only by changing the lengthwise density of the weft yarns, while preserving the same yarn setting.
- The cross-striped fabrics with different yarn setting and lengthwise density on stripes is decomposed in partial fabrics, whose characteristics in terms of yarn setting, lengthwise density and weave, belong to the cross stripes that form the fabric.
- In order to simplify the calculation, only the warp yarns from the fabric ground are being considered, without the selvage yarns.

3. ALGORITHM FOR CALCULATION AND DESIGN THROUGH THE METHOD OF LENGTHWISE DENSITY

The calculus algorithm for designing the cross-striped fabrics with imposed mass, through the method of lengthwise density is presented under a synthetic and logical form in the flow sheet from Table 1.

Table 1: Flow sheet for designing the cross-striped fabrics with imposed mass. Method of lengthwise density.

Input data	Symbol	MU
Characteristics of reference fabric		
Width – finite	lf	m
- selvages	lm	m
ground width	l'f =lf ·lm	m
- stripes (i)	Li	cm
Yarn lengthwise density from:		
- warp: from ground	Tu	tex
from selvages	Tum	tex
-weft: from stripes (i)	Tbi	tex
Yarn setting from:		
warp	Pu	yarns/10 cm
weft from stripe (i)	Pbi	yarns/10 cm
Yarn contraction:		
from warp	au med	%
from weft in stripe (i)	abi	%
Mass loss or gain	±pf	%

↓

1. Calculus of mass of the reference fabric:

$$Mt = \left[\frac{Pu\ Tt_u \cdot l'_f}{100\text{-}a_{u_{med}}} + \sum_{i=1}^{n} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi} \cdot l'_f}{100(100 - a_{b_i})} \right] \cdot \frac{100 \pm p_f}{100}; \ l'_f \text{ în m}$$

↓

2. Modified mass calculus:

$$M't = Mt_i \frac{100 \pm m}{100}$$

↓

3. Mass calculus for partial fabric with weave (i):

$$Mt = \left[\frac{Pu\ Tt_u \cdot l'_f}{100\text{-}a_{u_{med}}} + \sum_{i=1}^{n} \frac{Lb_i \cdot Pb_i \cdot Tt_{bi} \cdot l'_f}{100(100 - a_{b_i})} \right] \cdot \frac{100 \pm p_f}{100}$$

↓

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 weft yarns for the fabric (i):

$$M'b_i = Mb_i \pm \Delta Mt_i$$

↓

② ①

↓

7. Calculs of lengthwise density of the weft yarns at the redesigned fabric:

$$Tt_{b_i} = \frac{M'b_i(100 - ab_i)}{Pb_i \cdot l'_f} \cdot \frac{100}{100 \pm p_f};$$

The normative Tt_{bi} with the closest value is adopted

↓

8. Calculus of imposed mass $M't_{i_a}$ for fabric (i):

Apply the relation (3) where $Tt_{bi} = Tt'_{bi}$

↓

9. Calculus of redesigned mass deviation:

$$\Delta M'b_i = M't_1 \pm M't_{i_a}$$

Admitted deviation $\Delta M'b_i \le [(2...3)/100] \cdot M't_1$

↓

10. Calculus of total mass of redesigned fabric:

$$M't_a = \left[\frac{Pu \cdot Tt_u \cdot l'_f}{100 - au_{med}} + \sum_{i=1}^{n} \frac{Lb_i \cdot P'b_i \cdot Tt_{b_i} \cdot l'_f}{100(100 - ab_i)}\right] \cdot \frac{100 \pm p_f}{100};\ l'_f \text{ în m}$$

↓

11. Calculus of total mass deviation:

$$\Delta M't = M't_a \pm M't$$

Admitted deviation $\Delta M't \le [(2...3)/100] \cdot M't$

↓

Scheme of weft repeat						MU
	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
Yarns setting Pb_i	Pb_1	Pb_2	Pb_3	Pb_2	…	yarns/10cm
Yarn number on stripes n_{ij}	n_{11}	n_{21}	n_{31}	n_{22}	…	yarns
Length of repeat L_{Rb}	$\sum l_{ij}$					cm
Yarn number in repeat Rb	$\sum n_{ij}$					yarns

4. EXPERIMENTAL PART

The algorithm for the calculation of the modified mass was applied on a cross-striped fabric with woolen yarns whose characteristics are given in Table 2 [1] for which a 5 % mass diminution is requested, through the modification of the lengthwise density.

4.1. Obtained results

Table 3: Scheme of the weave repeat in weft for the modified fabric

	Stripes ij				MU
Weave	1	2	3	2	yarns
Length of stripes l_{ij}	3.0	1.6	0.75	2.0	cm
Incomplete repeat r_{ij}	3.0	1.4	-	-	cm
Yarn setting Pb_i	180	200	240	200	yarns/10cm
Yarn number on stripes n_{ij}	54	32	18	40	yarns
Length of weave repeat L_{Rb}	7.35				cm
Yarn number of the repeat Rb	144				yarns

Table 4: Scheme of the weft repeat for 1 meter of fabric

	Stripes ij				MU
Weave	1	2	3	2	yarns
Yarn setting on stripes	180	200	240	200	yarns/10cm
Total width of stripes with setting L_{Bi}	42	22.2	9.75	26	cm
Numărul total de fire pe dungi n_{mi}	756	444	234	520	yarns
Number of weft yarns per 1 m of striped fabric n_{ij}	1954				yarns
Mass of redesigned fabric	242.36				g/m
Deviation of redesigned mass	-0.64				g/m

The lengthwise density of yarns is not a continuous function. In practice, only a narrow range of yarns with different lengthwise density is manufactured.

That is why, after the calculation of the lengthwise density, the wires with the closest lengthwise density should be adopted. Due to this fact, the obtained mass of the fabric with the adopted lengthwise density can result in deviations from the value imposed through the theme; nevertheless, it is within the acceptable margins decided by the designer.

Table 5: Characteristics of the redesigned fabric Comparative study

<table>
<tr><th colspan="2" rowspan="2">Characteristics</th><th rowspan="2">MU</th><th rowspan="2">Reference fabric</th><th colspan="2">Fabric redesigned through the method:</th></tr>
<tr><th>Yarn settings</th><th>Lengthwise density</th></tr>
<tr><td colspan="6">Yarn setting</td></tr>
<tr><td>- warp</td><td>Pu</td><td>fire/10 cm</td><td>160</td><td>160</td><td>160</td></tr>
<tr><td rowspan="3">- weft</td><td>Pb_1</td><td>fire/10 cm</td><td>180</td><td>165</td><td>180</td></tr>
<tr><td>Pb_2</td><td>fire/10 cm</td><td>200</td><td>180</td><td>200</td></tr>
<tr><td>Pb_3</td><td>fire/10 cm</td><td>240</td><td>220</td><td>240</td></tr>
<tr><td colspan="6">Lengthwise density</td></tr>
<tr><td>- warp</td><td>Tt_u</td><td>tex (Nm)</td><td>25·2 (40/2)</td><td>25·2 (40/2)</td><td>25·2 (40/2)</td></tr>
<tr><td rowspan="3">- weft</td><td>Tt_{b1}</td><td>tex (Nm)</td><td>25·2 (40/2)</td><td>25·2 (40/2)</td><td>22.72·3 (44/2)</td></tr>
<tr><td>Tt_{b2}</td><td>tex (Nm)</td><td>20·2 (50/2)</td><td>20·2 (50/2)</td><td>18.5·2 (54/2)</td></tr>
<tr><td>Tt_{b3}</td><td>tex (Nm)</td><td>20.8·2 (48/2)</td><td>20.8·2 (48/2)</td><td>19.23·2 (52/2)</td></tr>
<tr><td colspan="6">Fabric mass</td></tr>
<tr><td>- reference</td><td>Mt</td><td>g/m</td><td colspan="3">255.3</td></tr>
<tr><td>- redesigned</td><td>M't</td><td>g/m</td><td>242.53</td><td>242.36</td><td>243.5</td></tr>
<tr><td colspan="2" rowspan="2">Deviation ΔM't</td><td>g/m</td><td>-</td><td>- 0.17</td><td>+ 0.97</td></tr>
<tr><td>%</td><td>-</td><td>- 0.07</td><td>+ 0.40</td></tr>
</table>

5. CONCLUSIONS

The originality, as well as the character of novelty of the methods proposed for the modification of the mass of cross-striped fabrics, consists in that this topic is highlighted and treated for the first time only in this work.

The concept set at the basis of the design method and the algorithm of calculation sets forth the possibilities offered by the manufacturing technology of cross-striped fabrics, which provide, at the same time, the realization of a wide variety of appearance by using the same warp system.

The proposed method and the algorithm of calculation for the mass modification of the cross-striped fabrics are accurate and recommendable for applications in all the cases of cross-striped fabrics obtained by using groups of yarns with different weave, setting and/or lengthwise density.

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STUDY ABOUT QUALITY ASSURANCE IN TEXTILE INDUSTRY BY IMPLEMENTING NEW CONCEPTS AND STRATEGIES

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Abstract:Implementing of a quality system in the textile industry requires the modernization of management and introduction of new items in work organizing. This is an important and necessary step for any company to certify of quality of the products. Implementing of new strategies and concepts regarding quality assurance leads at increased productivity, immediate and rapid improving of the technological processes, decrease of production costs, product quality increase, control of the products in a shorter time and defects finding after a small number of pieces.
Key words: *calitate, textile, management, Kaizen, productie*

1. INTRODUCTION

Companies in textile industry are concerned about continuously improving of the quality of their products, that is the mainly ability to meet consumer demands.

Achieving of this objective leads directly to the company success and to profit.

The generalization perspective of advanced manufacturing systems using modern management methods for manufacturing must meet the new demands in the field of continually improving of product and production quality. In recent years, it has intensified the implementation of new strategies that lead to the development of high quality products that are offered to customers in the shortest possible time.

2. CONCEPTS AND STRATEGIES

Continuous improvement strategy known as Japanese "KAIZEN" (KAI = change; ZEN = for better, KAIZEN = "continuous improvement") is a strategy which means gradually and continuously improvement of the management and business activities as the quality parameters, productivity and competitiveness, with direct involvement of the staff.

KAIZEN software is implemented as a current management practices based on the principle of gradual improvement through the "strategy of small steps."

Among the Japanese-inspired management tools united under the „umbrella of KAIZEN" were widely applicable the following: JIT (Just-in-time"), Taguchi method, maintaining total production, techniques of the "3S" and "5S" suggestions system etc.

JUST IN TIME (JIT) - is a coordination method of manufacturing processes that ensure the sub-assemblies manufacture in "perfect time" set by commands coming from the next workstation

JIT or FLT (FIXED IN TIME) is based on the principle that all orders are sent to last workstation of the technological process, and this is the one that transmits the necessary of pieces and subsets to the up stream workplace

The efficiency of this method of product organization is embodied in a number of advantages: increased product quality, improvement of the informational system, simplification of accounting of material consumption, increased productivity and optimal sizing of stocks, decentralization and flexibility of production accounting, increasing the adaptability of the product market demand, etc

TOTAL PRODUCTIVE MAINTENANCE (MPT) represents a comprehensive and integrated technical management for the equipments used in the KAIZEN strategy in order to enhance the use and life of machines, with the participation of all workers**.** The term "total" that occurs in the MPT method name has three meanings which define the main features of this type of maintenance: total efficiency, total maintenance system that includes prevention of failures, maintenance corrective and preventive maintenance, involving the entire staff - autonomous maintenance performed by the workers that operating the machinery.

TAGUCHI METHOD

The contribution of Japanese specialist Genichi Taguchi in improving quality is the foundation of so-called "loss function" to quantify, in monetary units, the company losses incurred as a result of some non-quality products made [1].

$$L(x) = k*(x-t)^2 \quad \textbf{(1)}$$

where: k - the coefficient of loss
x - the measured value
t- the value target (target)

THE TECHNIQUE OF "3S" involves the coordinated development of the following three categories of activities

- SEIRI: removal of all that is useless at work: waste materials, semi -products and unused equipment, scrap or obsolete documents;
- SEITON: ordering of useful objects remaining after the previous operation and their preparation so they can be used every moment;
- SEISSO: assure the cleaning of the entire affected area and all objects that are in that area.

THE TECHNIQUE OF "5 S" means the completion of previous activities with the following two operations

- SEIKETSU: maintaining of an hygienic and pleasant ambience in the workplace;
- SHITSUKE: strict adherence to established work procedures.

SUGGESTIONS SYSTEM represents the collection and use of staff suggestions for company improvement Due practical application, there are two variants of this technique: the first of which relate to individual suggestions, and the second which relate the group suggestions developed under various organizational forms, name: "quality circles", productivity committees and teams "zero defects ", etc. Implementation of the suggestions system involves encouraging and training workers in the formulation of relevant solutions to improve their activities, and secondly the objective analysis of the suggestions made.

The concept "zero defects" should be linked with KAIZEN strategy because to achieving system derived objectives: "zero-inventory "supply, "zero-disruption" in production, "zero-loss clients", a.s.o. requires continuous improvement of activity located on different levels of quality spiral.

3. CASE STUDY

IMPLEMENTATION OF CONCEPT KAIZEN BY FLT PRODUCTION METHOD IN TEXTILE COMPANIES

Italian Group X has many garment factories in Romania, Bulgaria, Croatia, Srilanka, Serbia. X was opened in order to create a new production line in tights, bikinis, swimsuits, blouses, t-shirts, pyjamas, a.s.o. for women, men and children. They sell through a network type franchising. Knits and woven fabrics are from Italy and China. This group has developed a network of over 1,200 large stores all around the world: Italy, Austria, Cyprus, Croatia, Czech Republic, Greece, Hungary, Lebanon, Mexico, Poland, Portugal, Russia, Serbia, Slovenia, Spain, Turkey, France, Macedonia, Montenegro, Great Britain, a.s.o

By implementing the KAIZEN concept, the group's turnover has continuously increased.

The directions in which the Italian X group has applied the KAIZEN concept are: reducing the production time by implementing the concept of "FLASH", reducing of stocks and time execution using the "MODE" concept (cell production, the island, Bucket Brigades, etc.).

Fig. 1. Module

FLT production is a concept which directly reduces the working times, reduce inventory and storage areas and management system, as well as personnel involved, shown in Fig. 2.
The absence of excessive stockpiling requires reducing and eliminating errors because there are no reserves to continue production when problems begin to appear.

Fig. 2. Storage areas organizing

FLT can not be implemented immediately into production. For this is necessary to make a series of changes as: focusing workstations, increase production capacity to enable better flexibility to change models, production quality improvement to reduce errors, multiple qualifications and training of workers to increase their effectiveness on a larger number of phases, reducing equipment breakdowns by developing a maintenance program, acquiring advanced equipment shown in figure no 3.

Fig. 3. Automation of working phase

Eliminating of all kinds of waste is the underlying ideology of FLT.

Successes or failures of FLT production are due to employees in most cases.
In Italian group X is trying to reduce seven types of losses (Fig. 4) as:

- Overproduction- it have to made only the bare necessity
- Waiting - planning of production flow and equipment
- Transport - the organization of production space

- Production unnecessary - remove all unnecessary production steps
- Interphase stocks - their elimination through better coordination between the production phases • Waste - removal of scraps and creating of perfect products by applying the principle of "zero defects".

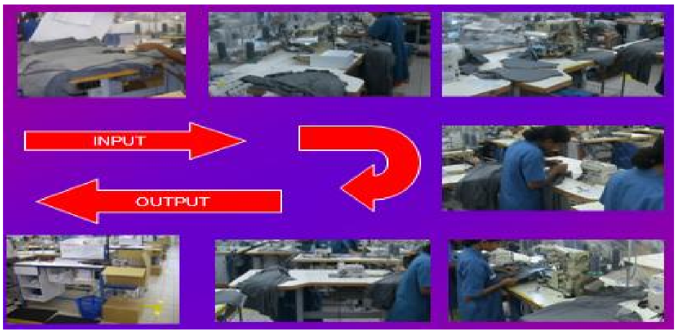

Fig. 4. Reduction of the seven types of waste

4. CONCLUSIONS

Implement of new strategies and cconcepts regarding quality assurance lead to:

- productivity increase;
- immediate and rapid improve of the technological processes;
- decrease of production costs;
- control of 100% of products in a shorter time and defects detected after a small number of pieces.

The experience of companies that have implemented such systems shows there was a 10-15% increase in annual revenue.

Here are just some of reasons which should give some thought to the producers about application of advanced methods of quality assurance in the textile industry.

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EFFECT OF WEAVE STRUCTURE ON FABRIC PROPERTIES

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ABSTRACT: Idea about raw material consumption, crimp and load elongation characteristics of woven fabrics is very important in many respects including designing of woven fabrics and fashion making. In the present paper the effect of weave structure on raw material consumption, crimp and load elongation characteristics etc. of woven fabrics have been concentrated. It was observed that the weave structure have substantial effect on the yarn consumption and fabric properties like crimp and load elongation characteristics of woven fabric. It is expected that the study will be helpful in (i) fixing cost of woven fabric more efficiently, (ii) generating a better understanding about the weaving of fabrics having different weave structures, (iii) manufacturing fabric more efficiently from the technical and technological point of view and finally fashion designing of woven garments.
Keywords: Weave structure, PPI, EPI, Plain, Satin and Twill.

1. INTRODUCTION

There are various ways of fabric formation e.g. weaving, knitting, nonwoven and felting etc. Every year Bangladesh imports huge amount of woven fabrics for its export oriented RMG sector. According to the latest information only 30% woven fabrics are produced locally and 70% are imported. It may imply the idea of our lacking in the area of export oriented woven sector. Woven fabrics are used for various application including technical textiles. Different application requires different fabric properties. The properties of a fabric in many respects depend on the constructional parameters of fabric, which is determined by the weave, the density of threads in the fabric, the characteristics of warp and weft threads and the characteristics of fibers [1].

The particular order of interlacing of warp and weft threads forms the weave [1]. Two kinds of warp and weft interlacing can be found in the woven fabric, depending on the mutual position of warp and weft threads at the points of intersections, i.e. warp over the weft and weft over the warp [1]. Different combination of these two kinds of intersections can form short and long floats of warp and weft threads and can form infinite variety of weave [1]. Among the parameters of fabric structure weave is the most important one. When all the parameters are constant except weave, the influence of weave on the fabric properties can be found.

2. EXPERIMENTAL

The experimental work was conducted in the weaving and testing laboratory of Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh. The laboratory is a state of art weaving laboratory, the machines were so selected that almost all weaving options are available in the laboratory.

2.1. The experimental loom

The present work has been conducted in the rapier loom, the details of which are stated below:

Model = IC 906, Origin = IH CHING MACHINERY CO. LTD. (Taiwan)
Loom R.P.M. = 200, Available Reed width = 72"
Utilized reed width = 70”, Reed count = 72 stock port
No. of heald frames = 16, No. of ends/dent = 2

2.2. Raw materials used

The fibre of both warp and weft yarns were tested by both burning and solubility test and we measure the count in indirect system for both unsized warp and weft yarn.

Tensile properties of both yarn was investigated by Titan Universal Strength Tester according to ASTM D2256 standard. After completion of the test a graph plotted with force against extension % was automatically produced by the software. Then the results along with the graph were printed for further investigation.

2.2.1. Investigation Summary

Table 1: Particulars of warp and weft

Warp/Weft	Fibre Type	Count (Ne)	Strength (N)	Extension (%)
Warp	100% Cotton	20	2.99	7.00
Weft	100% Cotton	30	1.69	6.07
	100% Cotton	20	2.66	9.88
	100% Cotton	10	7.10	8.10

2.3. Details about the fabric samples

Fabrics were produced using two different weaves such as 8- end satin and 3/1 twill. For each weave three different weft yarns e.g. 30/1 Ne, 20/1 Ne and 10/1 Ne counts and three different PPI were used. Thus nine different fabrics were produced for 8- end satin weave and eight different fabric were produced for 3/1 twill weave. One fabric could not produce using 3/1 twill weave due to high yarn breakage. Producing fabric details were shown in the Table 2.

Table 2: Fabric sample details

Sample no	Weave	EPI	Warp Count (Ne)	PPI	Weft Count (Ne)
1-3	8 – end Satin	76	20	42	10,20,30
4-6				52	10,20,30
7-9				66	10,20,30
10-12	$\frac{3}{1}$ Twill			42	10,20,30
13-15				52	10,20,30
16-17				66	20,30

2.4. Experimental results

2.4.1 Effect of weave on warp and weft crimp

Due to the interlacing of warp and weft threads a certain amount of waviness is imparted to the warp and weft threads in the fabric [5]. This waviness is called crimp as shown in the figure 1:

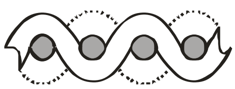

Fig. 1: Interlaced yarn (crimp)

Warp and weft crimp was measured by using the TAUTEX Digital Crimp Tester provided by James H. Heal. The pretension for the warp yarn and different weft yarns ware calculated by using following formula [2]:

Pretension in (gm) = (0.2 X Yarn count in Tex system) + 4

Three different samples each of 30 cm were taken from the different position (from left hand side, middle and right hand side).This was done for both warp and weft direction. Therefore from each fabric 6 samples were taken. The yarn from the fabric samples was pulled carefully and it was mounted on the instrument. When the monitor of the instrument showed the required pretension, the straightened length of the yarn was taken from the scale of the instrument. Finally using the following formula crimp of each individual yarns was calculated [5].

Crimp % = {(L – r) ÷ r} X 100,
Where, L = Length of straightened yarn, r = Length of yarn in the fabric form

The average of the crimp of these three yarns was calculated for each fabric sample and the results were shown in the Table 3.

Table 3: Effect of weave on warp and weft crimp

Weave	PPI	Warp (Ne)	Weft (Ne)	Specimen length(cm)	**Warp crimp** %	**Weft Crimp** %
8-end Satin	42	20	30	30	1.87	6.77
			20		2.1	6.3
			10		3.53	6
	52	20	30	30	1.43	8
			20		3	7
			10		3.53	6.1
	66	20	30	30	1.87	9
			20		3.2	8
			10		6	7
$\frac{3}{1}$ Twill	42	20	30	30	3	8.5
			20		6	7
			10		10.9	6.5
	52	20	30	30	4.2	9.1
			20		8.9	7.5
			10		11.1	7
	66	20	30	30	6	10
			20		13	9.1

2.4.2. Effect of weave on fabric tensile properties

The strength and elongation of the fabric was investigated by using Titan Universal Strength Tester, by taking three individual specimens in warp and weft direction. The specimen size was (Length X Width = 7 X 2.5 inch). The average results have shown in the Table 4.

Table 4: Effect of weave on fabric tensile properties

Weave	PPI	Warp (Ne)	Weft (Ne)	Warp direction		Weft direction
				Avg. force required to break the sample (N)	Avg. Extension%.	Avg. force required to break the sample (N)
8-end Satin	42	20	10	531.60	11.22	803.66
			20	553.29	10.11	272.36
			30	509.63	9.30	147.15
	52	20	10	536.28	11.94	915.97
			20	557.83	10.33	267.63
			30	528.81	9.03	199.68
	66	20	10	527.63	13.61	749.95
			20	562.95	11.40	361.95
			30	547.71	9.9	290.99
	42	20	10	542.61	17.46	880.01
			20	588.94	15.21	320.28
			30	564.42	11.74	184.44

3/1 Twill	52	20	10	548.20	18.08	993.64
			20	568.22	17.87	396.02
			30	564.99	13.38	335.46
	66	20	20	585.53	18.28	577.23
			30	554.04	14.00	433.67

3. DISCUSSION OF RESULTS

3.1. Effect of weave on yarn crimp:

Table 3, chart 1 and 2 show that both warp and weft crimp is higher for twill weave than that of satin weave. This may be due to the fact that for twill the number of interlacement is more than that of satin weave.

3.2. Effect of PPI and yarn count on yarn crimp:

Table 3, chart 1 and 2 show that in case of both satin and twill weave as the PPI and diameter of weft yarn increases warp crimp increases [3]. Regarding the effect of weft count it can be seen in the tables that for both satin and twill weave as weft count increases (i.e. diameter decreases) warp crimp decreases but weft crimp increases. This may be due to the fact that a coarser weft yarn is more rigid so that during crimp interlacement the coarser weft bends less and associated warp bend more [3]. However, in all cases the rate of increase of crimp is more for twill than that for satin.

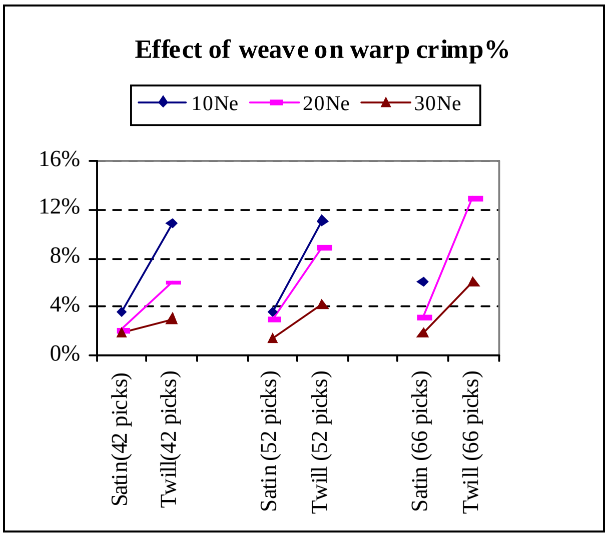

Chart 1: Effect of weave on warp crimp%

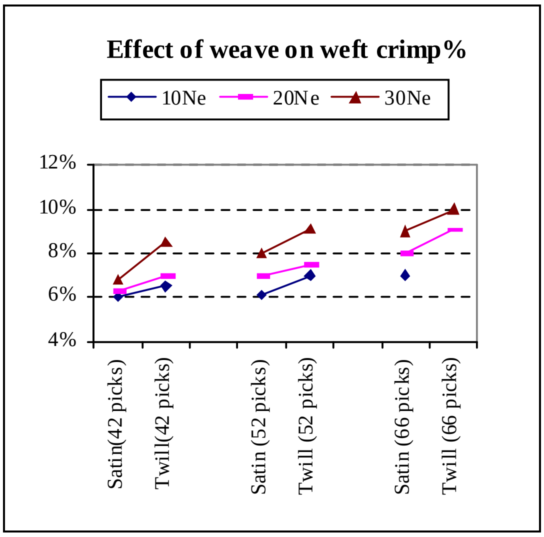

Chart 2: Effect of weave on weft crimp%

3.3. Effect of weave on tensile strength:

Table 4, chart 3 and 4 show the effect of weave on tensile strength on both warp and weft direction. Though all the readings do not show but majority of the data give the idea that the strength of twill fabric is more than that of satin fabric. This is an important finding because normally strength should not be expected to be affected by weave**;** it seems that this has happened due to "fabric assistance' effect. Fabric assistance is a phenomenon when fabric strength is accelerated by the frictional force due to interlacement [4]. Since the number of interlacement is higher for twill weave than satin, therefore the strength of twill become high.

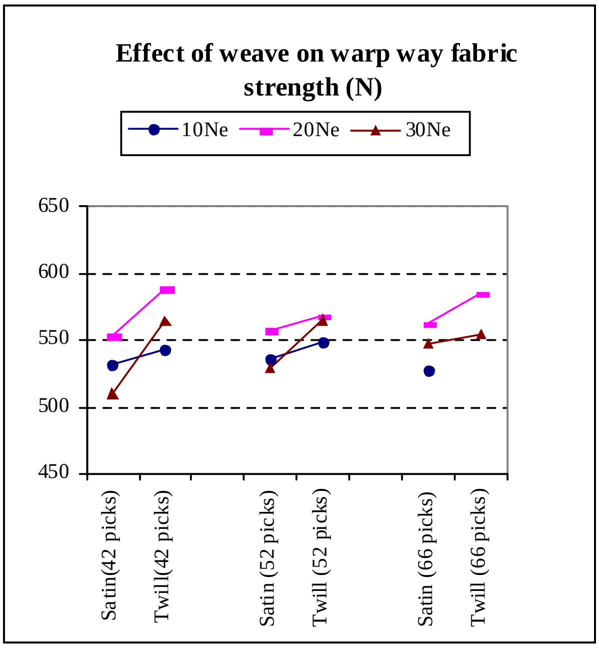

Chart 3: Effect of weave on fabric strength (warp way)

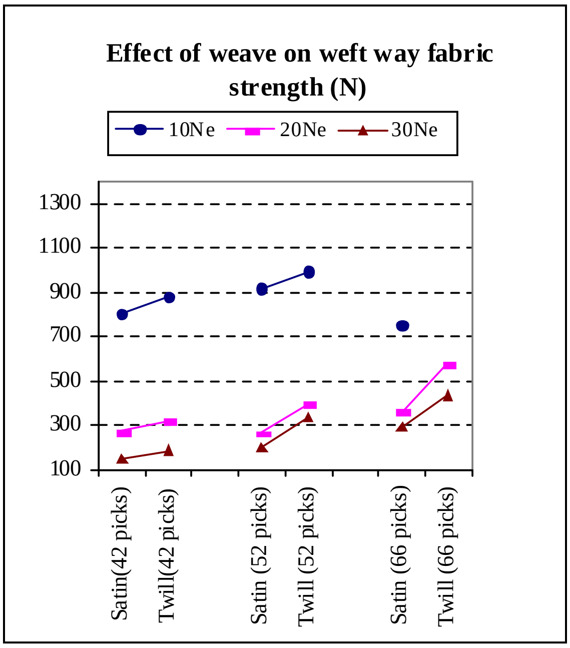

Chart 4: Effect of weave on fabric strength (weft way)

3.4. Effect of weave on extension:

Table 4 and chart 5 show that weave has significant effect on the extension produced by tensile test. It can be seen in the chart that in all cases the extension of twill weave is more than that of satin weave. This is probably due to the fact that the yarn crimp of twill weave is more than that of satin weave leading to higher extension of twill weave.

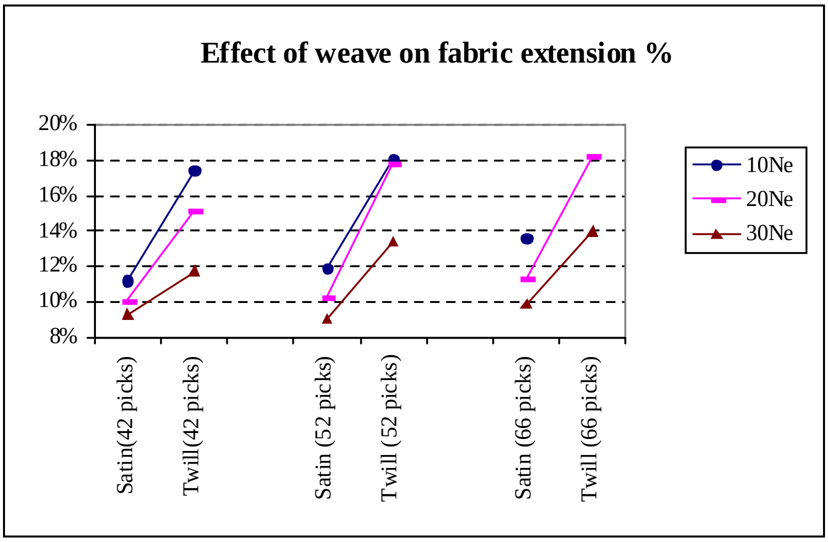

Chart 5: Effect of weave on fabric extension%

4. CONCLUSION

The work reported here lead us to many important observations regarding formation of warp and weft crimp. It was observed that keeping all other parameters fixed if we change the weave then the twill weave form more crimp than satin weave which is due to more interlacement. Thus more yarns will be required to manufacture twill weave fabrics than satin weave. Hence cost of twill weave fabric will be more than that of satin weave fabric. It was found in certain cases that the fabric strength is more for twill weave than that of satin weave, which is due to friction caused by more interlacement in twill weave. Twill woven fabric has shown greater extensibility than that of satin weave which is due to higher crimp in twill weave fabric. A plain weave fabric consists of maximum interlacement (more than twill weave) therefore above findings will applicable to plain weave in such a way that the properties of twill weave fabric will remain in the middle and plain and satin will stay at the two sides of the twill weave fabric.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY REGARDING THE IMPLEMENTATION OF COMPONENT PARTS OF SHOE UPPERS MADE OF LEATHER SUBSTITUTES USING THE GEMINI-CAD PROGRAM

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Abstract: This paper presents the results of the research into optimal pattern framing of artificial leather using the GEMINI-CAD application to frame the entire surface of the material.
Key words: footwear, pattern, leather substitutes, model, GeminiCAD.

1. INTRODUCTION

The efficient use of base materials (leather, artificial leather) is the basis for obtaining flexible patterns for footwear uppers[2]. Cutting using modern techniques such as automated cutting of the patterns for footwear uppers is an important objective for the leather and artificial leather industry.

Laser cutting is only used for cutting leather and artificial leather lifts, due to the properties of the laser beam used. The system includes the laser beam emitter, the cutting table, the fault detection system and the computers required for programming and guiding the laser beam.

The waste between decks is inexistent in the case of these technologies, saving 5-8% of the material's surface. Compared to traditional cutting systems, when using laser or jet cutting the material is not stretched or moved, because the width of the cut line is extremely small[3]. This system allows the cutting of up to three times more layers than the familiar punching machines, cutting much more efficiently.

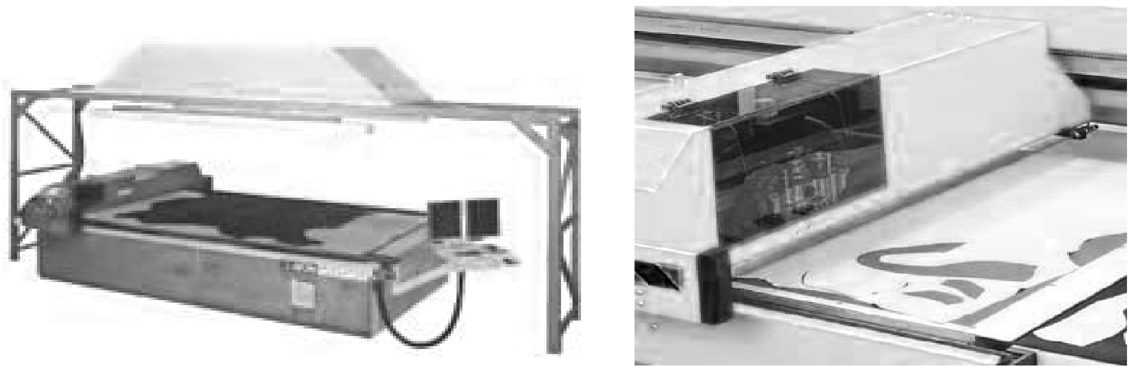

Fig. 1: Automated pattern cutting

This paper presents the results of the research into optimal pattern framing of artificial leather using the GEMINI-CAD application to frame the entire surface of the material[1].

2. THE EXPERIMENTAL PART

To emphasize how footwear pattern framing is done using CAD methods, the Gemini-Cad application will be used. Patterns for three types of footwear will be positioned.

In the application the useful width of the material as well as the recommended flaking length can be set, and also we can set the distance between pieces. (fig.no.2).

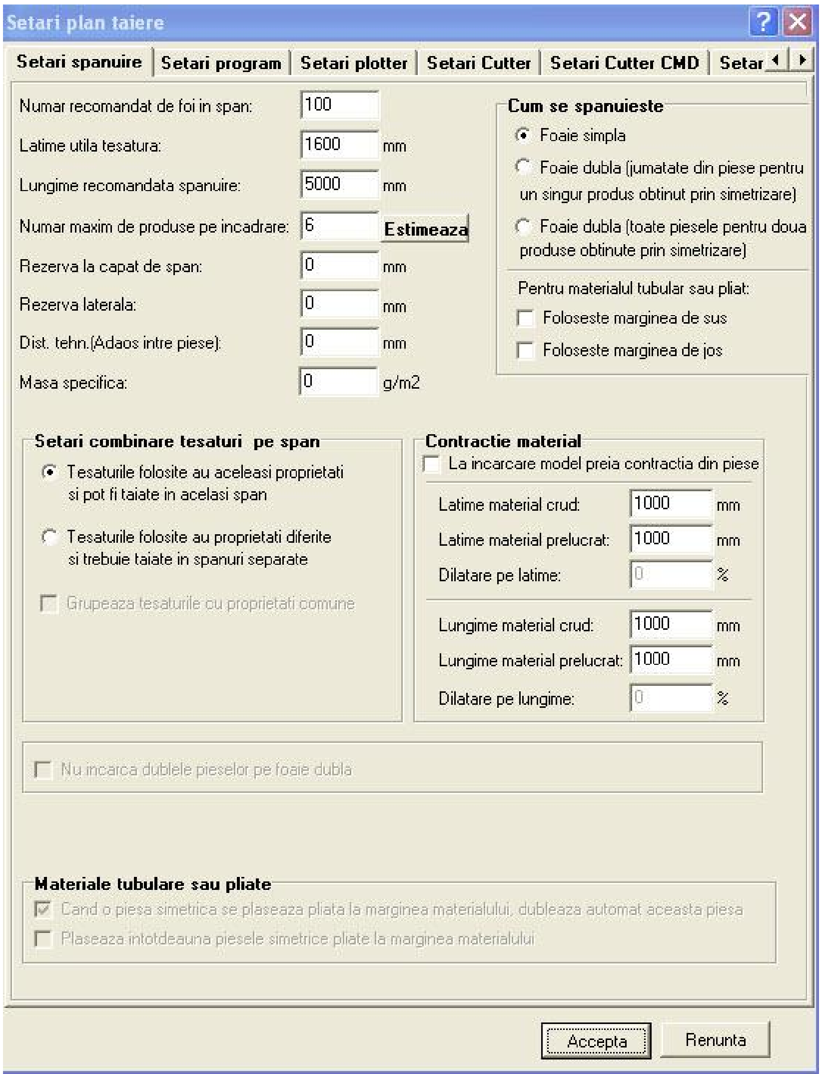

Fig. 2: Window: Settings for cutting

The advantage of this application lies in the fact that it performs an automated framing of the patterns (fig. no. 3) on the surface of the material – the surface of the artificial leather.

The positioning is done taking into consideration the minimum stretching direction of the material, as well as the maximum stress direction of the pattern during product manufacture, in order to obtain a superior use ratio.

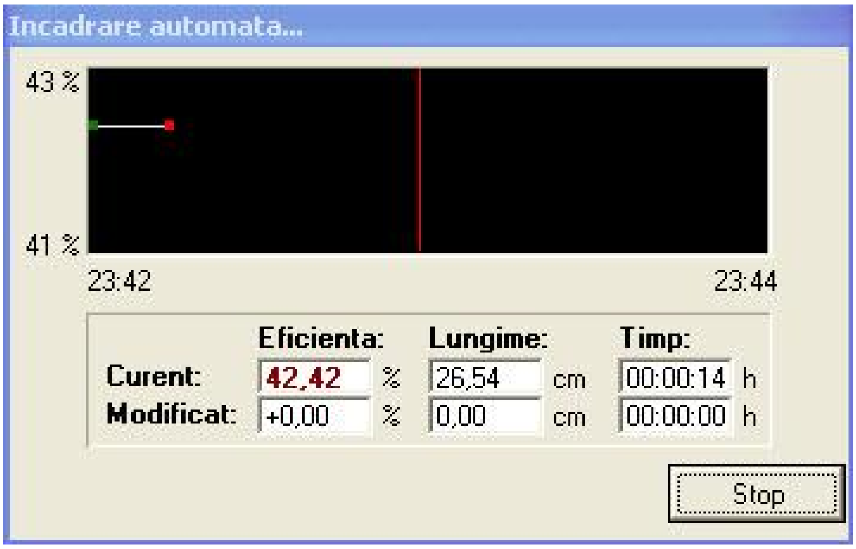

Fig. 3: The menu: automated framing with a time limit

3. RESULTS AND INTERPRETATIONS

The figures below show the optimal positioning variants, using Gemini-CAD for patterns cut from artificial leather, positions which frame the patterns for all the parts for a pair of footwear, to obtain an efficient use ratio.

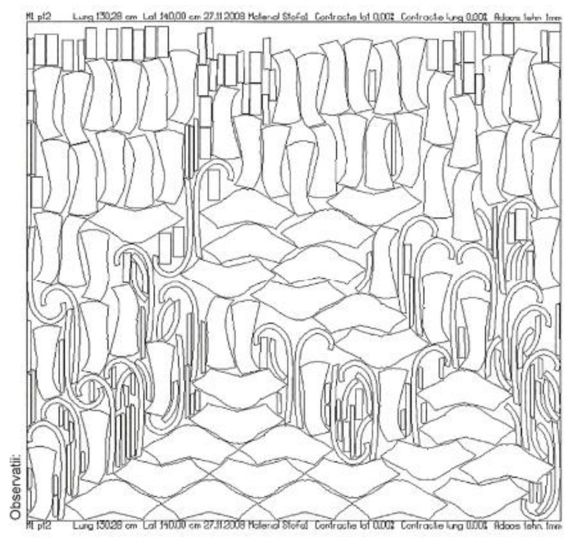

Fig. 4: Settlement practice simple model 2

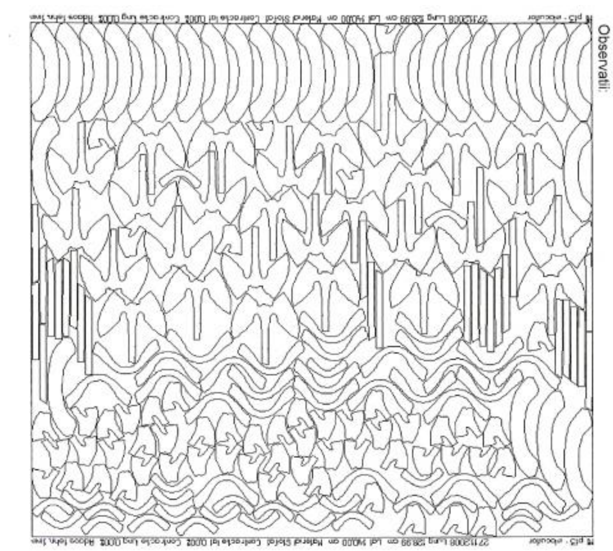

Fig. 5: Settlement practice simple model 3

For model 1, the use ratio obtained by combining the patterns for the parts of the product is 51,62% , by using the practical positioning of the patterns in model 2, a 63,66% use ratio is obtained, if all the patterns for the product parts are positioned on the surface of the material..
With model 3, a 58,79% use ratio is obtained.

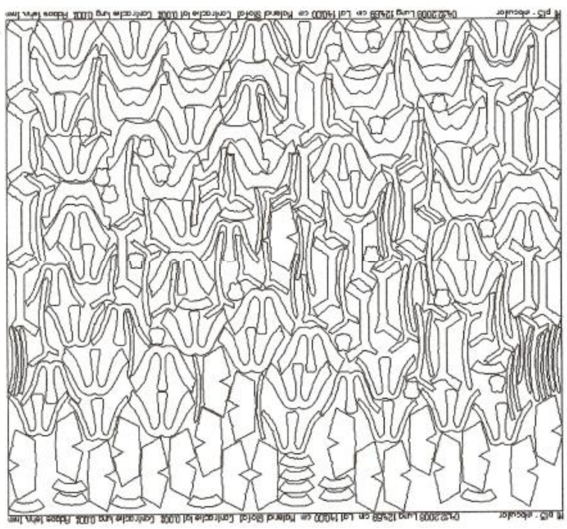

Fig. 6: Settlement practice simple model 1

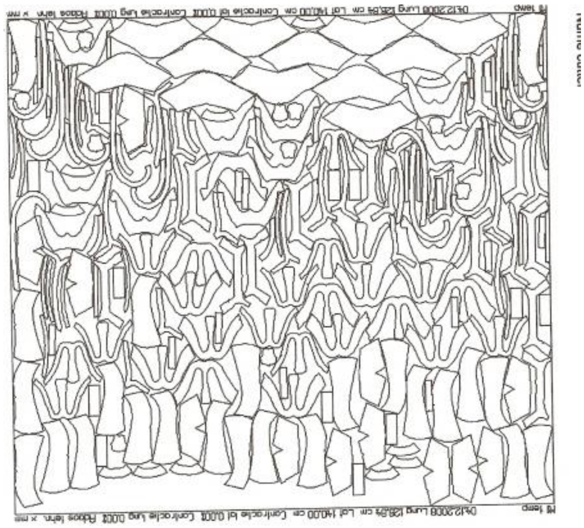

Fig. 7: Settlement practice simple model 1 and model 2

It can be pointed out that, by combining the patterns in model 1 with those in model 2 (fig.nr.7), a 61,44% use ratio is obtained.

For a better illustration of the resulting values, see the variation of the use ratio resulting from the automated positioning of patterns by the Gemini-Cad application, for each model separately (fig.nr.8).

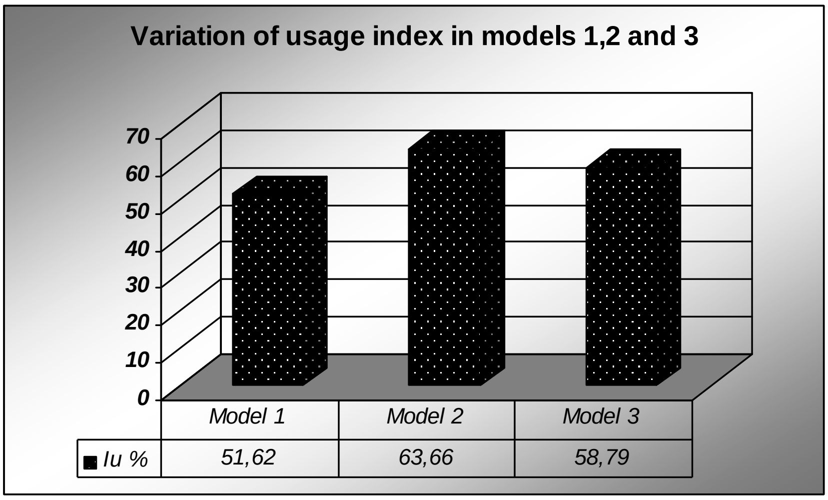

Fig. 8: Variation of usage index in models 1,2 and 3

The graph corresponding to model 1 is shown below in figure 9.

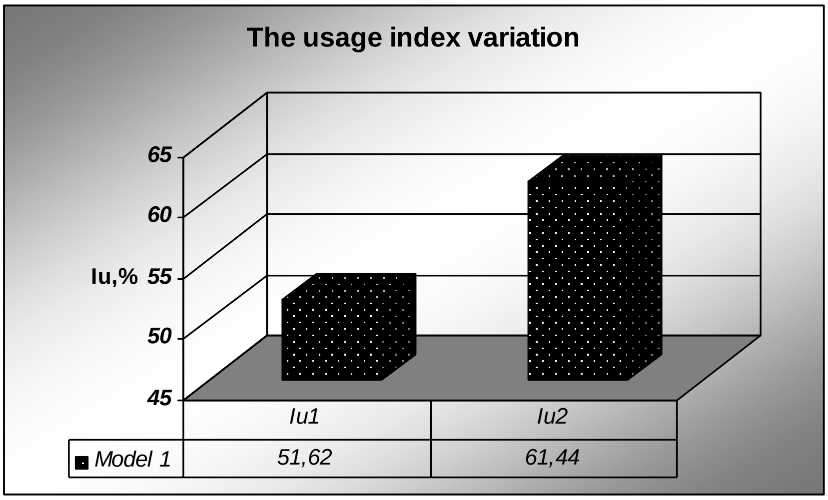

Fig. 9: The usage index variation

4. CONCLUSIONS

By using the GEMINI-CAD application, the use ratio after positioning the component patterns of a footwear product on the surface of the artificial leather is considerably improved, thanks to the program's ability to make a combined positioning of all the patterns of a footwear product while taking into consideration the minimum stretch direction of the material and the maximum stress direction of the pattern, in use or in exploitation.

For a superior use of the artificial leather's surface, the combined cutting of the component patterns of a footwear product and other leather goods is recommended, in order to raise the value of the use ratio.

The build of the model has an important influence in obtaining the optimal framing of the patterns of a footwear product's parts, through the configuration of its patterns and the possibility of overlapping, but also the width and length of the material on which the positioning is done.

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EFFECT OF FLAT SPEED OF CARDING MACHINE ON QUALITY OF CARD SLIVER AND YARN

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Abstract: Carding is the first and only machine (in card process) which can eliminate neps, seed coat neps and the remaining impurities which cannot be eliminated by blowroom section. In case of carding machine the higher the production rate, the more sensitive the carding operation and the greater danger of negative influence on quality. So the optimization of speed is the prime factor today [1]. Excessive higher speed can lead to fiber damage and higher neps generation which will downgrade the final product. Again lower speed will reduce production rate which is not acceptable. So we need to find out the optimum speed which results best for both production rate and quality. In carding machine actual carding action takes place between the cylinder and flats [1]. Generally the high production cards process higher flat speed. The speed of flats affect the carding process and quality of final yarn and in practice the flat is optimized.
Key words: Neps, blowroom, flat, cylinder, impurities.

1. INTRODUCTION

Two proverbs of the experts “Carding is the heart of spinning” and “Well carded is half-spun”- demonstrate the immense significant of carding for the final result of the spinning operation [1]. Carding is the first and only machine (in card process) which can eliminate neps, seed coat neps and the remaining impurities (dust, trash, foreign matter) which cannot be eliminated by blowroom section.To produce yarn, we need to go through different processes. In the modern spinning concept we try to increase the speed of different machine parts in order to increase production rate. But this concept leads towards the downgrading of quality. In case of carding machine the higher the production rate the more sensitive the carding operation and the greater danger of negative influence on quality. So the optimization of speed is the prime factor today. Excessive higher speed can lead to fiber damage and higher neps generation which will downgrade the final product. Again lower speed will reduce production rate which is not acceptable. So we need to find out the optimum speed which results best for both production rate and quality. In carding machine, actual carding action takes place between the cylinder and flats [1]. Generally the high production cards process higher flat speed. The speed of flats affects the carding process and quality of final yarn and in practice the flat is optimized.

2. MATERIALS AND METHOD

In modern installation the raw material is supplied via ducting pipe into the feed chute of the card. A transport roller forwards the material to feed arrangement. This consists of a feed roller and feed plate designed to push the sheet of fiber slowly into the operating range of taker-in. The projecting sheet from the feed roller is combed through and opens to flocks by the taker-in. This flock are passed over grid equipment and transferred to the main cylinder. While moving, interacting with mote knives, grids, carding segment etc. the material loses greater part of impurities. The suction device carries away the impurities. The flocks are then carried away to the main cylinder, penetrate into flats and open up to individual fibers. Between these two organs the actual carding action takes place. Flat strips take fiber neps, foreign matter, short fibers and dust particles from the individual fiber. Then fibres are transferred to doffer from the cylinder. The doffer combines the fiber into a web because of its substantially lower peripheral speed relative to the main cylinder. A stripping device draws the web from the doffer. Then a calendar roller compressed it to sliver and the coiler deposits it into a can. In carding machine actual carding action takes place between the cylinder and flats. Generally the high production cards process higher flat speed. The speed of flats affects the carding process and quality of final yarn [3].

3. EXPERIMENTAL PROCEDURE

At first 48 bales were laid down in the blow room. The delivery material was then fed into the carding machine. The speed of revolving flat changed 5 (five) times. The speed were 220 mm/min, 250 mm/min, 280 mm/min, 300mm/min, 320mm/min and all the following data of the carding machine remained same for the five speeds of flats.

1. Cylinder rpm = 600
2. 1st Taker-in rpm= 1084
3. 2nd Taker-in rpm= 1695
4. 3rd Taker-in rpm= 2234
5. Delivery speed = 220 m/min
6. Delivery sliver weight = 70 grain/yard
7. Production = 65.5 Kg/hr

For each flat speed, slivers were taken in a can and 8 cans for each flat speed. Then the slivers were tested in USTER tester -5 [2]. After that the slivers were fed into breaker draw frame and breaker drawn slivers were produced. Then slivers were passed to finisher draw frame and finisher sliver were produced. After that roving bobbins were produced from speed frame. Finally yarn was produced in the ring frame from the above mentioned roving. After producing yarn it was tested to observe the quality aspects of all five different flat speeds.

4. DATA ANALYSIS

The result for card sliver obtained from USTER tester-5 on various quality aspect of carded sliver by changing flat speed were summarized and shown in tables 1 to 5 and the result for 30/1 Ne card yarn obtained from USTER tester-5 on various quality aspect of carded yarn by changing flat speed were summarized and shown in table 6.

Table 1: Flat speed 220 mm/min (card sliver):

No	U%	Cvm%	Cvm% 1m	Cvm% 3m	Rel.Cnt
1	3.42	4.23	2.12	1.25	1.8
2	3.45	4.31	2.15	1.15	0.2
3	3.25	4.44	2.25	1.18	0.6
4	3.46	4.52	2.19	1.06	-1.1
5	3.45	4.08	2.21	1.68	-0.4
Mean	3.40	4.31	2.18	1.26	0.22

Table 2: Flat speed 250 mm/min (card sliver):

No	U%	Cvm%	Cvm% 1m	Cvm% 3m	Rel.Cnt
1	3.32	4.13	1.91	1.05	1.6
2	3.45	4.31	2.15	1.03	0.1
3	3.20	4.10	2.01	1.15	0.8
4	3.16	4.02	2.10	1.26	-1.2
5	3.25	4.08	2.21	1.58	-0.6
Mean	3.27	4.12	2.07	1.21	0.14

Table 3: Flat speed 280 mm/min (card sliver):

No	U%	Cvm%	Cvm% 1m	Cvm% 3m	Rel.Cnt
1	3.12	4.05	1.81	1.06	1.2
2	3.45	4.21	2.19	1.02	0.2
3	3.25	4.01	2.06	1.18	-0.4
4	3.14	4.13	2.13	1.13	-1.2
5	3.23	4.05	2.11	1.28	1.5
Mean	3.23	4.09	2.06	1.13	0.26

Table 4: Flat speed 300 mm/min (card sliver):

No	U%	Cvm%	Cvm% 1m	Cvm% 3m	Rel.Cnt
1	3.10	3.90	2.00	1.05	-0.6
2	3.25	4.10	2.15	1.26	0.1
3	3.02	3.95	1.98	1.25	0.2
4	3.28	3.99	2.01	1.10	-1.2
5	3.32	3.95	1.95	1.55	1.6
Mean	3.19	3.97	2.01	1.24	0.02

Table 5: Flat speed 320 mm/min (card sliver):

No	U%	Cvm%	Cvm% 1m	Cvm% 3m	Rel.Cnt
1	3.10	3.76	1.99	1.15	1.6
2	2.95	3.79	2.09	1.03	0.01
3	3.05	3.88	1.95	1.30	1.3
4	3.02	3.80	2.00	1.10	-1.2
5	3.00	3.75	2.06	1.20	-0.6
Mean	3.02	3.79	2.01	1.15	0.22

Table 6: Yarn result for different flat speed (card sliver):

Flat Speed mm/min	U%	Cvm%	Thin (-50)	Thick (+50)	Neps (+200)	IPI	H
220	10.25	13.12	4.5	110.5	189	304	5.60
250	10.63	13.24	1.75	112.5	196	310.25	5.68
280	11.14	14.12	2.3	169	142	313.3	5.80
300	10.89	13.93	1.5	156.5	165	323	6.65
320	10.65	13.63	5.8	156	164	325.8	6.70

5. RESULT AND DICUSSION

Flat Speed mm/min	U%
220	3.40
250	3.27
280	3.23
300	3.19
320	3.02

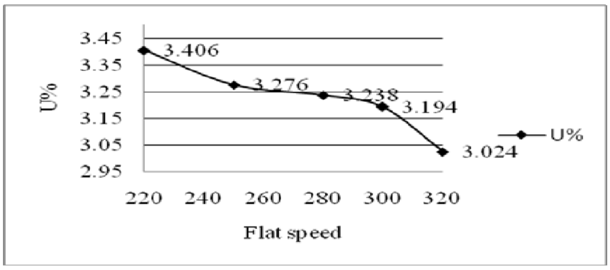


Fig. 1: Relation between U% of card sliver vs different flat speed

Flat Speed mm/min	Cvm%
200	4.31
250	4.12
280	4.09
300	3.97
320	3.79

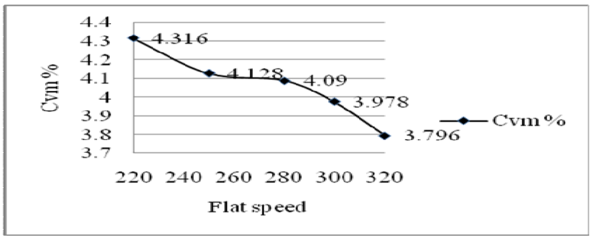


Fig. 2: Relation between Cvm% of card sliver vs different flat speed

From Figure 1 & 2, it is obserbe that U% & Cvm% of card sliver shows a decreasing trend when the flat speed increase.

Flat Speed mm/min	U%
200	10.25
250	10.63
280	11.14
300	10.89
320	10.65

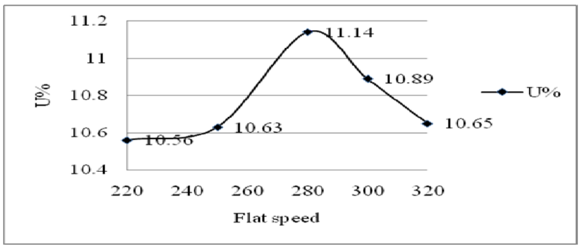
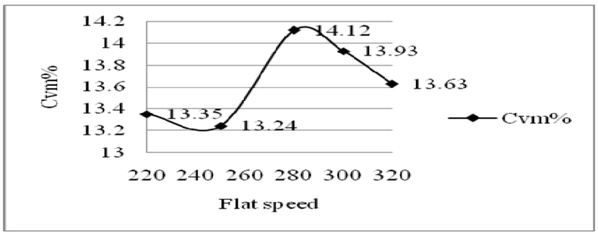


Fig. 3: Relation between U% of yarn vs different flat speed

Flat Speed mm/min	Cvm%
200	13.35
250	13.24
280	14.12
300	13.93
320	13.63

Fig. 4:

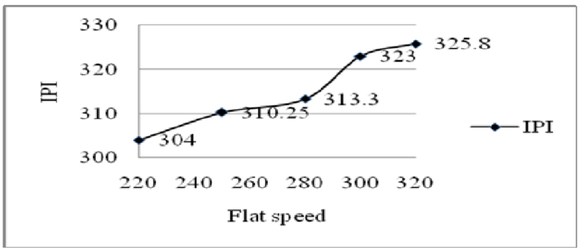


Relation between Cvm% of yarn vs different flat speed

From Figure 3 & 4, it is obserbe that U% & Cvm% of yarn first increase up to 280 mm/min flat speed but after 280mm/min flat speed the U% & Cvm% of the yarn again shows a decreasing trend though the flat speed increased

Flat Speed mm/min	IPI
200	304
250	310.25
280	313.3
300	323
320	325.8

Fig. 5:



Relation between IPI of yarn vs different flat speed

Flat Speed mm/min	Hairiness
200	5.60
250	5.68
280	5.80
300	6.65
320	6.70

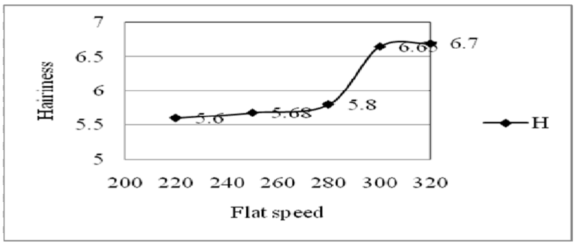


Fig. 6: Relation between hairiness of yarn vs different flat speed

From Figure 5 & 6, it is obserbe that IPI & hairiness of yarn shows an increasing trend when the flat speed increase

In all the exeperiment it is clearly observed that there is a clear relationship between flat speed and card sliver quality. When the flat speed increased the card sliver U% and Cvm% decreased. In case of yarn quality when flat speed increased the U% and Cvm% slightly increase at a certain level but after that it started to decrease. But when the flat speed increased yarn IPI and hairiness increased sharply.

6. CONCLUSION

This paper shows that there is an option of increasing the productivity of carding and as well as a significant improvement of quality of output i. e. Sliver. On the contrary though the sliver properties improved in terms of quality such as U%, Cvm%, the yarn properties such as IPI & hairiness inecrease for the same which is a phenomenoan of decrease the quality. Again it shows that an optimal flat speed (here 280mm/min) of carding is to be set for a high quality yarn.

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A REVIEW OF PRICE TRENDS OF CLOTHING PRODUCTS IN THE EUROPEAN UNION

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Abstract: This paper presents the evolution of last years clothing prices on EU markets and the main causes behind this trend. He pointed out that in recent years has decreased the price of apparel products in most EU countries, a phenomenon first observed in the United States. Among the causes of such developments we mention slow European economic growth, increased exchange rate euro/$, liberalizing trade in clothing, concentration and organization of apparel production chain, the success of large retailers such as hypermarkets and specialized retail chains, changing consumption patterns in the clothing industry, etc.
***Keywords*:** price, clothing, hypermarkets, specialized retail chains, consumer

1. INTRODUCTION

In recent years, worldwide, the main clothing markets like the US and some European countries have witnessed a relative decline in prices. The trend was first observed in the US where clothing prices sank 9.6 percent nation wide from 1993 to 2003, according to the U.S. Bureau of Labor Statistics, while at the same time, the Consumer Price Index rose 27.3 percent. [1].
In recent years, decrease in clothing prices continues, but at a much slower rate than before (see table no. 1.)

A more recent evolution of the American Consumer Price Index (2000-2008) is shown below [2].

Table. 1. – The evolution of U.S. Consumer Price Index

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Clothing	-1,3	-1,8	-2,6	-2,5	-4	-7	0	-4	-1
All items	3.4	2.8	1.6	2.3	2.7	3.4	3.2	2.8	3.8

Source: Bureau of Labor Statistic, 2009

2. THE EVOLUTION OF PRICES OF CLOTHING PRODUCTS IN THE EUROPEAN UNION

In Europe, the harmonized indices for consumer prices for all items indicate a moderate price growth across countries (both EU-25 and EU-15). In the last five years, most Southern and Eastern European countries – such as Spain, Greece and Hungary – maintained an average rate of change which was above 3 per cent, while most Northern European countries (United Kingdom, Denmark, Netherlands, Germany and Sweden) displayed a more limited increase.
If we analyze the clothing market, we observe that the harmonized index of consumer prices in the EU-27, recorded a steady decline over the past five years. This trend was in contrast with the average annual increase of 2.4% consumer price index for all consumer goods - during the same period of time [3].

Table. 2. - Harmonized indices of consumer prices: annual average rate of change (Clothing)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
UE-27	**-0.5**	**-0.7**	**0.5**	**0.1**	**-0.4**	**-0.9**	**-0.6**	**-0.1**	**-0.8**
Belgium	-2.6	0.4	0.8	1.0	0.5	-0.4	-0.4	0.2	0.8
Bulgaria	-3.0	0.5	-0.4	-2.6	-0.1	0.7	3.2	5.8	9.8
Czech Republic	:	-1.2	-2.5	-4.1	-3.1	-4.9	-5.7	-1.1	-1.8
Denmark	-4.7	-1.0	3.1	0.5	-0.6	-1.4	-3.3	-3.2	-0.8
Germany	0.0	0.5	0.4	-0.9	-0.7	-2.1	-0.9	0.9	0.1
Estonia	4.3	5.1	4.9	1.1	-0.3	1.8	3.1	3.8	4.6
Ireland	-5.4	-2.9	-4.3	-3.8	-3.3	-2.4	-1.7	-3.1	-4.7
Greece	1.6	2.9	3.1	1.9	3.8	4.8	2.2	3.3	2.7
Spain	2.0	-1.1	5.0	3. 8	1.8	1.1	1.1	1.0	0.4
France	0.3	0.3	0.7	-0.5	0.1	0.0	0.2	0.5	0.5
Italy	2.0	0.5	2.5	2.0	1.9	1.2	1.0	0.6	1.6
Cyprus	0.3	-8.1	-4.0	1.6	-1.4	-0.4	-4.0	-0.2	-1.9
Latvia	2.4	0.9	-0.7	2.6	2.7	0.2	1.6	2.1	-0.9
Lithuania	0.0	-2.9	-2.8	-2.0	-0.2	-1.4	-2.7	-4.7	-3.6
Luxembourg	1.0	2.1	1.6	1.4	0.4	0.3	-0.1	0.5	0.2
Hungary	:	:	4.0	3.2	3.1	0.4	-0.9	1.3	0.2
Malta	-0.3	-2.1	-1.7	-8.4	-2.7	-0.2	-1.2	0.1	3.7
Netherlands	-1.3	0.6	2.6	-3.5	-1.8	-2.8	0.3	1.5	0.0
Austria	-1.1	-0.9	0.0	-0.3	-0.7	-0.6	0.3	2.3	1.3
Poland	5.6	1.8	-0.7	-2.1	-2.8	-4.3	-5.6	-5.8	-5.1
Portugal	0.4	0.4	1.5	0.3	-1.4	-1.1	0.7	2.0	1.2
Romania	**:**	**:**	**15.4**	**11.9**	**7.6**	**5.1**	**3.9**	**3.2**	**2.8**
Slovenia	:	2.1	2.2	6.2	1.9	-1.8	-0.8	1.7	3.3
Slovakia	2.1	1.4	1.7	2.0	0.5	-1.0	0.0	0.6	0.6
Finland	0.2	1.0	-1.1	-0.2	0.2	-0.7	-1.9	0.5	0.3
Sweden	0.8	2.8	2.2	-0.4	-3.2	0.1	1.5	2.5	-0.6
United Kingdom	-7.8	-8.0	-7.8	-4.1	-5.2	-5.2	-4.0	-4.0	-7.0

Source: EUROSTAT

Looking at individual markets, it is to notice significant reductions in clothing prices in Poland, Czech Republic, Ireland, Lithuania, United Kingdom and in other countries, constant price increases, for example in Estonia, Greece, Spain, Italy, Luxembourg Hungary and Romania.The evolution of consumer price index for clothing and footwear present a large variations from one state to another, in 2008. Thus, there is a strong growth in Bulgaria (9.8%) and Estonia (4.6%) and a sharp drop in Poland (-5.1%), United Kingdom (-7%), Ireland (- 4.7) and Lithuania (-3.6%).

In the evolution of the harmonized index of consumer prices for various products of light industry in the EU-27 also notes two distinct periods: first, between 2000 and 2004, characterized by a decrease in clothing prices and a rise in prices of materials and accessories. In the second period, that after 2004, it appears that the price of materials for clothing and accessories has stabilized, while continuing to reduce the price of apparel products increased sharply while the price for cleaning, repairs and hire of clothing (see Fig. 1.).

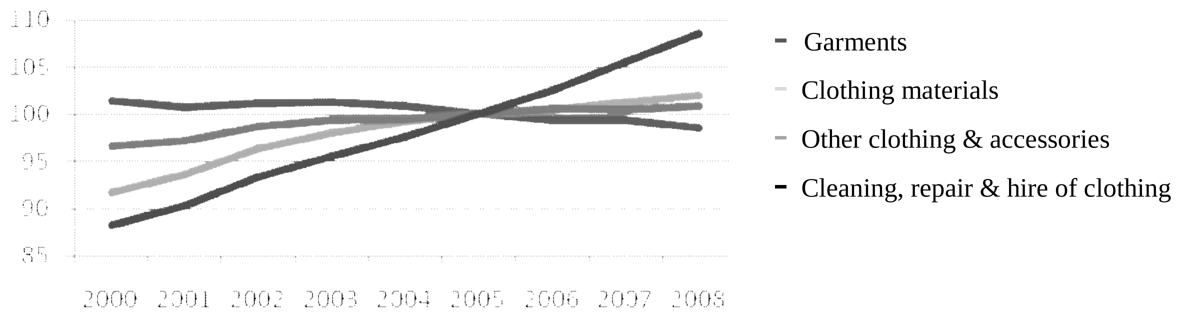

Fig. 1. - Evolution of harmonized indeces of consumer prices, in the EU-27, different products of light industry (2005 = 100)
Source: by the author, EUROSTAT data

Evolution of the harmonized index of consumer prices for various products of light industry indicates that the EU, clothes got cheaper in recent years, while prices of materials and accessories used in further increases in their achievement record. These increases are much lower as compared to the previous period will be reflected in a decrease in the future and higher final prices for apparel products.

Comparing the price indices for clothing products for European Union countries in 2008, it is noted that in most Member States, there were values that are within the range + / - 20% of average EU-27 as can be seen from Fig. 2. The same comparison highlights that the clothing was more expensive in the Nordic countries, Denmark, Finland and Sweden where prices were about 10-15% higher than the EU-27 and Norway and Switzerland with approximately 25% higher. In contrast, prices for clothing have been in 10 Member States, smaller than the EU-27 lowest price is in Great Britain, with about 20% below the EU-27.

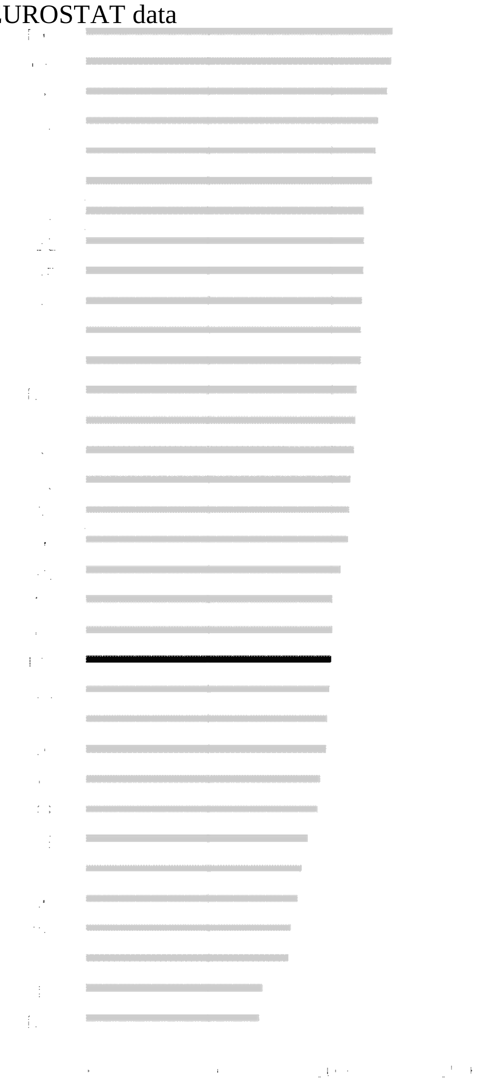

Fig. 2. - Price indices for clothing products, in EU countries (EU-27 = 100), in 2008
Source: by the author, EUROSTAT data

3. THE MAIN CAUSES OF DECLINING PRICES CLOTHING PRODUCTS

Decrease in prices of clothing can be explained by the slow European economic growth, increased exchange rate euro/$, liberalizing trade in clothing, as well as concentration and organization of apparel production chain, which led to a substantial increase in imports from cheaper producers from outside the EU.

Another cause of falling prices of clothing to an increase in general consumer prices is the success of large retailers such as hypermarkets and specialized retail chains, which due to large scale and bargaining power could advantage of the liberalization of imports of apparel and retail chains to reconfigure, so going to the local production of cheap imports.

Clothing sales trends in key European specialized chains can be seen in the following table [4]

Table. 3. - Top specialty chains in Europe

Nr. crt.	Name of company	Country of origin	2007 retail sales (U.S. $ mil)	2002-2007 retail sales
1	Inditex S.A.	Spain	12,929	20.1%
2	Hennes & Mauritz (H & M)	Sweden	11,559	11.5%
3	C&A Europe	Belgium	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

In recent years the so-called strategy speaks of "fast fashion" - the presentation of 5-6 collections a year instead of two, small and limited series production, to give consumers the feeling of exclusivity, uniqueness and a desire to satisfy to break the ordinary mass-market market. [5] This strategy was adopted by the leaders of the specialty chains, and based on small orders, product life cycle shorter and increased efficiency of the supply chain that enable products to quickly reach store shelves. [6] European specialty chains that have adopted the model of 'fast fashion' recorded higher growth rates of around three to four times the average growth rate of apparel industry as a whole - see table below.

Table. 4. - Evolution of total sales of the key European specialty chains that have adopted the model of "fast fashion"

	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 of firms and ****Feeling the squeeze Global Powers of Retailing 2009,* Deloitte Development LLC, 2009

4. CONCLUSIONS

The analysis of the harmonized index of consumer prices for various products of light industry indicated that, at EU level, while prices of materials and accessories used to produce garments have increased in recent years, the price of the products decreased. As in past years, these increases are much lower than the previous period, we expect that in future this will be reflected in a decline and higher final prices for apparel products.

Various studies on consumer trends have highlighted the fact that they have become more practical in recent years that has diminished loyalty to established brands and the increased tendency to purchase products during periods of reduced sale prices. Changing consumption patterns in the clothing industry [7] highlights the increasing importance given the product price to its purchase decision by consumers.

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A PROJECT PROPOSAL: TRANSFER OF PATTERN GRADING IN TEXTILE TRAINING

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Abstract: This paper aims to present a project proposal which is a perfect sample of ICT use in vocational education and training. The proposal aims to support participants in training and further training activities in the acquisition and the use of knowledge, skills and qualifications to facilitate personal development, employability and participation in the European labour market. In addition, it wants to support improvements in quality and innovation in vocational education and training systems, institutions and practices. The proposal addresses the operational objectives becasue it envisages 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. It also plans to support the development of innovative ICT-based content, services, pedagogies and practice for lifelong Learning. The priority addressed in the proposal is the promotion of the acquisition of key competences in VET. The tool to be transferred is an innovative training tool that is clearly defined in advanced multi-media CD-ROM. The full programme for Pattern Grading contains three complete sections: Womenswear Pattern Grading, Menswear Pattern Grading and Childrenswear Pattern Grading. This module is in the form of a CD-ROM called "Pattern Grading AB". Pattern Grading AB is a Training module, Open & Distance Learning material in Greek, English and German. The Pattern Grading module will present a high quality pedagogic approach and methodology. With this pedagogy, the user will acquire complex creative pattern construction and grading skills, with limited or no supervision, through simple, standardised and reliable procedures.
Key words: Pattern Grading, Textile training, Vocational Education

1. INTRODUCTION

The European textile/clothing sector will require industrial networks for specialised, high value added products in response to the growing complexity of today's market requirements for product design and development. The multi-stage value chain of the textile and clothing industry is dominated by SMEs which have been traditionally co-operated in communities and clusters presenting geographical and cultural proximity. Product development in the fashion industry in Europe is undergoing a dramatic change and it changes the way companies are coming together in this new collaboration landscape. One of the major problems of the clothing industry at the moment is that the overall level of skills and qualifications needs to be raised and, therefore, it is also necessary for training modules to respond to the continuous evolution in the workplace so as to confront the problem of unemployment and increased competition. A very recent survey report identified a lack of skilled staff at 42% as one of the strongest change drivers in the clothing industry, while 42% of clothing companies reported difficulty in filling vacancies due to skill shortages. Only about half of those realize that a further increase in skill needs is expected and would now like to plan in-house training. In general, small and medium companies have the biggest problems concerning access to adequate training as they cannot afford experienced training programmes. They are not well informed on existing training schemes and they fear more than bigger companies interruptions of their production process. It must be considered that the clothing industry is one of the largest and most important industries in the partner countries involved in this project. There are over 3000 companies in Turkey and Romania. 99% of these companies are SMEs and account for about half the total employment in the sector. Traditionally, the industry employs a high proportion of women (about 70%) and it also makes a significant contribution to the employment of ethnic minority and inner city groups.. The project addresses Article 3.2.1. (Priority 1) in Lifelong Learning Programme and Article 3.2.3.(Priority 3). This project also addresses Article 1:3 of Decision by The European Parliament and the Council.

Including technology and connection into teaching and learning has started to transform learning theories into a digital age. Advances in technology and the changes in teaching and learning approaches (from teacher centred to student centred one) facilitates the new models to come out. Educators have been preoccupied with integrating technology into the classroom for decades (Dziuban, Hartman, Moskal, 2004). We can no longer personally experience and acquire learning that we need to act and we draw our competence from not only from texts. Now, we are embracing rapid changes in Internet technologies. In 21st century, technology and students are changing rapidly and individuals have the capacity for this change, which implies that educators should be embracing “the new digital reality of the online, computerized world” (Jukes, 2008:6). Young (2002) predicted, “Within five years, there will be lots of blended models such as students going to school two days a week and working at home three days a week. Bourne (as cited in Young, 2002) also said: “within five years, you'll see a very significant number of classes that are available in a hybrid fashion …. somewhere in the 80-90-percent range.” Buckley et al. (2002) and Tagg (1995) noted a paradigm shift in higher education leading to new models of teaching and learning. In addition, Karen Stephenson (2004) states that experience has long been considered the best teacher of knowledge and since we cannot experience everything, other people’s experiences, and hence other people, become the surrogate for knowledge and ‘I store my knowledge in my friends’ is an axiom for collecting knowledge through collecting people (undated).Therefore, the natural attempt of theorists is to continue to revise and evolve theories in accord with the changing conditions.

This paper aims to present a project proposal which is a perfect sample of ICT use in vocational education and training. The proposal aims to support participants in training and further training activities in the acquisition and the use of knowledge, skills and qualifications to facilitate personal development, employability and participation in the European labour market. In addition, it wants to support improvements in quality and innovation in vocational education and training systems, institutions and practices. The proposal addresses the operational objectives becasue it envisages 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. It also plans to support the development of innovative ICT-based content, services, pedagogies and practice for lifelong Learning. The priority addressed in the proposal is the promotion of the acquisition of key competences in VET.

2.THE TRAINING TOO

The project propsal aims to transfer the pattern grading module in textile training tool developed by eTelestia AB. It proposes to transfer and transform the training module produced in advanced multi-media CD-ROM called TELESTIA AB: Pattern Grading into Turkish and Romanian. The reason for this transfer is that the pattern grading module is based on a unique methodology that allows to grade patterns 3Dimensionally and accurately in up to 7 sizes with one simple procedure. the objective is to provide the next level of skills after pattern cutting. It starts from the basic theory of how the body grows in size and covers size charts, cardinal points and a variety of grading increments. A trainee can learn how to use the unique Telestia Pattern Grading methodology for basic blocks and how to apply it to a very wide variety of styled blocks covering Womenswear, Menswear and Childrenswear, including separate garment parts (Collars, Blouses, Sleeves, Dresses, Jackets, Coats, Trousers, Lingerie). The Pattern Grading AB Module covers the spectrum from beginner and amateur to semi professional in pattern construction, which can extend to a professional level with respect to producing for knitted or jersey garments. This module enhances multi-skilling and can be available as CVT to amateurs, students and professionals for both on-and off-the job training. The training is indeed systematic, effective quick and accessible, and does provide a comprehensive means of accredited skills acquisition for the Fashion and Clothing industry, to all interested. It is very well suited to those disadvantaged due to geographical or other factors, including disabilities and or social disadvantages, and particularly important for supporting equality of opportunities between men and

women. The training tool on which the project is based is already in Greek, English and German. The first value to be added will be their translation and transformation into Turkish and Romanian. Thus, the products will be available in more EU languages. In addition, the project's scientific and pedagogic objectives are in tune with the main priority in Lifelong Learning Programme. The Pattern Grading learning tool can be applied to all member states without any specific requirements and adaptations apart from more languages. This recently developed interactive personalised learning tool for design skills will allow for the development of made-to-measure clothes in a very short time scale with accurate results. The pedagogic methodology, combined with new technology and innovative interactive multimedia tool will have very promising results for the future of the clothing industry in Europe and may bring the dream of mass-customisation effectively to reality sooner than expected.
In terms of Strategic Impact and Contribution to growth, the Pattern Grading tool is expected to have a very powerful impact in the European Clothing industry. In addition, the Pattern Grading training tool will help improve competitiveness and enhance the capability of meeting short lead times in production and design with effective, standardised and customised results and for lower budgets. In addition, this will lead to increased consumer response to clothing products. Thus, the Pattern Grading training tool's added value for the Community lies in the provision of a training tool that has the dynamics not only to provide valuable training and skills to the targeted beneficiaries but also to empower the processes of the EU Clothing Industry and thus, increase productivity and competitiveness. This, in its turn, is expected help the industry grow and, thus, increase the demand for more skilled employees. In the assessment tests for pattern making given to partnership students, 80% of them will be expected to score over 90% in marks compared to 30%-70% with the traditional teaching methods. The students to be trained with this module will be consistently far better than those trained under the same design methods but using traditional means. In other words, the multimedia technology integrated into our pedagogy will increase the training effectiveness significantly.

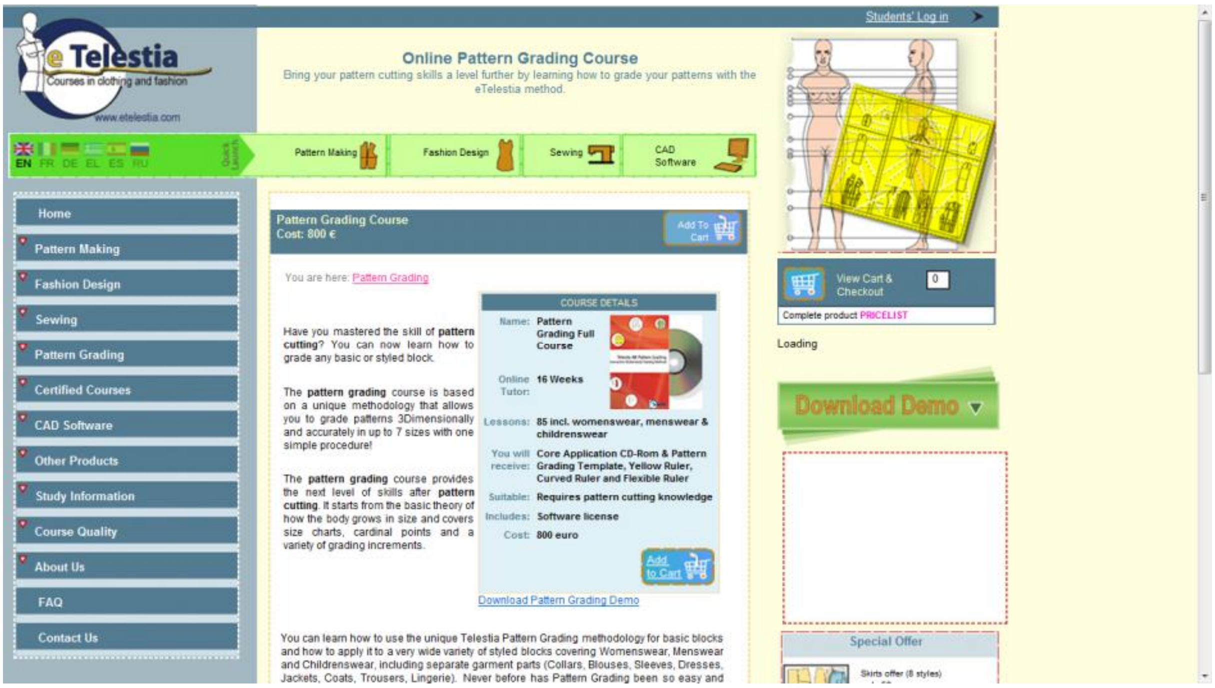

Fig. 1: Interface of Online Pattern Grading Course

The Online Pattern Grading Course is designed to help the trainees to master the skill of pattern cutting. The trainees can learn how to grade any basic or styled block. The pattern grading course is based on a unique methodology that allows you to grade patterns 3Dimensionally and accurately in up to 7 sizes with one simple procedure. It also provides the next level of skills after pattern cutting. It starts from the basic theory of how the body grows in size and covers size charts, cardinal points and a variety of grading increments. The full programme for Pattern Grading contains three complete sections: Womenswear Pattern Grading, Menswear Pattern Grading and Childrenswear Pattern Grading. The trainees can study each section as a separate complete course. However, if you choose to study the full course you will benefit from a reduced price. It is more cost effective to register for the complete course rather than to purchase each section individually. The course is suitable for individuals wishing to develop these skills for a career, for those who would like to advance their skills in pattern cutting for their own personal use, and also for use by Colleges and Institutes of Further Education to supplement their curriculum and offer students alternative study medias facilitating the tutors' job.

Womenswear Pattern Grading Course aims to teach how to grade any basic or styled block for women's clothing. If the trainees are working as a freelancer or would like to work in the clothing industry, the womenswear pattern grading course is for them. They can forget all the painstaking calculations and time consuming procedures with uncertain results. By joining the eTelestia womenswear pattern grading course, trainees will learn the basic grading terminology, the work stages of production blocks, how to grade blocks and a variety of more than 40 style blocks of blouses, dresses, sleeves, collars, skirts and other women's clothing. The Womenswear Pattern Grading course is part of the Pattern Grading Full Course, but can be studied independently. This course is comprised of the following modules:

- Basıc Terminology
- Women's Sizing Tables
- Block Grading
- Gradıng Specificatıons
- Work Stages of Production Blocks
- Styles (40) including Blouses, Dresses, Kimono-Raglan, Collars, Sleeves – Capes, Skirts and Other.
- Cutting
- Self-Assessment Tests

Menswear Pattern Grading is the course for trainees who want to learn how to grade menswear accurately and easily in no time at all. This easy and affordable course is ideal for learners who work as freelancers or would like to work in the clothing industry as pattern cutting graders for men's garments. The pattern grading course provides the next level of skills after pattern cutting and covers all the theory of how the body grows in size, terminology and step-by-step instructions for block grading of men's garments. The Menswear section is part of the Pattern Grading Full Course but can be studied independently. This grading course for menswear contains instructions on how to grade shirts, sleeves, trousers and jackets and is comprised of the following modules:

- Basic Terminology
- Men's Sizing Tables
- Block Grading (4)
- Work Stages of Production Blocks
- Classic Jacket
- Cutting
- Self-Assessment Tests

Childrenswear Pattern Grading course provides the unique guide for grading children's garments for all ages, ranging from 3 months to 15 years old for both girls and boys. With this easy to use grading system you will be able to grade any style or garment, by applying these basic principles on any design you will be given. This easy and affordable course is ideal for learners who work as freelancers or would like to work in the clothing industry as pattern cutting graders for childrenswear. The Childrenswear section is part of the Pattern Grading Full Course but can be studied independently. The course contains step-by-step instructions on how to grade childrenswear for different age groups divided into two groups of 4-5 categories. The following modules are included:

- Basic Terminology
- Children's Sizing Tables
- Production Blocks
- Block Grading (9 Groups)

3.THE PARTNERS

The partnership maintains a very simple but effective organizational structure. The proposal covers three partners from three countries: Turkey, Greece and Romania.The partnership comprises of members from both the industry and the training sectors 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 together with support in the valorisation and accreditation activities. Through dissemination seminars and conferences, a number of colleges and/or SMEs will start either pilot using the methods or join the project as users. Through participation in international conferences, training institutions and other key players will show active interest in acquiring and using this module.

a. Selcuk University in Turkey

Selcuk University, Higher School of Vocational and Technical Sciences, Turkey (SOVT) provides 2 years of undergraduate education to about 4100 students, with 70 teachers and trainers, 30 technicians and 25 other staff. It has 25 labs and 15 departments: Mechanical Engineering, Machine Design, Air Conditioning and Refrigerating, Agricultural Machinery, Civil Engineering, Surveying, Electrical Engineering, Industrial Electronics, Electronics Telecommunication, Computer technology, Industrial Automation, Furniture and Decoration, Chemistry, Shoe Design and Textile Design. The school has necessary skills, knowledge, expertise and experience of the organisation in relation to its role in the project. The school itself was founded by World Bank/Turkish Higher Education Council Project in 1986. At present, it is the promoter or coordniator of the innovative LdV projects “Virtual Training Centre for CNC”, “Virtual Training Centre for Shoe Design” and “Excellence in Textile Through Fashion Express".

b. School of Fashion Design and Applied Arts in Greece

School of Fashion Design and Applied Arts (SITAM-AB) was founded in 1970 in Thessaloniki, Greece. Since then, it has provided valuable support for the industry of garment manufacture being innovative in its educational methods, both in terms of fashion design and clothing technology. It has been the first to offer accredited Vocational Training courses in Clothing Technology and Fashion Design SITAM-AB has established educational collaborations and partnerships based on its innovative training methodologies with English, German and French Universities and Institutions. The unique expertise of SITAM-AB lies in the innovative training methodologies and tools that it has developed and patented worldwide. They relate to pattern construction, pattern grading, sewing techniques, fashion design. They combined software packages that address the skills problem in Apparel Product Development. Telestia Trainer and Telestia Creator were named in the SPESA exhibition in MIAMI 2007, the first ‘COOL STUFFS ‘ of Hot Technologies.

c. University of Oradea in Romania

As a part of University of Oradea, Faculty of Textiles and Leatherwork offers an academic excellence in both graduate and post-graduate programs by providing the high level of education necessary for students to have the best opportunities and professional capacities. The Technology of Ready-Made Clothing and Knitting Department is directly related to the project activities and purpose, as provider of a top quality, competitive, higher education, addressing today’s need for a new generation of professionals in engineering in the Romanian textile industry. Its expertise is based on the high staff qualification and the strong infrastructure consisting of two modern equipped laboratories for Clothing. The grading laboratories for Clothing is developed in collaboration with the most representative software and technology producers from the world (Gemini, Gerber). The education in Technology and Pattern Design of Ready-Made Clothing courses, continuous education are given by qualified staff.

4. TARGET GROUPS

Tangible outcomes will be the transferred training tool in advanced multi-media CD-ROM into the official languages used in partner countries. This module will present a high quality pedagogic approach and methodology. There will be quantifiable increase in the learning procedure and in skills of the target users (amateurs, students and employees) involved in the product development departments of clothing companies, i.e. designers and pattern technologists. This module will also target the home market, men and women who do not necessarily want to be involved with pattern making professionally, but who would like to acquire pattern making skills for their personal use. This tool will be a live example and a valuable precedent, which can be applied in the development of personalized learning tools for other disciplines that involve creative processes and acquisition of skills. The training module will be transferred to record skills in grading, and to find a way to use advanced multimedia IT to simplify the training procedure in a clear and appealing way for both the amateur and the professional. It will also meet the need for an eLearning media that will integrate traditional much needed skills, rapidly becoming extinct, into innovative training methods using advanced technology.

5. CONCLUSION

This Project proposal is based on an innovative training tool that is clearly defined in advanced multi-media CD-ROM. The full programme for Pattern Grading contains three complete sections: Womenswear Pattern Grading, Menswear Pattern Grading and Childrenswear Pattern Grading. This module is in the form of a CD-ROM called “Pattern Grading AB”. Pattern Grading AB is a Training module, Open & Distance Learning material in Greek, English and German. English version of this product has been chosen as basis of this proposal because this module is designed to train individuals on pattern construction and can be used either for distance-learning with partial to no moderation or even for classroom based training with full to partial moderation. The Pattern Grading module will present a high quality pedagogic approach and methodology. With this pedagogy, the user will acquire complex creative pattern construction and grading skills, with limited or no supervision, through simple, standardised and reliable procedures. There will be quantifiable increase in the learning procedure and in skills of the target users (amateurs, students and employees) involved in the product development departments of clothing companies, i.e. designers and pattern technologists. This module will also target the home market, men and women who do not necessarily want to be involved with pattern making professionally, but who would like to acquire pattern making skills for their personal use. This tool will be a live example and a valuable precedent, which can be applied in the development of personalized learning tools for other disciplines that involve creative processes and acquisition of skills. The success of the transfer will be measured through numerous evaluation, testing and dissemination activities that the partners will undertake considering the objectives determined for the product. The interactive multimedia pedagogical methodology that is integrated in the modules, along with text and/or audio instructions, will be an effective way for this purpose.

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MARKETING STRATEGY AND PRODUCT DESIGN REQUIREMENTS FOR BETTER POSITIONING THE COMPANY CLOTHING INDUSTRY

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Abstract: Harsh concurrence on the international market imposes the need for more effective business dealings of the textile industry companies. The concurrence of the clothing items at the market is very harsh because there is a great number of the producers and consumers. The sales channels of such products are longer and more complex, and the necessity for constant supply in the form of "just in time" is more evident (at the right time, on the right place, in the right form and at the right price). Well-organized design and marketing sector represent the important condition for market orientation of a company and successful product design. Interaction between marketing and design in the production and business dealings of the clothing industry company enables the complete adjustment of the product quality to the needs, demands and special wishes of the consumers.
Key words: design, marketing, concurrence, clothing industry

1.INTRODUCTION

Today, the clothing industry has an important place in overall industrial complex of the Republic of Serbia regarding employees, import and role in the gross domestic product. Thereby, this industry has never enjoyed any kind of important support or a help of a foreign country [1].Taking into account the market conditions and internal factors, the clothes producers determine the goals of their own business. The main strategic developmental goal of the clothing industry is meeting the needs and demands of the consumers on domestic and international market, by accomplishing the optimal financial results. It is not possible to accomplish the main goal without defining and realizing series of goals on marketing concept. Some of the most important goals of domestic clothing producers are:

- Adjusting the methods and organization to the marketing concept,
- Observing the technologic equipment and necessary investment in the equipment,
- Providing the deficiently cadre, especially of the technological and marketing profile,
- Applying the world's standards in the production ISO 9000 and ISO 14000,
- Improving the quality and design of the garments,
- Continuous monitoring of the fashion trends and swift reaction on the changes in needs and demands of the consumer,
- Accomplishing the competitiveness in price by increasing the productivity, [2].

The quality of the product created in the design process, secures a stable market position to the product, as well as to the company. If that position is stable for a long time, than the company will have high reputation both in industry and on market, it will attract consumers, it will increase the sale in a period of time, and it will increase the production. Planned profit is a result of this. The product design, which is continuously created, has an impact on the company's economy as an economy subject. Therein, the design impact is very important on the profit growth and capital accumulation. However, there will be no profit if the consumers on the market do not accept and buy new products in the size, which is profitable for the company. This is the main point of the design in the production and in business, that is, the company's economy. Because of that, the position on the market depends on how designers create new products regarding quality and competition [2].

Thanking to the factors that are not connected to the prices many companies from developed countries are highly competitive (quality, design, wide range of products, top-level standardization, delivery deadlines). Serbian textile and clothing industry is not competitive in this sector because of the fact that the high quality performances have become dominating factor of competition on the developed countries' market [3].

Creating new products with some recognizable characteristics is one of the factors influencing on successful business of clothing industry.

One of the most important goals of the design is to create as competitive and efficient products as to prevail over other producers' products, and to be sold in optimal range and to contribute to the planned profit. Designing can be observed in a company in the creating new and improvement of the existing products. The main part of the design in the production and business is constant designing of the product that will make work easier for the people, bring standard to a higher level, make life more beautiful and create satisfaction while using the product. As a creative discipline, design has an important part in production and business as well as in satisfying the consumers.

The future development of textile industry perspectives in Serbia are above all the need for changes in production, which is conditioned by the need to advance the production program. The changes should take part in the product production direction with higher additional value. These products are those whose price is not of a great importance to the consumers, but some other distinctive product characteristics matter to them. Distinctiveness could be achieved on various ways: promotion activities which will create a certain brand, orientation on satisfying the specific needs of a certain parts of the market, excellent product quality, design, and use of new technological achievements, reliability and swiftness in delivering, afford services after buying the product [4].

Serbia has to be competitive on the international market with finished garments, good fashion and brands. Development of its own fashion brand are potential that could be created in 5-15 years ([5]), because Serbian industry is short of its own products that could be offered on the European market, and the greatest export part so far was finishing work. One of the long-term domestic textile and clothing industry development measures is creating a domestic product brand intended for higher or medium caste first off from the EU countries, as well as some rich purchasers from the near East interested in the European styles and fashion trends.

2. FASHION MARKETING CONCEPT

The design must be integrated with the marketing and then with other sectors (production, research and development), and the management has to be applied both in the company and in design sector. The corporation between design and marketing will provide the product designing and forming of the product range strictly according to the market institutions, and above all in accordance with the needs, demands, wishes and purchasing power of the consumer. On the other hand, management in the design sector will provide planning, organizing, managing and controlling the creation of the new product – in accordance with the company's business goals.

It is clear that design and marketing are two inseparable activities in a company. Their entire actions and activities must be oriented towards one goal – profit and company's development.

Marketing will become more challenging in the future. According to Kotler the following should be considered:

- It will be more and more difficult to the national brand's to cover all expenses for creating its own identity,
- The companies use the consumer management as a cure for every malady, but the resistance against collecting the personal information is growing stronger,
- No matter how many companies can cheaply produce its own product on the domestic area, it can never be cheaper as long as China has anything to offer,
- The expenses of global marketing grow, even though the efficiency of the global marketing is falling down,
- The companies keep reducing its marketing expenses during the crisis, [6].

The textile items producers, that perceive marketing as a function having basic task to identify and satisfy consumers' needs, that is, the leading philosophy not only for the marketing sector but also for the entire organization, achieved their goals by satisfying and overcoming the consumers' needs better that concurrence. The successful producers achieved that goal because they had proactive aggressive approach towards future and proactive approach towards the development of new products, made marketing training more important and adopted further time horizon for marketing planning, what erased marketing to a higher level in a company.

Strategic goals of marketing are more profit, more favorable market participation and larger sales volume. It implies directing the attention of this function on consumers and concurrence. Involvement of this function in market research, designing the marketing behavior and product selling is necessary. In this sense, marketing function enables realization of the company goals through anticipating, recognizing and satisfying the consumers' needs better that the concurrence. Operative goals and tasks of this business area are elaborated based on the strategic decisions in the marketing domain [7].

Marketing as a way of doing business play an important role in fashion industry. Fashion industry encompasses other products and certain fashion services even though most people regard clothing items as fashion. Fashion marketing is different from other types of commodity marketing. There are two opinions about fashion marketing such as design orientation and marketing orientation as shown in *figure 1.*

Typical statement	Fashion marketing equals promotion	Design must be based upon market research
Starting point	Sell everything we can make	Make what we can sell
Orientation	Design orientation	Marketing orientation
Flaws	High failure rate Reliance on intuition	Prosaic creations Repression of creativity

Fig. 1: Attitudes on fashion marketing (Source: Sh. Atkinson (1995), Designing and Marketing Fashion Product (ed. Fashion Marketing) Blackwell Science, London)

Fashion marketing could be defined as a business philosophy dealing with existing and potential clothes buyers, as well as products and services connected to clothes, in order to accomplish long-term goals of a company. Fashion marketing concept should encompass positive aspects of high interest in creation, buyers and profit. The experience of fashion companies confirms dependence between marketing and creation, meaning marketing appliance in fashion domain assumes equal respect of buyers, designers and profit. According to this, the fashion-marketing concept is based upon basic marketing postulates and creative activities of creators and designers. Fashion marketing can be perceived as a process as shown in *Figure 2.*

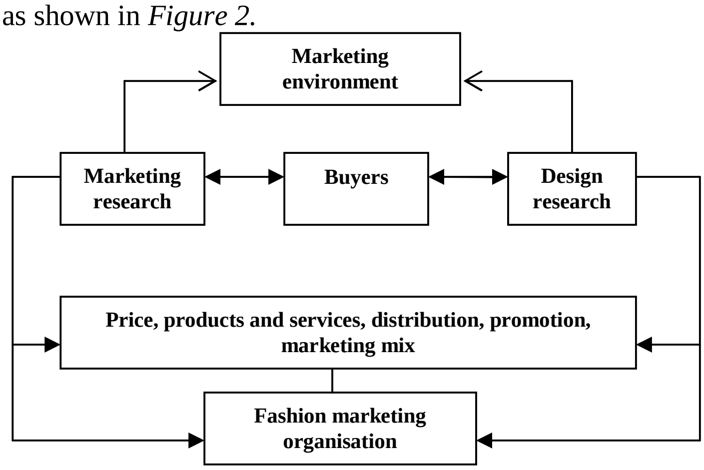

Fig. 2: Fashion marketing process- Source: M. Easey, (1995)

Fashion companies depend upon the buyers that constantly buy their clothes, and the key of such loyalty is in satisfying the buyers' needs with the products that are stylish, long-lasting, easy to maintain, comfortable, of high quality and fulfill all criteria considered relevant to the buyers, [2].

Many organizations have accepted the fashion-marketing concept and are successful not only in designing but also in selling and realizing the profit. The key for successful business dealings and development is long-term satisfaction of the buyers, which is in accordance with fashion marketing concept. The core of marketing concept is satisfying the consumers' needs, wishes and demands.

In that sense, the company of fashion industry must have products designed and made according to marketing information system. Information gained in marketing researching is directing factor of the entire business and production process. The designing process, that is, research, development and production of a new item is directed according to this information, because it points out the buyers' needs, possibilities, demands and wishes. Every new product must go through designing process during the creation and development process.

3. MARKETING STARTEGIES OF THE CLOTHING INDUSTRY

Strategic goals of marketing are more profit, more favorable market participation and larger sales volume. It implies directing the attention of this function on consumers and concurrence. Involvement of this function in market research, designing the marketing behavior and product selling is necessary.

Marketing function enables the realization of company's goals through anticipation, recognition and satisfaction of consumers' demands better that the concurrence. New operative goals and tasks of this business domain are elaborated based on strategic decisions in marketing. Important marketing innovation is positioning the market and consumers in the centre of the producer's preoccupation [8].

It used to be enough for the company to satisfy the basic economy goals – the profit, as a base for accomplishing growth and development. Since the 1970s, satisfying the consumers' demands is becoming more important-well-informed consumers have become the first and the last link in the economy chain. First, the company has to spot consumers' demands, and then to define the ways to satisfy them. The 1990's have brought with them the necessity to satisfy the general interest of the society – besides the consumers and capital owners, the company has to satisfy a wider range of the interests, which dominate in its environment.

On the present level of business dealing, the companies must accept the advanced market philosophy, marked as the public marketing, [9].

The modern society directs to the company more and more demands concerning defining its public responsibility. On the other hand, the companies are totally aware that they have to have an affirmative relation to these demands. Public business responsibility refers to the company's commitment and other business organizations, to increase its positive influence and to reduce its negative activity on society. One of the most important principles on which a modern business lies upon is an organization based on responsibility. Organizations must take over the responsibility for its part in the society.

Consumers are always in the centre of marketing researches and activities. If consumers are satisfied in better way than the concurrence satisfies them, it is certain that the company will accomplish its business goals. Many domestic companies do not execute marketing activities fully, because there is not good postulate of marketing function. If marketing researching exists, researchers working within independent, commercial or design sector usually carry out the research. Strategic business and marketing decisions are made randomly, according to manager's experience and intuition. It is necessary that managers of these companies understand the importance of marketing research (analysis of marketing environment, market potential, sales and consumers potential). Information gained from marketing research represents the basis for formulating, conducting and controlling marketing strategies of the textile industry, [10].

Exploring the first of all the consumers and then market and business environment, marketing starts its activity. Gained information represents the base and support to design in creating the products demanded by the consumers. On the other hand, every product becomes the main marketing instrument for conquering the market and attracting the consumers, but also for suppressing the concurrence. One can see there a strong and organic relationship between design and marketing as a necessity for common acting in a company and beyond it. All activities are directed towards the concurrent, effective and optimal product to design, produce, sell and realize the profit. These activities happen within the company and beyond it, they overlap or go separate ways, but they will eventually meet in unique goal-the profit. The guiding factor and meaning of design and marketing common practice are required profitability level of production and company's business dealings, [11].

There are many aspect and parameters to analyze the product: quality, packaging, design, trademark and so on. The producer influences his market position by adequate combining these parameters and other aspects along with the consumers' needs and tastes. Technical-technological development and fluctuations of market needs point out the product as a very dynamic instrument of the company's business policy. "It is necessary to distinguish the products dimensions in order to use the product more effectively, as a marketing mix instrument", [12].

Marketing goals direct us towards the program enlargement, while the demands of optimal size often do not satisfy it. Therefore, the process of optimal program construction is an activity – continuous process of adjusting the marketing and production goals. Stable growth and sustention of market participation on one hand and adequate level of productivity and economy in business on the other hand is provided by optimal production program.

The textile companies cannot always keep the same production program and satisfy the condition for constant growth and development of a company. That is why they choose the new products to help them in that intention. New products must be new completely, even without some direct relations to the present program, and they can represent the modification of an existing production program (assortment).

Policy of assortment, product and services development encompass the activity within a company regarded to the selection of all elements influencing the product formation, in a way that their features and appliance are at most adjusted to the consumers' needs. Product planning is catalytic process where that knowledge is transferred form the technology, costs and profit area into admissible product able to sell. It is a continuous process and it starts immediately when an idea of a new product is born and it lasts until the product is on the market, while it ends by drawing the product from the market.

Regarding all modern business conditions, many factors, as marketing instruments of fashion industry, are defined of which the most important are:

- Science and technology development extend the development possibilities of the existing products and their creative modification;
- Harsh concurrence between the producers stimulates physics and psychological product differentiating resulting in many products versions made to satisfy the consumers;
- Higher income of the citizens, particularly their consumption stimulates the production of specific versions of a product;
- Opposite to the prices, instruments not regarded to the prices (product, promotion) have the tendency to produce the indirect effects hardly neutralized by the concurrence.

Good clothes design, strategically sophisticated and realized marketing activities, along with good organization of production, sales and marketing from foreign partners create the basis for different and better position of domestic companies. Experiences gained in this kind of business cooperation can create conditions in the future for independent outbreak on domestic and international market, by creating strong and well-positioned trademarks [10].

Design influence on every company's business is perceived in continuous creation and development of a company that will be more powerful on the market in comparison to the concurrence. The product quality made during the design process provides stable market position both to the product and to entire company. If this position is long-term stable, then the company has high reputation in the industry and market, it attracts the consumers, enlarges the sales volume and production volume from one period of time to another [13].

Having in mind larger offer than demand on almost all world's markets, it is obvious that the company can enlarge its own sales by suppressing the concurrence sales, and this is achieved by possessing the products of higher quality in the assortment. Such product can create only design in corporation with other functions within a company. Design must act along with marketing and other sectors (production, research and development), and management must be applied both on company level and design sector. Corporation between design and marketing sector will provide product design and assortment forming strictly according to the market institutions, and firstly in accordance with the consumers' needs demands, wishes and purchasing power. On the other hand, management in the design sector will provide planning, organization, managing and creation controlling of new products in accordance with business goals of the company.

4. CONCLUSION

It is necessary to create the product as wanted, that is, the one that will appease the interest of the production and consumption in order to achieve the goals in the production and business dealings. Such product is competitive and efficient, aesthetic and economical. It is necessary for the marketing and design process to interact during the production and business dealings, and the design process itself does not end in making the prototype of a new product or by ending the experimental and zero series. The process continues after the product leaves the production process. In the conclusion, the interaction lasts as long as the production process and it represents the inevitability in the business dealings of the fashion industry company.

According to these circumstances, we can conclude that the development of strategic marketing is very important component of the companies' development in clothing industry and it creates strong relations with the consumers. By refreshing the production program, the designers invest a lot of effort and activities in order to make the product of high quality and better in comparison to the concurrence. In this sense, each phase and activities in design process have many specifics, which make it special creation. Domestic producers are starting to pay more attention lately on the design because along with promotion activities of becomes the main instrument in fighting for the market. Product strategies must be estimated in comparison to the company's quality and ability, and in comparison to the environmental dangers. It would denote managing the successful existing products along with the repairing of the current design, as well as an introduction of new products.

Product design represents the active instrument of the production mix and together with the quality and trademark, it can influence greatly on the consumers' orientation towards the certain product, and it must be planned in correlation with other instruments of the marketing mix.

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ASSISTANCE STRATEGIC TOOL FOR CHANGE IN THE SPANISH TEXTILE SECTOR

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Abstract: Spanish textile sector is facing important changes several years. This paper aims to analyses the adverse evolution in the Spanish manufacturing textile firms. Another contribution of our work is to show alternative strategic change in business.
In this way we are able to provide some indication of which operational decisions would improve the international competitiveness of the industry.
The population of the study is composed of the Spanish manufacturing firms in the textilel sector, particularly in companies of Valencia Community. It was found that to start the process of diversification, companies have problems on the technical and market knowledge. It is considered necessary to use reflective tools to help them make strategic decisions in the company.

Key words: Diversification, Textil, strategic tool, reflexion tool,

1. INTRODUCTION

The textile-apparel industry represents traditional manufacturing in some of the European Union (EU) member countries. Recently, however, this industry is facing important challenges that wonder about its ability to survive and perform at an efficient level particularly in its operational function.[1] [2] [3]

The source of those challenges can be found in the fast and unstoppable advances in information technologies, market deregulation and large reductions in transport costs, which together constitute what is commonly called globalization. These aspects joined define a new and more intensely competitive scenario and, in this way, globalization has become one of the phenomena that better explains the recent slowdown in some traditional industrial sectors in the EU. [3] [4] [5]

This affects to Spain from the eighties. In fact, Table I shows the negative change registered in some main indicators.

Table 1: Key figures of the Textile Sector Trends in Spain. 1990-2010. Source: Information Centre Textile and Apparel (CITYC), Spain

	1990	*1995*	*2000*	*2005*	*2010*	*% Variatión*
Employees (000)	386,8	276,9	278,2	223,2	150,3	-61 %
Productión (M€)	14.314	14.038	14.829	11.650	8.700	-39 %
Imports (M€)	2.407	4.309	7.669	11.011	13.305	453 %
Exports (M€)	1.373	2.898	5.476	6.659	8.544	522 %
Trade deficit	57 %	67 %	71 %	60 %	64 %	13 %

The analysis of the table shows a derease in employment and textile production, with decrease of 61% and 39% respectively.

On the other hand, contrasts the increased values of imports and exports. This is due to a change in the strategy and the internationalization to improve their situation.

The Spanish territory is divided into different regions. The weight of the textile sector is different for every one. The textile industry is more relevant in Spanish regions of Cataluña and Comunidad Valenciana. These two regions overcome about 50% of textile activity.

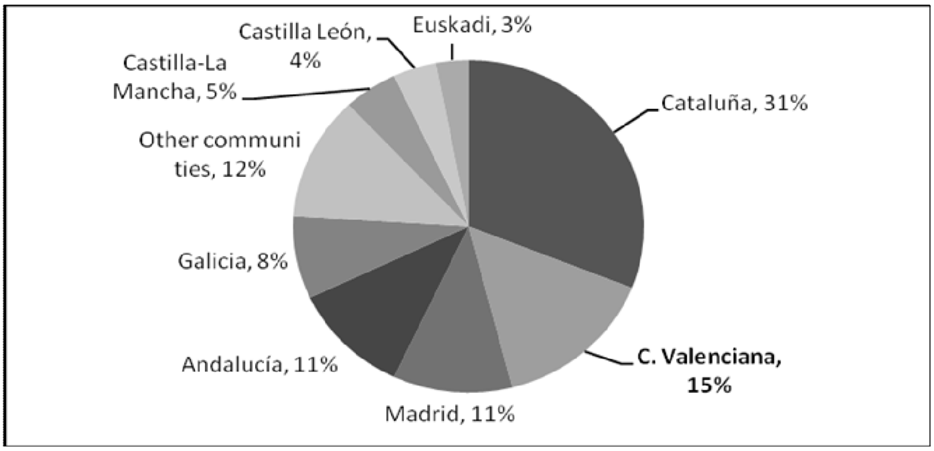

Fig. 1: Distribution of the Spanish textile industry by regions. 2007 data, source National Statistical Institute (INE)

The study will focus on the situation of companies in the Valencian Community.

The textile sector at Valencian community takes, at present, as a principal market the technical textiles. There exist more of 1700 companies that employ to 32000 employeeds.

2. STRATEGIC OPTIONS FOR CHANGE. DIVERSIFICATION.

There are two types of alternatives for strategic change that can help to improve the situation of the companies described:

- External actions: training support, economic measures and / or political support to the textile sector, Research Support, creation of structures for knowledge transfer, etc.

- Internal actions: Developing a strategy for change. This strategy can be based on relocating their operations to reduce costs in labour, use of brand, own channels for distribution, diversification into higher value-added, etc.

This article focuses on diversification and potential for growth.

The incorporation of different activities from the already existing ones in the company, it is considered to be necessary for getting dynamic companies and with future. [6]

We can suggest that the motive for which the companies diversify, it is the search of synergies or a search of the global risk of the company.

To portray alternative corporate growth strategies, Igor Ansoff presented a matrix. It stablished different ways to diversificate. On one side there is the market, wich can be an existing one or a new market. On the other side, referring to the products the company can work with the ones previously existing or with new products. [7]

		PRODUCTS	
		EXISTING PRODUCTS	**NEW PRODUCTS**
MARKETS	**EXISTING MARKETS**	Market penetration	Product development
	NEW MARKETS	Market development	Diversification

Fig. 2: Ansoff Matrix

3. DIVERSIFICATION TOWARDS THE SECTOR OF THE TECHNICAL TEXTILES. STUDY DESIGN.

Textile sector is a representative example of a traditional manufacturing one in crisis as the adaptation to the changes introduced by the internationalization of markets and technological change has been difficult.

Taking advantage about the know how of the companies in the textile sector at the Valencian Community, diversdificación can be directed towards the sector of the technical textiles or products with more technology. Moreore, considering the own technology of the company, companies can try to enter on new markets (Markets of the textiles of technical use) with new products (textiles of technical use).

It is appropriate for a company to explore its technological potential in other sectors, to analyze new application in other areas presenting a profit possibility. An analysis of combination of new technologies, which have already been proven and offer an important innovation, could be interesting.

Funded by IMPIVA (II Plan of Competitiveness of the Valencian Company) ERDF: European Regional Development Fund, and in collaboration with the UPV GIITEX GROUP (Integrated Management Group Textile Industry Technical University of Valencia), and Association of Textile Businessmen of the Valencian Community (ATEVAL) has developed the project "DIVERSIFICATEX".

The ain of this study is to know the technological capacities of the companies, the perception that they have on the necessity to diversify and which think that they are the barriers of to enter on new markets.

The population of the study is composed by the Valencian Companies, manufacturing firms in the textile-apparel sector. In this project more than 100 textile companies have been asked.

4. RESULTS AND DISCUSSION

Majority of the companies indicated the difficulty of thinking about new opportunities in business, for two fundamental motives: ignorance about the new markets and barrier existence of income in some of them. [8]

A wide number of companies that answered the survey were companies of middle size. In figure 3 can there turns the classification of the companies consulted depending on his size can be observed. There can be verified that the companies of less than 10 workers represent only 19 % of the answers.

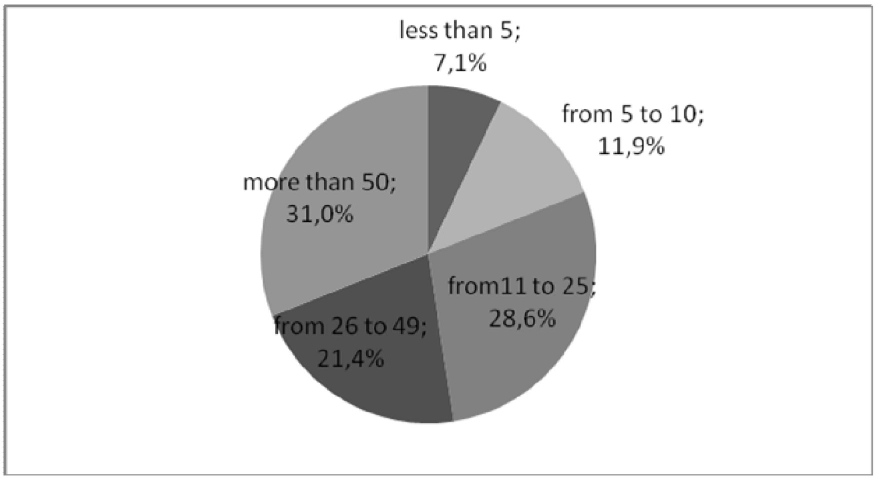

Fig. 3: classification of the companies consulted depending on his size

The first result of the survey indicates clearly that the companies know and consider the diversification to be important towards the technical textiles.

90 % of the polled companies think that the diversification is an indispensable element to support the competitiveness of the business.

The companies consider the causes that difficult them insert their products in technical textiles sector, are as principal factor the ignorance of the new markets, problems of commercialization, and secondly, technical aspects. (figure 4)

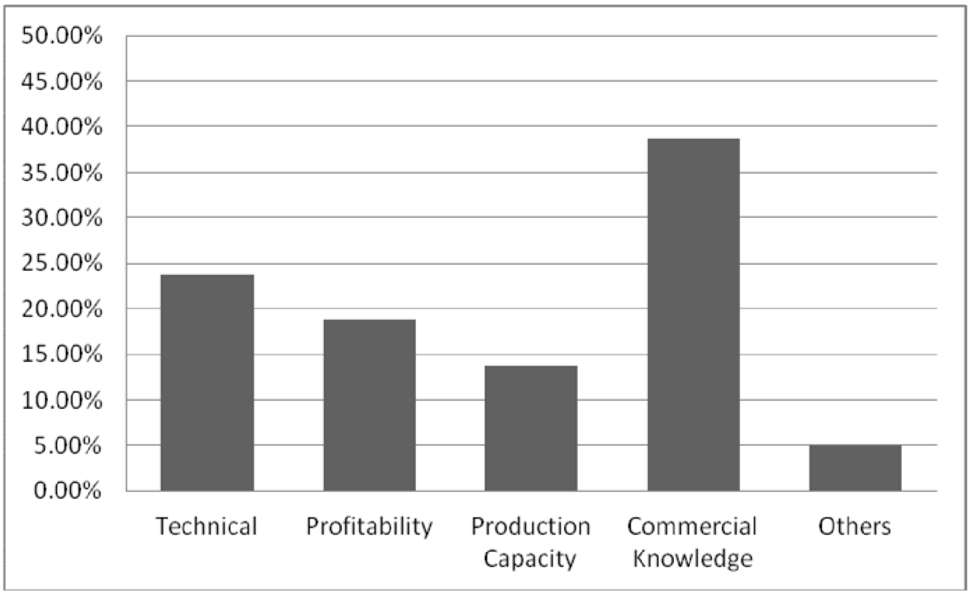

Figure 4: Principal barriers of entry

One of the aspects to consider in order to approach to diversification successfully is the know how of the companies. It is important for the transition towards new markets the utilization of the existing technologies in the company. Furthemore it is important to know, the capacities of the companies that compose the industrial district, with the purpose of take advantage ofit. There are studies about which are the most representative technologies of the district. The technological capacities of the companies of the Valencian Community detailed belw in the figure 5.

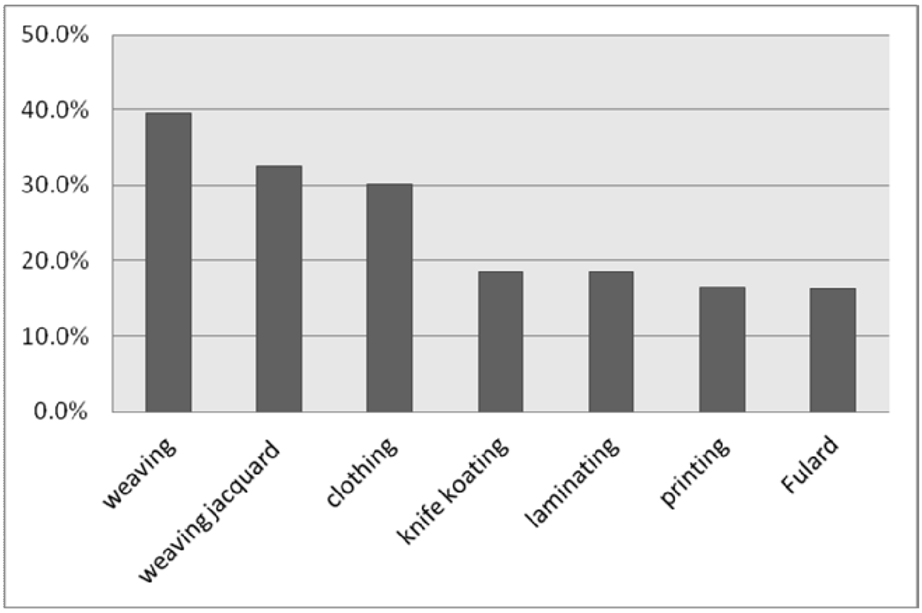

Fig. 5: Most representative technologies in textile Valencian companies

There are analyzed parallel the productive possibilities that offer the technological existing capacities in the industrial district. In this way, as on example, it will be mentioned the technological possibilities of the weaving. At present home textiles are made by weaving such as curtains, upholstery, etc., They can be easily moved towards the manufacture of fabrics for automotion, agriculture, etc. complementing itself with other technologies.

5. CONCLUSIONS AND RECOMMENDATIONS

The main objective of this work was been to study the impact of globalization on operational decisions and particularly to understand the possibilities of the companies before the same one.

This allowed us to draw recommendations about operational decisions for specialization and diversification in a traditional manufacturing textile industry in a country, Spain, in an specific region, Valencia, where this type of manufacturing has had great importance from the economic, social and political point of view.

The work realized with the cooperation of companies, allowed us to confirm aspects that the bibliography indicates, concretely for the companies of the region of Valencia.

This, we can state:

Before the globalization, one of the possibilities of the textile Valencian companies is the diversification.

The majority textile companies do not know the possibilities that offer them the new markets. They found barriers of entry that the companies consider cannot overcome.

The companies need tools that allow them to think about which are his possibilities. Tools for the strategic reflection, that allow them to analyse his technology and know how in order to make and to commercialize new products.

This work propitiates, as future line of work, the development of tools to favor the process of DIVERSIFICATION.

6. ACKNOWLEDGEMENT

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