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CONTENTS

29	**FISCAL FRAUD IN TEXTILE AND CLOTHING IMPORTS**	**STANCIU Dorică**	University of Oradea, Faculty of Economics, Economic Department, Street. Călimăneştilor Nr.8, 410109 Oradea, Bihor, Romania	**151**

ANNALS OF THE UNIVERSITY OF ORADEA
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RESEARCH OF THE TYPES OF POSTURES OF THE WOMAN FIGURE FOR THE PURPOSE OF DEVELOPING HIGH QUALITY GARMENTS

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Abstract: *The high interchangeability of produced garments and the increased requirements towards the quality of production is conditioned by the growing individualization of orders, this is why it is important to perform systematically anthropometric researches of the modern female population for the purpose of revealing the peculiarities of constitution of the figures of this consumer group.*
During the researches, the existing classifications and data on the postures and types of body constitution of women were studied. The point of departure was the healthy human vertebral column and the position of human body in normal posture. The aspects of possible deviations from the normal body posture were studied. Taking into consideration the fact that various age groups were examined in the paper, various age-related modifications of the vertebral column and, thus, of the human posture were studied.
To attain the established goal, anthropometric researches were performed on women of various age groups. The studied women were taken photos; using the photos, the figure contours were obtained, and the types of body constitutions and postures were studied according to the methods described in the special literature. The obtained data were analyzed and presented in graphic form for a more precise visualization of the results and for a more exact interpretation of those results. The result of the performed researches was the classification of postural defects, revealed in the frontal and sagittal planes, taking into consideration the eventual peculiarities of the individual figure of any age. This classification is meant to facilitate the work of the designers at the stage of projecting or when making corrections in the design of garments.

Key words: *anthropometric researches, classification of postural defects.*

1. INTRODUCTION

The modern garment industry is generally oriented to the young and middle age consumers, the basic mass of produced garments is meant to satisfy the preferences and expectances namely of these age categories, almost not paying attention to the garments for the elder age group. Namely the targeted projecting will lead to the increase of quality of garments for consumers of different age categories, and also for women with different body constitutions and postures. As of today, when mainly the typical approach is used in the projecting of garments, the young women having a body constitution and posture not characteristic to their age group have to wear garments not satisfying their esthetic preferences [1], the research performed in this paper is meant to help solving the above mentioned problems.

The development of classification of the frequently revealed postural defects would facilitate the process of creating designs for the figures with deviations from the conventional typical ones, and the anthropometric data on the age-relating modifications of posture will favor the increase of quality of designs, fits and production as a whole.

2. GENERAL INFORMATION

The main morphological indices laying at the basis of the determination of external human body form include: total or general measures, proportions, body constitution and body posture. Any

morphological body index is subject to changeability. The form, degree of manifestation and direction of changeability is different depending on the index, and is determined by the impact of such factors as the age, sex, social environment, peculiarities of the biochemical livelihood of the organism [2].

During the design of new fashions, the designers use to be oriented to three main types of figure: ideal, typical and individual. The ideal figure is the contour and image of the figure which, under the influence of various masterpieces, style, fashion and peculiarities of life is principal and serve as an etalon. The typical figure represents the statistically average figure, determined by the corresponding standards and measure typology of a specific country. The individual figure represents the real figure of the consumer, characterized by form and measures deviating more or less from the typical ones, and has various deviations in the posture, proportions and peculiarities of body constitution [3].

The posture, like other morphological indices, determines in at a great extent the peculiarities of the external human body form. This is why the posture is long ago the object of special attention both of the anthropologists and physicians and of the specialists of the garments industry [4].

The modern science examines the posture as one of the main characteristics of the equilibrate vertical position of the human body in calm and upright position [5].

When characterizing the type of posture, special attention is paid to the curvature of the vertebral column. In the classification proposed by the Polish researcher N. Voljanski, the curvature of the vertebral column is subdivided into three complexes, each of the includes three types. According to the performed researches, the classification proposed by N. Voljanski may be used both for the characteristic of children's posture and adults' posture. The complex of equilibrated postures is found commonly often in all the age categories, it is also accepted to consider that the lordotic postures are more characteristic to younger women and children, and the kyphotic ones – for older women.

The upright position is mainly characterized by the position of the pelvis, which correctly is in neutral position. At that the natural lumbar lordosis is kept, the shoulders are not protracted or retracted, and are not elevated. Knees are minimally bent, the body weight is uniformly distributed to the front and back part of the foot, and the head is in a balanced position (figure 1).

The upright position

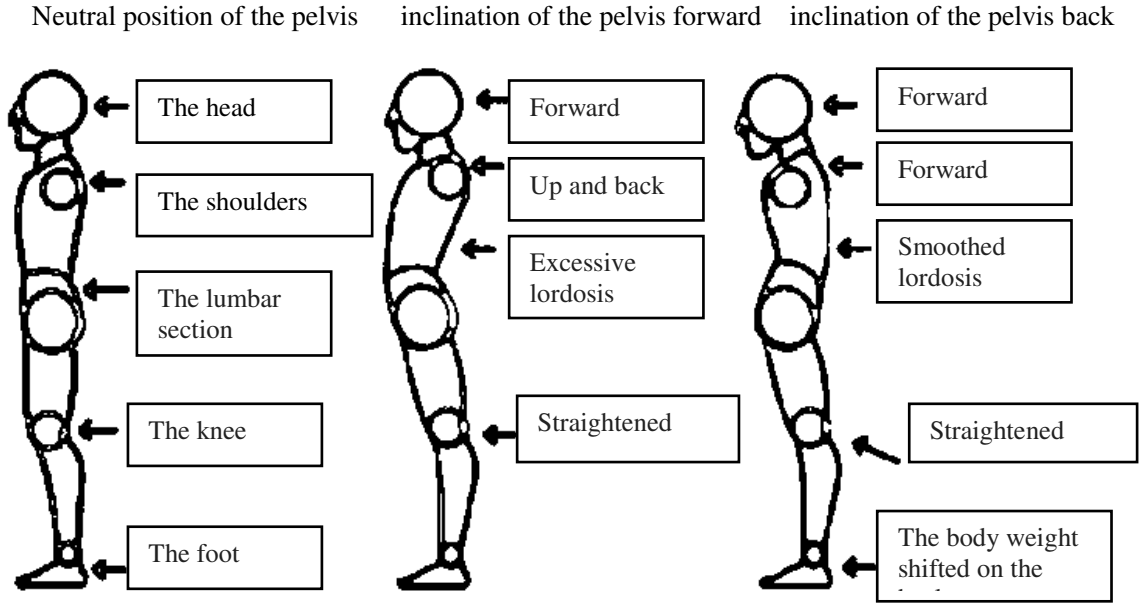

Fig. 1: *Upright body position.*

The position of the gravitation center of the figure has a great impact during the determination of the type of posture. When we look at a normal, equilibrated body, we can see that its gravitation center passes through the midst of the ear, shoulder, pelvis, knee and ankle-bone. It is in this position when the vertebral column has minimally possible stress [6].

When the posture changes, the gravitation center also displaces, increasing the stress on certain sections of the vertebral column and favoring the onset of its pathologic conditions. There are three types of postural defects [5]:

Type 1 – postural defects in the sagittal plane, manifested by incorrect proportion between the physiological curvatures of the vertebral column;

Type 2 - postural defects in the frontal plane, characterized by a deviation of the vertebral column from the middle line (when looking from behind);

Type 3 – combined defects.

One of the most common postural defects in the sagittal plane is the slouching and round back. Both types of defects are characterized by the increase of the retracted curvature of the vertebral column and decreased inclination of the pelvis forward. The thoracic cage seems to be low in people with round back. The person often has half-bent legs when in upright position, compensating thus the insufficient curvature forward of the vertebral column.

Another widespread postural defect is the „flat back". This defect onsets if the physiological curvatures in the pectoral section of the vertebral column. In case of a flat back, the pelvis has a very poor inclination forward, the physiological curvature backwards in the pectoral section of the vertebral column is missing or very mild.

Another type of postural defect in the sagittal plane is related to the increase of the curvature of the vertebral column in the lumbar section and is called lordosis or lordotic posture. In this postural defect the pelvis inclination forward is increased. The lordotic pasture is, as a rule, accompanied by changes in form and increase of the belly dimension.

The postural deviations may be combined; in such case we speak about combined defects, for example, in case of a round or flat back, the increase of the lumbar curvature o the vertebral column may be observed, this is called round-concave or flat-concave back.

3. EXPERIMENTAL RESEARCHES

A series of anthropometric measurements were performed on a sample of women from five age categories: from 18 to 24 years; from 25 to 34 years; from 35 to 44 years; from 45 to 54 years and from 55 to 80 years. The total number of examined – 50 women, 10 women in each examined group. Thus, during the study of all the age groups, it is possible to take a conclusion on the prevalence of certain peculiarities of posture and body constitution in certain period of women's life, and also to examine variants of correction of the typical designs of the garments, taking into consideration the revealed deviations.

Photos were taken of the examined women in frontal and sagittal planes. On the basis of the photos, the contours of the figures were marked, which were studied according to the method of Voljanski N. (table 1, figure 2).

Table 1: *Study of postures of women's figures of all age categories according to the method of Voljanski N*

Indicator	**K**			**∑K**	**R**			**∑R**	**L**			**∑L**	**Combined types**	**∑**
Group	**K1**	**K2**	**K3**		**R1**	**R2**	**R3**		**L1**	**L2**	**L3**			
18-24	-	-	-	-	8	-	-	8	1	-	1	2	K1R1-2; K2L3-1; K3L1-1	5
25-34	3	2	-	5	2	3	-	5	-	-	-	0	-	0
35-44	3	2	-	5	-	1	-	1	3	-	1	4	R1L1-1; R2L2-1	2
45-54	2	-	1	3	1	1	1	3	4	-	-	4	R1L1-1	1
55-80	3	1	2	6	1	-	-	1	-	-	3	3	K1L3-2; K2L3-1	3

4. CONCLUSIONS

Analyzing the obtained data, it is possible to affirm that in the youngest age group, the figures with normal posture are prevalent – 80%, but it is in this group were most cases of combined types of

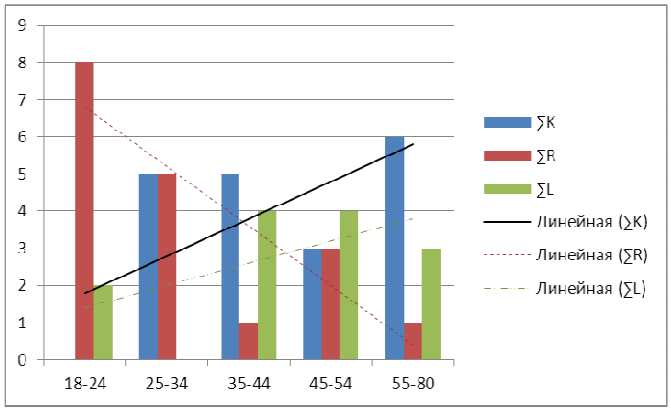

Fig. 2: *Distribution of the studied women by types of posture, according to Voljanski N.*

posture is revealed, namely the combination between the normal and kyphotic postures, lordotic and kyphotic postures. Ain all the studies figures, the kyphotic modification of the vertebral column is situated in the neck section of the vertebral column. This modification, and also the number of studied women having this modification in this studied group, may be explained by the habit of using mobile devices frequently and long-time. In medicine, such modification has at present the name of „text neck syndrome", earlier such modifications were found in the representatives of certain professions related to the long-time staying in a certain position when the neck is inclined forward, and was not so widespread. In the case of the performed study, 50% of the studied women have this syndrome.

In the age group of women from 25 years to 34 years, the figures with kyphotic position of the vertebral column are prevalent; they represent 50% of the total number of studied people. The other 50% have normal posture. No combined types of postures were revealed in this age category.

In the group from 35 to 44 years, 50% of the studied women have kyphotic postures, 10 % have normal postures and 40 % have lordotic postures. Two figures hav combined types of posture, with lordotic curvatures in the lumbar section of the vertebral column.

The women from the age category from 45 to 54 years have approximately equal distribution of posture types: 30% kyphotic, 30% normal and 40% lordotic postures. One representative of the group has a combined type: normal-lordotic posture with lordotic modification in the area of the lumbar section of the vertebral column.

In the eldest age group, there is an evident prevalence of the kyphotic types of postures – 60% of the total number of studied women, 10% normal and 30% lordotic postures. In this group, there are three people with combined type of posture: kyphotic-lordotic curvatures of the vertebral column, kyphotic curvature in the neck and pectoral sections of the vertebral column and lordotic curvature in the lumbar section. The prevalence of kyphotic postures in this category is conditioned by the age-related changes in the organism of the women.

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ANALYSIS OF PILLING PERFORMANCE OF DIFFERENT FABRIC STRUCTURES WITH RESPECT TO YARN COUNT AND PICK DENSITY

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Abstract: *Fabric of three basic weave structure such as plain, twill, satin and their derivative matt and diamond consisted of 100% cotton fibre composition were tested with different picks per inch of 42, 52, 66 and different yarn count of Ne 20/1, Ne 30/1 and Ne 40/1 to determine their surface pilling performance. The investigation developed a way so that it can be visualized or can forecast the resulting fabric specification with required configuration. The research emphasized on the adjustable points mainly controlled physical parameters on which fabric pilling performance directly or indirectly depends. The pilling were evaluated according to the standard ISO 12945-2 and up to 2000 multi-directional rubbing cycle. From the visual assessment it can be approached that fabric pill formation decreases with the increase of picks per inch and same number of ends. Higher yarn count causes compact fabric structure resulting less fibre migration and surface pilling. At different ranges of yarn count and pick density the variation of finished fabric pilling performance with different weave structure is different. Open structure consist of long float length facilitates high degree of pilling and vice versa. From a constant, grade of pilling can be obtained for a particular fabric type, structure and yarn countcount.*

Key words: *Pilling, Fabric composition, Yarn count, Pick density, Weave structure.*

1. INTRODUCTION

The range of usage of woven fabrics is quite varied. In general any woven fabric has a smooth surface, thickness, tensile strength and flexibility [1]. Mechanical characteristics are very important within fabric characteristics. The mechanical characteristics of fabrics generally affect fiber, yarn and fabric characteristics and the finishing process [2].

Pilling is a fabric defect which is observed as small fiber balls or group consisting of intervened fibers that have been attached to the fabric surface by one or more fibers [3]. Pilling in general, is a self-limiting process which emerges at three consumptive different stages. Formation of surface fuzz, entanglement, and transformation into pills. Subsequently, pills are broken off the fabric surface when by excessive frictions, the anchor fibers are broken [4]. The pills are formed during wear and washing, which means that fabrics are affected by friction forces during usage. Friction forces results in the abrasion and pilling of fabric. Consequently there are some relationships between abrasion resistance and pilling .The construction of the fabric is also important in determining its susceptibility to pilling. A very tight, compact construction, such as denim, usually pills very little. However, a loosely knitted or woven fabric will show more pilling with both wear and cleaning. Pills do not interfere with the functionality of the textile, unless a spot with a lot of pills turns into a hole in the fabric. This is because both pills and holes are caused by the fabric wearing [5].

Many textile scientists have studied the factors that generally affect pilling performance [6-9]. Pilling attitude is prejudiced by not only the structure of the yarn and fabric but also by the fiber properties, e.g. tensile strength, percent elongation, flex abrasion, bending rigidity, fiber titer, shape of fiber cross-section and friction [10]. A mathematical model was established to evaluate fiber–fiber

friction and that gave an indication of the pilling properties of man-made cellulosic knitted fabrics [11]. In another work, fabric pilling was evaluated with light-projected image analysis. It was found that the method could eliminate interference with pilling information from the fabric color and pattern [12]. Different pilling testers may give different pilling results for the same fabric, and it has different sensitivities for various yarn fibre and fabric parameters [13].

2. MATERIAL AND METHOD

The objects of investigations were woven fabrics of five different weave structures which main characteristics are presented in Table 1.

Table 1: *Test Material Specification*

Fabric Type	EPI	PPI	Warp Count	Weft Count
100 % Cotton	80	42, 52, 66	Ne 30/1	Ne 20/1, 30/1, 40/1
70% Polyester 30% Cotton		56		Ne 40/1
100% Polyester		56		75D

The fabric went through enzymatic desizing. Chemicals used for desizing were Hostapal Xtra Liquid conc, Sirrix Antox CN liquid, Cytosol PHC liquid and acetic acid. The liquor PH was 5-5.5 at 90°C temperature for 30 minutes. Soaping was done to the desized fabric for 10 minutes at 90°C temperature. 1gm/liter of Hostapal Xtra liquid conc. was used.
GSM cutter (SDL International, England) was used to cut the fabric specimen and electronic precision balance (AND Company Ltd., England) was used to weight the test samples.
Wet and Dry Bulb Hygrometer (ZEAL, England) was used to determine the atmospheric condition of the testing room. During pilling test in testing lab the temperature was 24°C and corresponding relative humidity was 68%.

Pilling test was done by Martindale Pilling Tester (SDL International, England). Method used for the experiment was ISO 12945-2 [14]. Specimen Size was 140 mm and Sample Size was 90 mm. Weight of Specimen: 423+/-7 gm. (For Woven). The samples were subjected to multi-directional rubbing for 125, 500 and 2000 cycles. After each completed cycle the samples were brought under sufficient light and compared to standard photographs and grading was done. The grading system for visual pilling assessment authorized by ISO is given in Table 2.

Table 2: *Grading of Pilling*

Grade	Description
5	No change
4	Slightly surface fuzzing and some pills formed
3	Moderate surface fuzzing and moderate pilling
2	Distinct surface fuzzing and distinct pilling
1	Dense surface fuzzing and severe pilling

3. RESULT AND DISCUSSION

During testing, the experimental data for five weave structures were observed and shown on the Table 3-7.

Table 3: *Pilling rating for 1/1 Plain structure*

Sample no.	Weft Count	Picks per inch	Pilling rating at 125 cycles	Pilling rating at 500 cycles	Pilling rating at 2000 cycles
01	Ne 20/1	42	4-5	4	3
02	Ne 20/1	52	4-5	4	3-4
03	Ne 30/1	42	4-5	4	3
04	Ne 30/1	52	4-5	4	3
05	Ne 40/1	42	4-5	3-4	2
06	Ne 40/1	52	4-5	4	2-3
07	Ne 40/1	66	4	3	3
08	Ne 40/1	52	4-5	4	2-3
09	Ne 40/1	66	4	3	3

Table 4: *Pilling rating for 2/2 Matt structure*

Sample no	Weft Count	PPI	Pilling rating at 125 cycles	Pilling rating at 500 cycles	Pilling rating at 2000 cycles
1	Ne 20/1	42	4	3-4	2-3
2	Ne 20/1	52	4-5	3-4	2-3
3	Ne 20/1	66	4-5	3-4	2-3
4	Ne 30/1	42	3-4	2-3	1-2
5	Ne 30/1	52	3-4	3	2
6	Ne 30/1	66	3-4	2	2
7	Ne 40/1	42	3-4	2-3	1
8	Ne 40/1	52	4	3-4	1-2
9	Ne 40/1	66	4-5	4	2

Table 5: *Pilling rating for 3/1 Twill structure*

Sample no	Weft Count	PPI	Pilling Rating at 125cycles	Pilling Rating at 500 cycles	Pilling Rating at 2000 cycles
1	Ne 20/1	42	5	5	3
2	Ne 20/1	52	5	4	3
3	Ne 20/1	66	5	4-5	3-4
4	Ne 30/1	42	4-5	4	2-3
5	Ne 30/1	52	4-5	3-4	3
6	Ne 30/1	66	4	3-4	3
7	Ne 40/1	42	4-5	3-4	2
8	Ne 40/1	52	4-5	3-4	2-3
9	Ne 40/1	66	4-5	4	2-3

Table 6: *Pilling rating for 2/2 Diamond structure*

Sample no	Weft Count	PPI	Pilling rating at 125 cycles	Pilling rating at 500 cycles	Pilling rating at 2000 cycles
1	Ne 20/1	42	5	4-5	3
2	Ne 20/1	52	5	4-5	3-4
3	Ne 20/1	66	4-5	4	3-4
4	Ne 30/1	42	4-5	3-4	2-3
5	Ne 30/1	52	4	3-4	3
6	Ne 30/1	66	4	3-4	3
7	Ne 40/1	42	4-5	3-4	2-3
8	Ne 40/1	52	4-5	4	3
9	Ne 40/1	66	4-5	4	3

Table 7: *Pilling rating for 8-ends Satin structure*

Sample no	Weft Count	PPI	Pilling rating at 125 cycles	Pilling rating at 500 cycles	Pilling rating at 2000 cycles
1	Ne 20/1	42	3-4	2-3	2
2	Ne 20/1	52	3-4	2-3	1-2
3	Ne 20/1	66	3-4	2-3	1-2
4	Ne 30/1	42	3-4	2	1-2
5	Ne 30/1	52	3-4	2-3	1-2
6	Ne 30/1	66	3-4	2	1-2
7	Ne 40/1	42	3-4	2	1
8	Ne 40/1	52	3-4	2	1
9	Ne 40/1	66	3-4	2	1

3.1. Effect of yarn count on pilling

From graph 1 it is seen that pilling rating decreases for finer count in all cases. The reason behind that fabrics made with finer yarn i.e. Ne 40/1 are less compact than the coarser yarn i.e. Ne 20/1 even though same structure. If the fabric is made with finer yarn the GSM and compactness will be less. As a result there is more chance of migration of loose fiber on the fabric surface which is responsible for the increase of pilling. For this reason pilling rating of a plain fabric consist of Ne 20/1 weft yarn is 3 which is better than plain fabric consists of Ne 40/1 which pilling rating is 2. This is true for all the structures.

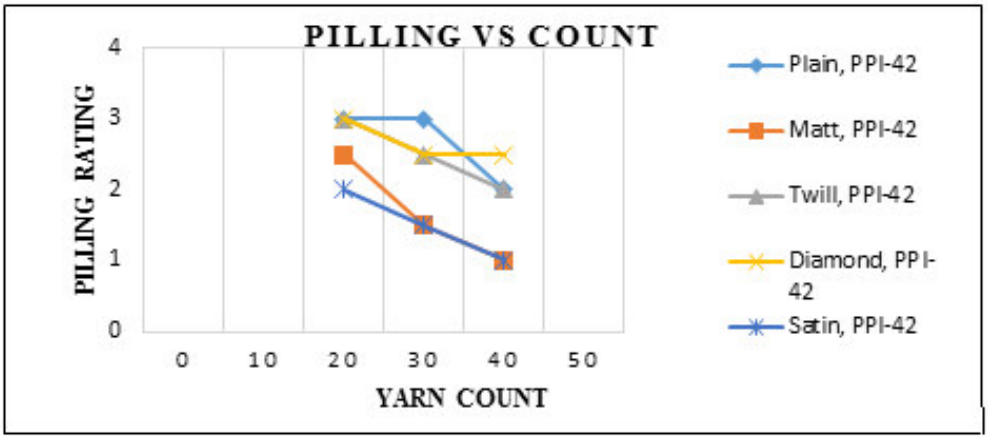

Fig 1: *Effect of yarn count on pilling*

3.2. Effect of pick density on pilling

From the graph 2 it is seen that pilling performance improve in case of higher pick density. The reason is that higher number of picks per inch causes tight and compact structure of fabrics and thus pilling performance is improved. Due to this reason for 42 ppi pilling rate is lower than the fabric having 52 and 66 ppi. It can be seen in all the fabric structures those have been tested.

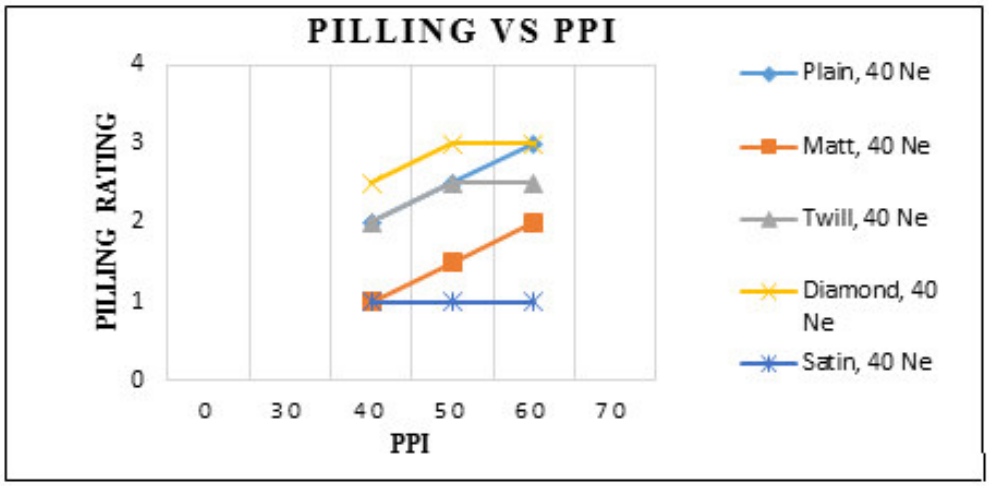

Fig 2: *Effect of pick density on pilling*

3.3. Effect of fabric structure on pilling

The movement of fibers at the fabric surface is influenced by the binding structure. The open structure, long float length facilitates fiber migration to the surface during wearing. In graph 3, plain weave has compact structure and having small float length so plain structure has lower pilling tendency i.e. pilling rating is 3. On the other hand satin has loose structure and long float length as a result pilling tendency is higher i.e. pilling rating is 1. Twill and matt have less compactness than plain fabric but more than satin. So both of them are showing higher resistance to pilling than satin.

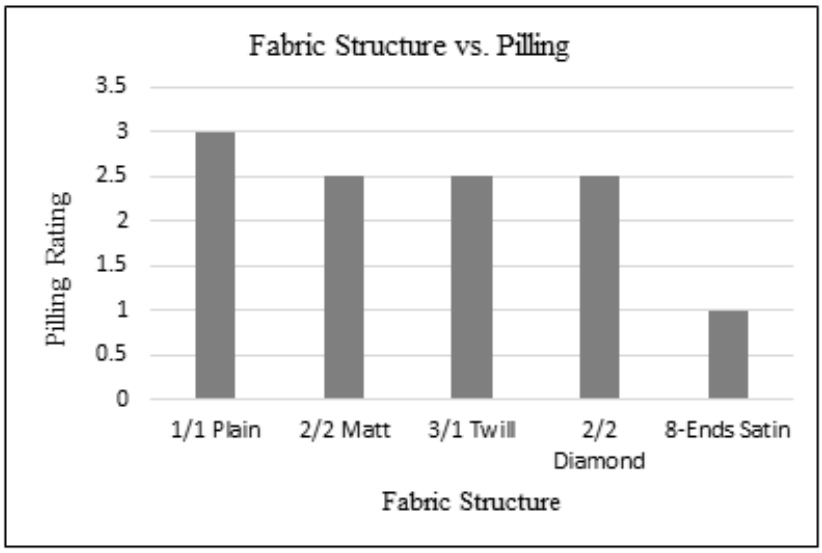

Fig 3: *Effect of fabric structure on pilling*

4. CONCLUSIONS

In this paper, woven fabric of five different weave structure with variable weaving parameters were investigated. According to the result obtained, surface pilling of woven fabrics are indeed dependent on pick density and yarn count incorporated with the fiber type and weave structure. In case of finer yarn count, due to the loose cover factor of fabric surface, pill tends to form more rapidly than that of coarser yarn count. Similarly if pick density is high then fabric structure become tighter and loose fibre migration become difficult resulting low pilling tendency.

Weave structures also plays major role in fabric pilling. Compact woven fabric like plain with short yarn floating is resistent to pilling than satin and twill fabric which due to their open structure facilitate yarn to come out and increase pilling. In case of fiber type, fabrics made of synthetic fiber is more prone to severe pilling but it needs longer wear and abrassion to visualize this properties.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

TO SEW OR NOT TO SEW. SEAMLESS CLOTHES AND SEAMLESS APPEARANCE IN FASHION DESIGN

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Abstract: *At first glance clothes are obviously made by cutting and sewing. The textile fabric is cut in different shapes and reassembled by sewing in the wanted shape and volume. Sometimes the structures can be quite complex. The truth is that there are more ways of making clothes, as we can see looking back into the history of fashion. The progress of technology in textile industry offers also very interesting directions that we could not dream about some time ago. Observing carefully the economy of seams, their presence, absence or the suitable number can move us towards creative solutions that are relevant not only for the esthetic of a garment but also for the process of making clothes suggesting alternatives for the present situation and its important problems like sustainability.*
This paper is a survey of alternative ways in making clothes and highlights the relation between concept and practical issues. The starting point is seamless clothing and the natural fascination of the subject. Going further on this line we should consider that the absence of the seams in a garment is not the same with a seamless appearance.
So, do we really need to sew our clothes?

Key words: *seamless, sustainable fashion design, textile techniques, rapid manufactured textiles, transformable clothes, design for disassemble*

1. INTRODUCTION

A Chinese idiom states that “Clothes from heaven are without seam”. This is obvious a way of suggesting perfection, the flaw-less handling of anything. Anyone can understand its meaning, the idea is traveling through time and cultures as it has deep roots in the human mind: “It is well known that smoothness is always an attribute of perfection because its opposite reveals a technical and typically human operation of assembling: Christ's robe was seamless, just as the airships of science-fiction are made of unbroken metal” [1] sais Roland Barthes in the XX- century. But what happens when it is taken literally? Is “seamless” a way to perfection in clothing too?

On the one hand, the desire to make the fabric follow the shape of the body varies across times and cultures. From the draped garments of the antique world to the rigid corsets in the 16 the century the story of the changing ideal human beauty and the practical needs developed a great variety of solutions in getting dressed and some of them need no sewing. On the other hand there are more ways to make structured garments without cutting and sewing than we could think.

2. UNSTRUCTURED CLOTHES. NO CUT, NO SEW. HOW TO CUT, HOW TO SEW

The unstructured garments of the Antiquity can be easy to build as they are wrapped, pinned or tied in place. In Europe the structured garment developed from the end of the Middle Ages on. Its increasing complexity in the construction, requesting a lot of cutting and sewing made the tailor s job and can be traced in the prestige of the fashion designer of our time.

To consider complex clothing simply better than unstructured clothing is just a way of thinking. Comparing different cultures can highlight different ways of seeing things. In oriental cultures a taste for unstructured and transformable clothing can be observed, considering the pareo, sari and kimono and other forms in which a piece of cloth becomes a garment in no time. The cult for wrapping and binding in China and Japan flowed into an art form in traditional culture tracing a different way to perfection. It is interesting that this way of dressing includes the wearer's skill, as in kimono wearing or furoshiki wrapping for example.This skill is trained and reflects the care and attention the wearer puts in the garment or object wrapping. Furoshiki, the Japanese traditional wrapping cloth, actually a square of cloth, is delightfull and multifunctional: a shoulder bag, tote bag, belt bag, or even a hat cap by folding. It is obviously creatively eco-friendly as it was promoted by the Japanese Minister of the Environment in 2006 or by Vivienne Westwood in 2013.

The western structured clothes live less space for intervention. In fact we can observe that to stitch means also to fix, to fix the unstable shape of the textile fabric in a certain configuration. This difference of thinking a garment reflects in fact in very practical issues and we can bring another example: the initial difficulties of selling the Singer sewing machine in Japan as the traditional clothing used loose chain stitches that were easy removed so that the clothing could be taken apart and the assorted pieces laundered separately. [2] The idea of loose versus fix easy can takes us also to the idea of transformable clothing and we could go further seeing the advantages in the implication of the user.

All the topics exposed here (multifunctional and transformable items, loose versus fix, implication of the wearer) are surprisingly current and could be resumed like this: “garment designs that extend the wear life of a garment through versatility, adaptability and meaningfulness.” as it is shown in a 2011 study [3] that reflects upon how, in the context of increasing interest in environmental impact, designers can promote sustainable fashion opportunities by creative design solutions.

The literature reflecting preoccupation for sustainable fashion is quite recent, in an 2013 study a timeline is attempted [4], a line that starts in 1998 with the book *Ecotextiles. Sustainable Development: Proceedings of the Conference Ecotextile ‘98*, of A.R. Horrocks as editor and we could highlight authors like Kate Fletcher, Sandy Black, Alison Gwilt and Timo Rissanen and we could ad Kirisi Niinimaki.

In achieving sustainability in fashion a few themes can be traced through these works and they can be resumed in fact by the principles of environmental design as they been established by the European Commission: use low-impact materials whenever it is possible, focus on resource efficiency, invest in high quality and durability: longer lasting and better functioning products which age aesthetically, reuse, recycle and renew[5] or more specific [6]: reuse waste materials, recycle/up cycle, repair and remodel garments, recreate (e.g. existing design concepts), reduce (use of resources and creation of waste), use ecological materials, use mono, materials, use new technologies, create longer lasting products, design multifunctional clothes, design for delight. The research performed on these themes is very interesting and in more than one case suggests that old solutions can be reconsidered. I would stop upon **multifunctional, transformable clothes, design for disassemble and the Zero Waste concept.**

The closer you stay to the fabric the more possibilities remain open. A sari can be worn in a lot of ways. In this direction could be mentioned also Ximena Valero's OMG garment from 2000, or Magic Wrap Skirts. These garments do not need high technology, but can be changed into various style and types, elasticity of fabric helps in adjusting it to the body. Wearing such a garment chalenges the users creativity favourising a diffrent relation to the object that is much deeper than can be achieved through typical fashion solutions. All this relates naturally with the idea of slow consumption. Different directions can be shown in making transformable clothes: reversible and folded/tying designs; modular designs; smart clothing; and do-it-yourself (DIY) and multi-lives designs. [7]

The first category is closer to our subject and we can quote here: "The Five Ways” research project developed by Kate Fletcher in 2002-2003, or “The Life of a Piece of Cloth” as done by Chen, C., & Lewis in 2006 [8], a project in which they demonstrate multiple lives of a garment: first a form of wrap, then cut and sewn and finally set for recycling or disposal.

The preoccupation for the after life and disposal of a product can lead us to think further. It is easy to recycle garments made form one material but this is not a common case. Another possibility is designing for easy disassemble, but this is more complicated in clothing. A very interesting solution goes on the direction showed by the reversible stitch used in Japanese traditional clothing that we

mentioned earlyer. „wear2™ developed a new seam technology that enabels garments to “fall apart” instantly as seams are made with a material that melts in microwave treatement. [9]

As we can imagine, the idea of zero-waste fashion is not new, it was just given a new name and developed some literature and projects around. In our grandmother's life, garments were made with a sense of economy, as in traditional clothing everywhere. The research performed on this subject showed there are several directions that can be developed. Basically, these methods rely on wrapping and tying or on creative pattern cutting. In the last case the idea is to consider not only the shapes used in constructing the garment but also the remaining ones in order to use the whole piece of fabric using a jigsaw like strategy. Using simple geometric shapes is obviously the easier solution. [10]

Design researchers preoccupied by the subject include Timo Rissanen and Holly McQuillan [11] who initiated *The Cutting Circle*, a global collective of creative pattern cutters. Julian Roberts is one of them and he is promoting a very interesting approach: “Substraction cutting”: The resulting shape is created by the removal of the fabric, rather than the addition of fabric. This removal creates empty space for the body to occupy but also effects how the fabric drapes around the body. [12] David Telfer is another designer preoccupied by the concept of zero waist design and DYO methods. He worked since 2008 upon a technique (Minimal Seam Construction) that relies on reducing the number of seams used to construct a garment and by this the manufacturing process is also shortened. [13]

3. SEAMLESS APPEARANCE IN CLOTHING.

Still, as we already stated, the absence of the seams is not the same with a seamless appearance in fashion. The shapes obtained by draping and wrapping are limited, it gets more complicated when we want to get closer to the shape of the body or the shape we want to achieve is not material driven.

To make a perfect gown, one that looks like it directly sprung out of its creator's mind or grown out like a flower from a seed reflecting the wisdom of nature, was as a matter of fact a temptation for many designers even if the history of fashion shows that the success does not depend on the number, presence or absence of the seams or on their visibility.

For Fall 2014 Couture Lagerfeld played with the idea to create "sans couture" demonstrating how the flawless appearance can be achieved by virtuosity. And history of fashion is full of dissimulating tricks. Knowing all of them one can get really close to the ideal image. The construction lines can be reduced in number by using the bias for example or can be placed strategically. And then, embroidery techniques, thinking that embroidery means working on the surface of the fabric, can do a lot in hiding the seams or on the contrary integrating them in the final image as graphic elements: “Those seams were often turned into points of emphasis, breaking into rivulets of fullness in back of sequin spackled day suits, or delineated by bands of golden braid on sculpted neoprene dresses. Others were beaded with microscopic cubes of concrete, smothered in ostrich feathers, or blanketed with billions of paillettes”[14] or: “The method he used requires four hours of handwork to cover a length of two inches, but the effect of flat, random stitches on pastel wool bouclé dresses and jackets was successful enough to make the seams appear magically erased.” [15]

The growing interest in seamless appearance and seamless clothes can be related to the technological development. “The success and excitement generated by the moon landing in 1969 inspired an enthusiasm for all things futuristic including the aesthetics of fashion and the performance of textiles.(...). Several contemporary designers have exaggerated seamless attributes, resulting in an overall aesthetic with a futuristic „otherworldly” quality.” [16] Such designers would be for example Cristobal Balenciaga (1967 silk gazer) who is known for the minimalistic, smooth constructions. Paco Rabane's 1966 *12 Unwerable Dresses in Contemporary Materials* collection shows a clear disregard for conventional seams along with the use of unconventional materials. His approach reveals alternative solutions in fastening the material in a desired shape.

The space suit, the completely sealed garment is first of all a technical performance. This is another reason for seamless appearance's gaining in popularity, especially in the development of performance apparel and along with new textile materials. Sportswear can substantially improve performance as the controversies on the subject shows. And of course if we talk about the real performance we should also consider the success of appearance that suggests performance that extended in clothing with other destination.

4. NO CUT NO SEW. ALTERNATIVES.

The truth is that the progress in textile offers more real possibilities in making seamless clothing that have, beyond the aesthetic aspect and performance, the advantage of economy in material and manufacturing time. Starting from the basic textile techniques, some traditional, some unconventional: braiding, basket weave, crochet, felt, knit, knot, lace/embroidery, mould, nonwoven, spun bound, paper/origami, plastic/rubber, latex, PVA(use of an intermediate medium), wrap, spray, thermo set, weave, material (formation of materials, material science, etc) we can find very interesting results. [17]

Braiding, basket weave, crochet, knit, knot and lately weave are techniques that basically allow the control of the evolution of each yarn in the structure and by this can be used in seamless complex structures. The development of digitally controlled looms led to amazing results as those performed by Japanese designer Issey Miyake.

Known for his innovation in fashion, Issey Miyake brought in 1999 to the catwalk a single banner of fabric embedded with 23 dresses connected. This was an unusual event but it illustrates the designers' interest in alternative ways of making clothes (and things). It is about an experiment he began in the mid - 90's and have turned into an independent line in 1999: A-POC (A Piece of Cloth). The process " breaks one of the fundamental laws of fashion physics: cut and sew. (...) Thread goes into the loom, the dress comes out. Specifically, a flattened tube of material emerges that contains the finished shirt, skirt, or pants, which need only to be cut out along the faint outline already woven or knit into the fabric. Moreover, the material can be snipped anywhere without unraveling, a feature that allows for complete customization. [18] Not merely technology innovation, this goes back to traditional Japanese clothing, the maximal use of the fabric and again the implication of the wearer. The minimal appearance of the 23 dresses from 1999, if not intended, can be improved; experiments with the thickness of the thread, the density of the weave, the shape of the garment, elasticity were already.

Other techniques can offer amazing results in seamless clothing. Working with fibers, in felting, the shape can be given directly like modeling in clay as we can see in the felted cashmere products promoted by the Chinese brand Shang Xia [19]. They go as far as even the buttons are made of the same material.

Starting with the fiber we can also mention the spray method. This is an older idea that can be traced back in 1981, [24] but was developed later by Manel Torres. The method „involves the creation of a liquid suspension which is then sprayed by use of either a spray gun or an aerosol can. The fabric is formed by the cross-linking of fibers which adhere to create an instant non-woven. [20]

Molding and modeling the fabric takes new perspectives in fashion design with the new synthetic materials which can be thermo set for example. Still, unexpected solutions popped up considering unconventional materials. We can quote here the experiments of Gary Cass and Donna Franklin through *SymbioticA*. [21] In 2007 they conceived a system for cultivating the *Acetobacter* in wine and obtained sheets of fermented fabric. The idea of bacteria producing fabric was also approached by Suzanne Lee. She is able to 'grow' a material that can also be molded in seamless structures. [22]

Growing dresses is an interesting concept in relation with seamless idea regarding the flawless quality not only of the shape but also of the process. The idea that we could find a direct way to the final object is of course appealing. A way of doing this would be rapid manufacture.

It seems that RM textiles were invented by Jiri Evenhuis back in 1999. The structures that he and his partner developed are realized using a usual layered prototyping method and actually are quite far from the filamentous common textile structures. Exactly the constructive characteristics of the structure opens possibilities of assembling different from the usual cutting-sewing method and so it offers possibilities in seamless clothing like in Paco Rabane's unconventional material dresses. "It talks about technology and convergence, and more importantly the idea that we are moving from an era of assembling 3D structures from 2D components, and into direct 3D manufacturing." [23]

Designers like Iris van Herpen were interested in working with this technology (2010- *Crystallization* at Amsterdam Fashion). The delicate construction illustrates the technique being explored in Haute Couture; still the clothes are rigid, quite far from the fluidity of the textile fabric. One problem of this method is "about finding the new aesthetic formal language of this new manufacturing paradigm. It's not just about replicating a form from the computer, though that is part of it—it's about cultivating new material behaviors." as designer Francis Bitonti shows [24] The way

to real dresses passes by designer Michael Schmidt who in 2013 created the already well known Dita von Tesse seamless dress: The First Fully-Articulated 3D Printed Gown. It is custom fit and essay to classify as "Haute Couture". For a RM piece it included a lot of manufacturing both in assembling and in decoration. Further, the designers from *Nervous System* show that all these problems can be solved. Their dresses' lace like structure moves like a real fabric and, more remarkable, is printed in one piece. More, they developed a web application where people can design custom-fit 3D.

5. CONCLUSIONS

Imaginary and reality are always intertwined. The ideals, imaginary things are not as far from us as it seems. Influencing the way we think, they always find their way into objects.

The idea of what a textile product can be, how it looks like and how it is made can be changed and it is changing as we speak. A lot of our problems can be solved only by going back to interrogate: how we do things around and why? Usual ways of doing things is not always better and revisiting traditions can lead to new solutions.

The new materials and methods have the power to challenge not only the design and manufacture of textile industry and fashion but the whole system of production, distribution and consumption.

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ANNALS OF THE UNIVERSITY OF ORADEA
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EXPERIMENTAL INVESTIGATION ON TENSILE STRENGTH OF JACQUARD KNITTED FABRICS

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Abstract: *An objective approach to select the best fabric for technical and home textiles consists in mechanical properties evaluation. The goal of this study is to analyze the behavior of knitted fabrics undergoing stretch stress. In this respect, three types of 2 colors Rib structure (backstripes jacquard, twillback jacquard and double-layered 3x3 rib fabric) have been presented and tested for tensile strength and elongation on three directions. First, the elasticity and the behavior of knitted Rib fabrics were described The fabrics were knitted using 100% PAN yarns with Nm 1/15x2 on a E5 CMS 330 Stoll V-bed knitting machine, and have been tested using INSTROM 5587 Tensile Testing Machine in respect of standards conditions. After a relaxation period, 15 specimens were prepared, being disposed at 0°, 45° and 90° angles to the wale direction on the flat knitted panel. The tensile strength and the elongation values were recorded and mean values were computed. After strength and tensile elongation testing for 3 types of rib based knitted fabrics, one can see that the double layer knit presents the best mechanical behavior, followed by birds-eyebacking 2 colors Jacquard and then back striped Jacquard. For tensile stress in bias direction, the twillbacking Jacquard has a good breakage resistance value due to the higher number of rib sinker loops in structure that are positioned on the same direction with the tensile force. The twillbacking Jacquard structure could be considered as an alternative for the base material for decorative and home textile products.*

Key words: *stress, strain, rib, knitted fabrics*

1. INTRODUCTION

Weft knitted structures, compared with other materials, present a purely elastic behavior, especially on transversal direction. Their elasticity, driven mainly by yarns bending, loops interlocking and the tendency to fill a minimal energy position, influences the possibilities of use. In addition, a low tightness due to inter and intraloops spaces and low mechanical properties due to fibers destruction during the knitting process, compared to other types of textile, limit the industrial knit applications [1], [2]. Nevertheless, they represent an important class of raw materials for home textiles, upholsteries and mattress sides.

The most frequent stress undergone by fabrics during wearing is traction. Tensile strain always results in a change of shape in the tensile direction. Traction forces acting on fabrics during wearing are often smaller than breaking forces. Nevertheless, they may cause irreversible damage. This kind of deformations may appear even after a first use but they are more visible after repeated stress. The size of deformations depends on stress type and duration, but it is also influenced by the raw materials used and the parameters of the knitting operation. The breaking resistance is determined by the value of the breaking force or through specific indices, through the specific resistance, the tenacity or breaking length. The traction force also depends on the fabric structure. The breaking force represents the value of the breaking force which causes the breaking of the fabric sample when applied as axial strain.

Tensile properties of weft knitted fabrics are influenced by factors such yarns interactions, structure and knitting parameters. The longer inlaid yarns on different directions increased the fabric extensibility, the thickness of the fabric and the cover factor, but reduced tensile recover [3]. The use

of structures which contain floating and normal loops has benefits on tensile behavior and fabrics stiffness (elastic modulus) [4], [5]. Other researchers have tried to improve the knitted fabrics suitability for composite materials by the pre-stretch of knitted perform uni-axially and/or bi-axially before consolidation [6].

The single jersey fabric's mechanical behavior was studied in many papers and in different conditions. In this respect, [7] presents studies on the tensile properties of plain weft knitted DuPont Kevlar fiber fabric reinforced epoxy matrix composites to investigate the anisotropy of knitted fabric composites at different angles. In [8], a "cross-over model" has been proposed for expressing the cross-over of curved yarns of knitted fabric and tensile strength properties have been predicted by estimating the fracture strength of yarns bridging the fracture plane. Z. Jinyun et al. [9] describe a method for testing the elastic knitted fabric Poisson ratio and modulus was proposed based on orthotropic theory and strip biaxial tensile test. The paper [10] is focused on the bursting strength of various derivatives of single jersey knit fabric in both grey and finished state. Higher presence of tuck and miss loops in wales direction affect the bursting strength.

The mechanical properties of Rib structures are also predicted or tested in many papers. In [11], the mechanical performance of the composites which are reinforced with glass knitted fabrics composed of tuck stitches have been investigated. Tensile, compression, impact and compression-after-impact tests were performed and the results of the composites reinforced with full cardigan derivative knitted fabrics and 1×1 rib knitted fabrics of glass fibers have been compared.

The paper in [12] shows that the weft knitted fabrics with Rib structure have a superior tenacity. Also, double jersey fabrics of Full Cardigan and Full Milano represent better mechanical properties in comparison with single jersey fabrics. In [13], the Milano rib knit fabric structure has been approximated by several simpler plain stitches and its stiffness and strength of each unidirectional composite is predicted.

2. RIB JACQUARDS

Traditionally, quilted double-layer structure filled with unidirectional weft yarns is the base material for mattress covers. These structures are thick, with good tensile strength and dimensional stability, due to reduced elongations by the float stitch of blister yarns and weft threads. Between the double-knitted fabrics, one can emphasize the double jersey and interlock structures. Due to the spatial position of the rib sinker loop, double jersey has high elasticity on the course direction. The ratio of the transverse and longitudinal directions elongations for 1x1 Rib is approximately equal to 4.

Many weft knitted jacquards in two colors are based on 1x1 Rib fabrics. A part of front bed needles are selected to knit with first color, while those remaining are selected to knit color 2. One design row is made with 2 feeders. If all backloops are knitted with every feeder, it will result horizontally color stripes on the back of the fabric. The length of the yarn floats lies on one space needle, which will involve a small extension on course direction. The twillbacking double jersey fabric is a knitted structures obtained with one to one back needles selection. It is a more stable and balanced structure than the striped backing one. The Rib Jacquards have lower breaking deformation and tensile because of uneven traction efforts placement.

A double layer knitted fabric can be obtained on twelve needles with purl set-out. In this case, two 3x3 Rib structures are intermeshed. The knit presents a greater elasticity and smaller width than double jersey fabric. Tensile strength on course direction is two times higher than Rib fabrics one, the width and length elongation have lower values than double jersey, but not too much. The knit will not unrove from the end knitted first; it is thicker and heavier and must be made of more fines, resistant and expensive yarns. Productivity is half the rib fabric case.

3. MATERIALS AND METHOD

The paper presents tensile strength and strain tests on three types of knitted fabrics: horizontally back color stripes Jacquard (K1), twillbacking Jacquard (K2) and double-layered 3x3 Rib knit fabric (K3), which respected the same pattern design on the face of fabrics. The sets were knitted on a Stoll CMS 330 V-bed knitting machine, with 5 needles per inch. The yarns used in this experiment were 100% acrylic, with Nm 1/15 size. Two parallel yarns were fed to yarn feeders, which were used throughout the whole knitting process.

The knitting speed was controlled electronically at 0.9 m/min. on the same number of needles. The take-down tension (the mean value WM = 7.0) and the yarn input tension were kept constant for each type of fabric by programming the knitting machine's software. The knitted fabrics were relaxed

in dry conditions for 48 hours until the structure parameters were measured, with ±(0.05 – 0.07) errors, according to British Standard BS 5441:1998 (Table 1).

Table 1: *Dimensional values for knitted fabrics*

Fabric type	Thickness [mm.]	CPC		WPC
		front	back	
K1	2.3	2.14	4.11	2.14
K2	3.6	3.40	3.30	2.50
K3	4.5	3.61	3.67	2.64

For each type of fabric, tensile tests were conducted at three off-axial angles: 0°, 45° and 90°, regarding the wale direction. At least five specimens for each group with 50 mm. widths were prepared and tested on the INSTROM 5587 Tensile Testing Machine, according to ISO 1421:1998, the Strip Test Method. The distance between the clamping grips was 100 mm. and the crosshead speed was v_1 = 15 mm/min.

4. RESULTS

Figure 1 presents a view of the INSTROM machine with one sample being tested for the tensile strength. Also, three stressed specimens for each direction are shown in the second figure. It could be observed the fact that each orientation sample performed differently, due to the angles between stress and the breaking elements.

Fig. 1*: View of the samples on the testing machine and after the stress test*

Table 2: *Mean values for stress and strain of knitted fabrics*

Fabric type	Average Stress [MPa]	Average Strain [%]
bias		
K1	2.777 ± 0.197	38.577 ± 5.718
K2	3.529 ± 0.284	46.917 ± 4.202
K3	3.915 ± 0.232	57.844 ± 6.975
horizontal		
K1	1.323 ± 0.158	65.024 ± 9.264
K2	2.599 ± 0.175	64.077 ± 6.262
K3	3.488 ± 0.344	80.583 ± 6.146
vertical		
K1	4.429 ± 0.481	59.685 ± 5.044
K2	4.701 ± 0.294	54.453 ± 3.631
K3	5.086 ± 0.294	66.445 ± 2.354

The tensile strength values for each sample and angle were recorded. The average values were determined for all 3 knitted types, each with 5 samples, in table 2. Figure 2 shows an example for the case of K3 type and walewise direction.

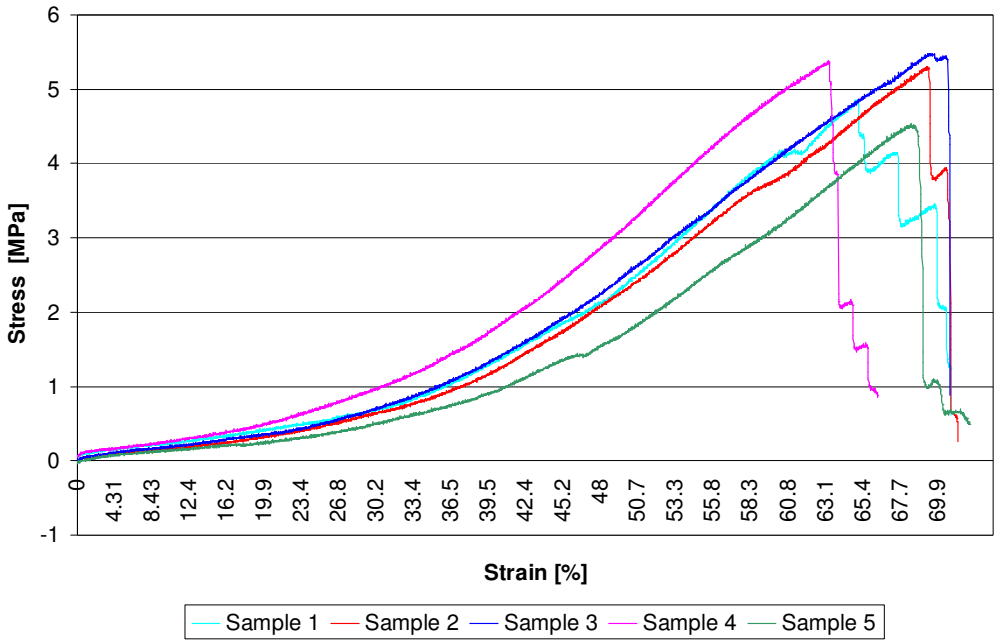

Fig. 2: *Stress – strain curve for double-layered fabric in walewise direction*

In figures 3 and 4, a comparative representation of stress and strains values of 3 fabric type and 3 tensile directions are presented.

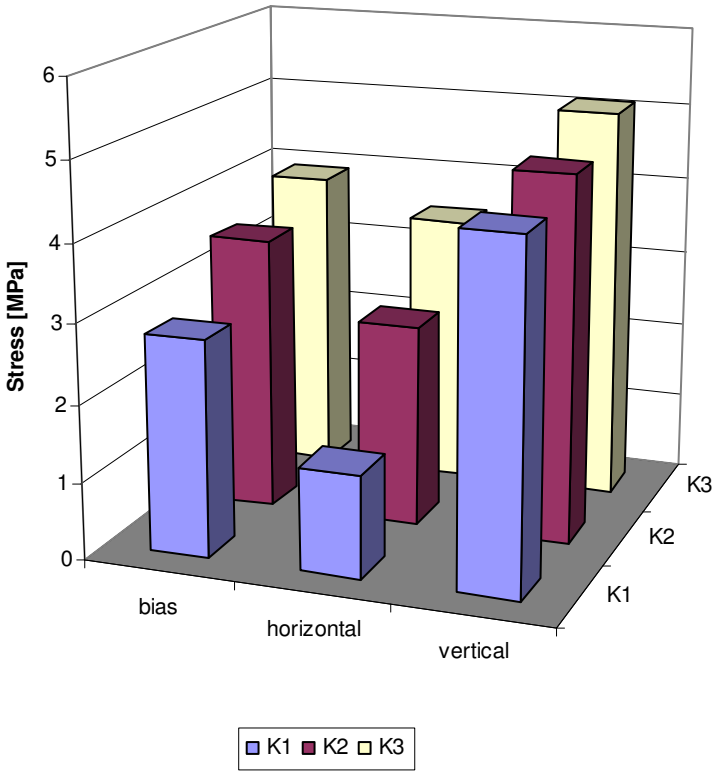

Fig. 3*: Comparative graphic of stress values of 3 rib fabric type and 3 tensile directions*

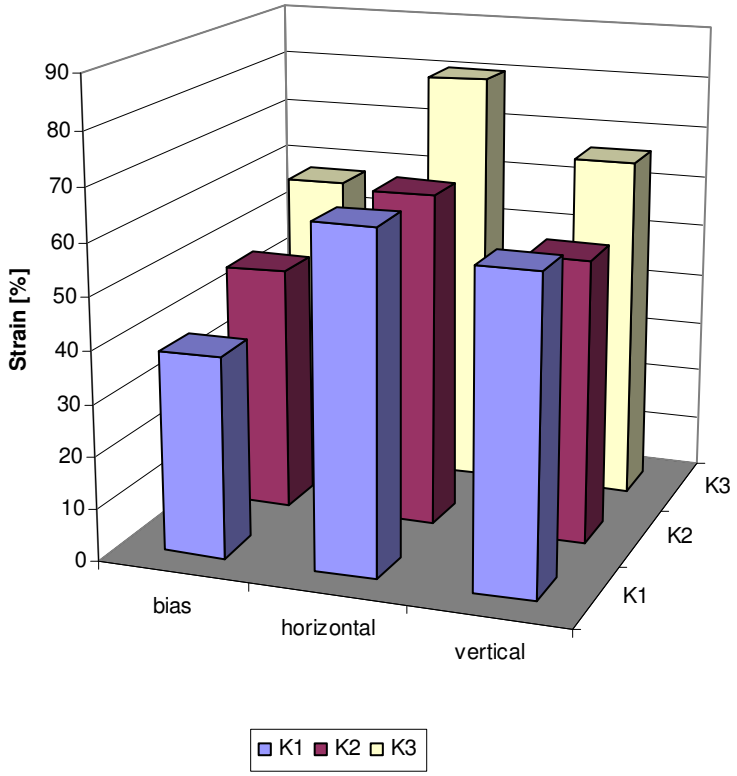

Fig. 4: *Comparative graphic of strain values*

In figure 3, one can observe that the highest values for the tensile regardless the structure corresponds to the vertical position due to a double number of side limbs in which the stresses occur, while the horizontal direction is characterized of lower values, as expected. The highest strain value was recorded for the course direction, while bias and walewise elongations are approximately the same especially for K2 and K3 samples.

5. CONCLUSIONS

After strength and tensile elongation testing for 3 types of 2 colors Rib based knitted fabrics, one can see that the double layer knit presents the best mechanical behavior, followed by birds-eyebacking Jacquard and then backstripes Jacquard. For tensile stress in bias direction, the twillbacking Jacquard has a good breakage resistance value due to the higher number of rib sinker loops in structure that are positioned on the same direction with the tensile force.

As a conclusion, the twillbacking Jacquard structure could be considered as an alternative for the quilted double-layer structure for the base material for mattress covers or other applications where a good resistance and elasticity are required.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

NONWOVEN TEXTILES WITH MEDICAL DESTINATION ROMANIAN PRODUCTION

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Abstract: *The widest range of medical disposable from nonwoven textiles are: absorbent and hygiene products : (diapers, feminine care, incontinence) from the layered structures absorbent or impervious; use products such as hospital operating theaters sterile clothing (caps, gowns, masks, shoe coverings), materials for field operators, lab coats, packaging materials for hot or cold treatments, sterile materials (wipes, bandages, sterile bandages, etc.). Currently these materials, in their majority, are imported. This paper presents research done for getting, with the country equipment, disposable medical products from 40 g/m^2 nonwoven textile materials. The technology adopted for the purpose, in SC "Minet" S.A. Ramnicu Valcea, Romania consisted of the following steps:Carding - folding, the aggregate Spinnbau-Hergeth type, Germany, with major changes carding technology adjustment and folding, to obtain a fibrous layer with a mass per unit surface of about 40-50 g / m^2 and a width of 2,1 m;Pre-heat consolidation by pre-heating required only to ensure product stability required minimal interphase transport to final consolidation.*
Final thermal consolidation of the fibrous layer by thermal calendering at a temperature of 110°C and calenders cylinder speed of 2 m / min. The processing of the fiber by carding - folding and preliminary thermally consolidation and final by calendering.

Key words:*, nonwoven textile ,medical destination,protective cloth,disposable material,*

1. INTRODUCTION

Medical nonwoven textile materials are used for a very wide range of articles - from materials to protect wounds in protective clothing used in operating rooms. They accounted in 2008, according to David Rigby Associates, approx. 9.0% of world consumption of textile products [1,2]. Annual growth in 2010 was 4.5% [3].Widest range of disposable medical products, nonwoven textile [4,5,6] are:

- absorbent hygiene products (diapers, feminine care, incontinence) as a layered structure of absorbent or impervious;
- use products such as hospital operating theaters sterile clothing (caps, gowns, masks, shoe coverings), materials for field operators, lab coats, packaging materials for hot or cold treatments, sterile materials (wipes, bandages , sterile bandages, etc.).

2.RAW MATERIALS USED

Nonwoven fabrics with medical destination, with mass per unit surface of up to 40 g / m^2, are taken in this moment of import, so that their production in the country presents an economic interest. The reason for not occurred in the country is the lack of instalation capable to process the fibers having a linear density of 4.5 den and produce fiber veil with a weight of up to 40-45 g / m^2.

As such research focused on the one hand, the problem of adapting technological and mechanical adjustments of our installation to allow processing of fibers, on the other hand, the research aimed to compare the properties of materials obtained from Romanian fiber material with witness material imported, which meets the requirements of the user.

Raw materials and nonwoven materials technology adopted are determined by each product according to its specific properties and intended use.

The most widely used synthetic fibers are polypropylene, polyester and polyethylene fibers as a basic fibres or bicomponent fibers for consolidation thermal purposes fibrous layer [4, 5, 6,].

The research aimed to achieve two articles with medical destination, weight not exceeding 40 g / m², further identified by codes A1 and A2, while article witness has code A3 (table 1).

Table 1: *The fiber composition of articles analyzed*

Code article that fiber and fiber characteristics	**The fiber composition and fiber characteristics Participation rate (%)**	**Mass unit per surface (g/m²)**
A1	- 70% polypropylene fibers standard 4den / 100mm; - 30% PE / PES 4 den / 50 mm, two-component core-sheath, PE-sheath-core PET 40-50	40 - 50
A2	- 70% standard polyester fibers, 4den / 64 mm; - 30% polyethylene fiber / polyester 4 den / 50 mm, two-component core-mantle-shell polyethylene, polyester-core 40-50	40 - 50
A3	100% polypropylene fibers, nonwoven product obtained by spunbonding process 40-50	40 - 50

Note that the material l used to compare the physical and mechanical properties of the samples obtained during research, is made of polypropylene continuous filaments by spunbonding process, which implies the existence of qualitative differences evident. The reason for this choice is given by the fact that in Romania, this not are type of fiber and spunbonding technology, but also non-woven textile items are found in disposable hospital gowns. And was needed a way to compare the obtained values , keeping the proportions.

Outside the point relating to raw materials and production technology should be noted that if the witness, the points of attachment between the filaments components are distributed randomly but in the body of the product, while for articles analyzed, because fiber used, the points of attachment account for only 10%, and they all random division, as seen from the diagram in fig.1.

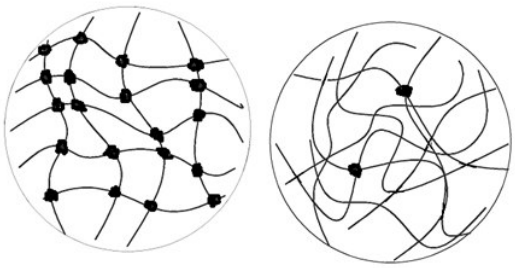

Fig. 1*: The distribution of soldering points*

With regard to the process of obtaining nonwoven fabric is mentioon following:

Since insatation Spinnbau-Hergeth, from SC "Minet" SA is designed to processing 7.5 den fiber and obtaining a fibrous layer of at least 100 g / m², has required changes to the geometry of the carriage submission veil, and technological and mechanical of the installation adjustments . It was necessary this modifications for to obtine in view of the subject required for obtaining a non-woven material of 4.5 den fibres and mass of approx. 40 g / m².

Were required changes of the geometry of the folded assembly , because the fibrous layer mass was reduced and its submission next band was done irregularly. Due the currents "stray", appeared the oblique portions which generated mass and thickness irregularities of the fibrous layer. Reducing the distance in the area marked "A" for submitting the fibrous wave by folded organs, has determined the disappearance of these currents and consequently obtain a uniform fiber layer with the desired mass. Preliminary consolidation by passing the fibrous layer through a hot air of about 190º C, ensures the dimensional stability of the fibrous layer during interphase transport, for the final consolidation by thermal calendering.

3. EXPERIMENTAL RESEARCHES REGARDING MASS PER UNIT SURFACE AND THICKNESS FOR MEDICAL NONWOVEN FABRICS

Features mass per unit surface and thickness are the basic characteristics of a nonwoven textile fabric because because it determines the consumption of raw materials and thus their costs, and on the other hand determines their destination. The samples with dimensions of 100 mm x 100 mm, were weighed, with the balance Partner, with 0,001g accurately for determine the average weight.

The thickness was determined with textile DM-100 micrometer, with an accuracy of 0.01 mm. The measurements were performed for samples taken after different directions: 0º-180º, 30º-210º, 60°-240º, 90º-270º, 120°-300º şi 150°-330º. The samples were cut after these directions because the nonwoven textiles materials for disposable medical products, must have a random structure, so therefore the same physical and mechanical characteristics in all directions. These characteristics are influenced by the orientation of the fibers in the fiber layer but also the mass unit area and thickness.

The average results for the mass unit area and thickness of the material analyzed are presented in table 2.

Table 2: *The average values for mass per unit surface and thickness*

Direction of request	ArticleA1, polypropylene		Article A2, polyester		ArticleA3 witness	
	Mass per unit surface M1[g/m^2]	Thickness d1[mm]	Mass per unit surface M2[g/m^2]	Thickness d2 [mm]	Mass per unit surface M3[g/m^2]	Thickness d3[mm]
0º - 180º	37,053	0,418	46,317	0,422	43,47	0,397
30º - 210º	31,324	0,408	39,155	0,384	43,88	0,367
60° - 240º	31,889	0,412	39,861	0,382	37,62	0,387
90º - 270º	32,608	0,454	40,760	0,378	43,47	0,397
120° - 300º	34,912	0,442	43,640	0,396	43,88	0,367
150° - 330º	31,434	0,440	39,293	0,398	37,62	0,387

For a better analysis of the results presented in table 2, was realised the polar and cartesian diagrams (fig.2 and fig.3).

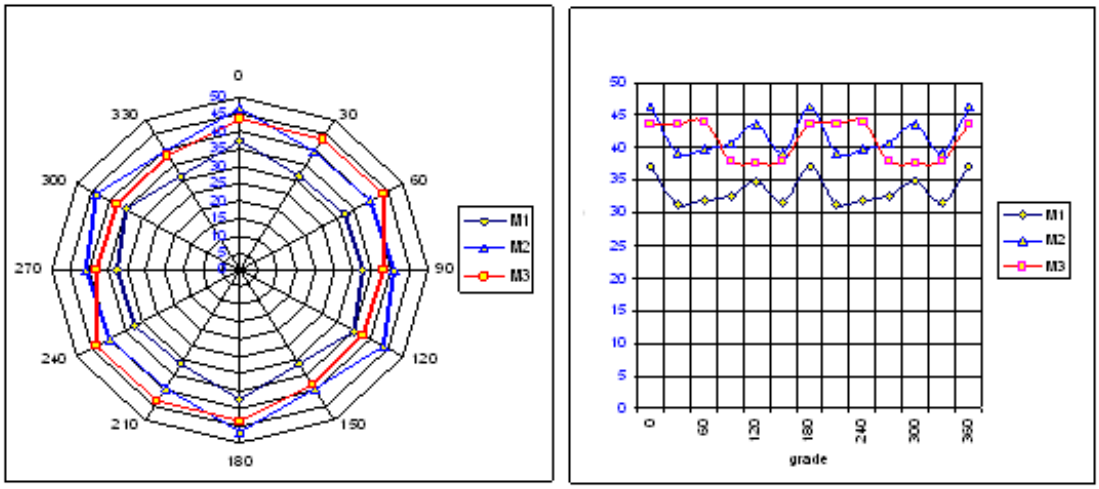

Fig.2: *Polar and cartesian diagram for the mass per unit*

From fig.2 it observes that the mass per unit surface for A1 article presents in average a difference of approx. 7.5 g / m^2 to the witness A3. This difference is due to lower specific density polypropylene fiber. As regards A2 article has a mass per unit area with 0.74 g / m^2 higher than the control sample A3, which is deemed statistically acceptable because it represents a departure from approx. 0.20% from the nominal value of 40 g / m2, required for the article in this category.

From fig. 3 can be observed that the thickness of articles produced is relatively uniform, and its variation is redused. The thickness of items A1 and A2 is uniform but larger than A3 witness article. This is due to the number of only 10% by weight of consolidation points as fiber. Thus, the difference in the thickness of the A1 article in comparation with A3 article is 0,43 mm and the thickness of the article A2 0.43 mm is 0.08 mm, which is in fact a diferernţă of 0.1% in the first case 0.02% in the second case. Therefore the articles A2 and A3 have the equal thickness.

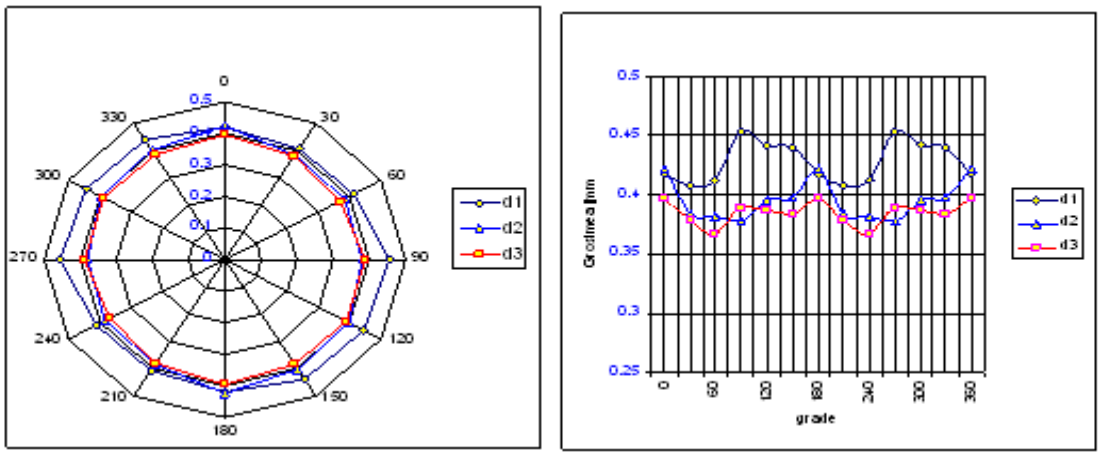

Fig.3: *Polar and cartesian diagram for the thickness*

The thickness for witness article is uniform because it has a filamentary structure by extrusion and thermal consolidation by pressing, with points in 100% of the intersections of filaments. In conclusion it can say that both articles analyzed, presented in terms of mass per unit surface and thickness values comparable to those of witness A3. Therefore these newly created articles can be used for the stated purpose.

4. CONCLUSIONS

The research aimed to achieve two articles from mixtures of fiber linear density of 4.5 den., for medical destination, disposable, with the weight not exceedi 40 g / m². The woven fabrics medical with 40 g / m2 mass per unit surface, are made from import, so their production in the country, and their use in disposable medical fabrics, has an economic interest.

According to the technical specifications of the installation constructive Spinnbau Hergeth from S.C.Minet SA. Ramnicu Valcea, it can not get fiber layers from fiber with a linear density of 7.5 den., by carding- folding process therefore no nonwoven fabrics with minimum mass per unit surface less than 100 g / m^2.

The witness sample imported, used to compare the physical and mechanical properties of the materials obtained during investigations, is made of polypropylene filaments by spunbonding process, which means there are obvious differences in terms of physical and mechanical properties. This method was chosen for comparison because in the country there is no raw material or production technology.

It can say that both articles A1 and A2, realized and analyzed in this paper, have values for the weight and the thickness comparable to those of witness A3.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

IMPLEMENTATION OF MODERN EDUCATIONAL TECHNOLOGIES IN DEVELOPING THE PERSONALITY OF FUTURE ENGINEERS FASHION DESIGNERS

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Abstract: *Applying the model of implementation process of modern educational technologies in higher education involved in technical implementation of educational technology in the educational activity based on critical thinking development strategies, future engineers' personality development of students. Through educational technologies correlation occurs between educators and educated, which places them in a position promoter of educational paradigms. At present, the efficiency of the educational process depends largely on the use of modern technologies.*
To determine the student's level of development through the integration of modern educational technologies is necessary to reveal aspects of operating in the thinking of students, which is their way of analysis of reality, to compare, to generalize certain concepts or processes.
Methodological peculiarities of modern educational technology based on application of interactive engagement between the two actors in the process of training / preparation and which involved the use of interactive teaching methods adapted to technical higher education. These groups have benefited greatly from the introduction in teaching and learning of modern educational strategies. The intervention was the catalyst that accelerated skills training. Qualitative aspects allow us to generalize the results of experiments performed. A student lays views representing a structure, a generalization, reasoning that arises from their previous experience.

Key words: *modern educational technology, design engineer, personality, humanization.*

1. INTRODUCTION

Research on intellectual development engineers denotes the fact that the true burden of teachers is to guide the student toward tomorrow. It is significant need for connection of science education in modern educational technologies humanistic role very significant to design an operational perspective humanist pedagogy.

The educational process contributes significantly to the training of young specialists, engineers not only educational technologies applied and the master teacher to motivate students to learn, to engage in the act of learning, boosting independent learning and personal evaluation.

The main task is to develop modern educational technologies that would allow not only improving the quality of education, but also solving the problem of a huge volume of information properties in a relatively short time without affecting the mental state of trained.

2. GENERAL INFORMATION

2.1 Concept - modern educational technologies

In Romanian term technology [1] is assigned acceptance of science methods and means of the processing of materials, assembly processes, methods, operations employed in order to obtain a product.

Any educational technology is:

- Dependent system of training and education purposes and psychological structure;
- Set of activities undertaken to achieve these goals;
- Psychological characteristics of teachers who realize these goals, using selected activities;
- Psychological characteristics of recipients;
- Means used to achieve these goals;
- Training and education principles, those serve as the basis for the formulation of goals.

Educational technology [2, 3] can be classified pedagogical objectives that were at the basis of their achievement:

- Technology training;
- Technology education;
- Development technologies;
- Technology assessment;
- Diagnostic technologies.

In developing modern educational technologies are taken into account the following development trends of contemporary educational process:

A. Democratization training process.

Very often students, who do not participate in the planning of training, fail to recognize the importance and necessity of studying the proposed material, they are not sufficiently motivated for learning and studying at a level that does not match their capabilities. Developing students' motivation for learning is achieved by transmission of those functions that they can perform:

- Independent study of topics;
- Self-assessment;
- Creating presentations, projects and portfolios.

B. Humanization pedagogical process.

The term "humanization of pedagogical process" shall mean use of educational technologies; they employ teachers and students in some relationships, developing personality characteristics that determine:

- Working with others;
- Positivist conception of ego;
- Personal responsibility.

C. The development of social competence of students.

The training should form the trained knowledge, skills and abilities of interaction with others.

Educational aspect must meet certain requirements: to liaise with life and reality; have varied in nature; provide the reasonableness of forms of work, holistic approach to student personality, rational and judicious distribution volume of educational [4, p. 12].

Training and personal development engineer requires direct involvement of students considering their needs and interests, the objectives of development of lifelong learning, self-education, independent learning. This requires a new form of design education, modern educational systems.

2.2. Implementation of modern educational technologies

In research-conducted observation, we aim to influence modern educational technologies used by the teacher in the classroom as well as laboratory. The aim of the research is to present the influence of modern educational methods on personality development of future design engineers. This will enable us argumentation idea that is supported by more research, renowned teachers as student achievement and success is the teacher, and intellectual development of one is closely related to the development of the other.

The main objectives at this stage of the research were in sight level of development of students by implementing modern educational technologies [5, 6] as a primary factor in the development of personality and professionalism of future engineers in light industry.

In the pedagogical experiment involving a total of 116 students, the form of education, the daily low frequency of Light Industry Faculty, Technical University of Moldova, specialties Textiles and Leather Products Engineering (IPTP), Engineering and Management in Industry Lightweight (IMIU) and Fashion Design Industrial (DVI).

1. Experiment findings include evidence that determine students' knowledge and skills regarding notions about anthropometry, costume, product, form and others related to the design clothing. In developing the theme of finding evidence for the experiment took into account the particularities of preparation, the availability and content of information presented. Topics for students as part of their sphere of concern belong to their value system and adapted to their level of knowledge. In the experiment of finding knowledge, students have been established at the time of their inclusion in the process of experimentation. Students were assessed according to three criteria previously established which shall be informed, less informed and current information. It took into account the fact that the questionnaire contains 32 items open type to fit into the category of informed must earn 25-32 points, 15-24 points category less informed and current information category 8-14 points.

After the questionnaire in control and experimental groups were obtained following data shown in the graphs below.

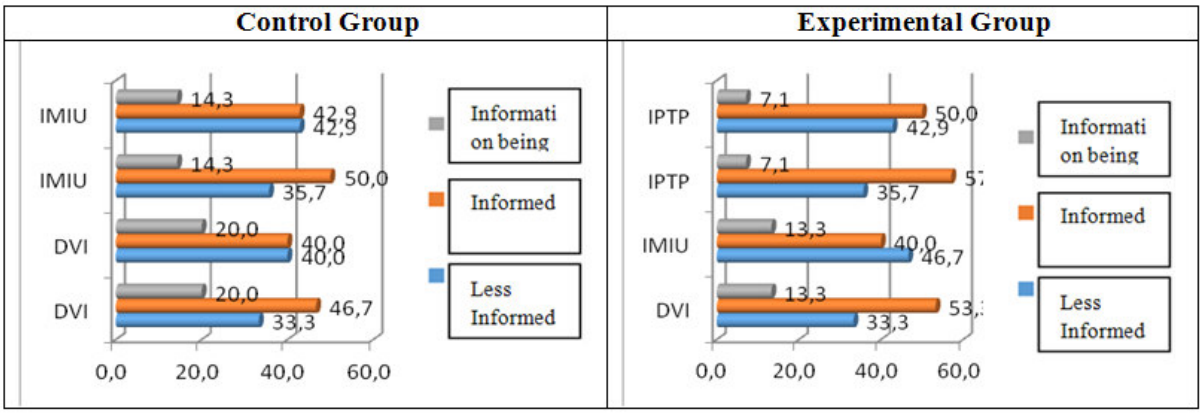

Fig. 1: *Interpretation of research results at the stage of finding*

From the results presented, we find that in control groups, informed students are on average 29% and experimental groups as 39.7% less informed media students in the control group was 44.9%, while the experimental group 50%, and student information under the control group average is 17.1% and the average experimental group is 10.2%.

We conclude the following: students of both groups are informed about the basics of the discipline of study, but in addition there are also those who are in the process of information. This will allow us to address issues of learning / teaching from different perspectives, which will allow us to apply objective methods of instruction.

2. When applying the final questionnaire includes 39 items and open type that have established the following criteria: informed 30-39 points 20-29 points less informed and course information in 20 points, it was found that control groups and experimental groups were established positive, although there were also students who were classified as current information criterion. However, this may be argued by the lack of responsibility or not shown at all times discipline for health reasons or personal reasons.

From the results we conclude that the graphs presented below average students informed control groups are 65.7% and 86.3% in the experimental groups, fewer students in control groups informed media is 26.4% and experimental groups of 12%, students in course information media control groups is 3.3% and 1.7% experimental groups.

These results allow us to argue that the application of modern educational technologies have had a significant contribution to the training of young specialists as professionals with personality.

Students reflexive attitudes that allow the formation of critical thinking; known traditional moral values, customs, traditions, people, language, and eternal values, love, friendship, supreme, sublime truth; creates original ideas, which shows them that develops creative thinking, which emphasizes design, fluidity, flexibility ideas, the ability to understand a message and processes to

reproduce material, develop imaginative and creative ability, spirit observation, creative learning and humanistic personality. There is a cooperation and mutual respect between teacher and student through the humanistic approach. This shows that the involvement and mutual help lead to the development and fruitful cooperation between the two subjects, two partners of education.

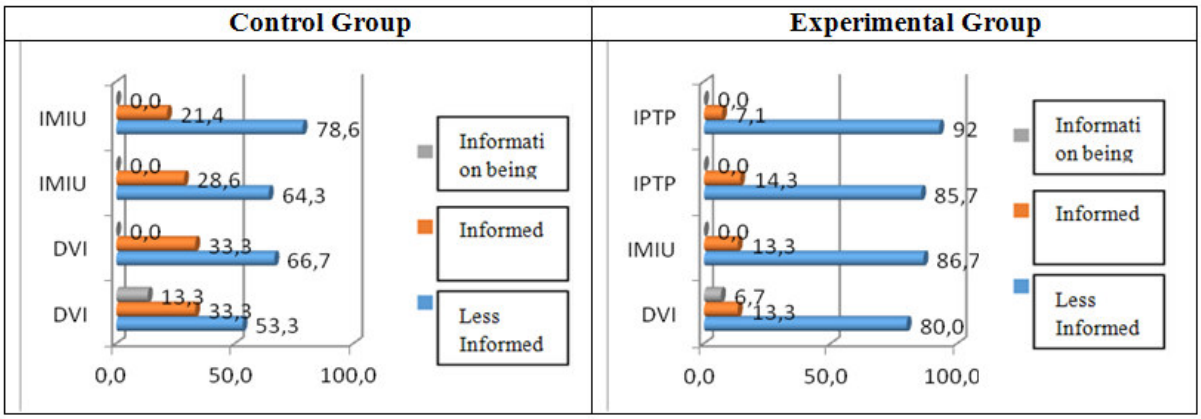

Fig. 2: *Results of the final questionnaire*

CONCLUSIONS

Interpretation of results at the stage of finding allowed us to highlight that in formulating ideas to students more prevalent operation analysis and generalization operation. During structuring activities, the teacher must give further explanation comes in student aid. The interaction between student / teacher becomes an obvious source of learning, a way of cooperation. At the same time, the teacher becomes an observer and facilitator in the work. This actually enhances mutual aid and beneficial interaction between the student and the teacher.

The objective of the training experiment consists predominantly logical cognitive skills training, representation, power to expose, interpret, explain, argue some notions, opinions, ability to actively interact with peers, to make certain judgments, the structure some ideas. Training strategies were organized as follows. On the one hand were designed learning situations from simple to complex. On the other hand, the organization of specific sequences of instruction, students were ranked to present some simulation topics.

To justify the situation on the research results we conclude the following fact: experimental group situation actually worked in the experiment and training has changed, namely, if we consider the degree of intervention on them.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

POTENTIAL AND FRECUENCY INFLUENCE ON THE MICROCAPSULES FORMATION BY COEXTRUSION AND GELLING

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Abstract: *Wide varieties of tecniques are currently avaible for encapsulation of active components in food, nutraceutical, pharmaceutical, cosmetics, textile, etc, industries. Coextrusion ang gelling technique is a physical encapsulation technique used for the formation of core-shell liquid filled microcapsules. The general microcapsules morphologies are presented as core-shell spheric microcapsules. There are several parameters to control in the process, and their control is outstanding for the correct microcapsules morphology with proper encapsulation of the active ingredient, these parameters are: frequency, potential, nozzle diameters, encapsulating material concentration, cross-linking concentration, flow rates of encapsulation and active materials, etc. Futhermore shell and core solutions must have viscosity, interfacial tension, density, solubility and thermal properties that must be compatibles with the coextrusion process.The versatility of the systems allows for encapsulation of water- or - oil soluble liquids and slurries.*
This work is focused on encapsulated an essential oil, rosemary oil, by coextrusion and gelling, therefore is important study and optimize the process parameters, focusing on potencial and frecuency.
A large numbers of experiments have been made in order to know the optimal values, the microcapsules morphology allow us which are the correct values.
A stereomicroscope was used as know the microcapsules morphology and determination the correct values.

Key words: *Core, Shell, Cross-linking, Droplet, Sodium Alginate, Calcium Chloride*

1. INTRODUCTION

Coextrusion, also know as anular jet atomization, is the preferred physical technique for the microencapsulation of liquids, slurries, or emulsions to form a core-shell morphology [1]. Coextrusion technology is capable of producing core-shell microcapsules from a few microns to several millimeters in diameters with payloads over 90%. There are three basic steps to consider for the use of coextrusion process: compound droplet formation; shell formation and capsule collection.

Droplet formations based on the successful combination of multiple parameters, such as frequency, potential, nozzle diameters, flow rates of encapsulation and active material, encapsulating material concentration, etc. Once the droplet is formed, the shell must completely harden while mainting the core-shell morphology. Finally, the microcapsules must be collected with breaking the shell or developing unwanted agglomeration. [2, 3]

The aim of this work is to optimize two parameters of the microencapsulation coextrusion process, potential and frequency, in order to encapsulate an essential oil. The shell material and the active material concentrations, nozzle diameters, cross-linking material have been optimizated in a previous research [4, 5, 6].

A stereosmicroscope can allow knows the microcapsules morphology and then optimizate these parameters.

2. EXPERIMENTAL

2.1 Materials

A low viscosity sodium alginate with a 3,5% of concentration provided by SIGMA ALDRICH was used as shell material. The active material was an essential oil, rosemary oil, provided by Esencias Lozano. In order to observe the oil presence inside the microcapsules we used a natural dye, Verde Cornasol C 0,1% provided by Prochimac.

The cross-linking material, calcium clorhidre 0,5M, was provided by SIGMA ALDRICH.

2.2 Microcapsules obtention

This encapsulation process is when a fluid flows in laminar state and breaks into droplets of a same size through an overlap vibration. Then these drops gelon an ionic solution, resulting, encapsulation of the active ingredient (Core) coated with a polymer (Shell).

Microcapsules were obtained by BUCHI B-390, the internal nozzle diameter (core) was 0,2mm and the external nozzle diameter (shell) was 0,4mm.

Potencial and frequency values are shown in table 1.

Table 1: *Potencial and frequency values used*

Potential (V)	2500	2000	1500	1000	500	250
Frequency (Hz)	6000	3000	1500	750	300	150

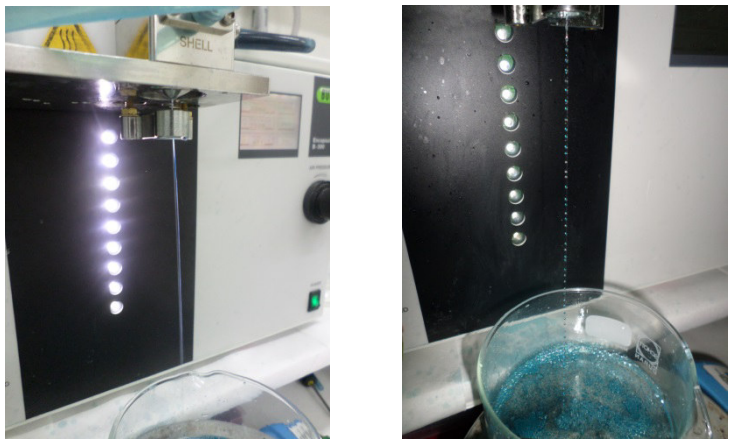
2.3 Instrumental techniques

A stereomicroscope Olympus SZX7 was used in order to study microcapsules morphology.

3. RESULTS AND DISCUSSION

The values of frequency and potential was optimized depends on the morphology of the chain, due to the strobe light.

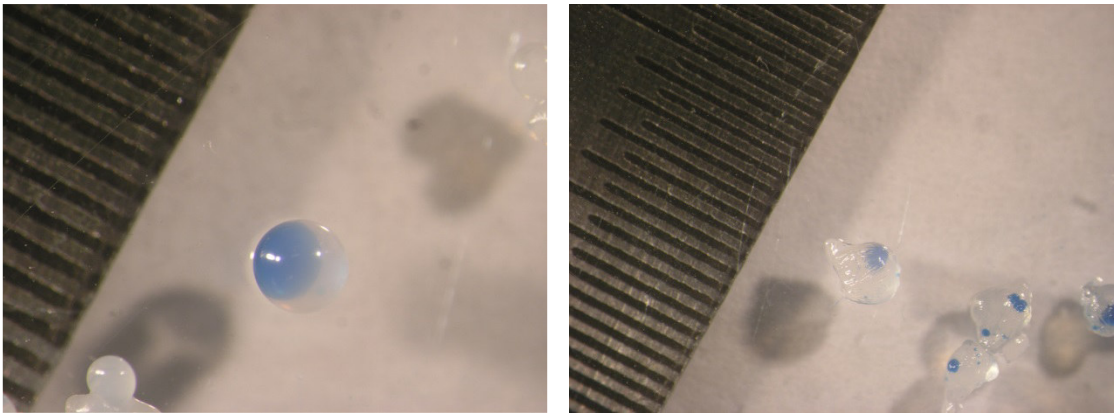
Frequency range where the chain wasn't appropriated to produce spherical microcapsules, using the optimal materials concentration was 750-6000Hz. Microcapsules with the correct shapes were obtained with frequency values between 750-150Hz. We can observe in the next figures these differences.



A) *B)*

Fig. 1: *Chain morphology. A) Inadequate shape; B) Adequate shape*

The chain that we can observe in picture *A* doesn´t allow the formation spherical microcapsules this is because the frequency is too high, whereas the picture b allows obtain microcapsules with the correct morphology like in the following figures .



A) *B)*

Fig. 2: *Microcapsules shape. A) Spherical shape; B) Non-spherical shape*

If potential is too high, the microcapsules agglomerate upon the electrode as we can see the next figure. For this work, this effect could be shown in the potential ranges between 2500-500 V.

Fig. 3: *Agglomerate microcapsules upon the electrode*

5. CONCLUSIONS

The present work optimizes the frequency and potential in a microencapsulation process, coextrusion and geling. Certain differences can be observed. Depending on the frequency values the chain changes and as a result, the microcapsules morphology changes too. Highly potentials produce in the microencapsulation process particles agglomerates on the electrode.

Specially at this work, after several assays, we obtain the optimal parameters. They are 300Hz of frequency and 250V of potential.

ACKNOWLEDGEMENTS

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

NEW METHOD TO ATTACH WEARABLE ELECTRONICS TO CLOTHS

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Abstract: *The integration of electronic devices and sensors into textiles has many different potential applications. Textile fabrics, from clothing to upholstery and home textiles, are an integral part of daily life and the ability to combine electronics into textiles means that a huge range of valuable data can be collected and used by the wearer to monitor their health, performance and wellbeing, among other uses. One of the most pressing challenges is that of interconnecting electronic components via the textile fibres in a robust and reliable way. Another aspect to be studied is the ability for the electronics to be connected and disconnected when necessary; for example, when charging the batteries or washing the garment. It is this aspect that has been considered by this development to facilitate ease-of-use among the older people. In addition, the complete package must be comfortable enough not to restrict movement, and must be unobtrusive so as to avoid any embarrassment to the wearer. The present paper presents a new solution for the connection of electronic measuring and monitoring devices to textile sensors to monitor variables such as movement, temperature, heart rate and breathing.*

Key words: *intelligent textiles, wearable sensors, knitted electrod, conductive yarn, smart textile*

1. INTRODUCTION

The demographic change leads to larger percentages of older people in society. Within the next 20 years, the amount of people over 75 will raise significantly in Europe. According to the third EU Demography Report, the life expectancy has also been increasing in an almost continuous and uniform trend at the rate of 2-3 months every year, and is the main driver behind the population ageing. The Digital Agenda for Europe reinforces solutions for Ambient Assisted Living to improve the quality of life of the older people and strengthen the competitiveness of European industry through the use of ICT. It also seeks to employ these innovative solutions to lengthen the time that an older person can remain independent and live in their own home.

The present development has been made in the frame of the Project ALFRED: Personal Interactive Assistant for Independent Living and Active Ageing. ALFRED's objective is to develop a mobile, personalized assistant for older people, which helps them to stay independent, to coordinate with carers and to foster their social inclusion. ALFRED is specifically dedicated towards older people and is fully focused around their needs. ALFRED will realize a mobile, personalized butler, created using cutting edge technologies such as advanced speech interaction, making it possible to talk directly to him. ALFRED will thus be very easy to use and will provide context-sensitive services related to social inclusion, care, physical exercise and cognitive games.

Part of the project is focused in integrate body sensors contributing in a more effective and personalized care process. This has been done by integrating wearable sensors and permiting that data can be accessible from everywhere by trusted carers and family members. All this data will be personalized according to the needs of end users and health status using a web portal. During the project the design of a wearable device has started including different sensors like heart rate, breathe rate, temperature and movement, according to the requirements previously defined. All these sensors

have been integrated into an underwear t-shirt using smart textiles. The requirements of low energy consumption and comfort have been considered in order to facilitate easy handling for older users.

2. DEVELOPMENT

2.1 Scope

The current project developed a t-shirt incorporating movement, temperature, heart rate and breathing rate sensors and designed a simple connectivity system so that the older wearer could operate it without problems. The authors have developed prototypes during recent years using different connection systems to combat the problem posed by conventional soldered connections breaking too easily with use or failing in other ways [1, 2]. In this development several technologies have been used in order to obtain a new method to attach electronic devices and wearable sensors to smart textiles.

2.2 Sensors

Heart and breathing rate monitors were connected using two electrodes made from a fabric incorporating pads made with conducting yarns. During development, different solutions to the problem of how to apply the technology to the garment were researched including embroidery using conducting yarns and serigraphy to print circuits into the fabric with conductive inks, but the selected solution improves the elasticity of the fabric, making it more comfortable and easy to use [3, 4, 5]. For this a seamless textile has been manufactured including sensors using a combination of conductive and non conductive treads.

Different locations of the sensors were also studied to achieve the most accurate measurements and results [6]. Another complex, but important aspect to resolve was that of achieving a design which does not apply excessive pressure on the wearer but allows reliable readings to be taken. The problem was approached by different authors to show variations that produce these aspects [7, 8]. The developed fabric offers be breathable improving comfort. At the same time it provides elasticity to fit sensors in contact to the body without being unconfortable.

Fig. 1: *T-shirt with sensors.*

2.3 Attachment method

In order to facilitate the attachment of the electronics to the fabric and make all the necessary connections, it was decided to design a comfortable and easy-to-use capsule/holder to accept the device and allow easy contact with the sensors. The holder design was undertaken using 3D design software and the prototype was constructed on a 3D printer using flexible filament.

The flexible design of the holder means that the electronic device can be easily removed for charging and/or when the garment needs to be washed, in addition to acting as a protective cover for the device and the connectors to prevent damage during use.

Fig. 2: *Attachment solution for sensor connection.*

2.4 Electronics

A prototype device, built around a Texas Instruments CC2540 microchip with Bluetooth low-energy support was designed to collect signals from the various sensors, which sends the readings to a mobile device. A 32 Mbit memory is incorporated to provide backup in the case of lost reception and temporary storage.

During development, different IIR and FIR filters were installed for the different channels to filter noise and improve reading accuracy [4, 9]. The firmware has been optimized to minimize the number of operations; this permits autonomy of 100h.

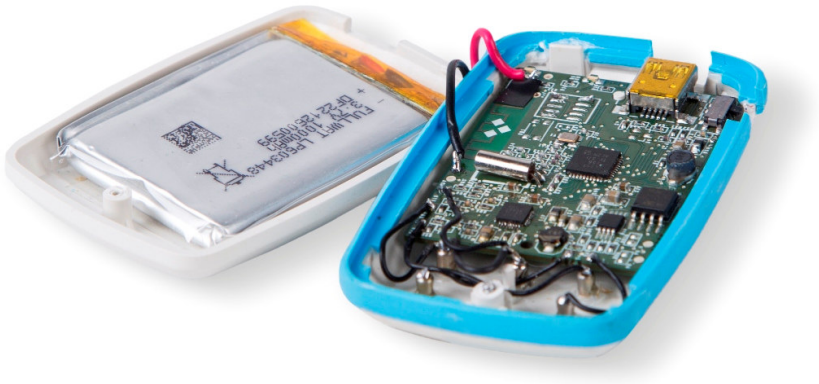

Fig. 3: *Electronic unit.*

3. RESULTS AND CONCLUSIONS

The electrodes designed for the project perform well and the system provides excellent flexibility for integration into clothing, as well as being comfortable and not interfering with the ease with which the garment is put on and taken off.

Readings taken through the device/garment interface are accurate and no excessive signal noise is generated. In addition, the support is easy to use and requires no additional wires or clips.

Current energy consumption figures for the device have demonstrated that more compact models can be designed which can incorporate sensors within a single unit. The use of Bluetooth LE communication means that there is constant communication between the device and a Smartphone.

4. ACKNOWLEDGEMENTS

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ANNALS OF THE UNIVERSITY OF ORADEA
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MAGNETIC WOVEN FABRICS - PHYSICAL AND MAGNETIC PROPERTIES

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***Abstract*:** *A coated material is a composite structure that consists of at least two components: base material and coating layer. The purpose of coating is to provide special properties to base material, with potential to be applied in EMI shielding and diverse smart technical fields. This paper reports the results of a study about some physical and magnetic properties of coated woven fabrics made from cotton yarns with fineness of 17 metric count. For this aim, a plain woven fabric was coated with a solution hard magnetic polymer based. As hard magnetic powder, barium hexaferrite ($BaFe_{12}O_{19}$) was selected. The plain woven fabric used as base has been coated with five solutions having different amounts of hard magnetic powder (15% - 45%) in order to obtain five different magnetic woven fabrics. A comparison of physical properties regarding weight (g/m^2), thickness (mm), degree of charging (%) and magnetic properties of magnetic woven samples were presented. Saturation magnetizing (emu/g), residual magnetizing (emu/g) and coercive force (kA/m) of pure hard magnetic powder and woven fabrics have been studied as hysteresis characteristics. The magnetic properties of the woven fabrics depend on the mass percentage of magnetic powder from coating solution. Also, the residual magnetism and coercive field of woven fabrics represents only a part of bulk barium hexafferite residual magnetism and coercive field.*

Key words: *coated woven fabric, magnetic solutions, weight, thickness,barium hexaferrite, hysteresis loop.*

1. INTRODUCTION

The advanced industrial technologies progress is reflecting directly or indirectly influence on economic and social aspects of life and therefore these fields are seeking harmonization of development within a common benefit. In terms of social and economic, the textile industry is a major user of technologies and the need to respond positively to a larger number of challenges is obviously.

The main advantages of low weight, high flexibility, human and nature friendly of some textile material represent a good reason to add new function and to improve the potential use of them. Thus, the frequency of functionalized textile that ensure conductivity, photo-luminescence, UV protection, catalytic and antistatic effects, antimicrobial effects, self-cleaning properties, rejection and limiting the spread of fire, magnetic properties is growing.

The link between textile materials, considered as dielectric and diamagnetic ones and different fillers and functionalizing materials lead to grow and improve of smart textile sector [1], with potential in electromagnetic shielding sector [2-4].

Most technological solutions of this kind involve the using by inserton into a woven, knitted or nonwoven structure of electroconductive [5] or amorphous yarns [6]. Modern technologies have led to obtain micro or nano fibers containg magnetic powder through extrusion [7], electrospinning [8, 9] or co-precipitation "in situ" [10].

For yarns, the magnetic properties can be obtained as a result of using electroconductive fibers in yarn structure, of introduction magnetic powder into fiber matter during fiber production or coating with solution having magnetic properties [11]. Manufacturing of textile structures with magnetic properties involves the combining of traditional or nonconventional technologies with finishing and coating technologies by direct or indirect methods [12, 13].

In this paper we present several physical and magnetic relevant properties of coated, magnetic cotton woven fabrics obtained by direct coating with hard magnetic powder solutions. Five mixtures containing barium hexaferrite powder, as hard filler particles have been used.

2. MATERIALS AND METHOD

2.1 Materials

A plain woven fabric made from 100% cotton yarns (fineness 17 metric count) have been selected as base due to the compatibility with thermoplastic polymers included in coating solutions.

We selected five coating solutions with various mass percentages of hard ferrimagnetic powder (izotropic barium hexaferrite $BaFe_{12}O_{19,}$ particularly used for permanent magnets, microwave absorber devices and recording media, two polymers in liquid state (polyvinyl acetate and polyurethane adhesive) and a glycerol ($C_3H_8O_3$) based plasticizer. The mass percentage of barium hexaferitte was varied between 15% and 45% while the amount of glycerol plasticizer was kept constant at 5%. The solution was performed by stirring for 24 h in a standard conditioning atmosphere (20^0C temperature and 65% relative humidity). After coating, five different magnetic woven fabric samples F1-F5 have been obtained.

The izotropic barium hexaferrite ($BaFe_{12}O_{19}$) - BF is a ferrimagnetic material, obtained from iron oxide (Fe_2O_3) and barium carbonate ($BaCO_3$) having the following estimated magnetic characteristics at room temperatures: saturation magnetization (M_s) of aproximatelly 54 emu/g, residual magnetization (M_r) of about 31 emu/g, and coercive field (H_c) of about 100 kA/m [13,14,15]

The polyvinyl acetate ($C_4H_6O_2$)n) - PVAc is a rubbery synthetic polymer in the thermoplastic class of polymers. PVA is an excelent polymer emloyed in the textile, paper and chemical industry due to its good adhesion on materials with cellulosic content.

Polyurethane adhesive (no applicable formula) - PUR is a polymer, not soluble in water, composed of a chain of organic units joined by carbamate (urethane) links. It is widely used in a wide range of fields owing to its superior physical and chemical properties, including good adherence on porous celulozic materials, good abrasion resistence and good elasticity without cracking [16].

Glycerol ($C_3H_8O_3$) -GLYC is a trihydric alcohol widely used in the food, cosmetic and pharmaceutical industries because it can serve many functions such as a humectant (moisture absorbing), plasticizer (softening), bodying agent, flavoring, denaturant, emollient (smoothing), antimicrobial, thickener and solvent. For our purpose GLYC is used as plasticizer of magnetic solutions.

2.2 Method

The technique for applying in-depth of solution (6) at the woven structure surface (5) was by scraper or knife coating which is shown in Fig. 1. A scraper steel knife (1) is placed above the horizontal woven fabric. The coating was performed in a multi-polar magnetizing field generated by permanent magnets (7) based on NdFeB and having an induction of 0.7 T. After solution application, the sample was passed through a device having a pair of rollers.

Top pressing roller (2) has a rubber sheath (for not damaging the coated surface) while the lower roller (3) has a metal surface. Before and after coating, the woven fabric is driven by guidance rollers (4).

In order to investigate woven fabrics structural modifications and magnetic properties, the coated woven fabrics were conditioned in a standard atmosphere of 65%±2% R.H. and a temperature of $20^0 \pm 2^0$C. To highlight the coated surface unevenness of woven fabrics was used an Olympus SZX 10 microscope equipped with Olympus DF PL 1, 5 X -4 and Olympus DF PLAPO 1 X -4 lens to a 6.3 magnification degree.

The woven fabric weight was measured (according to SR 6142:2007, Romanian Standard) in g/m^2 by using a Radwag Radon RS 232C weighing scale. The fabric thickness was measured (according to PN-EN 29073-2:1994, Polish Standard) in mm by using a Tilmet 73-Grubosciomierz under a pressure of 2kPa.

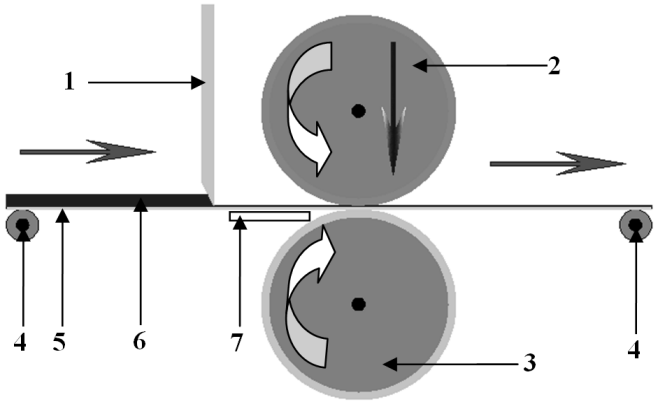


***Fig.1**:Schematic drawing of scraper coating; 1) scraper knife; 2) top roller; 3) lower roller; 4) guidance rollers; 6) magnetic solution; 7) permanent magnets*

The degree of charging was calculated according to relation:

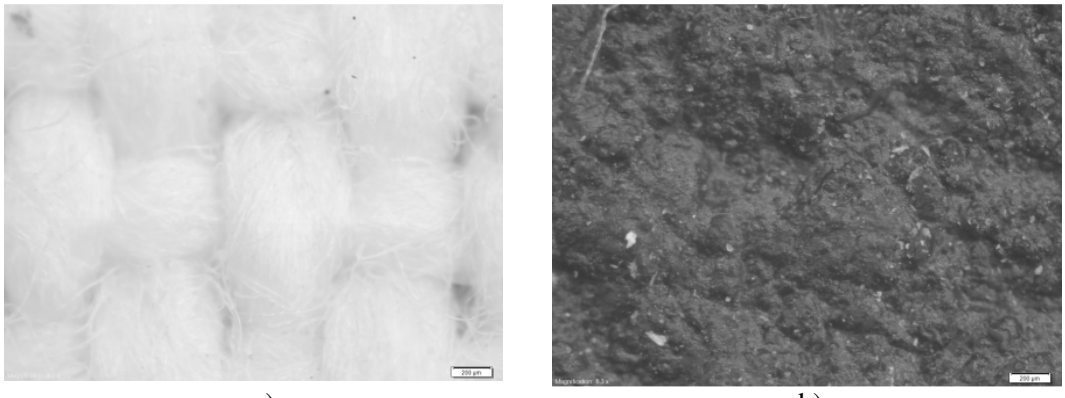
$$D_c = \frac{W_c - W_0}{W_0} \cdot 100(\%) \quad (1)$$

where: W_C – coated woven fabric weight in g/m^2;
W_0 – uncoated woven fabric weight in g/m^2.

In order to estimate the magnetic characteristics of bulk barium hexaferrite (FB) and coated woven fabrics (F_1 - F_5), a VSM Lake Shore 7300 magnetometer has been used. Magnetic measurements with VSM have been made in accordance with ASTM A894/A894M-00(2011) e1, „Standard Test Method for Saturation Magnetization or Induction of Nonmetallic Magnetic Materials".

3. RESULTS AND DISCUSSION

Two optical images of the uncoated woven fabric (F) and coated woven fabric (sample F3 with 30% hard magnetic powder in solution), respectively are given in Fig. 2.



a) b)

***Fig.2:** a) Microscope images: a) uncoated cotton woven fabric F and b) coated woven fabric-sample F3*

On surface of uncoated woven fabric can be seen fiber ends free, out of yarn structure. Depending on the content of ferrimagnetic powder from coating solution, the surface of coated woven fabrics has various shades of brown. Fig. 2.b highlights the presence of hexaferrite grains on the sample F3 surface and also the coating unevenness. The coating solution enters even the spaces between those two yarns systems (warp and weft yarn system) due to the rollers device.

Table 1 shows the experimental average physical characteristics of weight, thickness and degree of charging for uncoated sample and for five coated samples depending on barium hexaferiite percent from solutions.

Table 1: *Physical characteristics of uncoated and coated samples*

Characteristics	F	F_1	F_2	F_3	F_4	F_5
Magnetic solution	-	R_1	R_2	R_3	R_4	R_5
Percent of barium hexaferrite, wt.%	-	15	20	30	40	45
Average weight, g/m^2	290	396	401	429	550	629
Variation coefficient of weight (%)	0.152	0.053	0.059	0.043	0.035	0.034
Average thickness, mm	1.01	1.23	1.27	1.3	1.34	1.37
Variation coefficient of thickness (%)	2.034	2.255	4.165	5.616	5.775	7.38
Degree of charging, %	0.00	34.60	35.41	39.63	52.91	58.82

It is observed from Table 1 that the weight of coated samples depends on the amount of hard magnetic powder from solutions compared to uncoated woven sample weight which is characterized by a value of 290g/m^2. For example, 30% increase of magnetic powder content from coating solution between sample F1 and F5 is resulting in an increase of weight woven sample from 396 g/m^2 to 629 g/m^2. The weight unevenness of woven samples decrease with the increasing of hard magnetic powder from 0.053% to 0.033%. Instead, the unevenness of thikness increases with the increasing of hard magnetic powder from 2.25% to 7.38% (see Table 1) because the hexaferrite grains may adhere in different amounts on the different parts of woven fabric surface. Therefore, the thickness is within range from 1.23 mm to 1.37 mm compared to uncoated woven fabric thickness of 1.01 mm.

The hysteresis loops of the barium hexaferrite and magnetic woven fabrics obtained are shown in Fig. 3. Experiments carried out indicated that for a maximum saturation magnezation of bulk magnetic powder, the value of maximum field H was 600kA/m and for the coated woven samples saturation magnetization was 1000 kA/m.

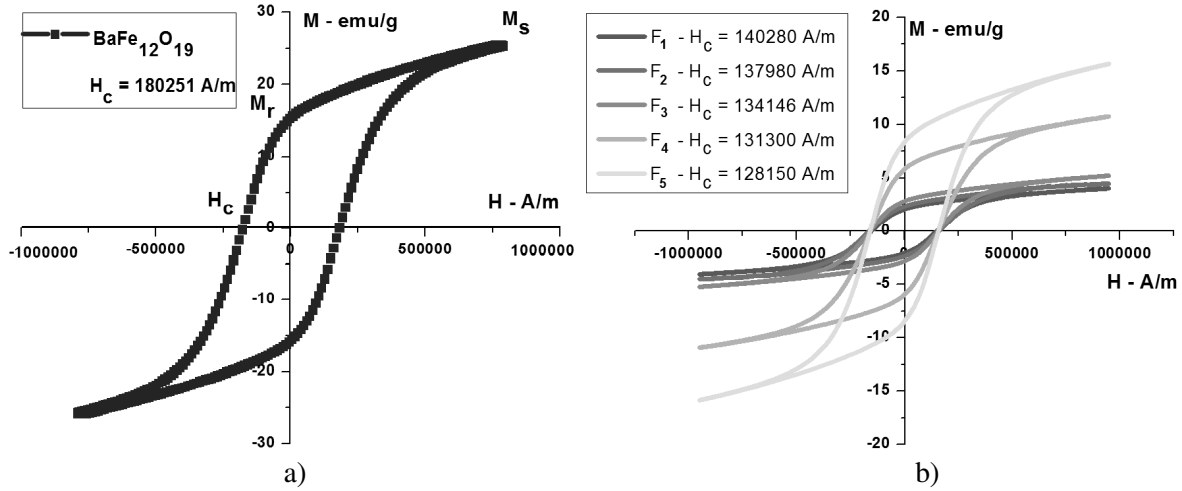


Fig. 3: *Hysteresis loops of: a) pure $BaFe_{12}O_{19}$ and b) F_1-F_5 woven samples*

Applying the magnetic grains onto the diamagnetic woven fabrics resulted in obtaining of composite woven fabrics with magnetic properties according to Table 2.

The higher degree of charging (see Table 1), the higher are the values of coated woven samples magnetic characteristics (see Table 2).

Table 2: *Magnetic characteristics of coated samples*

Characteristics	$BaFe_{12}O_{19}$	F_1	F_2	F_3	F_4	F_5
Saturation magnetisation, M_s – emu/g	25.5	4.05	449	5.23	10.76	15.65
Residual magnetisation M_r – emu/g	15.43	2.07	2.35	2.84	5.81	8.34
Coercive field, H_c kA/m	180.2	128.1	131.3	134.1	137.9	140.2

Penetration depth of solution in the woven fabric pores depends on the solution amount and the pressure applied on rollers device. Since the solution amount and the pressure were kept constant for all woven samples, the magnetic properties of woven fabrics depends only the magnetic powder content from each solution. The magnetic woven samples, whose hysteresis loops are presented in Fig. 3.b, are characterized by smaller values of magnetic properties than magnetic hard powder. This behaviour may be testified by the lower (by 38%) value of the sample F5 residual magnetization in comparison with the pure magnetic powder, which has a value of 25.5 emu/g Also, the value of the

field intensity of coated woven samples coercive force is lower (140.2 kA/m for sample F5) compared to coercive field of pure magnetic powder of 180.2 kA/m (see Table 2).

4. CONCLUSIONS

Five coating solutions with various mass percentages of hard ferrimagnetic powder, two polymers in liquid state and a glycerol have been proposed in order to obtain composite woven fabrics. The technique for applying of magnetic solution at the cotton woven sample surface was by scraper or knife coating.

Depending on mass percentage of hard magnetic powder, the surface of coated woven fabrics has various shades of brown.

Experiments carried out indicated that the coated woven fabrics physical properties depend on the hexaferrite percentage content from solution. Therefore, the higher the magnetic powder percentage content, the higher are the weight and thickness of the coated cotton woven fabrics. Magnetic grains from coating solution may adhere on different parts of woven fabric surface in different amounts and therefore the unevenness of thickness is higher than of the weight unevenness.

Nevertheless, the magnetic properties depend on the kind of magnetic filler and its percentage content by mass on the woven fabric surface. Also, the higher degree of charging, the higher are the values of coated woven samples magnetic characteristics.

The cotton coated woven samples are characterized by smaller values of magnetic properties than pure magnetic hard powder.

Improving of woven fabrics magnetic properties can be possible by using magnetic materials with smaller grain diameter (like nano magnetic grains), which would enable to increase of filling degree.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

APPRAISAL OF THE QUALITY OF FABRICS MADE OF COMBED WOOL YARNS THROUGH SYNTHETIC INDICES

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Abstract: *In order to assess the quality level, it is necessary to determine a series of indices, then to establish the reference elements on whose basis to formulate the findings and the conclusions, thus highlighting the optimum variants of fabrics. In this work have been determined the values of synthetic durability indices, setting the basis for a ranking of studied fabric variants in terms of surface characteristics. The highest weight in this work belongs to the measurement applied to an important number of quality characteristics, representative for the appraisal of durability functions specific to fabric surfaces. The selection of the representative characteristics: breaking strength, Pr (daN); mass loss due to friction stress, Δm (%); thickness diminution due to friction stress, Sg (%), breaking strain work, Ws (daN/m), fabric strength per denier, τ_t (cN/tex) and wrinkle recovering angle α (^{o}), on whose basis the durability indices were calculated, have been determined through standardized means and methods. The expertise method has been applied to assess the significance degree of the characteristics which express the analyzed products functions.*
*Quality index is the relative expression of a certain characteristic, obtained by referring it to a reference value (norm, standard or pattern). The index can be converted in marks, namely by convention the qualificative/mark «**0**» represents an inadequate product/non-quality, while the qualificative/mark «**1**» represents the high qualificative/mark level. In terms of complexity, quality indices can be simple, synthetic and global. The work sets the accent on the appraisal of quality level of the analyzed textile surface by means of synthetic indices.*

Key words: *synhtetic indices, breaking strength, wool fabrics, quality, qualificative*

1. INTRODUCTION

Quality has a complex character, which is determined by the large number of qualities or attributes which must be satisfied by the product in order to be considered as a quality product. Quality characteristics are used in order to assess or evaluate the quality. Named also quality criteria or parameters, these are quantitative and qualitative properties used to set forth the quality requirements imposed to products and/or their components [1], [2], [3]. Quality indices represent numerical expressions of the quality level of a product and they need to satisfy a series of conditions:

- to be simple, such that their calculus variant, their expression and their significance to be easily understood;
- to be pertinent, such that to provide the most accurate description of the real quality level;
- to be verifiable, i.e. to permit recalculation at any moment based on the utilized method.

Yarns quality characteristics influence the fabrics structure and properties in the processing procedures, wearing and maintenance; they motivate the prescription through standards and their testing through adequate methods [4], [5]. In order to determine the indices, it is necessary to apply appraisal methods for the quality characteristics specific to textile industry: *measurement* with a known accuracy through standardized means; *expertise*, accomplished through sensorial analysis by persons specialized in the field; *sociological*, based inquiry questionnaires address to potential users [6], [7], [8].

The basic raw material in the garment industry is represented by the fabrics which, depending on their destination, must satisfy a series of quality conditions related to the consumer, these being given by: properties which express the use value (of composition and structure, physical); properties

which express durability (mechanical), properties expressing the comfort (physical, defining physiological comfort; mechanical, defining psycho- sensorial comfort) [9], [10]. Quality indices are very useful to help management companies, current conditions of globalization. Business should strive to increase the competitive advantage that will increasingly depend on the parameters of innovation, new product development, versatility, quality, cost, etc, and indices will be measured [11], [12].

2. EXPERIMENTAL PART

2.1. MATERIALS AND METHODS

The study has been performed on fabrics of combed wool -type yarns used to manufacture overdresses. Durability indices have been determined based on an experimental matrix (Table 1) which included 4 input variables: fibrous composition, weave type, warp and weft yarn counts and flotation of the two yarn systems.

Table 1: *Experimental Matrix*

Variant Code	X1	X2	X3		X4	
	Fibrous composition	Bonding	Yarn count Nm		Flotation F	
			Warp	Weft	Warp	Weft
A2	100% Wool	D2/1	40/2	24/1	1.5	1.5
A5		P 2/1	52/2	52/2	1.5	1.5
A8		D2/1	48/2	30/1	1.5	1.5
A9		crepe	48/2	30/1	1.5	1.5
A10		crepe	48/2	48/2	1.5	1.5
A15		crepe	45/2	45/2	1.5	1.5
A16		D2/1	64/2	64/2	1.5	1.5
A17		D2/1	60/2	60/2	1.5	1.5
A18		D 3/1 3/1 1/2 1/1	60/2	60/2	1.6	1.6
A19		D2/1	56/2	37/1	1.5	1.5
A21		D2/1	56/2	37/1	1.5	1.5
A22		D1/2	56/2	37/1	1.5	1.5

The basic parameters (fibre composition, linear density, technological density of the two yarn systems and weave type) have been determined for the finished fabric through classical means and standardized methods. The intersection between a warp yarn and weft yarn is called bonding point, thus the bonding contains all bonding points having a warp or weft effect along a longitudinal or transversal direction. One or more bonding points having the same effect and forming one bonding segment can exist in longitudinal or transversal direction [13]. The bonding segments with the same effect are called flotation (F). They can be warp flotation (Fwarp) when the warp yarn passes over the weft yarn and weft flotation (Fweft) when the weft yarns passes over the warp yarn. The flotation size, similar to the bonding segment, have the minimum value F=1. The following relations exist between the ration (R), number of passes (t) and mean flotation (F):

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

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

Stages of synthetic index calculation:

- select the representative characteristics;
- get the set of representative samples (n);
- measure the characteristics through standardized methods;
- establish preferable sense of increase/decrease of each characteristic, depending on product destination;
- refer the values for each characteristic to a unique scale [0÷1]; the ratio will give the usefulness characteristic U_i from the relation:

$$U_i = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}} \quad (3)$$

for preferable increase sense of the characteristic value (positive characteristic);

$$U_i = \frac{x_{\max} - x_i}{x_{\max} - x_{\min}} \tag{4}$$

for preferable decrease sense of characteristic value (negative characteristic) [14];

- set the hierarchy of quality characteristics in terms of significance coefficient (significance degree), computed with the relation

$$\gamma_i = \frac{100 / \sum_{j=1}^{m} R_{ij}}{\sum_{i=1}^{n} (100 / \sum_{j=1}^{m} R_{ij})} \tag{5}$$

where: $R_{ij} = 1$ represents the rank assigned to the characteristic considered as the most important (with maximum mark/qualificative);

$R_{ij} = n$ represents the rank assigned to the characteristic considered as the less important (with minimum mark/qualificative);

n- number of characteristics, i= 1, …., n;

m – number of experts, j= 1,……., m.

The expertise method was used in order to establish the significance characteristic. The ranks corresponding to quality characteristics have been evaluated by an expert team consisting of six specialists in textile area (high instruction teaching staff). Based on appraisals, inquiry cards were drawn up, where the experts wrote the rank of each adopted characteristic (Table VI.4). In the polls carried out within the work, the experts have different ranks to quality characteristics.

The following relation was applied in order to check the agreement between the experts opinion:

$$W = \frac{\sum_{i=1}^{n} \left(\sum_{j=1}^{m} R_{ij} - R_{ij,n} \right)^2}{m^2 \cdot \left(n^3 - n\right)/12} \tag{6}$$

where:

$$R_{ij,n} = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} R_{ij}}{12} \tag{7}$$

In order to check the agreement between expert opinions, the χ^2 test was applied, where:

$$\chi^2 = W \cdot m(n-1) \tag{8}$$

If $\chi^2_{\text{calc}} > \chi^2_{\nu=n-1,\alpha=0.05}$ it follows that expert opinions agree with each other (W is significant)

For $W \geq 0.8$, the significance coefficient γ_i is determined with the relation:

$$\gamma_i = \frac{100 / \sum_{j=1}^{m} R_{ij}}{\sum_{i=1}^{n} 100 / \sum_{j=1}^{m} R_{ij}} \tag{9}$$

The characteristic hierarchy/ranking will be established based on the criterion of decreasing γ_i values. The representative values must satisfy the condition $\gamma_i > 1/n$

- calculate the synthetic index with the relation:

$$Is = \sum_{i=1}^{n} U_i \gamma_i \tag{10}$$

2.2. RESULTS AND DISCUSSIONS

In this work the synthetic durability (I_s) indices were calculated for each studied article, based on the previously presented algorithm:

- choose the representative characteristic:
  - breaking strength, Pr (daN);
  - mass loss due to friction stress, ΔM (%);
  - thickness decrease due to friction stress, Sg (%);
  - breaking strain work, Ws (daN/m);
  - fabric strength per denier, τ_t (cN/tex);
  - wrinkle recovering angle, α (°).
- The mean values of the durability characteristics for the fabrics from group A (100%L) are presented in Table 2.

***Table 2:**. Mean values of durability characteristics for fabrics of A group (100%L)*

Fibrous composition	Art. Code	Pr (daN)	ΔM (%)	Sg (%)	Ws (daN/m)	τ_t (cN/tex)	α (°)
Gruop A 100%	A2	30.28	2.5	8.50	66.5	6.61	167.2
	A5	32.48	3.0	11.21	54.5	7.28	168
	A8	24.53	2.8	9.94	62.3	6.06	166
	A9	25.12	2.6	8.08	38.5	6.20	169
	A10	30.88	2.3	8.08	57.1	8.06	162.2
	A15	28.92	2.4	5.30	51.6	5.81	161.4
	A16	23.1	3.1	12.16	54.0	6.19	167
	A17	28.24	5.8	9.40	67.9	6.83	164.2
	A18	39.6	2.6	8.10	125.3	8.22	166.4
	A19	25.12	3.2	11.65	55.6	7.15	166.6
	A21	24.7	3.1	12.28	57.0	7.03	167.6
	A22	24.98	3.1	10.03	47.3	6.72	169
min		**23.1**	**2.3**	**5.3**	**38.5**	**5.8**	**161.4**
max		**39.6**	**5.8**	**12.3**	**125.3**	**8.2**	**169.0**

- Preferable sense of variation for durability characteristics was adopted as follows:
  - positive characteristics: Pr, Ws, τ_t and α;
  - negative characteristics: ΔM and Sg.
- Refer the obtained characteristics to a unique scale (0- 1), presented in Table 3;
- for positive characteristics: $U_i = (X_i - X_{min})/(X_{max} - X_{min})$;
- for negative characteristics: $U_i = (X_{max} - X_i)/(X_{max} - X_{min})$.
- The calculus of synthetic durability indicator for **Group A** fabrics is presented in Table 3.
- To compute the indicator (l_s), the values of durability characteristics significance degree presented in Table 4 are necessary. The durability characteristics significance degree has been evaluated through the experts' method (Table 5).

***Table 3:**. Calculus of synthetic durability index for Group A fabrics*

Fibrous composition	Art. Code	positive Pr (daN)	negative ΔM (%)	negative Sg (%)	positive Ws (daN/m)	positive τ_t (cN/tex)	positive α (°)	I_s
Group A 100%	A2	0.435	0.936	0.542	0.322	0.330	0.763	0.534
	A5	0.568	0.778	0.153	0.184	0.610	0.868	0.537
	A8	0.087	0.857	0.335	0.274	0.102	0.605	0.345
	A9	0.122	0.890	0.602	0.000	0.163	1.000	0.416
	A10	0.472	1.000	0.602	0.214	0.931	0.105	0.518
	A15	0.353	0.953	1.000	0.151	0.000	0.000	0.352
	A16	0.000	0.762	0.018	0.178	0.156	0.737	**0.289**
	A17	0.312	0.000	0.413	0.338	0.424	0.368	0.314
	A18	1.000	0.892	0.599	1.000	1.000	0.658	**0.880**
	A19	0.122	0.739	0.091	0.196	0.556	0.684	0.381
	A21	0.097	0.748	0.000	0.213	0.506	0.816	0.383
	A22	0.114	0.771	0.322	0.101	0.378	1.000	0.419

Table 4: *Significance degree of durability characteristics*

Significance degree	Pr (daN)	ΔM (%)	Sg (%)	Ws (daN/m)	τ_t (cN/tex)	α (°)
γ_i	0.24	0.13	0.11	0.18	0.16	0.17

The conditions of characteristics ranking (γ= 0.11 and W= 105.2) were satisfied. The position of the characteristics presented in Table 5 was established in terms of γ_i. Ranking the fabric quality level has been performed in terms of synthetic indices (Fig. 1), whence one can see that the highest level of synthetic index was obtained at the article **A18**. Therefore this article can be considered as reference article for assortments of group A fabrics.

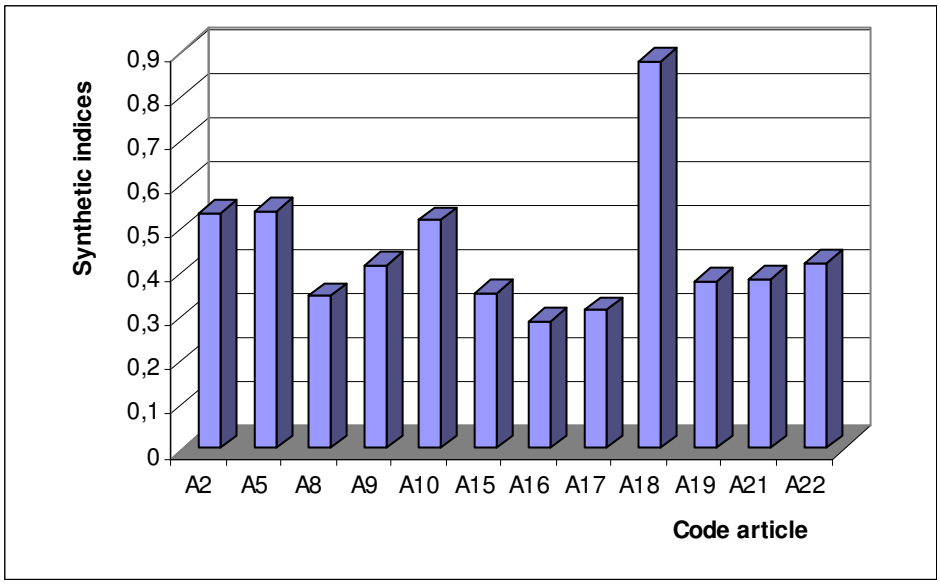

Fig. 1: *Fabrics ranking in terms of synthetic indicators*

Table 5*:. Determination of characteristics' significance degree through experts' method*

Characteristics / Experts	Pr (daN)	ΔM (%)	Sg (%)	Ws (daN/m)	τ_t (cN/tex)	α (°)	$\sum_{j=1}^{n} R_{ij}$
E1	1	5	6	2	4	3	21
E2	2	6	5	1	3	4	21
E3	2	5	6	4	1	3	21
E4	4	5	6	3	2	1	21
E5	1	3	4	5	6	2	21
E6	4	1	2	3	5	6	21
$\sum_{i=1}^{m} R_{ij}$	14	25	29	18	21	19	126
$100/\sum_{j=1}^{m} R_{ij}$	7.14	4.00	3.45	5.56	4.76	5.26	30.2
γ_{ij}	0.24	0.13	0.11	0.18	0.16	0.17	1.0
Position	1	5	6	2	4	3	21.0
$\sum_{j=1}^{m} R_{ij} - R_{ij,n}$	12544	10201	9409	11664	11025	11449	$\sum_{i=1}^{n}(\sum_{j=1}^{m} R_{ij} - R_{ij,n})^2$

3. CONCLUSIONS

This calculation mode permits to draw direct conclusions based on the values of quality indices: the closer to 1 is the index value, the better is the quality to which it refers.

The synthetic index I_s includes all the characteristics reflected in the analyzed fabric durability, as one can see from the experimental values in the case of **Group A** fabrics (100%L). Art **A18**, characterized by Nm_{warp}= Nm_{weft}= 60/2, P_{warp}= 310 yarns/10cm, P_{weft}=290 yarns/10cm, weave $D\frac{3\ 1\ 3\ 1}{1\ 1\ 2\ 1}$ with floating F= 1.6, has the highest value of the synthetic index I_s = 0.880. This is justified by the fact that within the range of analyzed assortments from **Group A**, the **Art 18** has the highest values for tensile strength, strain breaking work and fabric strength per denier, while the mass loss and thickness decrease due to friction are reduced; it also has a high crease recovering capacity.

The smallest value of the synthetic index I_s = 0.289, under the mean value of this index, was obtained at the article **Art A 16** from **Group A**, characterized by Nm_{warp} = Nm_{weft} = 64/2, Pwarp= 360 yarns/10 cm, Pweft= 240 yarns/10 cm, weave $D\frac{2}{1}/$ with floating F= 1.5, since it has the smallest tensile strength.

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

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

NEW METHOD OF UNION DYEING OF COTTON/NYLON BLENDED FABRIC USING CHITOSAN NANOPARTICLES

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Abstract: *Dyeing of fabric blends such as Cotton/Nylon (C/N) is presently dyed by two-bath or one-bath two-step dyeing. Cellulose fibers when immersed in water produce a negative electrokinetic potential. The negative charge on the fiber repels the anionic dye ions and consequently the exhaustion of the dye bath is limited. When the fabric is treated with chitosan (polyacrylamide), the primary hydroxyl groups of cellulose is partially modified into amide groups, which intern leads the cellulose to act like as polyamide fiber. As a naturally deriving substance, chitosan has several beneficial properties such as being nontoxic and biodegradable. Absorption of acid dyes by chitosan is mostly by electrostatic interactions, the larger surface area of chitosan nanoparticles is advantageous for enhancement of dyeability of textile material. Experimental work was carried out on finding the possibility of one bath dyeing of chitosan pretreated cotton/nylon fabric with acid dyes. The effect of chitosan pretreatment on dyeability, fastness, and few physicochemical properties has been investigated, and results are presented. The cotton/nylon sample treated with 0.3% of chitosan nanoparticles had higher K/S values, washing, and crocking fastness. Also observed, dyed fabric had antibacterial potential due to the antibacterial property of chitosan. New method of union dyeing showed level dyeing having good fastness properties and offers the option of cost effective and eco-friendly.*

Key words: *amide groups, acid dyes, chitosan, colour strength, pH, oxidation*

1. INTRODUCTION

Good solidity of hue and depth is more critical in 50:50 blends and in union fabrics, such as nylon warp stretch fabrics, containing cotton or nylon/ cotton wefts for swim wear and narrow fabrics, rain wear or work wear. Nylon/cotton is also used in socks. Nylon being a polyamide contains many amide groups in its structure. It also contains free amine groups at the ends of its polymeric chains, although the number of these free amine groups is less than the number of carboxylic groups, and the fiber possesses a negative charge unless in the appropriate pH region[1].

These amide and amine groups provide excellent hydrogen bonding sites and are the main factors contributing to the substantively of the dye molecules. Acid dyes have very little affinity for cotton, but cationic cotton can be dyed readily with acid dyes. The ammonium groups act as dye sites [2]. Conventional dyeing method of the cotton/nylon blend fabric carried out by two-bath or one-bath two-step dyeing with reactive / acid dyes (duration of 3 hours).

Chitosan is the deacetylated derivative of chitin. Chitin is the second most abundant polysaccharide found next to cellulose, the main component in the shells of crustaceans.Chitosan has the same backbone with cellulose except for its acetamide group instead of a hydroxy group. Chitosan is ß-1, 4-linked linear polysaccharides, and most of its glucopyranose residues are 2, 2-deoxy-b-D-glucopyranos [3]. Chitosan can easily adsorb anionic dyes, such as acid dyes, by electrostatic attraction due to its cationic nature in an acidic condition.

The use of chitosan, a polycationic biopolymer, is more eco-friendly [4]. The dye enhancement activity of Chitosan nanoparticles was seldom reported. Unique characters of nanoparticles for their small size and quantum size effect supposedly promised Chitosan nanoparticles to exhibit superior dyeability improvement [5].

Cellulosic fabrics can be oxidized by several oxidizing agents such as hydrogen peroxide (H2O2), sodium persulphate (Na2S2O8) and potassium periodate (KIO3). Oxidation of cellulosic fabric using sodium metaperiodate (NaIO4) has been extensively investigated in the literature, since it leads to selective cleavage at the C2 and C3 vicinal hydroxyl groups to yield a product with 2, 3-dialdehyde units along the polymer chain. The latter is an important functional polymer for further derivatisation to specialized products. Potassium periodate is known to selectively convert 1, 2-dihydroxyl groups to a pair of aldehyde groups without significant side reaction and is widely used in structural analysis of carbohydrates [6].This oxidizing agent was used successfully for surface oxidation of cotton fiber in the preparatory process with chitosan nanoparticles to produce chitosan coated cotton fiber.

A novel one step process is devised for preparation of modified fabrics; the fabric is treated in an aqueous solution containing the oxidant and chitosan [7]. Therefore, with blended fabrics or mixed fabrics, using cationic cellulosic fiber and regular cotton, two-tone effects can be obtained in one-bath dyeing. Meanwhile, this phenomenon gives a possibility to one-bath dyeing for blended fabrics, using cationic cellulosic fiber and nylon [8]. The main objective of this research is to explore the possibilities of union dyeing of cotton /Nylon fabric with acid dyes by introducing amino group in oxidized cotton using chitosan nano-particles and also enhancing antibacterial properties of dyed fabrics.

2. EXPERIMENTAL

2.1 Materials

Ready for dyeing 50/50 Cotton/Nylon (C/N) blended fabric with the weights of 150 g/m^2 was used. Chitosan (Degree of deacetylation (DD) = 92.5%, Molecular Weight=1000kD) and C.I.Acid Red 138 was used respectively for pretreatment and dyeing. All other reagents are commonly used laboratory reagent grade.

2.2. Preparation of chitosan nanoparticles

Chitosan was dissolved in a dilute aqueous acetic acid solution of 0.5 % (w/v). Aqueous ammonia was then dropped into the chitosan solution to precipitate the chitosan. The obtained gel-like swollen chitosan was washed to neutral with deionised water, and was then transferred into a 25 mL volumetric flask. The total volume of liquid was added to 25 mL with deionized water. An ultrasound processor (Cole Parmer – Qsonica) with a probe of 6mm diameter was used and it was put into the volumetric flask. Ultrasound treatment was conducted under an ice-water bath at 25W for 15 min. Finally, a milky emulsion was obtained.

2.3. Pretreatment with chitosan and sodium periodate

Pre-washed cotton/nylon blend fabrics were soaked for 30 minutes at 40 ºC in chitosan nano-emulsion at five different concentrations 0.01%, 0.05%, 0.1%, 0.3 and 0.5% (w/v) with 50 mg/100ml of sodium periodate (1:50). Then cotton/nylon blend fabric washed several times with water and dried.

2.4 Dyeing

Dyeing of the pretreated blend fabrics were carried out in the laboratory dyeing machine by exhaust method. Fabrics were dyed with 3% C.I.Acid Red 138 in a bath containing 9 %of Ammonium acetate, and 3% hydrochloric acid of 10%, with a liquor ratio of 1:20. Firstly, salt and acid were added to water and the dyeing bath was warmed at 60º C, then the samples were immersed in the dyeing bath and the dyeing continued for 10 min, followed by adding dye solution and the dyeing continued for 15 min., then the temperature was raised to boiling through 20 min, the dyeing was continued at this temperature for 30 min, finally the dyeing was stopped and the dyeing bath was cooled.

2.5 Evaluation of the dyed cotton fabrics

The color strength (K/S) of the treated sample using the undyed samples as blank was determined using X-rite spectrophotometer, according to Kubelka- Munk equation.

$$K/S = (1-R)^2 / 2R \quad (1)$$

The color difference (ΔE) and relative color strength between chitosan treated dyed and untreated dyed samples were also calculated according to Eq. (2)

Realtive colour strength (%) = K/S value of Tretated sample / K/S value of Untreated sample (2)

2.6 Antibacterial Efficiency

AATCC100-2012 test method was used to analyze the antibacterial activity of the treated cotton/nylon blend fabrics. The organisms taken for this study were *Staphylococcus aureus* (*S.aureus*) and *Escherichia coli (E.coli*). To evaluate the antibacterial activities of the treated fabrics, the reduction in colony number between the treated and untreated samples after incubation was determined with two specimens for each organism.

3. RESULT AND DISCUSSION

3.1. Colour Strength

K/S value of a dyed material has a close relationship to the amount of dye absorbed by the fabric. K/S values and the relative color strength of cotton/nylon dyed samples with C.I.Acid Red 108 are shown in *Table 1.* It was observed that the color measurements of untreated cotton/nylon fabric have the lowest values. This was because cotton fibers when immersed in water produce a negative zeta potential. The negative charge on the fiber repels the C.I.Acid Red 138 dye ions and consequently the exhaustion of the dye bath was limited which lead to the decrease of the color measurements. The color measurements of cotton/nylon blends increased with the Chitosan pretreatment.

Table 1: *K/S Values of dyed samples*

Chitosan concentration (%)	**ΔE**	**K/S**	**Relative colour strength (%)**
0	-	12.246	100
0.01	1.494	16.786	137
0.05	1.796	17.724	145
0.1	1.909	18.967	154
0.3	2.321	20.989	171
0.5	2.307	20.693	169

This enhancement in (K/S) values of chitosan treated cotton/nylon fabrics shows that the chitosan has an incremental effect in dyeing processes. The improved dye ability is postulated due to the presence of amide groups (-CONH2) available from the polyacrylamide (chitosan). It is observed (*Table 1*) that by increasing the chitosan concentration the (K/S) values has been increased up to 0.3% and then decreased. This detraction in (K/S) values of chitosan treated cotton fabric is associated with the saturation of cotton/nylon fabrics by chitosan.

3.2. Colour Fastness Properties

For evaluation of colour fastness of dyed fabrics, the following test methods were performed with three repeats and average values given in table 2.

- Colour fastness to Washing, according to ISO 105 C06:2010
- Colour fastness to Rubbing, according to ISO 105 X12:2002
- Colour fastness to Light, according to ISO 105 B02:2013

Table 2: *Colour fastness properties*

Chitosan concentration (%)	Wash Fastness			Wet Rub Fastness	Light Fastness
	Colour change	Staining on Cotton	Staining on Nylon		
0	3-4	3-4	2-3	3	4
0.01	4	4-5	4-5	4	4
0.05	4	4-5	4-5	4	4
0.1	4	4-5	4-5	4	4
0.3	4	4-5	4-5	4	4
0.5	4	4-5	4-5	4	4

The attachment of the dye molecules onto the partially-modified cellulosic substrate is by ionic bonding since no dyes strips out from the dyed sample. This is also indicative through the wash fastness properties. The fastness values of all such dyed samples are quite improved whereas untreated sample shows poor washing and crocking fastness properties.

3.3. Physical properties

Dyed cotton/ nylon samples were tested for various fabric properties such as air permeability and tensile strength. For Air permeability testing, ten measurements carried out in each sample using TEXTEST FX 3300 Air Permeability Tester and average value given in table 3. It is inferred from the table 3 that there is a change in air permeability of the nano chitosan treated cotton fabric as compared to the untreated one. It is perhaps due to the attachment of chitosan to all over the whole structure of the fabric. The slight losses of air permeability in the pretreated fabrics have not affected intact breathability of the cotton fabrics which is important requirement for comfort properties.

Table 3: *Physical properties*

Chitosan concentration (%)	Tensile Strength-Warp (N)	Air Permeability ($l/m^2/s$)
0	459.5	350.5
0.01	397.4	304.5
0.05	395.6	298.7
0.1	392.2	293.2
0.3	389.8	290.9
0.5	398.5	289.7

For Tensile strength, five measument taken in warp direction and it is obvious from table 3 that tensile strength loss slightly significant after the process. The slight loss of strength is mainly due to the oxidation and stiffening of the molecular backbone after cross-link formation.

3.4. Antibacterial Activity

The antibacterial activities of cotton/nylon fabrics have been tested with prepared two specimens for each analysis and figure 1 represents average reduction values against both *E. coli* and *S. aureus*. These data show that treated fabrics had bacterial reduction. The antibacterial activity of cotton treated with chitosan was considerably decreased after dyeing due to the blocking of the cationic groups of the chitosan and fibers by dye molecules. The reduction values exhibited by chitosan treated and subsequently dyed fabrics are higher than un-dyed samples which prove that

chitosan treatment enhances the antibacterial activity of the dyed fabrics. It has been observed that the antibacterial action of treated samples is due to chitosan nanoparticles.

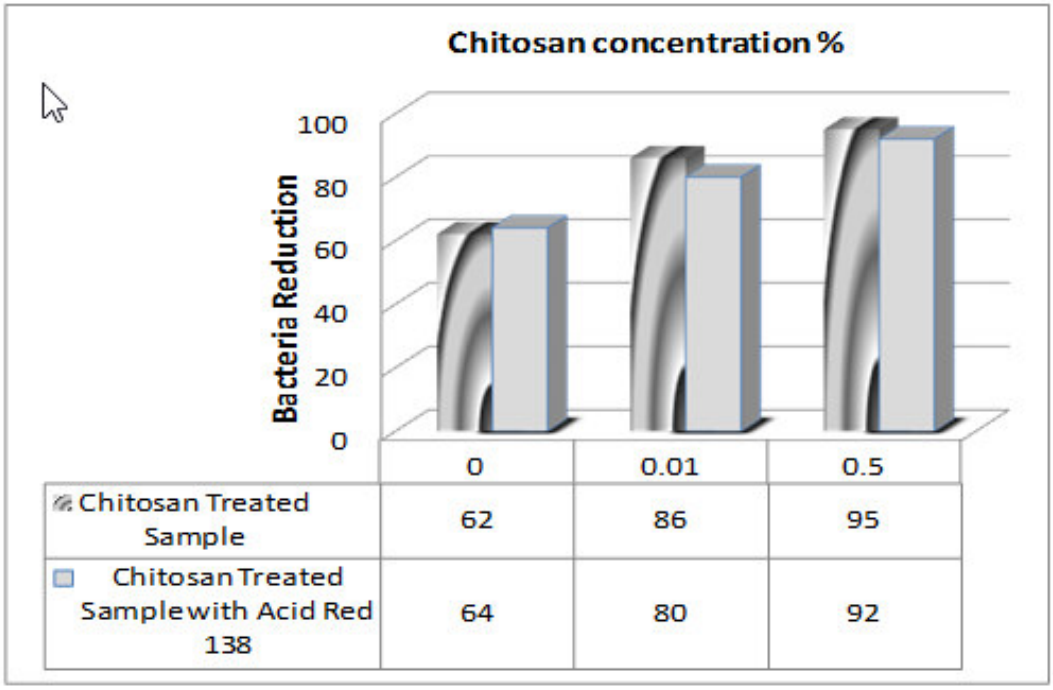

Fig. 1: *Graphical representation of antibacterial activity results*

4.CONCLUSIONS

This paper described the ability to dye cotton/nylon blend fabric in one step, one dyeing bath with shortened time. It was found that the pretreatment of cotton/nylon fabrics with chitosan nanoparticles enhanced the dye uptake and also increased the antibacterial activity of cotton/nylon fabrics compared with untreated fabric. The improved dye ability of cotton to acid dye is postulated due to the presence of amide groups available from the chitosan. Based on the depth of shade values, it was found that by increasing chitosan nanoparticles concentration up to 0.3% (w/v), there was significant improvement of relative color strength. Moreover, colorfastness properties to washing and wet crocking of the treated samples were improved. Union dyeing of cotton/ nylon fabrics with acid dyes using biodegradable modification agent such as chitosan is an environmental friendly approach in the field of textile dyeing industry.

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ANNALS OF THE UNIVERSITY OF ORADEA
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TRACTION RESISTANCE IN CHITOSAN TREATED COTTON

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Abstract: *Nowadays natural products interest has increased. However, when some products are included on textile fibres, they have no affinity and need some binders or other kind of auxiliaries to improve the yeld of the process, and some of them are not so natural as the product which are binding and consequently the "bio" definition is missed as some of them can be considered as highly pollutant. Chitosan is a common used bonding agent for cotton. It improves the antimicrobial and antifungal activity, improves wound healing and is a non-toxic bonding agent. The biopolymer used in this work is chitosan, which is a deacetylated derivative of chitin. These properties depend on the amount of deacetylation (DD) and the Molecular weight (MW). Along with these improving properties, as it recquires some acid pH to ve solved the treatment with chitosan can have some decreasing mechanical properties. The aim of that paper is to evaluate the change in breaking force of the treated samples and a change in elongation of those samples. It compared different amounts of concentration of chitosan with non treated cotton. The traction resistance test were performed on a dynamometer. The test was conducted according to the UNE EN ISO 13934-1 standard.*

Key words: *chitosan, breaking force, elongation, heat treatment, oxzidized cotton.*

1. INTRODUCTION

Chitosan is an N-deacetylated derivative biopolymer of chitin. The deacetylation of the chitin is never completed. Fig 1 shows the molecular structures of cotton, chitosan and chitin. [1] Chitosan has a wide range of use due to antimicrobial and antifungal activity, non-toxicity and ability to improve wound healing.[2, 3] Three important parameters influence these properties: degree of deacetylation (DD), molecular weight (MW) and the amount and location of the aminogroups. [3] Despite these usefull properties, the curing of the cotton-chitosan has a reduction in mechanical strength.[4] Therefore we investigate the traction resistance according the UNE EN ISO 13934-1 standard.

2. EXPERIMENTAL

2.1.Materials

The used chitosan is deacetylated chitin. One has low molecular weight (XL), one medium molecular weight (XM) and one chitosan comes from shrimp shells (XS). All chitosan were commercial products, obtained by Sigma-Aldrich. Different kinds of concentration were 3g/L and 5g/L. The amount of both was 2l to obtain a good pick-up in the impregnation bath. The solution stirred 24 hours before it was used in the impregnation bath.

The cotton fabrics were cotton samples from the Universitat Politecnica de Valencia. There denisty was 210g/m². The cotton in these fabrics were oxidized cotton as shown in Fig 2 [5]. The test was performered in the weft direction.

The impregnated cotton was dryed at 80°C in a screen printing engineering TD-20. Afterwards different pieces were cutted and cured at different temperatures in a range from 80 °C till 200 °C in a WTC Binder 030.

Tensile strength was performed on a dynamometer Zwick/Roell following the UNE EN ISO 13934-1 procedure.

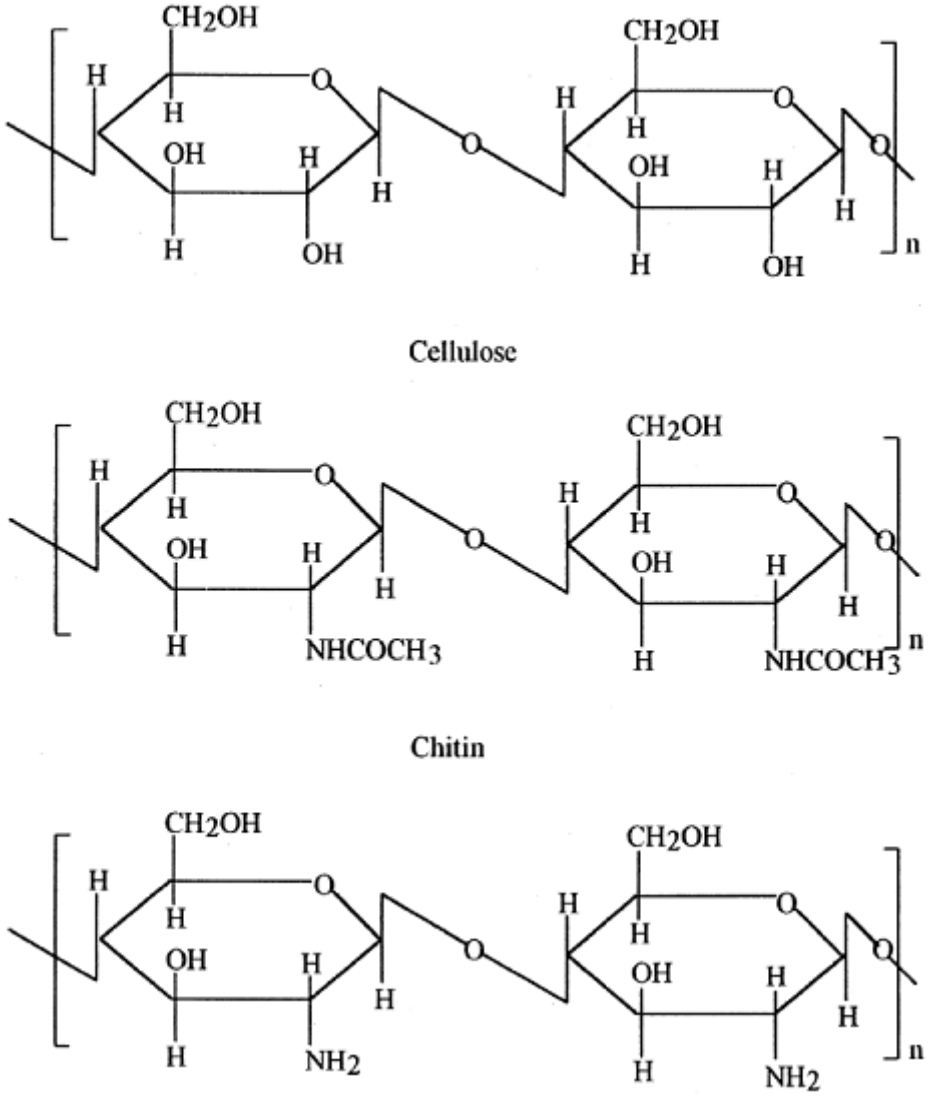

Fig. 1: *Structure of cotton, chitin and chitosan*

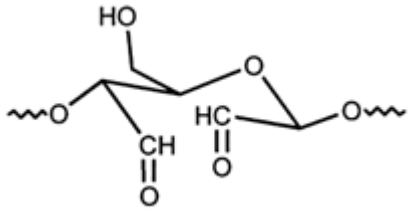

Fig. 2: *Oxidized cotton*

2.2. Treatment of the cotton

Cottons were impregnated in the different chitosans by using an impregnation unit, with a 3 bar pressure between the rolls. After drying in the screen printing dryer, the cotton was cutted in different pieces to let them cure at different temperatures as shown in table 1.

Table 1: *Different cure temperatures of the chitosan for both of the different concentrations of chitosan.*

Name	Cure Temperature(°C)	Name	Cure Temperature(°C)	Name	Cure Temperature(°C)
XM_80	80	XM_80	80	XM_80	80
XM_100	100	XM_100	100	XM_100	100
XM_120	120	XM_120	120	XM_120	120
XM_140	140	XM_140	140	XM_140	140
XM_160	160	XM_160	160	XM_160	160
XM_180	180	XM_180	180	XM_180	180
XM_200	200	XM_200	200	XM_200	200

2.3. Testing the traction resistance

The samples were cutted in the weft direction. The size of the samples was 25cm by 5 cm. The distance between the two clamps was 20 cm. According the UNE EN ISO 13934-1 procedure.

3.RESULTS AND DISCUSSION

3.1. Breaking force

Fig 3and 4 show the differences in breaking force between the different chitosan treated and untreated cotton. There is not a lot of difference between the different chitosans, its concentration, and is curing temperature. Untreated is the one that stay somewhat the same until 200°C. The treated samples go up and down, and ther is no constant. Fig 5 shows that when a cotton is heated the breaking force decrease allready with 40% at 80°C and decrease slighty until 180°C. At 200°C it has decreased with 60%.

The difference in breaking force between the unheated and heated cotton is that the cellulose in cotton start decomposing slowly after 60°C. The difference in breaking force between 200°C and the other curing temperatures is that after 180°C the decomposition accelerated. [6] Decomposing of the cotton results in loss of mechanical strength. Fig 3, 4 and 5 show that not the treatment with chitosan but the heating is the source of the loss in breaking force.

3.2. Breaking elongation

Fig 6 and 7 show that if a cotton fabric is treated with chitosan its percentage of breaking elongation increase. The reason for this increase is the treatment of cotton with the chitosan. Chitosan is a wet solution, this will make the cotton fabrics shrink and more dense. [4]

Fig 8 shows an increase in breaking elongation after a heat treatment, this can be explained by the shrinking of cotton and loss of mass due the decomposition of the cotton after 60°C. Decrease of elongation after 180°C is of the decomposition of the cotton cellulose. [4, 6] The results of fig 6, 7 and 8 show that because of heat treatment and chitosan treatment the breaking elongation is higher than without chitosan treatment. This is the combination of the two reasons the cotton shrinks, so it elongation is higher.

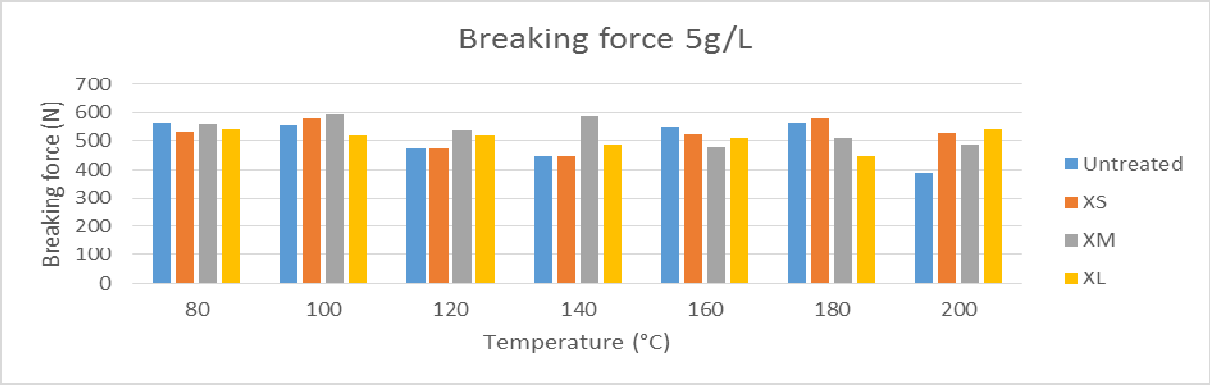

Fig. 3: *Breaking force in the weft condition for 5g/L at different temperatures for the different types of chitosan*

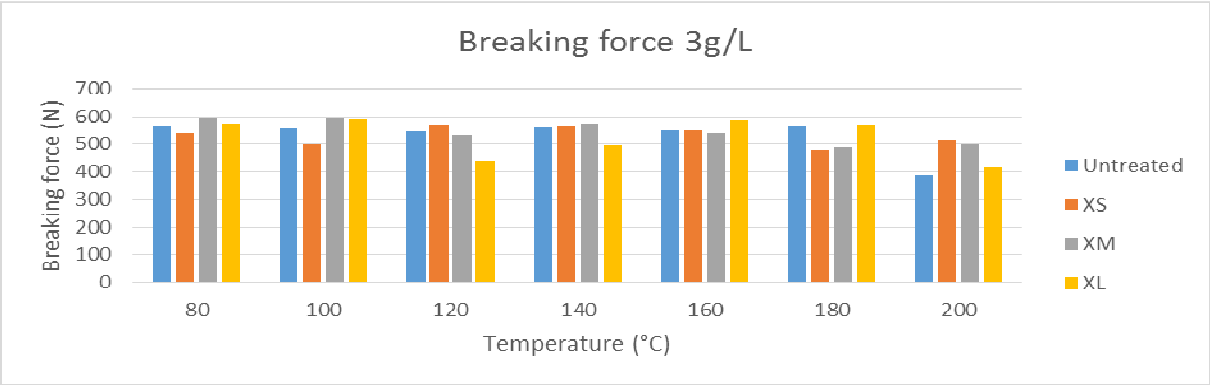

Fig. 4: *Breaking force in the weft condition for 3g/L at different temperatures and the different types of chitosan*

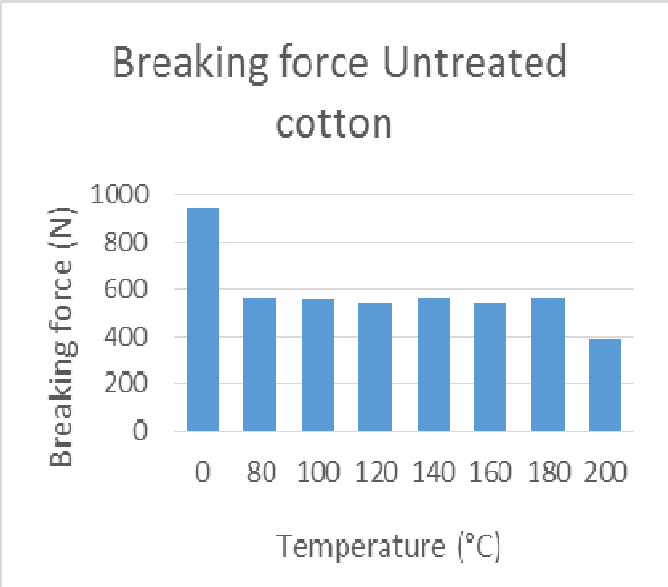

Fig. 5: *Untreated cotton on different curing temperatures (0°C is not cured cotton)*

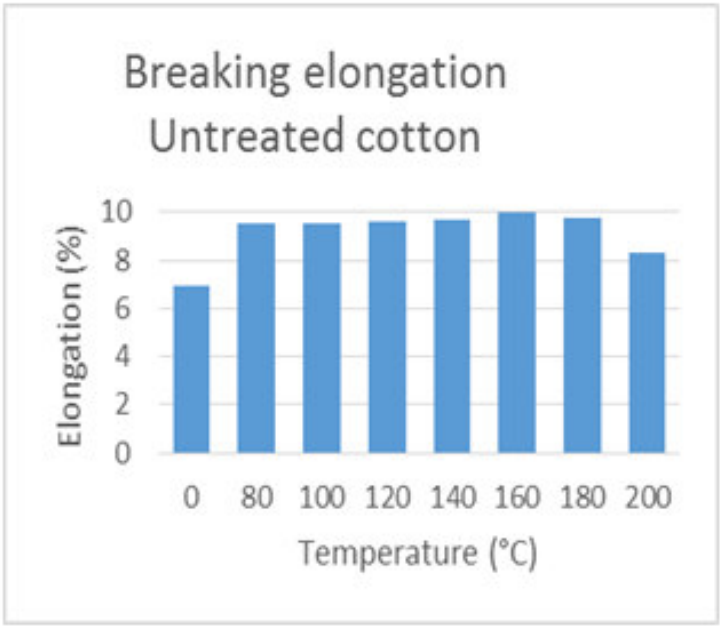

Fig. 6: *Elongation of untreated samples at different temperatures*

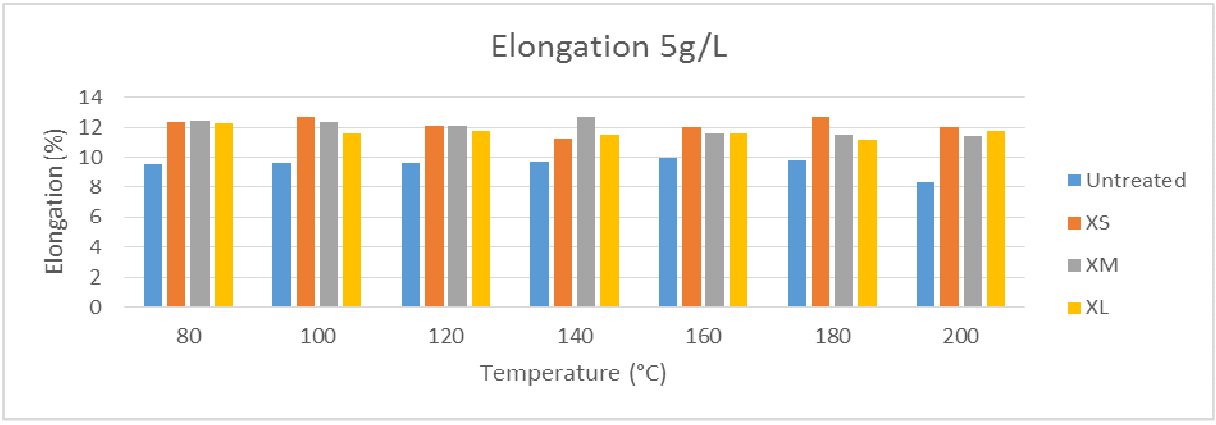

Fig. 7: *Elongation of the fabric cured at different temperatures in the weft direction for treatment with 5g/L*

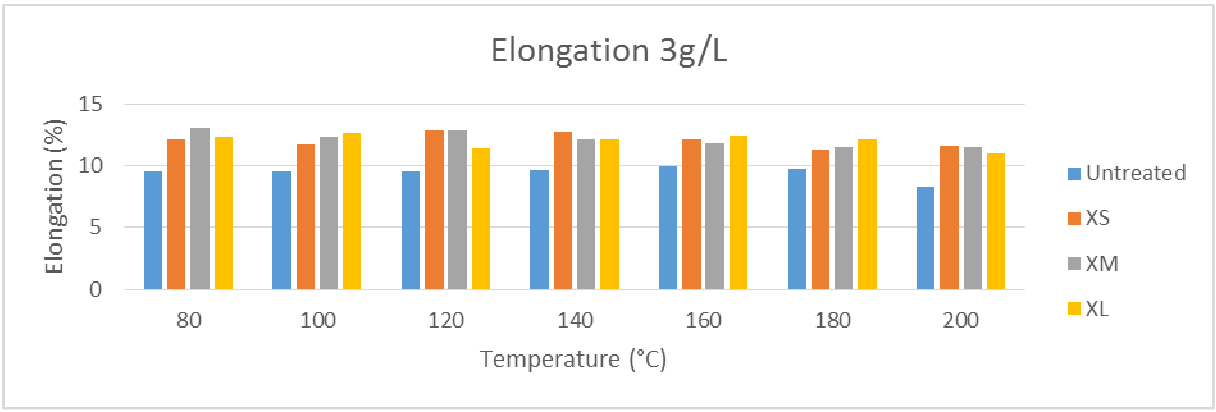

Fig. 8: *Elongation of the fabric cured at different temperatures in the weft direction for treatment with 3g/L*

4.CONCLUSIONS

Breaking force reduces after treatment with heat and chitosan. The reason of the loss in not the treatment with chitosan, but the heat treatment to bond the chitosan with the cotton cellulose. When the temperature gets to high, the cotton starts decomposing and the breaking force reduces significantly.

Elongation increases after treatment with chitosan and heat due to shrinking of the water and heat treatment. It decreases again after decomposing of the cotton.

Chitosan treatment lets the decompising at high temperature become even higer.

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ANNALS OF THE UNIVERSITY OF ORADEA
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EXPERIENCES IN THE AIR SPINNING TO MANUFACTURE MEDICAL DEVICES

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Abstract: *The work aims to determine, with scientific rigor, differences in key parameters of the yarns produced by conventional ring spinning systems, open-end and air spinning and its interrelation with the main parameters of those products that are intended for medical-sanitary sector. The experiences have been made in a Spanish company from short fibers sector that has three spinning systems, with tradition and prestige in world market, validating the results in Innotex Center laboratories of the Polytechnic University of Catalonia.*
Considering the results, it shows that the technology of manufacture of yarns by air is suitable for yarn, woven fabrics and knitting, structures to textile medical-sanitary application, by specific properties as well as enhanced competitiveness, due to the high production rate and shortened spinning process.
The viscose yarns manufactured by air mass are more mass regular. The new DR parameter clearly indicates a better look of the finished fabric when we work with yarns produced by air technology.The significant reduction of the hairiness means less formation of loose fibres by friction, very important in the application of these yarns in the manufacture of textile structures for medical-sanitary use. Also no-table increase of about 15% in the absorption capacity of the fluids, especially water, from the yarns made by air. In the functionalization of fabrics obtained from spun yarn by air will need to apply a permanent smoothing.

Key words: *Air spinning, Open-end spinning, Medical Devices*

1. INTRODUCTION

It is well known by experts in medical and sanitary sector and those responsible for textiles technology centers trend over the next 10 years textiles for these applications will experience exponential growth sustained. Much higher than the fabrics for the world of fashion and home textiles growth [1]. To focus on Spanish case, we understand can be extrapolated to many other countries, according to the National Institute of Statistics, in 2020 the 19.9% of the Spanish population will be over 65 years, implying an increase in spending on medical devices and, especially, all those products specifically for older people [1].

From technical literature studied [1], it follows that the yarns for medical-sanitary applications must accomplish with very strict specifications, some of them closely linked with the fibrillar structure of yarns, depending on the spinning system followed for manufacturing. The appearance on the world market of open-end systems and later the air spinning, much more productive than conventional spinning ring, has involved obtaining yarns with a different structure (Figures 1, 2 and 3), with different behavior in the rest of the textile production.

Fig. 1: *Structure of a yarn obtained in the ring spinning*

Fig.2: *Structure of a yarn obtained in open-end machine*

Fig. 3: *Structure of a yarn obtained in air machine*

It is well known that it has had to adapt technologies of woven fabric and knitting, dyeing, stamping and finishing to these new yarn structures. In general, we can say that air technology, we must have a minimum of 70 fibers in section, compared to 60 that are usual for a yarn of spinning ring.

It should be in mind that an open-end yarn is difficult to obtain, in an industrial production process, with less than 120 fibers per section [2].

A recent comparative study [3], from the economic point of view, between the conventional ring system and the spinning air to produce viscose yarns of 30 Ne, for knitted fabrics, with a production of 750 kilos / hour is deducted that in the study conditions established, air technology reduces the space occupied and the energy required to manufacture the yarn in 30% and it reduces the personnel required to 18 people instead of the 47 required in the ring continuous process.

2. EXPERIMENTAL PHASE

The spinning process followed cotton carding, comprising a blowroom, suited to the characteristics of the treated material, a card autoregulated short and long term, two steps of drawframe, the second self-regulating, a roving frame and a spinning frame. Subsequently, the yarns are cleaned and winding. We worked on ring spinning frames of 912 spindles, open-end machines of 312 spindles and air spinning machines of 40 spindles. Production speeds have gone from 21,5 meters/minute on ring spinning, 110 meters/minute in the open-end machine, reaching 330 meters/minute in the air spinning.

We have manufactured viscose yarn number 40 metric, with a twist of 700 turns/meter in Z direc-tion, by the carded cotton system, by open-end system and by air spinning. In open-end systems and spinning by air we start from the same second step of drawframe used in the manufacture of yarns in the ring spinning frame. In our study are strictly maintained environment conditions, both raw material and the spinning process. Only the parameters have varied in spinning machine. The work was carried out in a Spanish short fibers spinning that has three spinning systems in industrial production process, at normal speed for this type of production, with a large sample, over several days of production, so we must understand results as very significant.

In Innotex Center laboratories of the Polytechnic University of Catalonia, we have validated the results. To characterize the yarns we compared its dynamometric behavior, regularity mass, hairiness, coefficient of friction and bulk. Has been extended the study of conventional mass regularity (Uster, CV, thin points, thick points and neps in 1000 meters length yarn) with a new parameter, developed in our laboratories in collaboration with Keisokki, called DR (Deviation Rate), which is much better parameter related to the appearance of the finished fabric than conventional parameters [4] [5]. A DR of 45% means that 45% of the analyzed meters exceed, more or less, the average mass of the yarn increased and decreased by 5%. For this determination we consider reference yarn lengths of 1,37 meter (1,5 yards), working the mass evenness installation at Inert Test. In Figure 4, the concept of DR is described. It has been completed the comparative study of the regularity of yarns mass by determining CV_L (%), obtained with the same reference lengths.

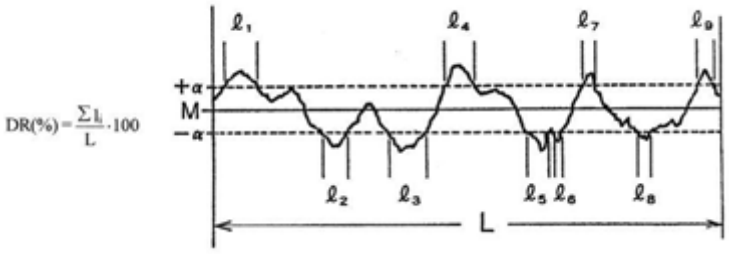

Fig. 4: *DR concept to determine the regularity of yarns and predict the appearance of the finished fabric*

Hairiness of the yarns is measured by the number of hairs of different lengths, in 400 meters of yarn. We define H index, an index of hairiness, with complex formulation, and S3 and as the amount of hairs length equal or higher than 3 mm. The bulk is measured on a Bulkometer indicating the bulkiness of the yarn in cm^3/g of yarn. With yarns obtained in three spinning systems to be compared, it has been manufactured knitted in a circular small diameter laboratory machine to determine their propensity to pilling, abrasion behavior and their ability to absorb fluids, especially water. The scale of pilling propensity varies from 1-5, reserving grade 1 for yarns with high propensity to pilling and level 5 for items that are not pilling in a normal use of the garment or medical device.

3. DISCUSSION OF THE RESULTS

In table 1, 2 and 3 indicate the main parameters of the yarns obtained in the ring spinning, open-end and air spinning, respectively.

Table 1: *Main parameters of yarns manufactured by spinning ring (viscose), 40Nm, 700 turns/meter*

PARAMETERS	RESULTS
Behavior dinamométric	
Breaking strength (cN)	377,7 ± 6,1
CV Breaking strength (%)	8,1
Elongation at break (%)	15,0 ± 0,1
CV Elongation (%)	5,0
Tenacity (cN/tex)	15,2
Mass regularity	
CV (%)	11,5
U (%)	8,9
Thin points (-50%)	0
Thick points (+50%)	8
Neps (+200%)	38
Neps (+400%)	1
DR (%) (1,37 m ± 5%)	21,2
CV_L (%) (1,37 m)	4,2
Hairiness	
N1	64137
N2	12635
N3	7590
N4	6975
N6	2045
N8	154
N10	2
H	15
S3	16766
Bulk (cm^3/g)	3,54
Pilling	2/3
Abrasion to 15.000 cycles	
Weight loss (%)	8,7
Water absorption (s)	6,8
Coefficient of friction	0,28

Table 1: *Main parameters of yarns manufactured byopen-end spinning (viscose), 40Nm, 700 turns/meter*

PARAMETERS	RESULTS
Behavior dinamométric	
Breaking strength (cN)	300,9 ± 6,4
CV Breaking strength (%)	10,6
Elongation at break (%)	12,1 ± 0,3
CV Elongation (%)	11,8
Tenacity (cN/tex)	12,1
Mass regularity	
CV (%)	13,2
U (%)	10,3
Thin points (-50%)	0
Thick points (+50%)	33
Neps (+200%)	39
Neps (+400%)	0
DR (%) (1,37 m ± 5%)	26,8
CV_L (%) (1,37 m)	4,5
Hairiness	
N1	10314
N2	1789
N3	1017
N4	1328
N6	685
N8	87
N10	1
H	33
S3	3118
Bulk (cm^3/g)	3,25
Pilling	3/4
Abrasion to 15.000 cycles	
Weight loss (%)	8,9
Water absorption (s)	6,7
Coefficient of friction	0,30

As it is well known, the yarn manufactured in the ring spinning has a greater tenacity. The yarns made by air increased toughness in comparation with open-end and their traction breaking elongation is very close, being smaller than that obtained when manufacturing the same yarn in the ring spinning.The yarns manufactured by air, as shown in the tables of comparative results, have excellent mass regularly. For most medical and health textiles, yarn regularity is a technical conditioning. The yarns manufactured by air improve regularity, whether measured with conventional parameters such as the new parameters used in this work (DR and CV_L). We move from a DR of 21,1% for the yarn obtained in the ring spinning, considered as reference, to values of 12,6% and CV_L is reduced from 4,2 to 3,2%. The yarns produced by air have very low hairiness, both in number of hairs in each length and respective hairiness rates. This point is essential to reduce the amount of loose fibers formed by friction in textiles for medical-sanitary use. We also note that the yarn produced by air has a higher water absorption capacity [6]. We go from value of about 6,8 seconds to 5,8 seconds only, implying an increase of the absorption capacity of 15%, most determinant factor in medical-sanitary applications.In contrast tests to assess the softness of the fabrics made with three sets of yarns, made by several expert evaluators in marketing fabrics [5], following a specific procedure essay that takes into account international standards, we obtain the softest are made of yarn of ring spinning, followed by open-end and the harsher are manufactured by air technology. This end finds its justification in the internal structure of these yarns. For some medical applications we leverage operations functionalization of fabrics, to confer specific properties to apply a permanent softening product compatible with the rest of applied products and the requirements marked in application protocols of these fabrics in the medical-sanitary sector.

4. MAIN CONCLUSIONS

Table 3: *Main parameters of yarns manufactured by air spinning (viscose), 40Nm, 700 turns/meter*

PARAMETERS	RESULTS
Behavior dinamométric	
Breaking strength (cN)	327,1 ± 6,9
CV Breaking strength (%)	10,5
Elongation at break (%)	11,9 ± 0,3
CV Elongation (%)	12,2
Tenacity (cN/tex)	13,1
Mass regularity	
CV (%)	12,0
U (%)	9,4
Thin points (-50%)	1
Thick points (+50%)	19
Neps (+200%)	6
Neps (+400%)	0
DR (%) (1,37 m ± 5%)	12,6
CV_L (%) (1,37 m)	3,2
Hairiness	
N1	2781
N2	68
N3	11
N4	4
N6	1
H	3
S3	16
Bulk (cm^3/g)	3,25
Pilling	3
Abrasion to 15.000 cycles	
Weight loss (%)	5,1
Water absorption (s)	5,8
Coefficient of friction	0,32

Considering the results, it shows that the technology of manufacture of yarns by air, is suitable for yarn, woven fabrics and knitting, structures to textile medical-sanitary application, by specific properties as well as enhanced competitiveness, due to the high production rate and shortened spinning process. The viscose yarns manufactured by air mass are more mass regular. The new DR parameter clearly indicates a better look of the finished fabric when we work with yarns produced by air technology.The significant reduction of the hairiness means less formation of loose fibres by friction, very important in the application of these yarns in the manufacture of textile structures for medical-sanitary use. Also no-table increase of about 15% in the absorption capacity of the fluids, especially water, from the yarns made by air. In the functionalization of fabrics obtained from spun yarn by air will need to apply a permanent smoothing.

Considering all economic elements that make up the cost of spinning in Spain, at present day in a company with a high degree of automation and modern machinery, and considering the cost of ring spinning yarn as pattern, we reduced spinning cost of the order of 27% for open-end yarn and 22% for the yarns made by air. This slight increase in yarns cost made by air, comparing with open-end, is due to the high cost of the technological air required in the air spinning machine. On the market are available technological solutions to reduce this air cost, with small investments, but they were not available at the company which has made a comparative study.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

STUDY OF UNCONVENTIONAL TEXTILES USED AS INSERTION FOR CLOTHES IN TERMS OF ITS DYNAMIC TENSILE STREGHT

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Abstract: *Unconventional textiles are manufactured different from those obtained by the classic spinning weaving and knitting. They are obtained by mechanical or chemical consolidation of a textile backing up of fibrous layers or combinations of layers of fiber and yarn, fabrics and yarns, fabrics or knitted fabrics and fibers.*
For the apparel industry has expanded the use of unconventional fabrics especially in auxiliary materials they replace traditional materials such as woven tassel and buckram.
Application of reinforcement layers have very important role in increasing the stability of form and material exploitation basic characteristics.
Using unconventional fabrics used as insertions for clothing presents a desosibit advantage in terms of possible replacement joints bonded by heat sealed seam, thus saving time and using technology more accessible.
For unconventional fabrics used as auxiliaries in the apparel industry is usually determined flexural stiffness, tensile strength, resistance to repeated stretches but more efficient in terms of proximity to the real conditions of the clothing is dynamic tensile resistance.
Unconventional textile materials have a certain anisotropy in terms of the performed measurements. So, we followed the conducted research to highlight the anisotropy of several samples and characterization of best of unconventional materials in this regard, to be used under conditions effective as clothing industry.

Key words: anisotropy, coefficient of variation, clothing, dispersion, bulk density.

1. INTRODUCTION

Article 1 contains 75% polyester fibers, 1.5 dtex / 38mm and 25% adhesive solution Romacril LN2 [1, 2]. In Table 1 are shown the average weight, average thickness and bulk density.

Table 1. *Average values of mass determinations, the average thickness and bulk density.*

Number of determinations	Di [g]	Mi=ni/0.01 [g/m^2]	D [mm]	T=M/d [kg/m^2]
1	0.2676	26,76	0.33	81.09
2	0.2612	26.12	0.33	79.15
3	0.2651	26.51	0.345	76.84
4	0.2700	27	0.36	75
5	0.2920	29.2	0.36	81.1
6	0.2613	26.13	0.338	77.307
7	0.2643	16.43	0.34	77.73
8	0.2537	25.37	0.35	72.48
9	0.2620	26.2	0.332	78.91
10	0.2912	29.12	0.351	82.96
	-	26.88	0.3436	78.25

After we obtained an average mass determinations of the article of 1 26,98g / m2. To determine the coefficient of variation we require the following amounts:

T^2- dispersion

$$T^2 = \frac{\sum(Mi - M)}{n - 1} \quad (1)$$

T – the standard deviation

$$T^2 = \sqrt{T^2} \quad (2)$$

$$T^2 = \frac{\sum(Mi - M)}{n - 1} = 1{,}2758$$

$$T = \frac{\sum(Mi - M)2}{n - 1} = 1{,}295$$

The coefficient of variation: Cv = 4,202%

Article 2 is an unconventional textile reinforced with curable powder respectively a copolyamide thermo ADEROM. [1] The weight, thickness and apparent density are shown in Table 2.

Table 2 *The values of average mass determinations, average thickness and bulk density.*

Number of determinations	Di [g]	Mi=ni/0.01 [g/m^2]	D [mm]	T=M/d [kg/m^2]
1	0,3692	36,92	0,351	105,18
2	0,3702	37,02	0,362	102,2
3	0,3631	36,31	0,35	103,7
4	0,3602	36,02	0,37	97,35
5	0,3326	33,26	0,35	95,02
6	0,3512	35,12	0,35	100,3
7	0,3441	34,41	0,358	96,11
8	0,3156	31,56	0,35	90,17
9	0,3500	35	0,361	96,95
10	0,3405	34,05	0,35	97,28
		34,96	0,3551	98,44

The dispersion - $T = \frac{\sum(Mi-M)2}{n-1} = 1{,}7204$

The standard deviation $T = \sqrt{T^2} = 1{,}3116$

The coefficient of variation is Cv=3,75%

It was observed that the article 2 we have a coefficient of variation of mass lower than for Article 1, so it can be concluded that it has a better uniformity in terms of unconventional fabric and adhesive.

Submission of ADEROM polyamide thermal adhesive powders can be traced in the technological process adopted in Figure 1.[3]

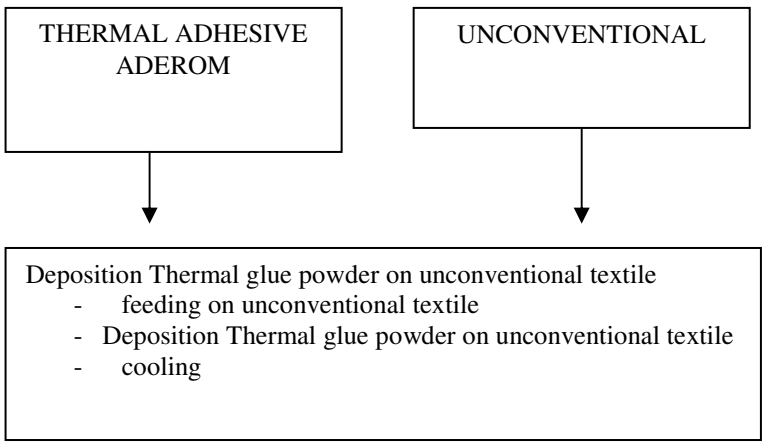

Fig. 1: *The technological process*

Article 3 is a PULVOTEX type 4 with a low mass per unit area. Realizing some samples of 10/10 cm, can cause weight variation, thickness and bulk density, then calculating the coefficient of variation for determining masses m^2.

Table 3: *The average mass determinations, the average thickness and bulk density*

Number of determinations	Di [g]	Mi=ni/0.01 [g/m^2]	D [mm]	T=M/d [kg/m^2]
1	0,3310	33,1	0,31	100,32
2	0,3318	33,18	0,301	110,2
3	0,3414	33,14	0,33	103,4
4	0,3135	33,35	0,3342	91,66
5	0,3546	33,46	0,296	119,7
6	0,3302	33,02	0,302	109,3
7	0,3251	33,51	0,34	98,55
8	0,3354	33,54	0,35	95,82
9	0,3209	33,09	0,31	103,5
10	0,3422	33,22	0,31	110,38
		33,16	0,317	104,31

The dispersion - $T = \frac{\Sigma(Mi-M)2}{n-1} = 1,3468$

The standard deviation $T = \sqrt{T^2} = 1,1605$

The coefficient of variation is Cv=3,499%

Comparing the three coefficients of variation observed that Article 3 presents the lowest coefficient of variation, so the homogeneous spreading of the adhesive on the surface unconventional, so by filing a pasty adhesive to obtain a homogeneous mass insertion. [4,5,6]

2. THE DYNAMIC TENSILE TESTING OF UNCONVENTIONAL MATERIALS

2.1 The dynamic tensile test of unconventional material in Article 1

Respecting operating mode, we obtain the following values for the angle β, for an angle $\alpha=88^0$

Table 4: The dynamic tension values obtained for Article 1

Nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	83	85,5	86,5	85,5	85,5	85
2	84	86	86,3	85,2	85	84,5
3	83,5	86,5	86	85	85	83,8
4	85	84,5	86,6	87	85,2	84,6
5	84	86	86,2	85	85,1	85,5

The obtained values shown in Table 4 will calculate the work in dynamic tensile rupture stress values summarized in Table 5.

$$W_u = G \cdot R(cos\beta - cos\alpha)[Nm] \quad (3)$$

G=42,63 N, R=0,22 m, $\alpha=88^0$

Table 5: *The values for the mechanical work at rupture of dynamic tensile stress*

Nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	8,18156	0,408	0,2452	0,4085	0,4085	0,49008
2	0,65301	0,326	0,2779	0,4576	0,49008	0,5155
3	0,7343	0,245	0,3269	0,326	0,49008	0,6855
4	0,49008	0,515	0,1962	0,1635	0,4576	0,5552
5	0,65301	0,3269	0,2964	0,3269	0,3105	0,4085
Wu	0,6692	0,3749	0,2789	0,3347	0,4313	0,53309
T^2	0,0145	0,0104	0,024	0,0119	0,0056	0,0103
T	0,1207	0,1022	0,0498	0,1093	0,0753	0,1017
Cv	18,03%	27,26%	17,85%	32,65%	17,45%	19,07%

It is noted that resistance is best 0-1800 direction because we have the lowest coefficient of variation of the directions that have the highest values of mechanical work 0-180 and 150-330 respectively at rupture. By drawing polar diagram there is a relatively uniform distribution in all directions, therefore a relatively low degree of anisotropy.

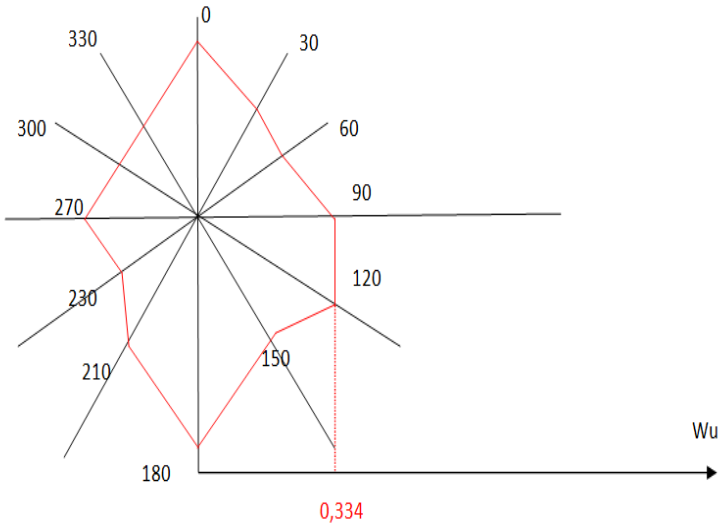

Fig.2: *The polar diagram for Article 1*

2.2 The tensile test of unconventional dynamic material for Article 2

Applying the same procedure as in Article 1, we obtain values for the angle β, for the same angle $\alpha=88^0$ previously determined.

Table 6: *Values for the angle β*

nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	82	86	86,2	86,9	87,2	86
2	79,5	86,5	86,5	87	87	85,9
3	80	86	87	86,4	86,2	87
4	79,5	86,6	86	87	86,5	86,1
5	83	87	86,7	87,1	87	86

The obtained values will calculate the mechanical work at rupture for the dynamic tensile stress, the values are summarized in Table 7.

Table 7: *The values of mechanical work at ruptures for dynamic tensile loads*

nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	0,9779	0,3269	0,2942	0,1917	0,1308	0,3269
2	1,38	0,2452	0,2452	0,1635	0,1635	0,3432
3	0,32	0,3269	0,1635	0,2789	0,2942	0,1632
4	1,3818	0,2288	0,3269	0,1635	0,2452	0,3105
5	0,8156	0,1635	0,2125	0,1471	0,1635	0,3269
Wu	1,17	0,2582	0,2484	0,188	0,1944	0,3942
T^2	0,0673	0,0048	0,036	0,0012	0,036	0,0043
T	0,2595	0,0697	0,0606	0,0354	0,0606	0,0662
Cv	22,14%	26,99	24,39	18,7	30,3	22,5

As for Article 1 the best tensile strength is the direction 00-1800 which is relatively high compared to the resistance in other directions because of the way thermoadhesive powder deposition and the targeting of unconventional textile fiber support structure [7]. By drawing polar diagram is observed that increased anisotropy compared to Article 1 the distribution on the 6 nominal ways of dynamic tensile strength is less homogeneous.

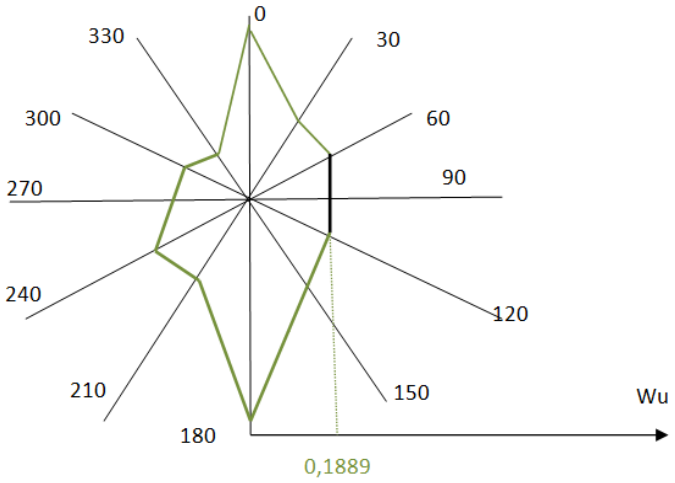

Fig.3: *The polar diagram for Article 2*

2.3 Testing the dynamic unconventional material at tensile for Article 3

Applying the same procedure as in Article 1 and 2, we obtain values for the angle β, α = 880 for the same angle previously determined.

Table 8: *Value for the angle β*

nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	61	86	86,1	87	87,8	86
2	60,2	86,8	86	86	88	85
3	61	86,2	86,3	86,8	87	84,8
4	60,8	86,5	86,5	86,7	87,3	86,1
5	62	87	86,3	86,4	87,5	86,2

With the values obtained will calculate the mechanical work for rupture for dynamic tensile stress values are summarized in Table 9.

Table 9: *Values for the mechanical work to rupture of dynamic tensile stress*

nr.det/dir	0^0-180^0	30^0-120^0	60^0-240^0	90^0-270^0	120^0-300^0	150^0-330^0
1	4,219	0,3269	0,3105	0,1635	0,0327	0,3269
2	4,333	0,1962	0,3269	0,2452	0	0,49008
3	4,219	0,2942	0,2779	0,1962	0,1635	0,5439
4	4,24	0,2452	0,2452	0,2125	0,1144	0,3105
5	4,075	0,1635	0,2779	0,2615	0,0817	0,2942
Wu	4,217	0,2452	0,2876	0,2157	0,0784	0,3897
T^2	0,0068	0,0045	0,008	0,0012	0,0033	0,0096
T	0,82	0,067	0,0284	0,0348	0,05798	0,0982
Cv	1,95%	27,47%	9,9%	%	73,9%	25,2%

It is noted that the best direction is the direction 00-1800 and also a minimum of resistance in the direction 120-300. Also 00-1800 direction is very small and the coefficient of variation so this will be a priority direction used for inserts used in protective clothing and products that can be frequently subjected to various stresses. Tracing polar diagram there is an uneven distribution of the 6 directions nominal maximum and minimum values very remote, article showing a high degree of unevenness thus large anisotropy.

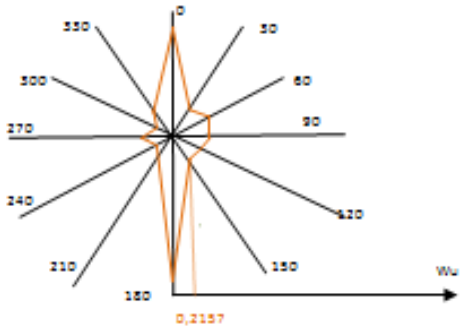

Fig.4: *The polar diagram for Article 3*

3. CONCLUSIONS

The analysis of polar diagrams made from measurements performed can be seen that there are some directions for dynamic tensile strength value is high. Although it is unusual that the deposition thermal resistance of materials to grow adhesives are directions in which the resistance value falls below the average resistance of Article 1 300-1200 oblique directions; 1200-3000; 150-3300 900-2700 transverse direction. This is explained by the fact that the fibers are mainly oriented in the longitudinal direction and supported thermoadhesive unconventional arrangement when it is subjected to dynamic traction, the emergence of lines of least resistance through the points of submission of thermal adhesives.

Article 3 is noted for extreme values, reaching both maximum and minimum tensile strength as dynamic, characterized by a high degree of anisotropy. Its use in the apparel industry would be recommended only if it can be used only 00-1800 direction that is where we have a very high dynamic tensile strength. Although consumption of material would be quite high due respect this direction, it is recommended especially for outdoor clothing products intended for manners that the circumstances in which it carries, are frequently subjected to various stresses that act very quickly.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

COMPUTER ASSISTED LOOM IN THE REVIVAL OF CONTEMPORARY MONUMENTAL TAPESTRY

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Abstract: *The art of tapestry has its basics back in time, probably in the decorations of tent, the house of the nomad. Tapestry in its beginnings is the first wall of the nomad's home and the decorative wall and canopy in the ancient Greek houses as architect Gottfried Semper stated in the nineteen century.*
The architectural approach is not unusual even in the next centuries. Tapestry becomes popular as a form of monumental art during the Middle Ages when it is used as decorative architectural element, coating the walls of medieval castles.
During the next centuries dominated by decadent styles of baroque, rococo, the tapestry will lose its monumental spirit and architectural quality but at the middle of the XX^{h} century a new approach will sustain the revival of the tapestry as monumental art.
Later, in the XXIst century, renowned multimedia artists will approach this medium and will use computer assisted looms in ambitious tapestry projects. This technique will allow them to realize complex and exquisite tapestries, sustaining in this way the revival of the tapestry in the contemporary art world.
The paper presents the importance of the architectural side of tapestry and the great achievement that computer assisted loom represents for this form of art.
The research activity is willing to inform Romanian textile designers about the possibilities to create tapestries on computer assisted looms. The research was made during the initial stage of a doctoral thesis consisting in a documentary study on monumental aspects of contemporary tapestry.

Key words: *tapestry, computer assisted loom, textile, architectural, monumental art*

1. INTRODUCTION

The tapestry is a monumental art by excellence and this idea was stated by renowned architects who studied the way tapestry found its place in architecture through the ages. From its very beginnings, as the initial form of textile wall, tapestry was used in building the nomad tent, being a architectural object destined to enclothe the human habitat. During the Middle Ages, since when the most valuable tapestries were preserved, tapestry became the most valuable form of art, destined to be part of the architecture of medieval castles and churches. Since then the art of tapestry took many forms, till that of being coverings for furniture, until the middle of the XXth century when two artists, a painter and an architect, Jean Lurçat and Le Corbusier, decided to revival this art and to put it in the right place in the art world. Unfortunately the process of weaving a monumental tapestry was very difficult and took long time to finish. This led to another aesthetic collapse in the art of tapestry, until the computer assisted loom became the tool of the contemporary artist. Ambitious and high quality projects became possible since then and the amount of necessary time was reduced considerably.

The contemporary artist wants to express himself through his art in the best way possible. He wants his art to be available to a numerous public. Also the art market is moving fast so there is a need for new technologies applied in the field of fine arts in order to obtain great artistic products in a short time. The inclusion of the computer assisted loom in the weaving process of a tapestry is one of the greatest achievements for contemporary textile artists.

2. MONUMENTAL TAPESTRY

The art of tapestry has its basics way back in time, probably in the decorations of the tent, the house of the nomad. Tapestry in its beginnings is the first wall of the nomad's home and the decorative wall and canopy in the ancient Greek houses as XIXth century architect Gottfried Semper stated [1].

Tapestry becomes popular as a form of decorative art during the Middle Ages when it is used as decorative architectural element, coating the walls of medieval castles in aesthetic and utilitarian purposes. The most evocative proof of using tapestries in medieval castles relies in frescoes and the miniatures from medieval manuscripts which depicts beautiful upholstery covering the walls of castles and churches and adding sumptuosity to interiors. Most of them are decorated with simple patterns. Another major role of these tapestries was to ensure thermic comfort and phonic isolation.

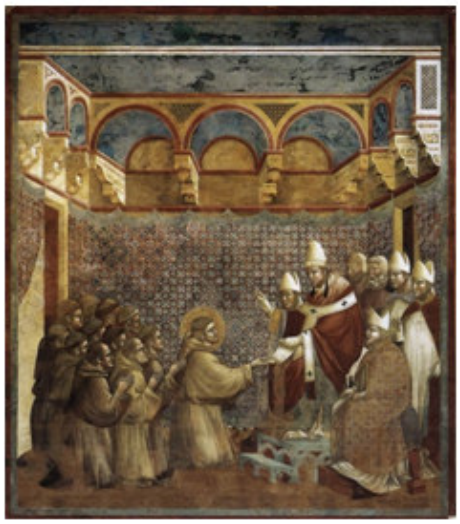

Fig. 1: *Confirmation of the Rule, 1297-1299, Giotto - Legend of St Francis*
Source*:http://www.wikiart.org*

Fig. 2: *Detail of a miniature of Christine de Pizan presenting her manuscript to Queen Isabeau of Bavaria c. 1410 – c. 1414, Harley MS 4431, f. 3r*
Source*:http://britishlibrary.typepad.co.uk*

From this period dates the first important tapestries in textile art. The most renowned is the Apocalypse tapestry from Angers, a monumental ensemble of seven panels, 24 x 6 metres each which was weaved in five years, between 1377 and 1382 [2]. This is the tapestry which will mark the revival of tapestry in the XXth century which led, in the XXI century to technological approach by using computer assisted looms to weave monumental pieces.

Fig. 3: *The Apocalypse tapestry, Angers, XIV century, Angers, France*
Source*: http://blog.univ-angers.fr*

Using a very restraint colour palette, in the medieval artistic way, these panels go together as an ensemble depicting religious scenes inspired by the story of the *Apocalypse* from the *Book of Revelation* by Saint John the Divine. The fact that weavers of the *Apocalypse* tapestry had optioned for the use of just a few colours, will have a tremendous impact in the almost scientific approach of artists in the XXth century as they will work also with just a few colours using the optical effect created by mixing different colours together.

Being monumental was the most important aspect in the art of tapestry in the Middle Eve as the tapestries were considered more than a decorative panel but a mobile wall to follow its owner everywhere. That's the idea developed by the architect Le Corbusier who patented in 1957 the term of *muralnomad* referring to the architectural characteristic of tapestry. [3]

When it comes to upholstery of the XXth century we cannot speak of an evolution of this art rather than a revolution manifested by the return to the aesthetic principles of medieval tapestry. This revolution, which follows a period of decadence of this art beginning in the Renaissance and lasts until near the end of the XIXth century, has begun to unfold in the early XXth century to its middle to take hold with the establishment of new rules and methods of weaving the tapestry designed by Jean Lurçat. Tapestry becomes a mural art again, unhooking from the likeness to the easel painting that it had acquired during its decay.

Jean Lurçat (1892-1966) inaugurates in the XXth century the revival of tapestry. Though starting to experiment in 1916, Lurçat's art knows its peak in 1930 when, under the influence of the Gothic tapestry, he formulates the principles which would ensure its place as independent art. No longer an imitation of painting, tapestry exploits new raw textures and vivid colours but in a palette limited to a few colours, a characteristic aspect of medieval tapestries. [4]

Fig. 4: *Jean Lurçat , Le Chant du monde, Contemporary Tapestry Museum Jean Lurçat, Angers*
Source*: http://www.angersloiretourisme.com*

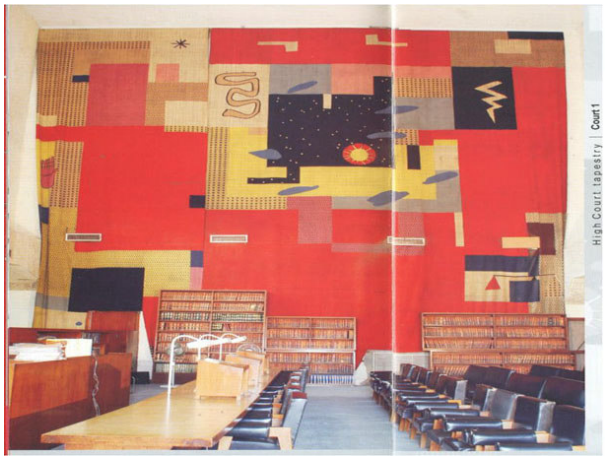

Fig. 5: *Le Corbusier, tapestry at the High Court in Chandigarh, 120 m^2*
Source*: http://highcourtchd.gov.in*

Beginning with its apparition, architectural tapestry has been associated with being an active component of the environment to which it belongs. Evolution of tapestry occurred according to the architecture development. The tapestry has gained gradually sufficient autonomy being considered to have the value in itself and having the power to modify or even to establish an architectural area, being no longer just a decorative object.

Since the XXth century tapestry has regained the status of monumental art under the influence of Le Corbusier and has extended its scope of influence on architecture. In the second half of the 1950^{s} Le Corbusier produced an important series of monumental tapestries to control the acoustics in the rooms of the public buildings in Chandigarh, India. He designed nine tapestries for the High Court with dimensions ranging between 65 and 144 m^2 and three other tapestries for the Assembly lounge areas with dimensions ranging from 135 to 155 m^2.

3. USES OF COMPUTER ASSISTED LOOM IN CONTEMPORARY MONUMENTAL TAPESTRY

From its emergence in industry, the Jacquard loom was intended for mass weaving of fabrics with sophisticated and detailed designs for decorations and fashion industry. This kind of loom precedes the emergence of computer assisted loom which, due to its technical possibilities to reproduce complicated designs with high fidelity, became in the XXIst century, the proper tool for artist willing to transpose their projects in textile medium. The time needed to realise such a project is shortened and the quality of the fabric is almost impeccable.

Thus the tapestry becomes a much more accessible artistic object with multiple applications such as: upholstery, carpet, decorative panel and even theatre curtain. Such an example is the use of

the tapestry as an opera curtain at the Opera House in Oslo [5]. The artistic project entitled *Metafoil* belongs to American multimedia artist Pae White. The image represented is that of a creased aluminium foil depicting the complexity of the surface, colours and gloss that such a surface implies. Pae White scanned the photo of a foil and the pixels of the image were transferred on a computer which controlled the loom.

Fig. 6: *Pae White, Metafoil*
Source:*http://www.operautsmykking.no*

Fig. 7: *Pae White Metafoil detail.*
Foto: *Anne Knutsen*
Source:*http://www.operautsmykking.no*

This large tapestry measures 29x11 metres and is made from wool, cotton and polyester. The project was weaved in 2005 on computer assisted loom in Flanders Tapestries workshop in Belgium. Manually weaving of such a complex and big image would have been almost imposible in a short time.

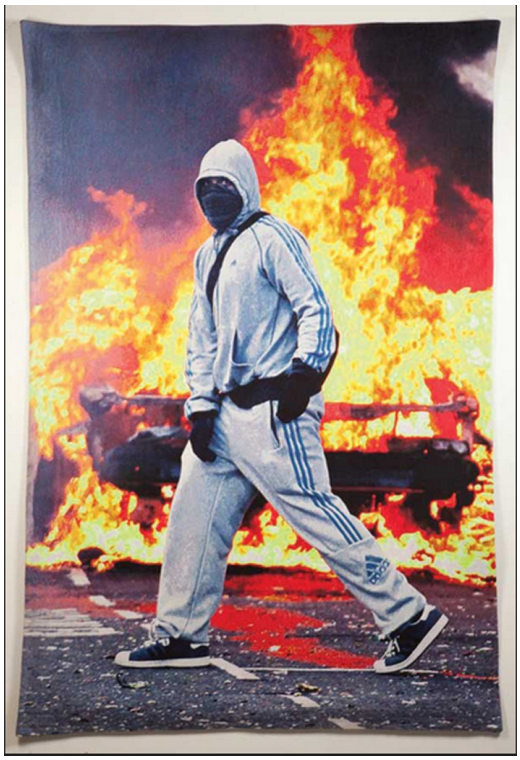

Fig 8 *Marc Quinn, The Creation of History, Jacquard tapestry, 250h x 160w cms*
Source:
http://metro.co.uk/2013/02/13/artist-marc-quinn-makes-london-riot-tapestry-3451193/

Another artist who exploits the technical possibilities offered by the computer assisted loom is the British artist Marc Quinn who uses this technique to realize some sort of photographic tapestries where the project is based on reportage photographies. Such an exemple is the tapestry entitled The Creation of History weaved in 2012 after a photo of a protester who fights in the streets during the 2011 UK riots [6].

The photographic tapestry is another example of the possibilities offered by the computer assisted loom to artists nowadays. Tapestry begins to be seen by artists and by public as a modern technique which can be integrated with success in the art field.

Tapestry is an artistic product enveloping the ambience; it cannot be an isolated artistic object but the environment becomes a decorative object itself. Computer assisted loom came to support artists and the art tapestry itself, allowing transposition of gigantic photographic images in a very short time and with maximum accuracy of detail.

In 2011, at the 54th edition of the Venice Biennale it was opened the exhibition entitled *Penelope 's Labour - weaving words and images*, a commemorative exhibition of tapestry art in which there were displayed, along with manually woven antique tapestries, tapestry of contemporary artists woven on computer-assisted Jacquard loom. The exhibition highlighted the artistic practice, weaving, used to achieve tapestry of images and presented as one of the most vital and innovative methods of artistic expression used by contemporary artists [6].

Half computerized Jacquard loom was used in Romania by the textile artist Liliana Moraru. In her projects only the cards were made by computer and the project was draw by hand. She made a

series of tapestries depicting abstract designs on large surfaces which were presented for the public in 1993 in an exhibition. As she is currently a professor in the Textile Design Department at the University of Arts and Design from Cluj-Napoca, Liliana Moraru has promoted the new weaving technologies of the tapestry projects of the students by using the computer assisted loom in the transposal of the licence projects [7].

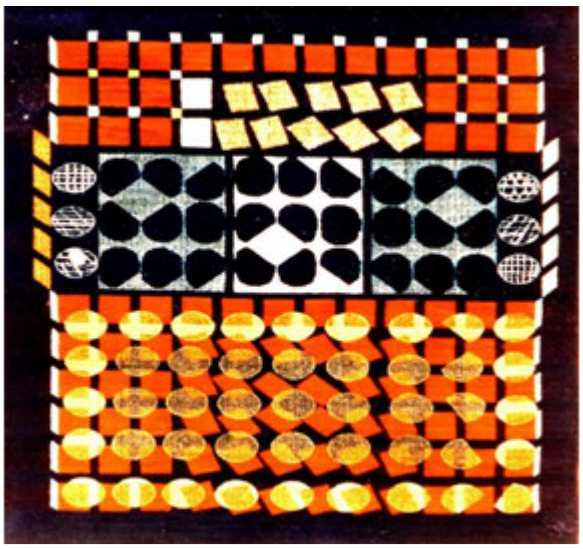

Fig. 8: *Liliana Moraru, Abstract composition, 150x150 cm, wool and cotton, Jacquard tapestry, 1995*
Source*: The artist*

Fig. 9: *Licence project coordinated by Ph.D professor Liliana Moraru, Jacquard tapestry, 2009*
Author: Alexandra Herța
Source*: The artist*

4. CONCLUSIONS

Since the XXth century the textile artist is directly involved in the process of artistic creation and transposition. Now the perspective on textile arts changed. Due to the interpretation given by Le Corbusier to tapestry and tapestry art revival made by Jean Lurçat by applying scientific rigor in achieving its tapestries inspired by the tradition of the Middle Ages, textile art has got beyond the registry of applied arts.

Architecture, in its traditional form, cannot adapt itself to the fast changes of the human aesthetic needs. Here comes the need to operate and build in the indoor and outdoor environment with flexible, light materials that can change/transform a space and its function (relaxation area, study area, industrial area, playground, etc.) in a very short time. In a practical way, contemporary environment is a *mise-en-scene*, a temporary scenography created to be used for various purposes as required.

The fabric, natural or synthetic, is one of the favourite materials of modern artists, designers and architects in the configuration/reconfiguration of the environment. Processing techniques of fibre and textile yarn, as weaving, are increasingly being used for the utilitarian and decorative items that complement the living environment. Due to the great technical possibilities offered by the computer assisted loom, a new type of tapestry emerges: the photographic monumental tapestry. The computer assisted loom permits the depiction of the photography on huge weaved surfaces and helps the tapestry to be easily integrated in the contemporary art market.

The aim of this research is to promote the use of new technologies to Romanian textile artists and to encourage them to develop artistic projects together with specialists in textile technology by presenting of possible achievements in textile art and tapestry. We strongly believe that there are numerous possibilities to develop new artistic and technological products in high quality by this collaboration between arts and technology.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

ULTRASONIC ASSEMBLY [REVIEW]

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Abstract: *The paper exposes the possibility of machine producesers to optimize the costs of clothes assembling. Ultrasonic systems being frequently utilized have many advantages on semi products of synthetic textile and technical textile. First of all, sewing – cutting process can be accomplished under high speeds and rate of losses can be minimized. Cutting seal applications are frequently used for underwear and sportswear. Slicing and unit cutting machines, as well as portable sealing machines are available for labeling sector. Products such as bag, pocket and cover can be sewed in a seamless manner for promotion purposes. All objects in terms of accessories are obtained in same standard. Our quilting machines are preferred in worldwide due to its threadless, high quality sealing. An alternative to the classic sewing assembly, with thread and needles is ultrasonic seaming. In ultrasonic welding, there are no connective bolts, nails, soldering materials, or adhesives necessary to bind the materials together. Ultrasonic is defined as acoustic frequencies above the range audible to the human ear. Ultrasonic frequencies are administered to the fabric from the sonotrode of bonding machine. The high frequency and powerful energy produced, when is release in one special environment, the ultrasound heating this environment. The ability to ultrasonic weld textiles and films depend on their thermoplastic contents and the desired end results. The paper defines the weld ability of more common textiles and films. The welding refers to all types of bonding and sealing, as in point bonding of fabric, or continuous sealing of film.*

Key words: *ultrasonic weld, ultrasonic sealing technology, fabric welding, ultrasonic bonding, ultrasonic.*

1. INTRODUCTION

1.1. Ultrasonic Welding

The classic sewing assembly, meaning thread and needles, has a big concurrent the ultrasonic seaming, without nails, soldering materials or adhesives. Ultrasonic is defined as acoustic frequencies above the range audible to human ear. High-frequency ultrasonic acoustic vibrations are locally applied to work pieces being held together under pressure to create a solid-state weld. The high frequency and energy produced ,when is released on special environment big heating, melting the point contacts between the parts and creates a joint.[1]

2. THE ULTRASONIC SYSTEM

2.1. Components and priciple

Ultrasonic plastic welding is a kind of thermoplastic jointing technology, which makes use of friction between molecules generated by ultrasonic horn. During ultrasonic welding, two plastic part halves are pressed together under pressure, ultrasonic system transform electric energy in 50/60Hz into mechanical energy in 15KHz, 20KHz, 28KHz, 30Khz, 35Khz, 40Khz by convertor, and strengthens it by booster, then transform the energy to the horn and strengthen it again, then the horn transform it to the plastic part and generate the friction between molecules, by which the temperature at the join increases quickly to melt the plastic material at joining surface. When the melting is enough, ultrasonic stops and keep two plastic being pressed together until the jointing area is re-solidified.[2]

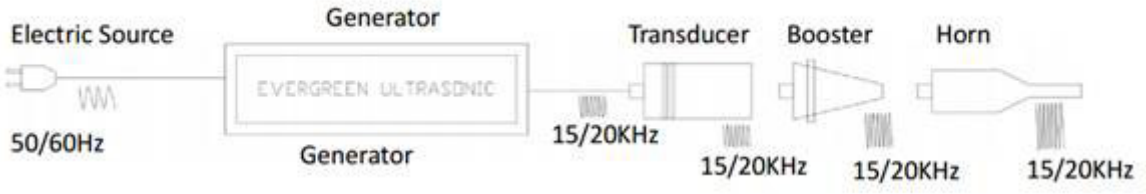

***Fig 1**: Generating System*

The basic principle of ultrasonic assembly is the conversion of standard 50/60 Hz power to 15 kHz, 20 kHz or 40 kHz. This electrical energy travels through a piezoelectric converter. The converter, typically lead zirconate titanate, expands and contracts at the same frequency, converting the electrical energy into high frequency mechanical vibration.[3] This vibration is amplified by a booster and transferred to the workpiece through a shaped tool, or horn, in the form of reciprocating longitudinal motion. Parts being assembled are clamped together under moderate pressure, at which point ultrasonic vibrations force the parts to impact against each other at a preset frequency creating a molecular bond equal to or above the material strength of the parts. Infinite and accurate combinations of weld time, distance and energy, established through a microprocessor, provide repeatable control of the process, and lend to the full automation of the assembly. Statistical process control and reporting are also possible .[3]

2.2. Applications

Ultrasonic sealing machine with rolling sonotrode [4]

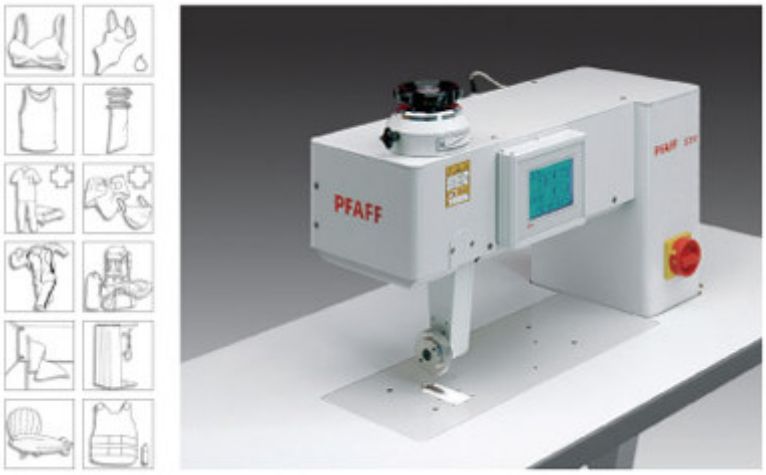

***Fig. 2:** Ultrasonic sealing machine with rolling sonotrode 8310*

Features

- Workpiece fixed between sonotrode and anvil wheel is welded continuously under pressure
- Differential feed: Smooth, non-distorted seams or adding a small fullness is possible by separate drive of sonotrode and anvil wheel
- Touch screen (simple handling with pictograms): programming of operations and complete work cycles
- Process reliability by monitoring of welding parameters
- 8310-041: Top sonotrode, feed-off-the-arm vers./li>
- 8310-042: Bottom sonotrode, flat-bed version, Ø 65.0 mm anvil wheel (standard)

Specifications

- Max. speed: 0.5 to 10 m/min.
- Optional up to: 20 m/min.
- Seam width: 1.0 to 10.0 mm
- Ultrasonic frequency: 35 KHZ

Mobile heat-sealing machine with hot-wedge[4]

Fig.3: *Mobile heat-sealing machine with hot-wedge 8362*

Features

- Noiseless and accurate sealing without any fumes
- All welding parameters can be adjusted separately
- Digital readout of set and actual temperature
- Easy handling as weight only 10 kg
- Low energy consumption (<0,8 KW)
- High seam quality: No marks outside the seam
- Solid, long lasting construction

Specifications

- Welding temperature: 0 - 450°C
- Max. Speed: 7 m/min.

2.3. Theory of Operation

Ultrasonic bonding is accomplished by channeling high-frequency vibrations to the fabric. As synthetic or nonwoven material passes between an ultrasonic unit's horn and anvil, the vibrations are directed into the fabric where they create a rapid heat buildup. This heat causes the material's synthetic fibers to melt and fuse, creating bonded seams that will not fray or unravel.

2.4. Categories of Welding Fabric

There are basically two types of fabric welding- Dielectric Welding and Rotary Welding.Ultrasonic welding is generally categorized as rotary welding. In this type, the fabric moves continuously through the machine while it is being welded.

Dielectric Welding is the older of the two types of welding. In this method, a die is lowered onto the two fabric pieces that are supported by an underlying base plate. A timed pulse of radiofrequency energy is sent between the die and the base plate. The fabric between the die and base plate gets heated enough so as to melt the thermoplastic coating on a temporary basis. With the melting oft his coating, both pieces of fabric are fused together. The die is then lifted and new pieces of fabric move into position, and the whole process is repeated again.

Rotary welding is a continuous process where the fabric pieces move continuously through the welding area, usually pulled along by a pair of drive wheels. Heat is sent through any of the sources like a heated metal wedge or hot air, just before the fabric passes between the drive wheels. On the drive wheels, the welding pressure is applied which seals the fabric permanently.

Rotary welding is faster than dielectric welding. The speed increases with the length of the products and seams. Welding speeds of up to 6 meters/ per minute and even higher can be achieved through it. However, rotary heat sealing requires a skilled and well trained operator to achieve full speed and flexibility[6]. It is also capable of producing three dimensional finished products (products that do not lie flat) like garments, inflatable boats, bags, and luggage. As dielectric welding uses flat

base plate, it restricts its application to the products whose seams must lie flat during the sealing process.[7]

However, nowadays, certain specialized dielectric welders have three dimensional dies, base plates and vacuum systems for holding the fabric pieces in position while the dies are applied but they are very costly.

3. CONCLUSIONS

The applications of ultrasonic welding are extensive and are found in many industries including electrical and IT, automotive and aerospace, medical, business, consumer, medical, toys and packaging. Whether two items can be ultrasonically welded is determined by their thickness.
Ultrasonic welding is a very popular technique for bonding thermoplastics. It is fast and easily automated with weld times often below one second and there is no ventilation system required tore move heat or exhaust. This welding technology may be an alternative method of manufacturing cloth and is gentle with the environment because less waste is produced. The method presents the advantage that no yarn, needles, adhesives are need and holes in fabric are not necessary and in consequence less waste is produced.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

SENSORIAL STRATEGIES IN THE DESIGN OF PUBLIC MEANS OF CONVEYANCE

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Abstract: *The present paper wishes to establish new criteria regarding the aesthetic revitalisation of public means of transport in the big cities of Romania, using the principles of sensorial design. Unlike France, country in which the public transport systems in big cities have been reconfigured and permanently improved by adopting new technical solutions, new materials and upholsteries, in Romania, the rough economic context from the last decades led to the purchase of used vehicles from the West; fact which gradually led to the increase of the aesthetic level of pollution in big cities. Taking into account that in the near-by future one cannot see any financial solutions for renewing the vehicle parks, in Iași, the TRAMCLUB NGO initiated the project "The aesthetic revitalisation of RATP [1] Iași public means of transport", in partnership with RATP Iași and two private companies as sponsors. The project foresees the aesthetic integration of means of transport in the urban aesthetics through a chromatic unification and increasing the quality of the travel experience by adopting a unitary upholstery resistant to wear and with a high level of washability. With the support of the Faculty of Visual Arts and Design ("G. Enescu" University of Arts, Iași), a workshop for students of all study years was organised, with the purpose of choosing the best version of chairs reupholstering, in full accordance with the new visual identity.*

Keywords: *public transport, ecology, urban aesthetics, upholstery, textile materials.*

1. INTRODUCTION

Having a powerful impact on the social environment, the passengers public transport represents a mean of sustainable development of urban mobility through neighbourhoods revitalisation and last, but not least, through the emphasis of architectural and cultural patrimony. With a long life duration (approx. 40 years for trams), public means of conveyance can be associated in time with the image of the city which owns them. In Romania, the difficult economic context from the last decades led to the purchase of used public transport vehicles from the big European cities. The non-unitary character of public means of transport, both stylistically and chromatically, gradually led to the increase of the aesthetic level of pollution in big cities of Romania. Taking into account that in the near future one cannot see any solutions for renewing the vehicle parks, in Iași, the TRAMCLUB NGO of Public Transport Enthusiasts initiated the project "The aesthetic revitalisation of RATP Iași public means of transport" (coordinator: Teodor-Stanciu Silviu), which foresees vehicle integration in urban aesthetics. Adopting a unique chromatic pattern and unitary upholstery for public means of transport, in full accordance with identity elements of Iași, represents a significant step in achieving the goal.

2. GENERAL INFORMATION

An important cultural, economic and academic centre, Iași can be considered a city of national premieres, this being the place of the first university, first typography, first botanical gardens, the urban development of the 18th – 19th centuries being made after Western Europe referential examples. Thus, in Iași started to work certain programmes of tree planting along the main boulevards or in the public gardens. According to historical sources, the present Carol I Boulevard (Copou area) was known as the

Green Bridge due to its elegant gardens made under the ruling of Grigore Matei Ghica and later, under that of Ion Callimah. Later on, the scholar Gheorghe Asachi revolutionised the city's modernisation and development process, applying technical solutions taken from the great European capitals. He redesigned, along with his students from the School of Roads and Bridges, the Copou Boulevard in 1812 after a Spanish concept, planting linden trees at regular intervals on both sides of the road. In the 20th century the process of linden tree planting was extended through the entire city, Iași gaining in time the name of *Linden tree city*.

Choosing green as the main colour in the identity of RATP Iași public means of transport is also sustained by its significances in an urban context: balance, visibility, freedom, cleanness and last, but not least, ecology. 116 years old, the public transport in Iași began to exist along with the exploitation of the first AEG electric trams, these being delivered to Iași with a special colour pattern, composed of three shades of green. During time, the tram represented the main means of conveyance, the network being extended through the city's main neighbourhoods. After the rehabilitation works of the tram running track, still in work, this will become once again starting from 2016, the main means of conveyance in Iași. Sustainable, economic and silent, the tram is by excellence an ecological vehicle and the fact that green was adopted emphasizes the development direction of the public transport in Iași through the care for the environment.

Fig. 1: *Criteria in choosing green for the new visual identity of RATP Iasi*

A really important aspect in finishing the project is represented by the new interior design of the vehicles. The direct contact of the passenger with the furnishing elements in the passenger compartment of the tram or the bus, demands the maintenance of certain minimum hygiene norms. By adopting a quality material, washable and resistant to wear would lead on a long term to a maintenance of the pleasant aspect of the vehicles, an essential criteria in attracting people to use public transport instead of the personal car. Customizing the upholstery in accordance with the key elements of Iași, both from a chromatic point of view, as well as a graphic one, implies a full integration of vehicles in the urban aesthetics, emphasizing the architectural and cultural values of the city. Creating an integrated identity attracts many benefits, from an improvement of the entire image of the city, to an encouragement of the citizens of Iași and tourists to use public transport.

A referential world example of a good adaptation, aesthetically and functionally, of means of conveyance to the particularities of each city, is France. During the last decades this country was the witness of a less known phenomenon to the wide audience: the "revival" of the tram. Reinforcing the tram transport system attracted urban modifications, from the reconfiguration of certain arteries, to the adjustments of both street furniture, as well as the one used in tram stations. A very important contribution to this process of reviving the urban passenger conveyance was brought in by numerous designers, architects, landscapers, and at the same time, plastic artists. The Alstom Company, a company which built railway rolling stock helped in making a custom design of trams according to the representative elements of the beneficiary cities. The increase of the level of life quality in the contemporary society imposed the identification of proper means of design for consumer products. Thus, the design system was rebuilt around sensorial perceptions which the product offers to the beneficiary [2]. This fact implies an extensive research process of the way in which the product answers the functional, aesthetic, tactile and auditory needs of the user [3]. The sensorial evaluation aims at quantifying and describing systematically all human perceptions generated by using a certain product. The result allows researchers to establish certain precise and quantifiable specifications and requirements, subordinated to the first four human senses: olfactory, visual, tactile and auditory [4]. Thus, a list of criteria was established: finish/ colour/ accessories/ aspect/ sounds made by the product during usage/ smell/ temperature/ luminosity, applicable in various categories of products. Sensorial design is directly responsible for the change of paradigm of the technical field in relation to the individual [5], creating through interdisciplinary connexions (visual arts, marketing) a link between

the product and the user. The purpose of sensorial design is that by relating to human perceptions during the stages of the design process, to lead to a progressive improvement of the product quality in relation to the individual's needs.

In the field of public transport, the sensorial analysis means improvements, sometimes small in what concerns design, applied to the interior of vehicles, to the information system or stations design, in order to optimize the travel experience [6]. The French agency RCP (Régine Charvet-Pello) Design Global [7], has an impressive project portfolio which seek to change the traveller's perception on the public transport system. Thus, numerous innovative solutions such as passenger conveyors from the Paris Montparnasse Railway Station or the customized design of trams built by the Alstom Company took shape. Looking beyond the industrial and urban conventions of our days, RCP uses the *Sensolab* concept in order to add more value to the user's life quality. Sensolab is a division inside RCP, which focuses on applying quantifiable criteria of human perceptions into the process of industrial design, through two interdependent approaches – sensorial evaluation and sensorial design. The first four human senses: olfactory, visual, tactile and auditory become the central point of an extensive research programme destined to create a more comfortable travel environment for the passengers. The RCP researches also aimed the chair upholstery used in public means of transport. It is known the fact that textile materials retain odours and get dirty, affecting the quality of the trip from an olfactory and visual point of view. As an experiment, the upholstery has been fitted with a diffusion system of fragrant odorous substances which were emitted in the moment one used the chair. Supplementary research showed that the olfactory perception of the individual is subjective, the task of establishing a universal consensus regarding a "pleasant odour" being a difficult one. Also, hiding an unpleasant odour with other so-called pleasant ones is not a sustainable solution. Taking into account all these aspects, the aim was to create a material with the capacity to absorb odours. This feature of upholstery could maintain a neutral environment in public conveyance vehicles. Also, the new technique could significantly contribute to the public's perception on the vehicle, offering for a longer time the feeling of novelty and cleanness. The material was applied on the latest model of tram, Citadis [8], produced by Alstom in collaboration with RCP, for the French city of Tours. The chromatic connection of the textile material with the wood and plastic elements of the interior furnishings, emphasize the vehicle's personality in relation to the urban aesthetics, offering the passengers a new perspective on the travel experience.

Fig. 2: *Sensorial design principles applied in the design of the Alstom Citadis tram for the city of Tours*

Taking into account the difficult economic context, in Iași, as in most of the cities in Romania, one cannot see any solutions for renewing the vehicle parks in the near future. The project "The aesthetic revitalisation of RATP Iași public means of transport", in partnership with RATP Iași and two private companies as sponsors, foresees public transport vehicle integration in urban aesthetics by unifying the chromatic aspect and the quality increase of travel experience by adopting a unitary upholstery, friendly and durable. With the support of the Faculty of Visual Arts and Design ("G. Enescu" University of Arts, Iași), a workshop for students of all study years was organised, with the purpose of choosing the best version of chairs reupholstering, in relation to the principles of sensorial design. For three weeks study visits were made at RATP Iași in order to analyse the current state of the approximately 250 trams and buses from the park. The purchase of used means of conveyance from the big western European cities for two decades led to a dissolution from an aesthetic point of view of the vehicle park. Although RATP permanently sought to purchase, as much as possible, the same type of vehicles in order to ensure their maintenance, many of them have been extensively modernised in

their origin cities. This fact is obvious especially in the different design of the passenger compartments, both functionally, as well as aesthetically. In various colours, inside the vehicles we encountered various types of chairs and upholsteries, as well as various types of furnishing layout. Altogether, we identified ten distinct variants of interior design of passenger compartments, an aspect which raises the level of complexity of the project. For a complete compared analysis, between the decades-old solutions and modern ones, we made a new visit, this time to the Wagon Factory Electroputere VFU Paşcani. The factory is specialised in repairing and modernising train wagons, and for the last four years, in modernising and reconstructing tram wagons, along with the making of the GT 4 M [9] prototype for Iaşi. During the visit we analysed various types of textile materials used in this industry, as well as the evolution during time of four types of textile upholstery used in modernised wagons. Choosing the materials was not a random one, in the Blue Hexagon and Green Hexagon wagons upholstery being chromatically adapted to the name of the vehicles (blue, green), but as well as stylistically by impressing a composition of geometric motifs which automatically describe the product – Hexagon.

Fig. 3: *Study visits at RATP Iaşi and Electroputere VFU Pascani / Sensorial analysis*

After the compared sensorial analysis, new criteria that the new material should have were identified. Thus, the use of a high quality material is imposed, material which is resistant to wear, elastic and waterproof. Although synthetic leather, used in approximately 30% of the RATP vehicles, offers some advantages in the case of the cleaning process, it does not answer the passenger's tactile needs (hot in summer/ cold in winter) and visual needs. Thus, the high degree of washability of the new textile material becomes a very important criterion. Also, the upholstery must be in full accordance with the new visual identity of RATP. So, the nine students involved in the workshop have elaborated numerous graphic variants of customising the upholstery, starting from a series of key words such as vegetation, linden, ecology, dynamism, urban. The adopted colour spectrum is in full accordance with the shades of the linden tree leaf and flower. The customisation of the upholstery would have been made through impressing or embroidering. Nevertheless, due to financial reasons and maintenance of vehicles, the decision of adopting a mass produced material, accessible and durable, was taken. Thus, the material supplier offered a full range of textile materials from the indicated chromatic palette.

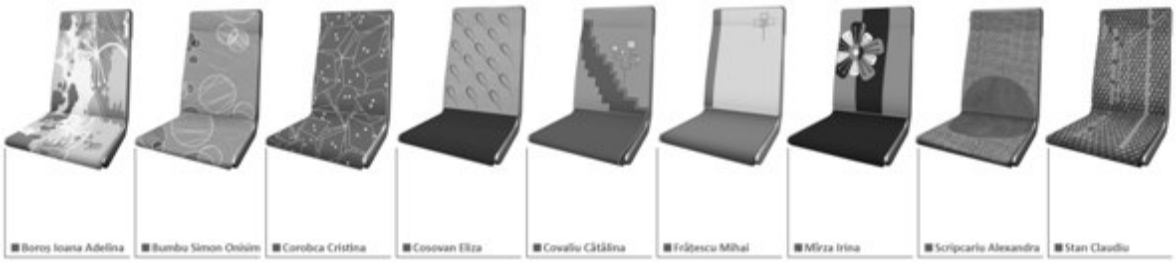

Fig. 4: *Customised upholstery variants*

The chosen material is part of the *Antara Plus* [10] range, being used both in furniture industry, as well as in the auto industry. The material is resistant to wear due to the plastic mass insertion on the back side. This offers elasticity and adherence to the sponge holder, preventing the deterioration of the material in the areas with corners or sharp edges. Also, the plastic mass insertion does not allow the laddering of the fabric when cut, due to which perimeter hems are not required, time and financial resources, being saved. The texture of the material offers comfort to the passenger and a refined aspect to the entire passenger compartment (tram/bus). Named *Lind Green*, the chosen shade fits in the chromatic spectrum of the new visual identity of RATP Iași, finishing the process of integrating the public means of conveyance in the urban aesthetics. The final stage of the workshop meant designing the model of a tram chair, in three steps: repainting the frame of the chair and rebuilding the necessary parts to fix the upholstery, applying the sponge layer (thickness 1 cm), fixing the upholstery. The creative and educational features of the workshop offered the students the opportunity to come in contact with specialists of the partner institutions and of applied working, in real time. The interdisciplinary component of the project contributes to the efficiency of adopting aesthetic parameters, as well as to saving work time and economic resources.

Fig. 5: *Choosing the material / Making the model*

3. CONCLUSIONS

The project will take place in two stages, in the first one the revival of a tram, respectively a bus, from an aesthetic point of view being proposed, and in the second one, the process would generalise over the entire vehicle park (2 – 5 years). The advantages of implementing the project are many, from creating a visual identity for the local transport administration, with direct effects on improving the city image, to the increase of comfort during the trip. By replacing the old upholstery with a customised, friendly, washable and resistant to wear material, the change of the passengers' negative perception of the experience of going by tram is desired. Also, one of the aims of the project is making the public aware of the advantages of using the ecological public transport system at the expense of the personal car. This fact would sustain on an average and long term the process of sustainable modernisation of the big cities in Romania, not only from an economic point of view, but from a cultural one as well.

PROJECT RESOURCES	
INITIATION / DESIGN	TRAMCLUB NGO Iași
EDUCATIONAL	"George Enescu" University of Arts, Iași
ECONOMIC	National Paints Romania, Rosini Design

Fig. 5: *Before / After*

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[8] Citadis is a modular, last generation tram, built by the French company Alstom. The vehicle's body is standardised, and the wagons can be customised by replacing the terminal modules.

[9] GT 4 M – GT 4 tram rebuilt and modernised at the Wagon Factory Electroputere VFU Paşcani (2011-2013), the letter "M" coming from "modernisation".

[10] Antara Plus fabric – Country of origin: Belgium; Composition: polyester; Width: 140 cm; Weight: 338 g / sqm; Tensile strength / breaking: - Warp 561.44 n - Thread 1217.35 n; Moving the threads in the seam: - Warp 2.46 mm - 3.55 mm thread; Resistance to abrasion: - In the dry state: 5 - In the wet 4/5; Resistance to pilling 4/5.

ANNALS OF THE UNIVERSITY OF ORADEA
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STUDY REGARDING YARN TENSION DURING KNITTING ON CIRCULAR MACHINE WITH SMALL DIAMETER

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Abstract: *If yarn tension is controlled properly during knitting, it gives an improved and uniform fabric appearance. The main objective of knitters is to feed yarn to the knitting point at a low and uniform tension.*
To ensure that the stress do not affect yarn properties, literature recommends that the yarn tension shall be so adjusted that it fits in the field elastic. The value of the yarn stress influences not only quality of knitted product, but also the value of the knitting machine production, by the frequency rupture of yarns. This is influenced directly by the yarn stress and yarn quality.
The value of this tension is influenced by a complex of factors, such as: technological diagram of the routing of the yarn from coils up to the knitting area, the structure and characteristics of the raw materials, the typo of knitting, type supply, etc.
In the present article, using practical method, we test some ecological yarns used to make sock, like cotton, organic cotton, bambooviscose, Tencel, according to 6 different fabric geometry: single jersey, plated single jersey, ribb 4:2, plated ribb 4:2, purl, plated purl. Was enregistered and discussed the values of yarn tension.

Key words: *cellulose yarns, socks, yarn tension, single jersey, purl, ribb*

1. INTRODUCTION

The yarn feeding tension in knitting means axial force in the yarn in the moment of its transformation into a loop [1], [2].

In the knitting industry maximum production speed is restricted to a certain limit such as 300m/min. on circular knitting machine. This limit is generally caused by yarn tension, wich breaks the yarn and create several process troubles. Yarn tension is one of the important factors in the knitting industry, not only to make high quality knitted products but also to prevent process faults. Hence, tension control should be properly maintained during knitting process [3].

Establish the yarn tension can be accomplished by practical methods (direct measurement with appropriate devices) and through theoretical methods (calculation of the tension at different points of the route travelled characteristic of yarn) [1], [2].

In circular weft knitting, the monitoring of ththe faults and at the same time controlled inside tight limits to prevent machine's premature stop due to yarn break [4].

Apart from the existing means of yarn tension control such as positive feed devices, yarn accumulating devices, yarn tension meter etc., innovative ways of monitoring and controlling yarn tension during knitting are always explored by scientists and researchers which benefits the manufacturer by lower costs and introduce a new concept on knitting machines, by using a full integrated information system with all sensing devices inter-connected [5].

2. METHOD AND APPARATUS

The "Matec Silver 1L" (fig. 1) is an automatic and computerized machine with two cylinder and two operating systems. These machine is for the production of socks from cotton and cotton type yarns, for children, women and men, in the structure jersey, rib and purl, with heal and top of product in swing motion.

Fig. 1: *Small cylinder knitting machine „SILVER 1L" [6]*

Fig. 2*: Mecanical tensiometer ZF2 – 10, model Schmidt*

Specifications of the knitting machine used to obtain samples [7]:

- Gauge: 14 E
- Diameter of cylinders: 3¾" (95, 25 mm)
- Number of neadles: 168
- Neadles tickness: 0,7 mm
- Number of cam systems: 2;
- Knitting speed: 300 rot/min. (circular motion), 180pend/min. (pendular motion)

Mecanical tensiometer ZF2 – 10, model Schmidt – figure 2 – was used for measure yarn feed tension in different point of yarn.

3. EXPERIMENTAL PART

To avoid obtaining knitted fabric with shades (different heights of loops in different rows), due to uneven usage cams from the two systems, were used only 1 knitting system for made samples.

For the purpose to establish the yarn feeding tension we've chosen practical method, using mechanically with Tensionmeter ZF2 - 10, model Schmidt.

In figure 3, we have represented the route of yarn, from the bobbin up into the area of unloading to the knitting needles.

The circles A … F represent points in which we have measured the tension. In the table 1 were describe the steps from figure 3 and we showed the contact points of the yarn with the machine parts 1 … 7 [8].

Table 1: *Yarn contact points [8]*

Contact point	Description
1	Yarn bobbin unwinding
2	Tensioning device with plates + photocell for automatic stop if detect broken yarn
3	Yarn guide + automatic stopping device if detect small yarn tension
4	Contact with a metal part
5	Yarn guide + tensioning device with plates
6	Antenna for yarn recovery (negative feeding with yarn) + yarn guide
7	Final yarn guide.

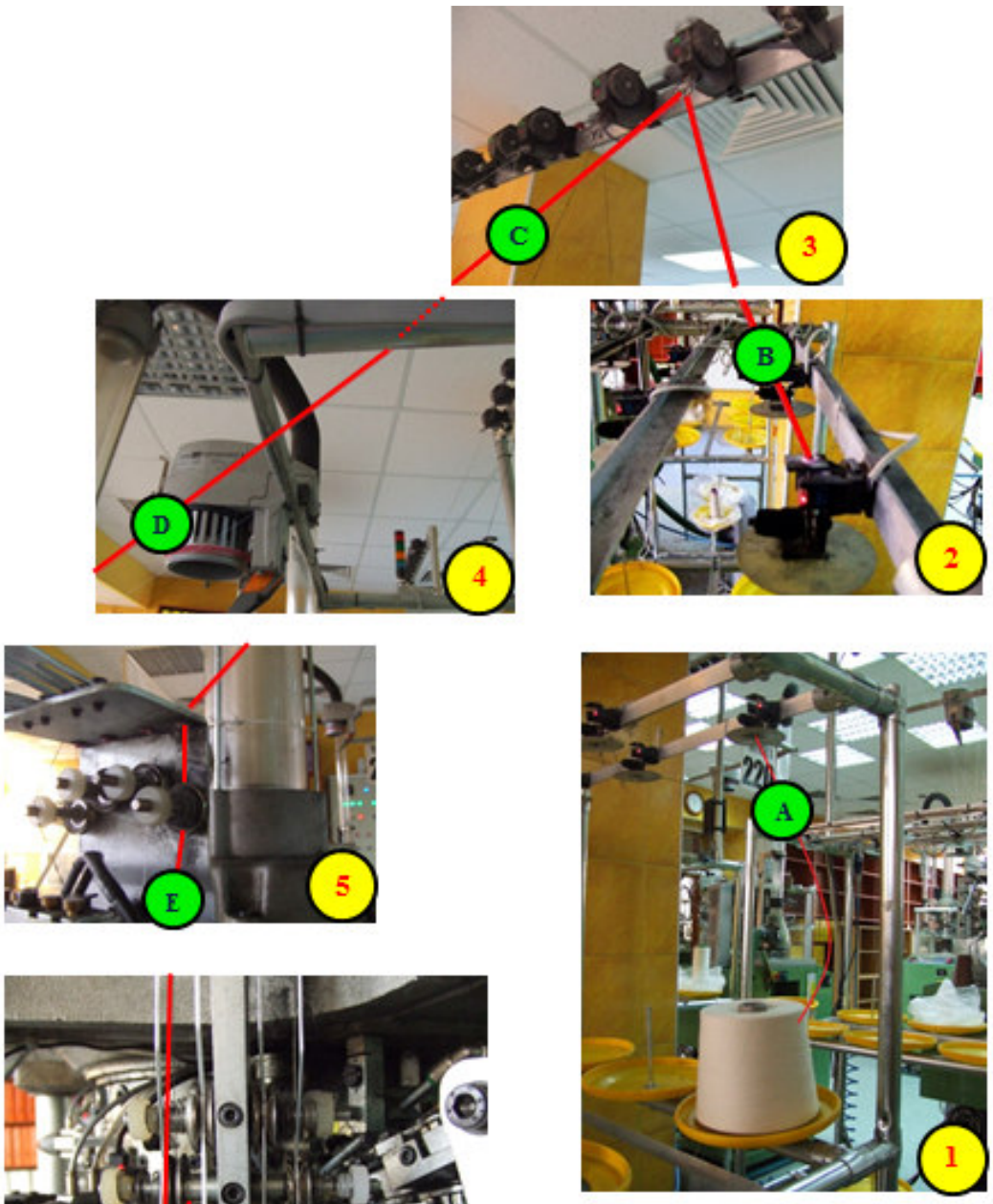
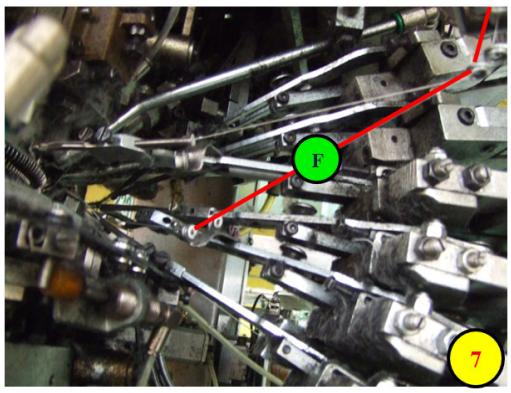


Fig. 3: The route of yarn in feeding system [8]



For study were chosed the samples knitted from 5 types of carded yarns, coded: **1MDX** (100% cotton, 34/1 Nm), **2MDX** (100% cotton, 40/1 Nm), **1DC** (100% organic cotton, 34/1 Nm), **9DC** (Tencel, 34/1 Nm), **10DC** (Bambooviscose, 34/1 Nm). The plated yarn is polyamide 6, 44/12x2 dtex.

4. RESULTS

The cumulated value of yarn tension (cN) is those measureated in the F point. Tests resultes are showed in tables 2 – 6.

*Table 2. Yarn tension for variant **1MDX** (**F**ond = cotton, 34/1Nm **+** Plating = Polyamide)*

Checkpoint for measured tension	Knitted fabric geometry								
	Single jersey	Plated single jersey		Ribb 4:2	Plated rib 4:2		Purl	Plated purl	
	F	F	P	F	F	P	F	F	P
A	1.1	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
B	2.4	2.8	1.8	2.2	2.4	1.7	2.6	2.8	2.4
C	2.6	2.2	2.2	2.3	2.5	2.2	2.6	2.8	2.5
D	2.6	2.5	2.2	2.3	2.5	2.2	2.8	2.8	2.4
E	2.8	2.6	2.4	2.6	2.5	2.4	2.8	3.2	2.6
F	8.5 cN	8.2 cN	10.2 cN	9.5 cN	9.5 cN	10.4 cN	9.8 cN	8.2 cN	10.2 cN

*Table 3. Yarn tension for variant **2MDX** (**F**ond = cotton, 40/1Nm + **P**lating = Polyamide)*

Checkpoint for measured tension	Knitted fabric geometry								
	Single jersey	Plated single jersey		Ribb 4:2	Plated rib 4:2		Purl	Plated purl	
	F	F	P	F	F	P	F	F	P
A	1.1	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
B	2.1	2.1	1.8	1.8	2.2	1.7	2.2	2.2	2.6
C	1.8	1.8	2.2	1.6	1.8	2.2	2.2	2.0	2.4
D	2.1	1.8	2.0	1.7	1.8	1.8	2.5	2.0	2.4
E	2.4	2.0	2.2	1.8	1.8	2.0	2.5	2.2	2.6
F	6.5 cN	7.5 cN	10.1 cN	6.2 cN	6.7 cN	10.3 cN	8.5 cN	8.2 cN	10.2 cN

*Table 4. Yarn tension for variant **1DC** (**F**ond = organic cotton, 34/1Nm **+** **P**lating = Polyamide)*

Checkpoint for measured tension	Knitted fabric geometry								
	Single jersey	Plated single jersey		Ribb 4:2	Plated rib 4:2		Purl	Plated purl	
	F	F	P	F	F	P	F	F	P
A	1.1	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
B	1.7	1.7	1.7	1.5	1.7	1.8	1.9	2.0	1.8
C	1.6	1.5	2.2	1.3	1.5	2.1	1.7	1.6	2.4
D	1.7	1.5	2.2	1.4	1.5	2.1	1.8	1.6	2.4
E	1.6	1.6	2.5	1.4	1.8	2.4	1.8	1.8	2.6
F	6.5 cN	5.2 cN	10.2 cN	5.2 cN	7.0 cN	10.2 cN	7.2 cN	6.7 cN	10.2 cN

*Table 5. Yarn tension for variant **9DC** (**F**ond = Tencel, 34/1Nm **+** **P**lating = Polyamide)*

Checkpoint for measured tension	Knitted fabric geometry								
	Single jersey	Plated single jersey		Ribb 4:2	Plated rib 4:2		Purl	Plated purl	
	F	F	P	F	F	P	F	F	P
A	1.1	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
B	1.8	1.8	1.8	1.8	1.8	2.2	1.8	2.0	1.8
C	1.6	1.5	2.2	1.5	1.5	1.5	1.6	1.6	2.5
D	1.7	1.6	2.2	1.6	1.6	1.6	1.6	1.7	2.6
E	1.8	1.6	2.4	1.6	1.7	1.7	1.6	1.6	2.6
F	5.3 cN	5.2 cN	10.2 cN	5.7 cN	5.2 cN	10.3 cN	5.5 cN	6.0 cN	10.5 cN

*Table 6. Yarn tension for variant **10 DC** (**F**ond = bamboo viscose, 34/1Nm + **P**lating = Polyamide)*

Checkpoint for measured tension	Knitted fabric geometry								
	Single jersey	Plated single jersey		Ribb 4:2	Plated rib 4:2		Purl	Plated purl	
	F	F	P	F	F	P	F	F	P
A	1.1	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
B	2.0	1.8	1.8	1.8	2.0	1.5	2.3	2.2	1.7
C	1.8	1.9	2.2	1.5	2.0	2.2	2.6	2.5	2.4
D	2.0	1.9	2.2	1.7	2.1	2.2	2.7	2.6	2.5
E	2.1	1.8	2.0	1.7	2.1	2.2	2.6	2.5	2.4
F	9.1 cN	9.2 cN	10.1 cN	7.0 cN	7.8 cN	10.5 cN	10.5 cN	10.5 cN	10.5 cN

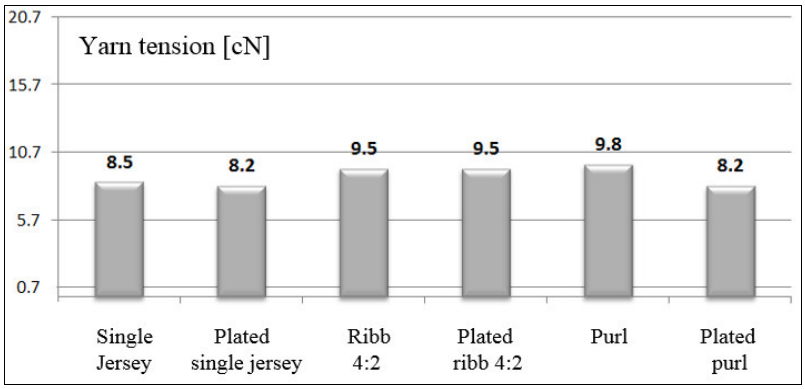


Fig. 4: Histogram of feeding yarn tension 1 MDX, according to different knitted fabric geometry

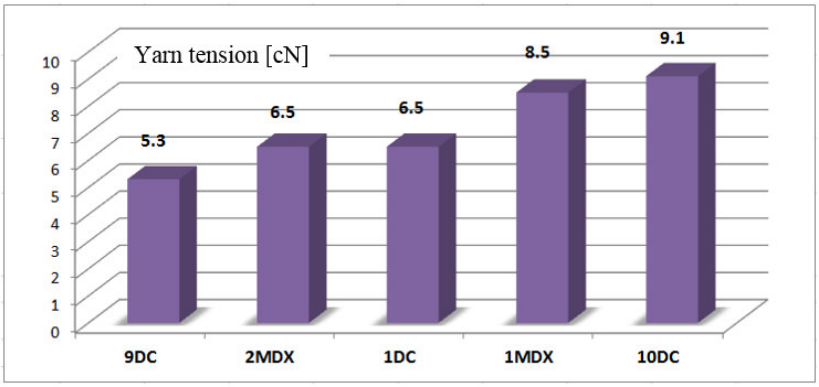


Fig. 5: Histogram of feeding yarn tension, according to single jersey fabric geometry, but different raw materials

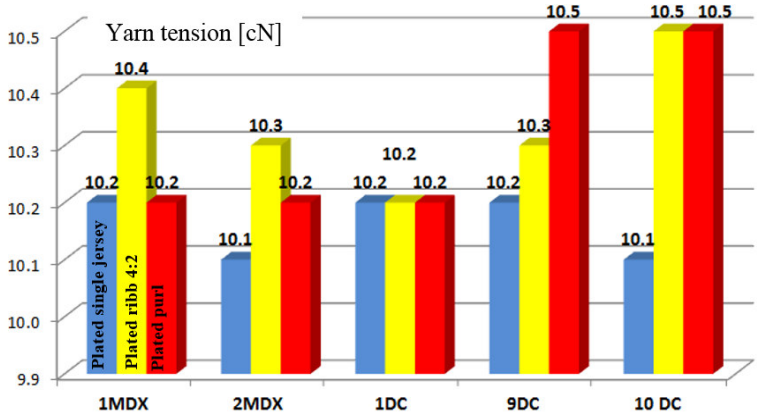


Fig. 6: Histogram of feeding yarn tension, according to plating yarn, polyamide 6 and different fabric geometry

CONCLUSIONS

In the case of same type of raw material - cotton 100 %, for a change of yarn fineness from 34/1 to 40/1 Nm, the yarn feeding tension decreases with 30,76 % (variants of knitted fabric G1.1MDX and G1.2MDX) – tables 2.- 6., fig. 6.

For the main yarn 1MDX, we find the same values the yarn feeding tension, in the case of knitted variants GV1 and LV1 – figure 4, 5.

The smallest value of yarn tension for the sample G1 is in the case of 9DC yarn. The highest is in the case of 10DC yarn, tables 2 - 6.

The medium yarn feeding tension for polyamide 6 (44/12x2dtex) is 10,2cN in all the cases, except the samples LV1 knitted from yarns 9DC and 10 DC, small increasing tension, tables 2 - 6, fig. 6.

ACKNOWLEDGMENT

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STUDY CONCERNING THE INFLUENCE OF CERTAIN HYDROPHILIC AUXILIARIES ON THE PROPERTIES OF THE PLASTICIZED POLYVINYL CHLORIDE POROUS FILMS PART 1 - MOISTURE SORPTION

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Abstract: *Plasticized PVC films are cheaper but their hydrophilic properties are still a problem. Sustained research in this respect is carried out. This research work refers to either poromeric films containing reactive hydrophilic groups linked to PVC or the utilization of hydrophilic auxiliaries in aqueous media. The present paper has the purpose of obtaining plasticized PVC porous films with an enhanced capacity of moisture sorption, by inducing the porosity with the help of the high frequency electric field (H.F.E.F.) simultaneously with the utilization of certain hydrophilic auxiliaries such as: collagen hydrolysates (CH), hydroxyl-terminated polydimethylsiloxane (HTPDMS), and nonylphenol ethoxylate (NPE). The collagen hydrolysates were obtained by the recovery of the Chamois leather waste resulted from the buffing operation, using a new method of electrolytic hydrolysis on an own design installation. The resulting product was analyzed in terms of the hydrolysis yield and of the structural changes, highlighted by the IR analysis. The resulting hydrolysis product was used as such or in different mixture varieties as hydrophilic agent for the obtaining of plasticized PVC porous films. The films were analyzed in terms of moisture sorption in correlation with the version of the recipe used. The obtained results highlighted the efficiency of using CH as such or in some binary and ternary mixtures as regards the enhancement of the moisture sorption of the plasticized PVC films, effect which is also amplified by the utilization of H.F.E.F.*

Key words: *sheepskin wastes, electrolytic hydrolysis, H.F.E.F generator, spectral analysis, collagen hydrolysates.*

1. INTRODUCTION

Leather industry provides a large amount of solid wastes; in this category, are included the wastes produced during the processing of Chamois leather which is used in the auto industry, and the wastes resulted in the leather goods industry. Generically the hides and skins waste material consists mainly of proteins and lipids. The most important is the collagen component which is a fibrous protein that is found abundantly in all animals and is the main leather making protein [1,2].

Leather waste hydrolysates prove to be a valuable protein resource possible to be converted to added value commercial products as: soil fertilizers, biodegradable polymers and additives for cosmetic industry, building materials, composite fabrics, surface-active agents and hydrophilic auxiliaries, nutritional supplements for the food-processing industry [3-8].

The research in the present paper targeted aspects with an applicative character regarding the possibility of recovery of certain by-products with a protein component such as collagen hydrolysates. They were obtained by electrolytic hydrolysis starting from Chamois leather powder resulted from the dry finishing operation (buffing), according to a methodology described in a previous paper [9].

In the field of artificial leather, there occurred old and recent concerns for the obtaining of plasticized PVC porous films used to create leather substitutes for different branches: footwear,

clothing, leather goods etc. Plasticized PVC films are cheaper but their hydrophilic properties are still a problem, sustained research in this respect being carried out. This research work refers to either poromeric films containing reactive hydrophilic groups linked to PVC or to the utilization of hydrophilic auxiliaries in aqueous media.

The chemical structure of the hydrophilic auxiliaries, with the existence of certain free chemical functions such as: -NH_2, -OH, -COOH (collagen hydrolysates), -OH (hydroxyl-terminated polydimethylsiloxane and nonylphenol ethoxylate), allows an enhanced absorption of water vapour by generating certain additional hydrogen bonds [10].

The present paper has the purpose of obtaining plasticized PVC films with an enhanced capacity of moisture sorption, by inducing the porosity with the help of the high frequency electric field simultaneously with the utilization of certain hydrophilic auxiliaries. The presence of the exterior electric field can also determine possible grafting processes between the vinyl group in PVC and the reagent groups in the hydrophilic auxiliaries (OH, NH_2, COOH, alkyl radicals etc), ultimately resulting in a porous structure with an enhanced moisture sorption.[11]

The use of the auxiliary components to obtain new types of porous structures allows the attainment of cellular structures where the walls of the cells obtained from the expanding process display an enhanced humidity absorption.

At the same time, certain constituents such as: the collagen hydrolysates and/or the nonylphenol ethoxylate also have the character of surfactant agent, representing a supplementary effect of the water vapour retention in the resulting porous structures.

2. EXPERIMENTAL

2.1. Materials and apparatus

In order to carry out the laboratory experiments, the following substances were used:

- to obtain the collagen hydrolysates: NaOH, NaCl, Na_2CO_3, alcohol, acetone, HCl, trichlorethylene, Chamois powder;
- to obtain the plasticized PVC films: PVC emulsion (Kw 68-70 index) plasticizer dioctylterephthalate (DOTP), thermal stabilizer (KZII), expanding agent (Genitron AC4), and as hydrophilic agents: collagen hydrolysates (CH), hydroxyl-terminated polydimethylsiloxane (HTPDMS), and nonylphenol ethoxylate (NPE).

The equipment used for the experiments was: an electric stove with a magnetic stirrer, thermoregulated oven, centrifuge, IR-ATR spectroscopy using a DIGILAB – SCIMITAR Series FTS 2000 spectrometer with ZnSe crystal, 750 - 4000 cm^{-1} range, 4 cm^{-1} resolution, Digital Balance KERN 474, D72336 (Kern&Sohn – Balingen Germany), desiccator.

For Chamois powder waste degreasing a classic Soxhlet installation was used, and for electrolytic hydrolysis an own design device was used [9].

For PVC expanded films and tests were used: a laboratory blender, 3-roll calender, vacuum oven, Werner-Mathise laminating device, H.F.E.F generator, KPV-Hungary climatic chamber.

2.2. Working method

a) Electrolytic hydrolysis

Chamois leather waste was first subjected to the process of soaking using a solution of Na_2CO_3 5% and then were dried in the thermoregulated oven at 60ºC, for 24 h, and next degreased in a Soxhlet type laboratory installation, for 8 h, using the trichloroethylene as degreasing agent.

For electrolytic hydrolysis a paste with a concentration of 10% degreased powder in 16 % NaOH was prepared. This paste was allowed to swell at room temperature, for 24h and then, the mixture was introduced in the tank of the electrolytic hydrolysis installation [9].

The working parameters were: time - 2h, voltage - 10 V, current intensity - 9 A, the distance between the electrodes – 3 cm, the nature of the electrodes – stainless steel. The anode area was separated from the cathode area by some semi-permeable fluoropolymer-based membranes which covered the 2 electrodes, in order to avoid gases from being released in the mixture and in order to direct the protein components through electrodeposition.

After the electrolytic process, the resulting mixture was introduced in a glass column and then it was allowed to decant in order to separate the components. The liquid phase was treated with a NaCl 30% solution for salting out effect and the solid fraction was then collected. Then these components were introduced in a glass, diluted with distilled water and treated with HCl 0,5N. The resulting precipitate was resuspended, and it was brought to a neutral pH and centrifuged at 8000 rpm, for 20

min. The solid component was then mixed with alcohol/acetone and dried at 25ºC for 24h and then introduced in a desiccator with $CaCO_3$.

For the dry powder resulting from experiments yield extraction was determined (table 1), and IR analysis (figure 1) was also performed in order to detect structural changes induced by the hydrolysis.

b) PVC plasticized film obtaining

Plastisols with the following composition were prepared: PVC - 100 parts, plasticizer - 60p, thermal stabilizer - 3p, expanding agent - 2p, hydrophilic agents - 8 p.

The hydrophilic agents were used as such or in different varieties of mixtures according to Table 2.

Each plastisol was prepared in a blender, refined on a laboratory 3-roll calendar, deaerated in a vacuum oven and left at rest for 2 hours; 0.5 mm thick-films were then laid on anti-adherent paper, in a Werner-Mathise laminating device. Then, 2x10 cm samples were cut and expanded in a 13.56 MHz H.F.E.F. at 190°C for 1 min.

Water sorption of the PVC films was determined using the method of discontinuous registration of weight changes in a static system by placing the samples into a controlled humidity environment at a constant temperature until an equilibrium state was obtained.

The expanded films were pre-dried for 72 hours in a desiccator with $CaCl_2$ ($t = 23^0C$ şi $\varphi <$ 0,5%), and then introduced in a KPV-Hungary climatic chamber at a temperature of 23ºC, with different values of the relative humidity of the air ranging between 40 – 90 %. They were then dried in the oven at a temperature of 105ºC to a constant mass. The amount of humidity taken by the samples was determined by weighing and the obtained results were presented in Table 2 and Figure 2.

3. RESULTS AND DISCUSSIONS

For the collagen hydrolysates resulting from hydrolysis yield extraction (table 1) shows an optimum value.

Table 1. *Characteristics of hydrolysate product*

Analysis	Values
Sample used (g)	10
Solubilised matter (g)	8,5
Yield (%)	85
Insoluble residue (g)	1,5
Time (h)	2

In figure 1 the spectra of leather samples treated by electrolytic hydrolysis shows changes of the characteristic band peaks especially in the area of the Amide A, Amide B, amide I, amide II, amide III, as compared to the initial sample, which indicates the formation of hydrolysis products (the fragmentation of the amino acid chains in collagen). These bands corresponding to amide A, amide B, amide I and III are very intensive, compared with the same bands of initial sample, which is due to the decrease of intermolecular interactions associated with a higher number of free functional groups.

The spectrum of initial sample shows a shift to lower frequencies of amide A band (at ~ 3300 cm^{-1}), suggesting that more NH groups were involved in the hydrogen bonding, in contrast to the hydrolysed sample where this band occurs at ~ 3400 cm^{-1}. This increase of intermolecular interactions is associated with broadening of the amide A band.

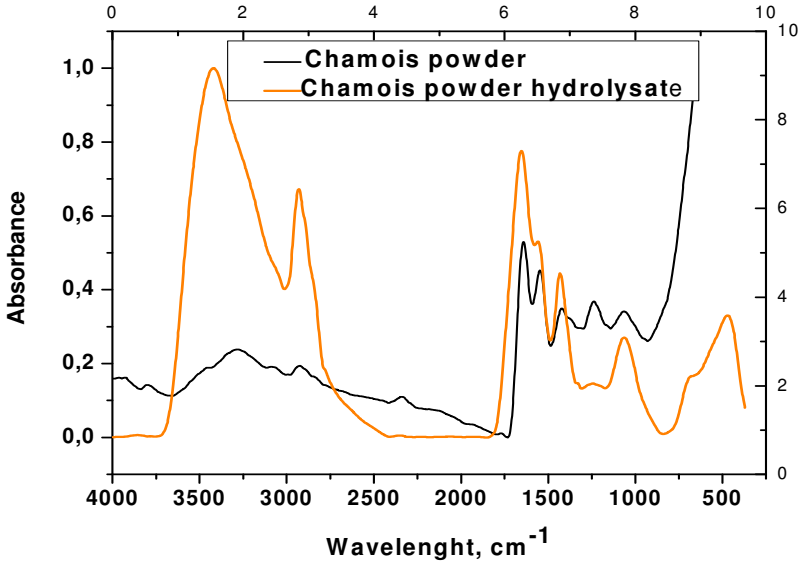

Fig. 1: *IR spectra of Chamois powder waste*

The results obtained for the sorption capacity of the films depending on the hydrophilic auxiliaries used in the recipe are presented in Table 2 and Figure 2.

Table 2. *The moisture content depending on the working variant*

No.	Sample	Relative humidity (%)					
		90%	80%	70%	60%	50%	40%
1	100% HTPDMS	11,58	7,95	5,2	4,3	3,35	2,43
2	100% CH	12,7	8,15	6,31	5,2	4,39	3,68
3	100% NPE	11,29	7,11	4,98	4,08	2,94	2,36
4	50% CH + 50% HTPDMS	12,41	7,39	5,74	4,84	4,38	3,26
5	50% PHDMS + 50% NPE	11,27	6,92	5,17	4,3	3,42	2,61
6	50% CH + NPE	14,87	9,14	7,28	6,4	5,38	4,33
7	33,3% HTPDMS + 33,3% CH + 33,3% NPE	14,94	8,41	6,7	5,7	5,04	4,11

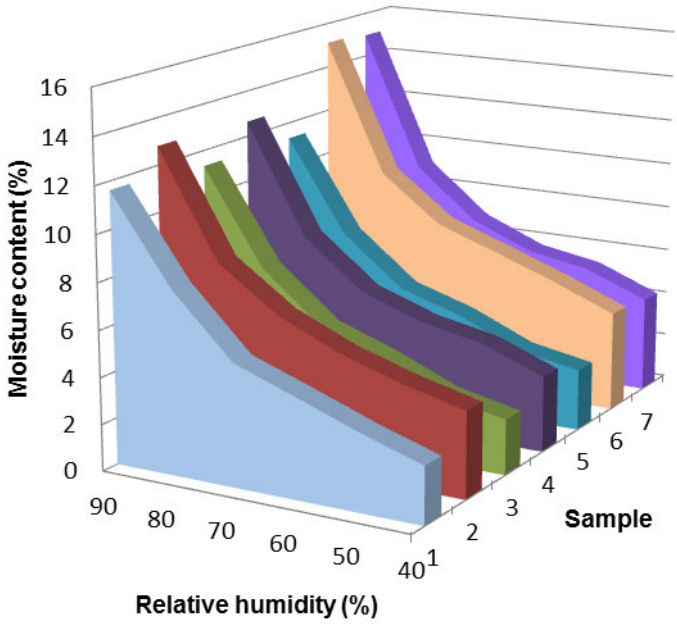

Fig. 2: *Moisture content depending on the relative humidity and the recipe variant*

The analysis of the experimental data in Table 2 highlights the following aspects:

- the monocomponent mixtures have sorption values correlated mainly with the chemical structure but also with the porous structure characteristics of the films. The highest values are noted for the hydrolysed collagen auxiliary (CH) followed by the hydroxyl-terminated polydimethylsiloxane (HTPDMS) and the nonylphenol ethoxylate (NPE), with almost similar values;
- the presence of a stronger synergistic effect for the ternary and HC/NPE binary mixtures.
- the THPDMS/NPE binary mixture presents an anergetic effect.

The synergistic effect could be owed to the surface-active character of the components in these mixtures correlated with a stronger internal plasticizing effect; at the same time, these effects are highly influenced by the H.F.E.F. The enhancement of the gelling-expanding processes under the influence of H.F.E.F. is accompanied at the same time by a supplementary internal plasticizing due to a strong stirring of the dipoles in the mixture at a frequency equal to that of the external electric field. This leads to the occurrence of a so-called "dielectric viscosity" which decreases during the film formation and increases at the end of the process. This contributes to the formation of a porous structure with an enhanced humidity sorption capacity.

There are, however, other interactions between the components of the mixture, intensified by the exterior electric field, but the multitude of the factors involved complicates very much the physico-chemical processes taking place. On the other hand, the porous structure characteristics represent another important factor in these processes, aspect to be investigated in a future study

4. CONCLUSIONS

1. Starting from the leather waste, there can be obtained valuable by-products like collagen hydrolysates by electrolytic hydrolysis, using an own design installation and method, and getting a good extraction yield.
2. The structural changes during hydrolysis materialized in a higher number of free functional groups were revealed by infrared analysis.
3. Of all the hydrophilic agents used to obtain plasticized PVC films, the collagen hydrolysates determined a higher enhancement of the moisture sorption.
4. Certain collagen hydrolysates binary and ternary combinations have stronger synergistic effects.
5. Supplementary plasticizing effect can occur under the action of H.F.E.F. by a permanent reorientation of the dipoles correlated with the decrease of the dielectric viscosity of the mixture during the process of gelling-expanding which contributes to an enhanced moisture sorption capacity.

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STUDY CONCERNING THE INFLUENCE OF CERTAIN HYDROPHILIC AUXILIARIES ON THE PROPERTIES OF THE PLASTICIZED POLYVINYL CHLORIDE POROUS FILMS PART II - HYGIENIC PROPERTIES

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Abstract: *The purpose of this paper was to obtain certain PVC films with improved hygienic properties, with applications both in the artificial leather industry and in other domains. This was done by introducing certain hydrophilic auxiliaries with free chemical functions into the chemical structure of the PVC films, such as: collagen hydrolysates (CH), hydroxyl-terminated polydimethylsiloxane (HTPDMS) and nonylphenol ethoxylate (NPE). The use of these hydrophilic auxiliaries combined with the action of the high frequency electric fields (H.F.E.F.) allows the attainment of cellular structures where the walls of the cells obtained from the expanding process display an enhanced humidity absorption. The collagen hydrolysates used to obtain the plasticized PVC porous films was obtained by electrolytic hydrolysis starting from Chamois leather powder waste resulting from buffing operation, according to a methodology described in a previous paper. The first part of this study was concerned with the influence of the addition of hydrophilic agents upon the moisture sorption of the plasticized PVC porous films. In this paper, there was investigated the water vapour and air permeability as well as the water vapour absorption of the porous films expanded in the H.F.E.F. in correlation with the nature and the recipe variant of the hydrophilic auxiliaries. The results highlighted the fact that the use of certain combinations of hydrophilic agents led to obtaining materials with adequate hygienic properties.*

Key words: *collagen hydrolysates, electrolytic hydrolysis, H.F.E.F generator, vapour permeability, air permeability, humidity absorption.*

1. INTRODUCTION

The set of characteristics that allow assessing the extent to which, at the contact between the human organism and some material, the normal activity of the skin is ensured, defines the concept of hygienic properties, including: water vapour and air permeability, water vapour absorption/desorbtion, and antimicrobial ability. In this respect, there are numerous signals in the specialized literature which point to the concern about the enhancement of the PVC films' hydrophilicity. If in the case of polyurethane films, this challenge was achieved, for plasticized PVC films, the problem has not been fully solved; there are still concerns due to lower cost price offered by this type of materials. The latest efforts of the specialists in the domain of leather substitutes indicate a constant concern to obtain poromeric films with remarkable hygienic properties.

This was done either by the direct synthesis of certain vinyl polymers containing hydrophilic groups, or by using additions of collagen hydrolysates-based aqueous solutions, polyvinyl alcohol, or by coupling collagen materials with polyvinyl alcohol in the presence of reagent auxiliaries, or by using acrylic copolymer blends and composite materials [1-6].

Besides the contributions brought to the induction of porosity with the help of the high frequency electric fields, the purpose of this paper was also to obtain certain polymer films with improved hygienic properties, with applications both in the artificial leather industry and in other domains. This was done by introducing certain hydrophilic auxiliaries with free chemical functions

into the chemical structure of the PVC films, such as: collagen hydrolysates (HC), hydroxyl-terminated polydimethylsiloxane (HTPDMS) and nonylphenol ethoxylate (NPE). The polar character of the used mixtures, as well as the changes appeared in the chemical structure of the films expanded due to the action of the high frequency electric fields can constitute a supplementary factor for the improvement of the hygienic properties of these new types of films [7].

The use of the auxiliary components to obtain new types of porous structures allows the attainment of cellular structures where the walls of the cells obtained from the expanding process display an enhanced humidity absorption.

The humidity transfer through the expanded films which contain these components is made by diffusion mechanism, by absorption through the pore walls and/or by movement the water molecules along the pore walls by adsorption (chemisorption). At the same time, certain constituents such as: HC and NPE also have the character of surface-active agent, representing a supplementary effect of the water vapour retention in the resulting porous structures.

The collagen hydrolysates used to obtain the plasticized PVC porous films was obtained by electrolytic hydrolysis starting from Chamois leather powder waste resulting from buffing operation, according to a methodology described in a previous paper [8].

The first part of this study was concerned with the influence of the addition of hydrophilic agents upon the moisture sorption of the plasticized PVC porous films. In this paper, there was investigated some hygienic properties as: the water vapour and air permeability as well as the water vapour absorption in correlation with the nature and the recipe variant of hydrophilic auxiliaries.

2. EXPERIMENTAL

2.1. Materials and apparatus

In order to carry out the laboratory experiments, the following substances were used:

- to obtain the collagen hydrolysates: NaOH, NaCl, Na_2CO_3, alcohol, acetone, HCl, trichlorethylene, Chamois powder;

- to obtain the plasticized PVC films: PVC emulsion (Kw 68-70 index), plasticizer dioctylterephthalate (DOTP), thermal stabilizer (KZII), expeanding agent (Genitron AC4), and as hydrophilic agents: collagen hydrolysates (CH), hydroxyl-terminated polydimethylsiloxane (HTPDMS), and nonylphenol ethoxylate (NPE).

The equipment used for the experiments was: an electric stove with a magnetic stirrer, thermoregulated oven, centrifuge, Digital Balance KERN 474, D72336 (Kern&Sohn – Balingen Germany). For Chamois powder waste degreasing a classic Soxhlet installation was used, and for electrolytic hydrolysis an own design device was used [8].

For PVC expanded films and tests were used: a laboratory blender, 3-roll calender, vacuum oven, Werner-Mathise laminating device, H.F.E.F generator, desiccator, Textest FX 3300-CK (Switzerland) air permeability tester, STM 473 apparatus for the vapour permeability determination, and STD 478 water vapour absorbtion test apparatus.

2.2. Working method

The electrolytic hydrolysis of the leather waste (Chamois powder from the dry finishing of leather) was achieved under the conditions described in the first part of this paper.

The plasticized PVC porous films were made with the same variants of hydrophilic agent mixtures and under similar conditions to those described in the first part of this paper.

Before all tests, the specimens were conditioned for 72 h at a standard atmosphere (t = 20 ^{0}C ±2 °C, φ = 65 ±5 %, i. e. 20/65), according to SR EN 20139: 1999.

Water vapour permeability and absorption of the investigated PVC films were determined according to the requirements of standard methods.

Water vapour permeability was measured according to LST EN ISO 14268 using a STM 473 test machine, at the same constant temperature (t = 20 ^{0}C ±2 °C) and relative humidity (φ = 65 ±5 %). Circular specimens of films were placed over pots, which contain a solid desiccant, i.e. silica gel. The samples were placed over the opening of the pot and secured with a screw top, which leaves the surface of the material exposed. The pots containing the silica gel and sample were weighed and located into a test station in the rotary support. The test stations are rotated for the duration of the test, and a controlled airflow passes over the surface of the test materials secured to the test pots; the test is run in a temperature and humidity conditioned atmosphere (i.e. 20/65). At the conclusion of the test (after 8, and 24 h respectively), the test jars are re-weighed. The increase in weight due to moisture

passing through the sample materials and combining with the desiccant is used to determine the test samples' permeability. The obtained results are presented in table 1 and figure 1.

Air permeability of the samples was measured via standard TS 391 EN ISO 9237 method, using a Textest FX 3300 air permeability tester. The measurements performed at a constant pressure drop of 100 Pa. All tests were performed under standard atmospheric conditions (20ºC, 65 %RH). The obtained results are presented in table 1 and figure 2.

Water vapour absorption was measured according to LST EN ISO 17229. The tests were conducted using a STD 478 water vapour absorption test apparatus. Each test specimen was clamped between the open end of a test pot containing a specified volume of water (50 ml) and an impermeable seal. The pots were stored at 20 ^{0}C for a set time (3 ÷ 24 h) and, on conclusion of the test the specimens were removed and reweighed. The increase in weight of the sample was used to determine the water absorption capacity of the material. The results are presented in table 2 and figure 3.

3. RESULTS AND DISCUSSIONS

The results obtained for the water vapour and air permeability and for water vapour absorption, depending on the working variant and time are presented in Tables 1-2 and in Figures 1-3.

Table 1. *Water vapour permeability and air permeability depending on the recipe variant*

No.	Sample	Water vapour permeability		Air permeability AP (Nl/100 cm^2/h)
		WVP (mg/dm^2/8h)	WVP (mg/dm^2/24h)	
1	100% HTPDMS	232	621	67
2	100% CH	211	607	62
3	100% NPE	181	560	53
4	50% CH + 50% HTPDMS	214	595	95
5	50% PHDMS + 50% NPE	175	535	87
6	50% CH + NPE	270	671	112
7	33,3% HTPDMS+ 33,3% CH + 33,3% NPE	252	662	98

Table 2*. Water vapour absorption depending on the recipe variant and time*

No.	Sample	Water vapour absorption WVA (%)				
		3h	6h	9h	12h	24h
1	100% HTPDMS	0,82	1,21	1,34	1,47	1,88
2	100% CH	0,95	1,18	1,37	1,52	2,57
3	100% NPE	1,09	1,25	1,45	1,64	2,83
4	50% CH + 50% HTPDMS	1,25	1,37	1,62	1,71	3,35
5	50% HTPDMS + 50% NPE	1,21	1,36	1,63	1,68	3,29
6	50% CH + NPE	1,28	1,42	1,71	1,78	3,49
7	33,3% HTPDMS+ 33,3% CH + 33,3% NPE	1,35	1,78	2,42	2,56	3,85

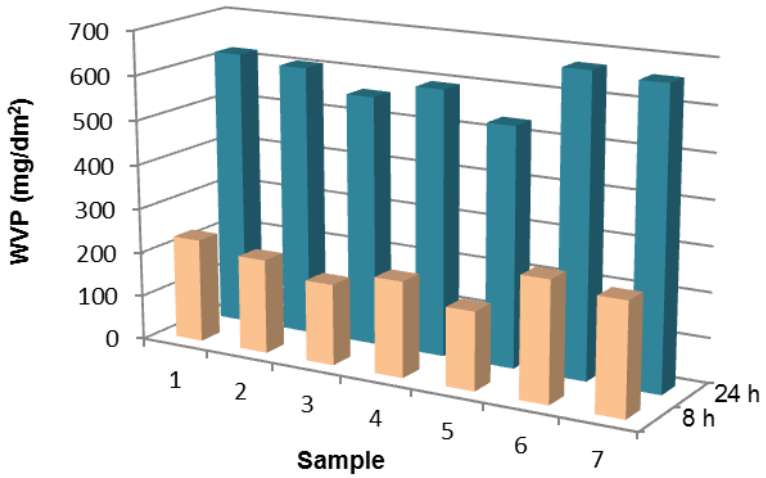

Fig. 1: *Water vapour permeability depending on time and the working variant*

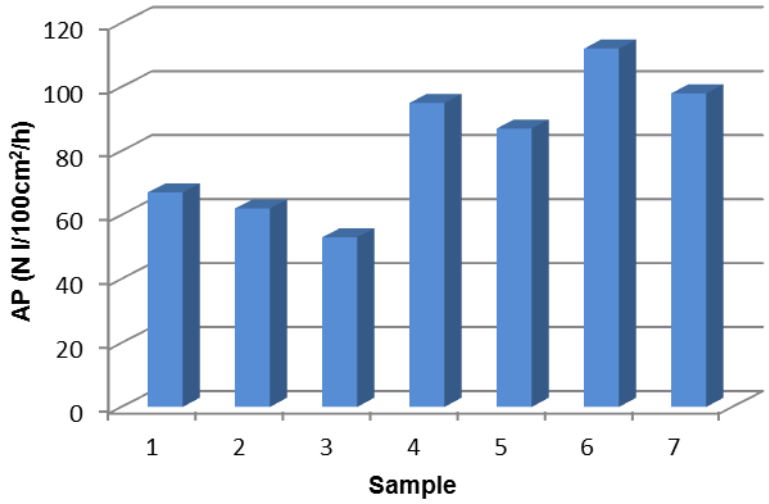

Fig. 2: *Air permeability depending on the working variant*

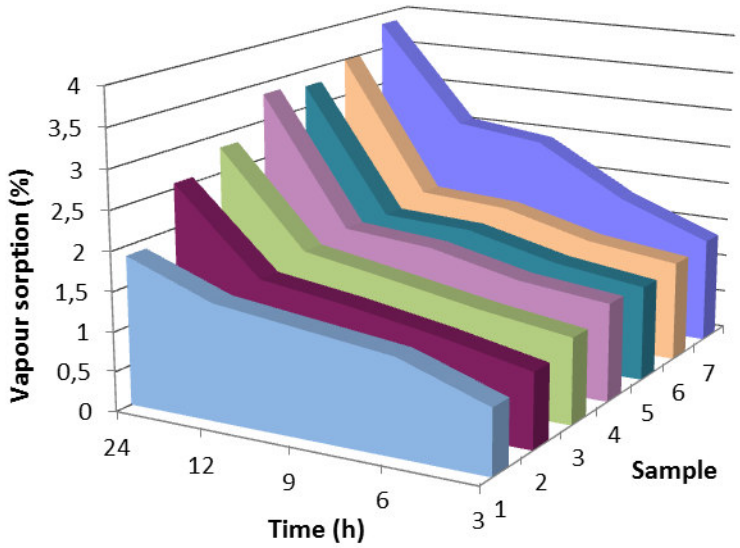

Fig. 3: *Water vapour absorption depending on time and the working variant*

The analysis of the experimental data on the amount of transferred water vapour (Table 1, Figure 1) shows:

The amount of transferred water vapour increases with increasing the duration of maintaining the sample in a humid atmosphere, being dependent on the composition of the expanded films.

Among the monocomponent mixtures, those based on HTPDMS and CH have the highest values of permeability to water vapours; multi-component mixtures have both synergistic and anergetic effects, depending on their composition. Thus, in the case of the binary mixtures a prevalent anergetic tendency can be noticed especially for the HTPDMS+NPE variant, while a strong synergy can be noticed in the case of the CH+NPE binary mixture as well as in the case of a ternary mixture.

In regard to the air permeability (Table 1, Figure 2), among the monocomponent mixtures, the highest values are registered for those based on HTPDMS. The binary mixtures have a synergistic character, which is stronger in the case of the CH+NPE combination; the ternary mixture also has a synergistic effect.

The results obtained both in the case of the water vapour permeability and that of the air permeability indicate the fact that both the CH+NPE binary mixtures and the ternary mixtures have the best values, pointing out that the resulting porous structures offer the possibility of an adequate water vapour and air transfer.

On the other hand, the porous structure characteristics represent another important factor in these processes, aspect to be investigated in a future study.

In regard to the results for the humidity absorption (Table 2, Figure 3), an increasing over time accumulation can be distinguished for all types of films. The obtained values explain their tendency to bond with water, due to the hydrophilic groups the components have, but also due to the surface-active character of the collagen hydrolysates and of the nonylphenol ethoxylate in the mixtures.

Higher values of humidity absorption are noticed for the multicomponent mixtures, having a synergistic effect in all cases, but strongest for the CH+NPE binary combination and for the ternary one; a possible explanation, besides the existence of mutual physico-chemical interactions of the components, could be the influence of the type of the created porous structure.

It would be expected that lower values of absorption correspond to high values of water vapour permeability. Nevertheless, the hydrophilic character of the components in the mixture, correlated to the surface-active character of some of those, the possibility of multiple interactions that may occur between them, as well as with the other components in the plastisols mixture in the presence of H.F.E.F., as well as the characteristics of the created porous structures, can increase the amount of humidity that can bond with the porous structures that result under these conditions.

The comparative data about the water vapour permeability and humidity absorption as shown in Table 3 indicate good response of the new obtained porous structures.

Table 3. *Comparative data regarding some hygienic properties of certain representative types of leather substitutes and of the PVC film obtained according to the no. 7 recipe variant [9]*

No.	Sample	Water vapour permeability ($mg/dm^2/24h$)	Absorption on 24 h (%)	Destination
1	Coaleda	623	1,65	Lining materials
2	Ceeregas	456	0,38	
3	Porokord Kid	269	2,63	
4	Dermosin 200	200	2,1	
5	Loricel 38	770	6,6	Insole materials
6	Texon	611	5,9	
7	Konit	466	5,6	
8	Berflax	409	5,5	
9	PVC films – no.7 recipe variant	662	3,85	

4. CONCLUSIONS

1. The use of hydrophilic agents to obtain plasticized PVC porous films expanded in H.F.E.F. lead to poromeric films with high hygienic properties.
2. Certain binary and ternary mixtures based on collagen hydrolysates have a stronger synergistic effect as compared to the others.
3. An important factor in the adjustment of hygienic properties is represented by the porous structure characteristics, aspect to be investigated in a future study.
4. There can be noticed an improvement to some hygienic characteristics as compared to other similar materials.
5. The current study adds novelty both in terms of the method used to obtain collagen hydrolysates and of its valorisation to obtain certain materials with improved properties which makes them ideal for the footwear industry.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

A STUDY FOR THE MATHEMATIC MODELING OF 2D IRREGULAR SHAPES FOR FOOTWEAR CAD SYSTEM

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Abstract: *For using a specialized footwear CAD system it's imperative to know the analytical expression of the outlines of the footwear patterns. This brings us to the field of mathematical modeling. Mathematic modeling is based on the equation of the function defining the outline of the model contour. Shapes, contours cannot be identified, in designing, by simple function of the form y=f(x), because most of them have irregular forms, with many concavities and convexities, wich explains why their form is intrisically dependent on the coordinates system. For example, if we want to plot a curve, it is absolutely necesary that we choose the right set of contour points in a system of coordinates, but the important factor in determining the form of the object is the relation between these points, not that between the points and the randomly chosen coordinates system.Furthe more, the contour forms may have vertical tangents. If the shape were represented by a function y=f(x), the vertical tangents would be an incovenient in designing, which might be avoided by an aproximation of analytic function (e.g. of polynomials) For all these reasons, the dominant representation of shapes in CAD is not possible a function y=f(x) but a set of function wich can be obtained on various partions.*
This paper presents a study regarding the interpolation of the footwear components and outlines contours and the graphic visualization, using the following methods: Lagrange, B-Spline, Bezier.

Key words: *footwear pattern, curves, interpolation, function*

1. MATHEMATIC MODELLING OF COMPONENTS. REQUIEREMENTS

Geometrical shapes commonly used in **Computer Aided Design** (**CAD**) systems can be defined by several points obtained through the digitizing process. The co-ordinates of the points situated between two nodes can be approximated through both analytic and graphic methods, with interpolation curves. Thus, the analytic expression of the curve that approximates the points will be a interpolation function. The graphical form will be represented by a curve that crosses all the co-ordinates of the digitized points, without bringing any mutations of the initial curve.

The analytic functions, approximating the contour to be designed, may be obtained by extrapolation if and only if there has been made a numeric coding of the geometric body, wich should furnish all necesary data.

As, however, many contours have irregular forms, the mathematic models are aproximative. Taking into account the advantage of computation technigue for these last years, we can asseses that highly performant programmes lead to approximations with minimum of errors.

Mention has to be of the processing centers with numerical command existent in highly developed countries, where, on the basis the coorditates of a set of points, the model to be designed in physically made up with the desired accuracy.

On a local scale, although the description and modelling of bodies, wich is an initial stage of data input, is slow (form keyboard) or very expensive (with specialized equipment) all efforts will be warranted by the spectacular results obtained.

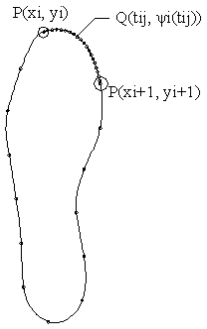

***Fig. 1**: The points Q between $P(x_i, x_{i+1})$ and $P(x_{i+1},y_{i+1})$ are defining for the coordinates $(t_{i,j}, \psi_j(t_{i,j}))$ with $t_{i,j} \in (x_i, x_{i+1})$*

Therefore, being given a finite number of points describing a curve, an interpolation problem is to be solved.

1.1 Interpolation methods in Mathematic Modelling.

Interpolation is a special case of a more general, approximating problem [1].A function f(t) will be approximated by interpolation as a finite sum: of a simple function ψ_i , so as to satisfy a certain set of constraints for function g(t). As the constants $c_1,c_2,...,c_n$ have to be determined, it is necessary that the restrictive conditions for function g(t) should be specified.

Usually these conditions are imposed on the function g(t) so as to be a goot aproximation for function f(t).

If function g(t) is continuous over the approximating interval [a,b] then the function $\psi_1(t)$, $\psi_2(t)$, ...$\psi_n(t)$, continuous on [a,b], will be chosen. In the approximating theory, the constraints imposed on function g(t) will very often be the following:

- interpolation constraints:

$g(t_i)=f(t_i)$ for i€[1,n] (1)

in other words, the functions curves will have the same number of values within a finite number of points;

- mixture of interpolation and constraints:

a) $g(t_i) = f(t_i)$ for i€[1,k], k<n,
b) $g'(t_1) = f'(t_1)$ and $g'(t_k) = f'(t_k)$, (2)
c) g(t) - twice differential function;

- variational constraints:

$\|f-g\| = \min\{\|f-h\|/h \in \text{distance}(\psi_1, \psi_2, ...\psi_n)\}$, (3)

i. e. constants $c_1,c_2,...,c_n$ should be chosen in such a way as to allow that the minimum of a possible functions $\|f - h\|$ should be obtained of the set of all possible linear combinations:

$h = c_1\psi_1 + c_2\psi_2 + c_3\psi_3 + ...c_n\psi_n$ (4)

In order to accurately model it is necessary to pay special attention to certain qualities wich are characteristic to a set of curves under specific conditions.Some call this quality a shape characteristic.

A whole series of interpolating methods are dealt with in the literature [2]. In this paper we will present methods and results for following interplolation methods:

- Lagrange interpolation;
- Bezier interpolation;
- B-Spline interpolation.

2. LAGRANGE INTERPOLATION

The Lagrange interpolation is a classic method of interpolation. The Lagrange polynomials are among the simplest interpolating polynomials [3], [4]. [5], [6].

Being given n+1 discrets points:

$x_0<x_1<x_2<...<x_n$ (5)

and a second set of real numbers:

$$y_1, y_2, y_3,...,y_n \tag{6}$$

there may be defined the Lagrange polynomial of nth power, associated to the two sets of number $\{x_i, y_i\}$ as being the polynomial P(x) wich solves the interpolation problem:

$$P(x_i) = y_i, \qquad i \in [0,n] \tag{7}$$

where x_i are called nodes and the y_i constraints of interpolation function.

The advantage of this way of interpolating is that these polynomials are single. If a function is defined in $x_0, x_1, x_2,...,x_n$ and the corresponding $y_0, y_1, y_2, ...y_n$ values are known, then:

$$f(x_i) = y_i \qquad i \in [0,n], \tag{8}$$

and by Lagrange interpolation of the nth power of the function f(x) in nodes x_i there results polynomial:

$$P_n(x) = \sum_{i=1}^{n} f(x_i) L_{i,n}(x) \tag{9}$$

with:

$$L_{i,n} = \frac{(x-x_0)(x-x_1)...(x-x_{i-1})(x-x_{i+1})...(x-x_n)}{(x_i-x_0)(x_i-x_1)...(x_i-x_{i-1})(x_i-x_{i+1})...(x-x_n)} \tag{10}$$

or expresising the classic Lagrange polynomial:

$$P_n(x) = a_0 + a_1x + a_2x^2 + a_3x^3+...+a_{n-1}x^{n-1} \tag{11}$$

It results from the theoretical considerations mentioned above that mathematic modelling by Lagrange method implies solving a system of n+1 equations with n+1 unknows of the form:

$$\begin{aligned} y_0 &= a_0 + a_1x_0 + a_2x_0^2 + a_3x_0^3 + ...+ a_nx_0^n \\ y_1 &= a_0 + a_1x_1 + a_2x_1^2 + a_3x_1^3 + ...+ a_nx_1^n \\ y_2 &= a_0 + a_1x_2 + a_2x_2^2 + a_3x_2^3 + ...+ a_nx_2^n \\ &\vdots \\ y_n &= a_0 + a_1x_n + a_2x_n^2 + a_3x_n^3 + ...+ a_nx_n^n \end{aligned} \tag{12}$$

where (x_i, y_i) with $i \in [0,n]$ are the points describing the forme to be indentified.

Therefore, the problem consists in determining the polynomial coeficients $a_0, a_1, a_2, ... , a_n$ by solving a system of n + 1 equations with n +1 unknowns.

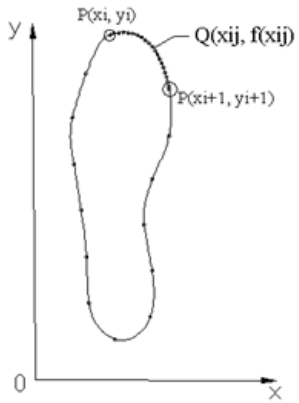

***Fig. 2**: The points Q between $P(x_i, y_i)$ and $P(x_{i+1}, y_{i+1})$ are defining for the coordinates $(x_{i,j}, f(t_{i,j}))$ where f is the Lagrange polynom*

2.1 Experimental estimations

For mathematical modelling of a contour by Lagrange interpolation will considered a contours of a footwear part to wich a system of XoY coordinates was attached. The contour was divided in several partions of convenient size, as shown in Fig. 2, after wich the coordinates (x_i, y_i) of the chosen points, necessary for Lagrange interpolation, were selected.

NOTE

Mention is made to the fact that an accurated modelling of a number of points the nth power of the polynomial does not have to be too big, because is ocurring errors and oscillations in displaying the polynomial. For that, we will utilize the parametrically represented.

3. THE PARAMETRICALLY REPRESENTED

The shapes of footwear parts cannot be precisely described by a simples function y=f(x). In CAD the shapes are parametricaly represented using a set of functions [4]. [5], [6]:

$x = x(t); \qquad y = y(t).$ (13)

In order to do that, we will attach two supplementary systems of co-ordinates – *tOx* and *tOy* – to the present one – *xOy*. We select the variation domain of parameter t. Then, we solve the two independent problems of theoretical interpolation for the two variables, x and y using many methods.

The parametric equations used in interpolation are actually polynomial equations, usually bicubic, described as:

$g(t)=at^3+bt^2+ct+d$ (14)

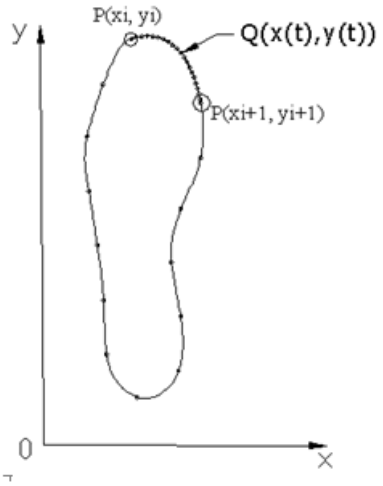

Fig. 3: *The points Q between $P(x_i, y_i)$ and $P(x_{i+1},y_{i+1})$ are defining for the coordinates (x(t),y(t)) two interpolating polynoms*

Thus, we will the set of points $(x_0, y_0), (x_1, y_1)\ldots (x_{n-1}, y_{n-1})$ by the aid of two variables *x(t)* and *y(t)*, defined by two parametric interpolation equations:

$$\begin{aligned} x(t) &= a_x t^3 + b_x t^2 + c_x t + d_x \\ y(t) &= a_y t^3 + b_y t^2 + c_y t + d_y \end{aligned} \qquad (15)$$

In order to do that, we will attach two supplementary systems of co-ordinates – *tOx* and *tOy* – to the present one – *xOy*. We select the variation domain of parameter t. Then, we solve the two independent problems of theoretical interpolation for the two variables, x and y.

3.1. Defining Bezier interpolating polynoms

This will allow the determination of the four coefficients from the following restrictive conditions:

1. The value of the polynom in the nodes must be the same with its numeric value:

$x(t_i)=x_i,\ y(t_i)=y_i$ (16)

where i=0… n and x_i and y_i are nodes: $(x_0, y_0), (x_1, y_1)\ldots (x_n, y_n)$

2. The vector that is tangent to the curve in a node must be the same as the vector of the initial curve. If the components of the vector tangent to the interpolating curve are:

$$\begin{aligned} x'(t) &= 3a_x t^2 + 2b_x t + c_x \\ y'(t) &= 3a_y t^2 + 2b_y t + c_y \end{aligned} \qquad (17)$$

then the restrictive conditions for the limit will be:

$x'(t_i)=l_i$ and $y'(t_i)=m_i$ (18)

where l_i and m_i are the values of the incline of the tangents in the nodes, as determined in the tOx and tOy co-ordinates systems.

3.1.1.Theoretically solving the interpolation Bézier curves.

Without affecting the general area of an interpolation problem, the interpolating Bézier polynoms derive from the following conditions [4],-5]:

C1. We take the interval [0,1] as a variation domain for parameter t. In this case, the conditions for the limit will be:

$x(0)=d_x \qquad y(0)=d_y$

$x(1)=a_x+b_x+c_x+d_x \qquad y(1)=a_y+b_y+c_y+d_y$ (19)

C2. The directions of the tangents in the nodes will be defined as the inclination of the tangent led in every node. For example, in the (x_i,y_i) node, they will be calculated with the following relations:

$l_i=m(x_i-x_{c1}) \qquad m_i=m(y_i-y_{c1})$ (20)
$l_{i+1}=m(x_{i+1}-x_{c2}) \qquad m_{i+1}=m(y_{i+1}-y_{c2})$

where:

- *m*, known as a **shape factor** in the literature, usually takes the value 3,
- x_i,y_i and x_{i+1},y_{i+1} are **the co-ordinates of the nodes** (the extreme point of the curves),
- x_{c1},y_{c1} and x_{c2},y_{c2} are the co-ordinates of the two points that belong to the tangents to the Bézier curve and they are called **points of control**.

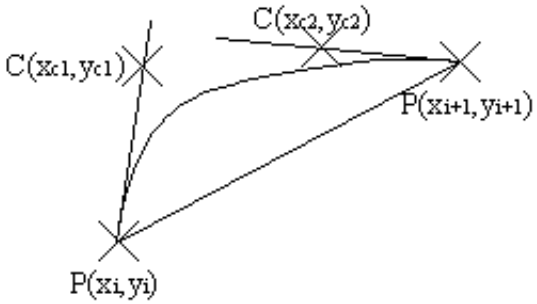

Fig. 4 *The Bezier polynom is defined for two nodes and two points of of* control

This relations and of the two conditions lead to a system of 8 equations with 8 unknown values, with the following solutions:

$d_x=x_i \qquad d_y=y_i$
$c_x=3(x_{c1}-x_i) \qquad c_y=3(y_{c1}-x_i)$
$b_x=3(x_{i+1}-x_i)-c_x \qquad b_y=3(y_{i+1}-y_i)-c_y$
$a_x=x_{c2}-x_i-c_x-b_x \qquad a_y=y_{c2}-y_i-c_y-b_y$ (21)

This represents the mathematical expression of the coefficients of the bicubic polynomial Bezier functions.

3.1.2. Discussions

If we analyse the two conditions, the conclusions will be as follows:

1. A Bézier curve is defined by four points:

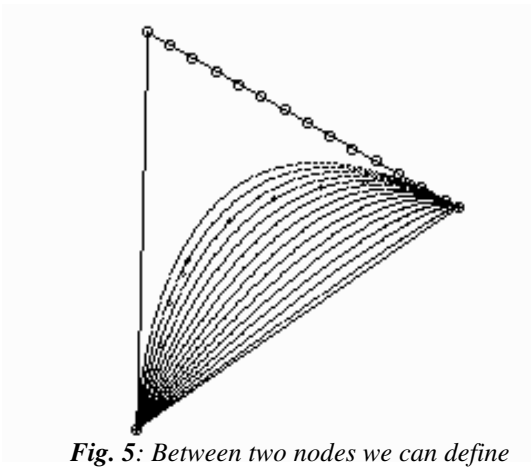

Fig. 5*: Between two nodes we can define many Bézier curves*

• two fixed points on the Bézier curve (nodes), that are fixed;

- • two other intermediate points, that belong not to the curve, but to its tangents. The two points are called **control points** and are positioned on the tangents of the curve led in the nodes($P(x_i,y_i)$, $P(x_{i+1},y_{i+1})$, *see picture 4*).

.2. Between two nodes we can define many Bézier curves, related to the position of the control point on the tangent *(see picture 5)*. This makes it possible, in a CAD work session, to draw several Bézier curves and choose the convenient one – the one that approximates a set of points between the two nodes with the highest precision.

3.2 Defining B-Spline interpolating polynoms

Let's take into consideration a network of points called $t_0<t_1<.....t_n$ whose nodes have known values given by $\{f_i\}$, $i\in[0,n]\rightarrow R$, where $\{f_i\}$ is an interpolating B-spline function that fulfills the following conditions:

- g(t) is continuous on the (t_0,t_n) interval, together with its first and second rank derivates.
- on each $[t_{i-1},t_{i+2}]$ interval, the function is a third degree polynom, $i\in[1,n-1]$

- in the nodes of the $\{t_i\}$, $i\in[0,n]$ network, the following conditions are fulfilled:
  $g(t_i)=f_i$, $i\in[0,n]$; g' fulfills the conditions of the limit: $g'(t_{i-1})=f'(t_{i-1})$
  $g'(t_{i+2})=f'(t_{i+2})$ g'' fulfills the conditions of the limit: $g''(t_i)=f''(t_i)$

3.2.1 The mathematical expression of the coefficients of the bicubic polynomial B-Spline functions

The B-spline functions are thirdy degree polynoms on portions defined by the pointes $t_{i-1},t_i,t_{i+1},t_{i+2}$.

By applying the same methodology as presented in the previous paragraph, the third degree polynom representing the interpolating B-spline function looks like:

$x(t)=a_xt^3+b_xt^2+c_xt+d_x$

$y(t)= a_yt^3+b_yt^2+c_yt+d_y$

P where:

$$\begin{aligned} a_x&=(-x_{i-1}+3x_i - 3x_{i+1} + x_{i+2})/6 & a_y&=(-y_{i-1}+3y_i - 3y_{i+1} + y_{i+2})/6\\ b_x&= (3x_{i-1}-6x_i+3x_{i+1})/6 & b_y&= (3y_{i-1}-6y_i+3y_{i+1})/6\\ c_x&= (-3x_{i-1} + 3x_{i+1})/6 & c_y&= (-3y_{i-1} + 3y_{i+1})/6\\ d_x&= (x_{i-1} +4x_i + x_{i+1})/6 & d_y&= (y_{i-1} +4y_i + y_{i+1})/6 \end{aligned} \qquad (11)$$

for $i\in[1,n-1]$.

The expressions lead to the conclusion that the interpolating B-spline function can be determined only by four successive coordinates of the shape.

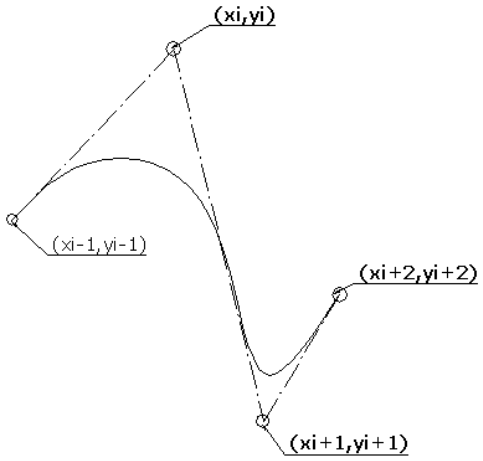

***Fig. 6**: Four successive coordinates determined a curves B-Spline*

4. CONCLUSIONS

After those presented, it can be noticed that a point belonging to a B-spline polynom depends on the coordinates of its neighboring points, but it doesn't depend at all of all the points defining the shape. In the words of specialists, this means that "a B-spline approximation has a local scheme".

The characteristic of being able to decrease the variation and the local character of the approximation when using a B-spline function can be explained by looking at the geometrical behavior of the B-spline curves.

- a point on such a curve is a convex combination of K neighboring nodes of the polygon and thus the curve can very well "fit" with the polygon.
- if one node of the polygon is moved, the curve will only be modified locally, in the neighborhood of the node. This characteristic is essential in design, because it allows the creator to modify a curve he is not satisfied with, without having to re-make the whole outline.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CONTRIBUTIONS TO DIVERSIFY SOLES MOULDS THAT FORMS DIRECTLY ON FACES SHOES

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Abstract: *The classical moulds which are currently used for forming the soles directly on the uppers, allow obtaining one sole model. One mould for each foot is made, and at least one mould for each size number in the size number series. To manufacture one single sole model in the sizes series an average set of 16 moulds are needed. Changing the model implies the entire production of a new set of moulds. Therefore, a large diversification of the soles requires the manufacturing a quantity of moulds sets equal with the quantity of sole models. In this paper are presented solutions to obtain more cavity shapes in the same mould, through the use of modular interchangeable pieces. The moulds with versatile cavities have the same functional characteristics as the moulds with unique cavities, are usable on the same type of machines and can be used independently or together with the classical moulds. A brief analysis on the technological processes for manufacturing moulds with versatile cavities reveals a significant lowering of the manufacturing time for moulds in which will be obtained other sole models. This is due to the fact that some of the mould parts are reused. In conclusion, the producers that chose this type of moulds can launch on the market new models in a shorter time and at lower prices.*

Key words: *shoes soles, designing soles, manufacture soles*

1. INTRODUCTION

More than 80% for footwear soles are obtained as prefabricated parts or directly on the footwear uppers by forming in moulds. The diversification possibilities by materials, shape, volume, antiskid relief mode, side surface model, colour, number of colours, fabrication technologies, etc., are multiple. The technologies currently used to obtain soles can be grouped in: vulcanization technologies of rubber blends; injection forming technologies of fluid thermoplastic polymeric blends and forming technologies of polymeric blends that lead to obtaining polyurethanes by a chemical structuration process [1], [2]. All these technologies are using the spatial forming of the soles in close moulds with cavities that resemble by size and shape the soles which will be obtained. To accomplish this, all over the world, to obtain the soles corresponding to each last model, for each sole model and for each size in the size series a mould is made.

To manufacture one single sole model in the sizes series an average set of 16 moulds are needed. Another sole model requires the design and manufacturing of an entirely new set of moulds. Therefore, a large diversification of the soles requires the manufacturing a quantity of moulds sets equal with the quantity of sole models [3].

These devices, by their complexity and by the high execution level, require high manufacturing costs. In the case of the big sole manufacturers who are using the mould till the physical outwear, the costs for the new moulds design and execution are covered without significantly increasing the soles price. For the smaller sole manufacturer, the moulds outwear morally way before

the physical outwear. This fact is seen in the soles price. If the two manufacturers are launching the same products at the same time on the market, it is obvious that the bigger manufacturers will gain the market by the smaller price of the soles they offer. On the other hand, the big manufacturers are not able to cover the entire footwear soles request and mainly, they can't cover all the fashion trends. It turned out that the smaller producers are more flexible to the new fashion trends and to the present market demands.

In this paper are presented solutions to obtain more cavity shapes in the same mould, in the case of forming the soles directly on the footwear uppers. The designed solutions are aimed to reduce the time and costs of new moulds manufacturing for new soles models.

2. THE SOLUTIONS DEVELOPMENT

The moulds in which the soles are formed directly on the footwear uppers, whatever the nature of th polymeric blends and the forming thermo chemical processes, are formed by a metal last, two lateral jaws and a die. By closing the assembly of the metal last with the upper lasted, the lateral jaws and the die, is formed a cavity in which the sole will be formed directly on the footwear uppers. The cavity formed using this technology is unique and serves for obtaining only one single sole model and size. [4], [5]. The solutions elaborated in this paper are developed in two different directions: one direction consist in obtaining versatile cavities in existing moulds with unique cavities [6].

2.1. Solutions for manufacturing versatile cavities in moulds with unique cavities

We are considering a mould with a specific cavity, which has the shape as in Figure 1. This type of cavity can be modified by successive milling of the lateral jaws, until is reached the situation when the cavity shape becomes cylindrical orthopaedic. For this type of solution, to obtain new cavities, the existing lateral jaws are milled and the die is entirely remanufactured.

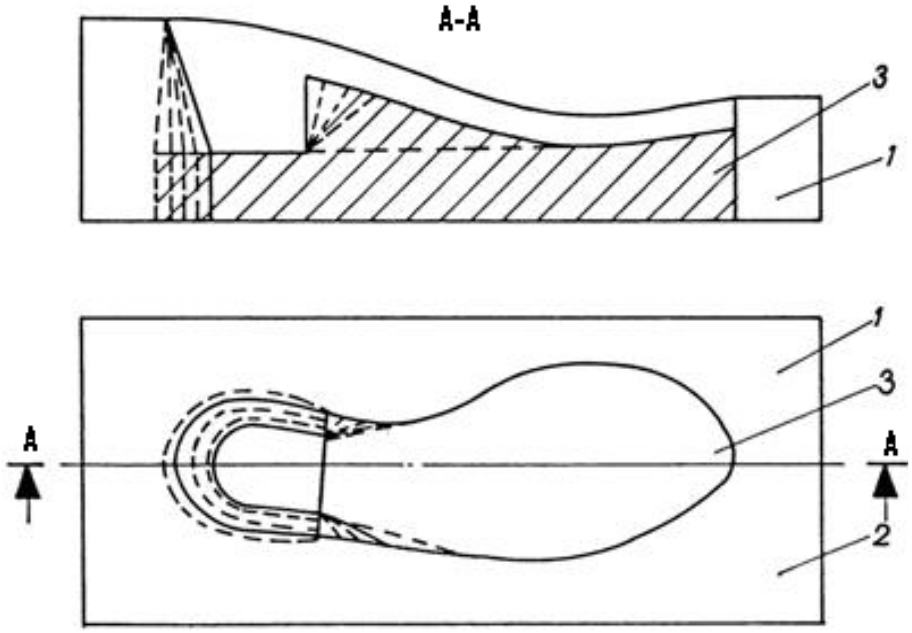

Fig. 1: *Cavity diversification by successive milling of the lateral jaws and remanufacturing the die*
1, 2 – lateral jaws; 3 - die

Returning from the cylindrical orthopaedic cavity shape to another shape is possible by the addition of filling parts on the two lateral jaws and by remanufacturing the die, as represented in the Figure2. Obtaining new cavities by processing all the mould parts, to which is added the necessity of manufacturing new filling parts, can't be a reliable solution for mass sole production [7].

To simplify the problem we chose a solution for obtaining versatility for an existing cavity which is easy to provide, without being necessary to remanufacture the die and without the necessity of major processing of the lateral jaws. This can be achieved by preserving the initial shape of the sole and processing only the antiskid relief model and side surface model. For this purpose, it is removed from the lateral jaws a portion of g_1 thickness all around the cavity, by milling, thickness equivalent with the interchangeable parts thickness which will be mounted on the lateral jaws. The same way is processed the die surface, on a g_2 thickness, on which will be mounted the part that will render the antiskid relief model. These operations [8] are presented in Figure 3.

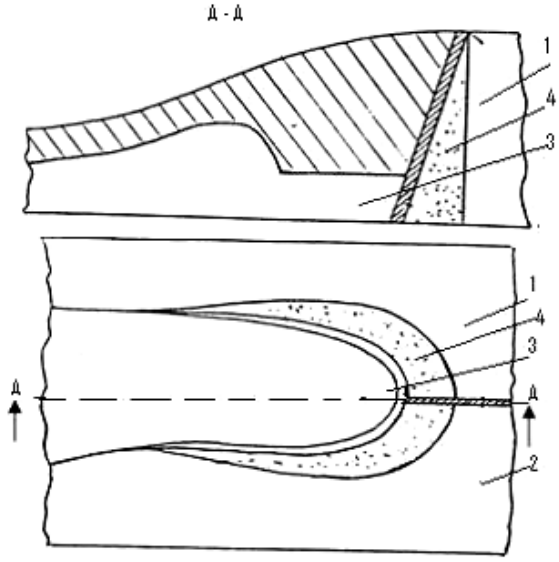

Fig. 2: *Cavity diversification by using filling parts on the lateral jaws and remanufacturing the die*
1, 2 – lateral jaws; 3 - die; 4 – filling parts

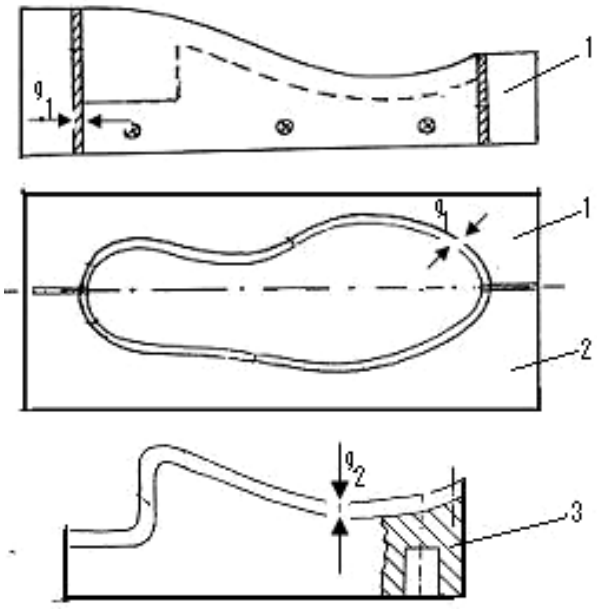

Fig. 3: *Cavity processing in order to mount parts for model diversification*
1, 2 – lateral jaws; 3 – die

The adjustment of mould closing is obtained by fine tuning the parts that will be mounted on the lateral jaws and on the die.

2.2. Solutions for obtaining moulds with versatile cavities

A mould with versatile cavity, in the acceptance of this paper, is a type of mould which is composed by a set of parts which remain unchanged till the mould physical outwear and a set of modules which are remanufactured each time the sole model is changed [6], [7]. This type of mould is presented in Figure 4.

This mould is composed of the lateral jaws 1 and 2 which remain unmodified until the mould outwear. The cavity is formed by mounting the modules 3 and 4 on the lateral jaws and of the module 5 on a mounting board on the machine [8]. The modules 3, 4 and 5 can be entirely modified, remanufactured or partially modified, depending on the sole model changes.

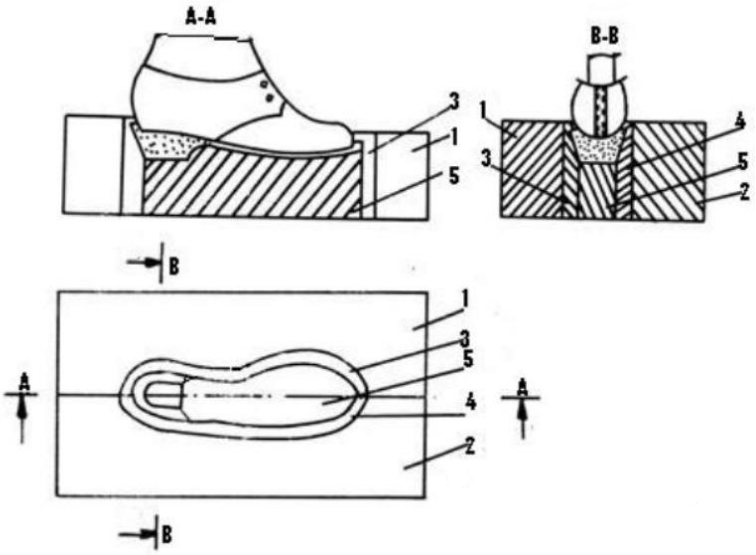

Fig. 4: *Mould with versatile cavity for forming soles directly on the uppers*
1, 2 – lateral jaws; 3, 4, 5 – cavity forming modules

3. EXPERIMENTAL ACHIEVEMENTS

3.1. Obtaining versatile cavities in moulds with unique cavities

The solutions presented on chapter 2.1 have been verified by manufacturing the moulds and the experimental use to obtain soles [7].

A solution for processing the existing mould cavity is represented by the modification of the cavity by successive mechanical milling. This type of moulds and the resulting soles are presented in Figure 5.

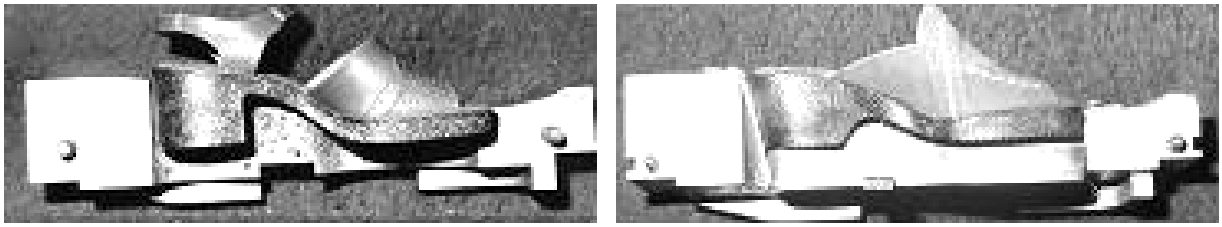

Fig. 5: *Modification of existing mould cavity by successive mechanical milling*

The diversification of the models for the same shape of sole is accomplished by interchanging the parts that render the side surface model and the bottom surface model. These types [7] of parts are presented in Figure 6.

Fig. 6: *Interchangeable parts for model diversification*

The model engraving can be achieved by mechanical milling, chemical and electrochemical processing or by a combination of this methods, on aluminium boards, zinc boards or copper boards.

3.2. Obtaining moulds with versatile cavities

In the case of the moulds that have been designed with versatile cavities, firstly the lateral jaws have were designed, which remain unmodified while using the mould, and the modules that are mounted on the two lateral jaws and the modules which are mounted on the die, corresponding to

multiple shapes and models of the soles [8]. This type of moulds and a set of soles resulting from these moulds are presented in Figure 7.

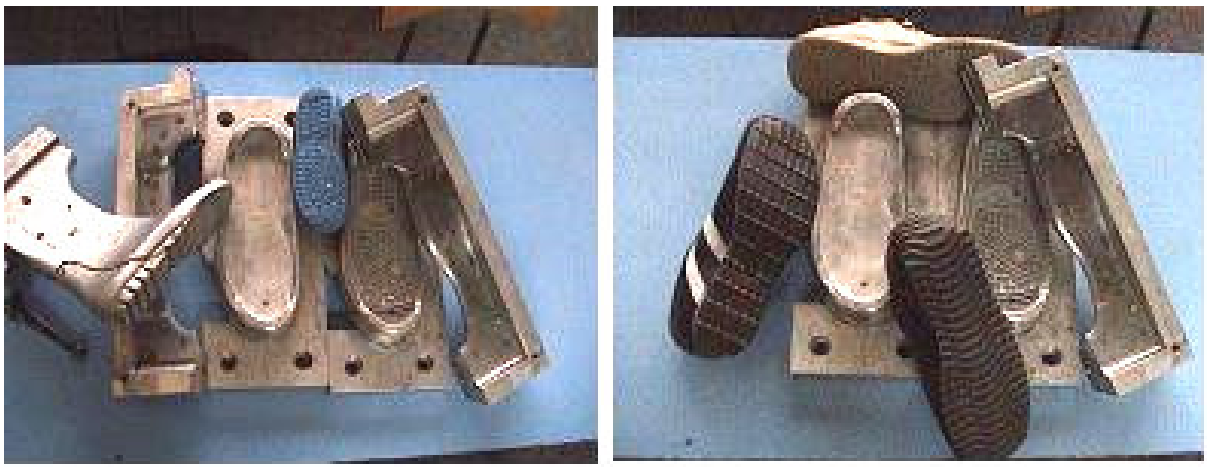

Fig. 7: Mould with modular cavity for sole injection directly on the footwear uppers

4. DISSCUTIONS

Obtaining moulds with versatile cavities by modifying the cavities of existing moulds and experimenting with this moulds revealed a set of aspects like [9]:

- The modifications which can be performed on moulds with classic cavities are limited.
- In the cases that the initial shape and size of the sole is preserved, diversification of the soles can be obtained by changing the side surface model and the antiskid relief model. This is accomplished with minimum costs by operating small modifications on the lateral jaws and manufacturing interchangeable parts which are mounted on the lateral jaws and on the die.
- The solutions for sole model diversification by modifying existing moulds proved to be efficient in the case of small sole production. This is due to the fact that the material of which are manufactured the interchangeable parts is aluminium, zinc or copper, materials that don't have a high hardness.
- The soles obtained in moulds with modified cavities, have similar qualities as the soles obtained in the initial mould.

The experimenting with moulds that have been designed with versatile cavities revealed a set of conclusions as [10]:

- The moulds are composed of base parts, that remain unchanged till the physical outwear, and the modules that are remanufactured entirely or partially on changing the sole model [9], [10].The mounting and dismounting of the modules is easily done, without influencing the lateral jaws quality of the formed soles quality.
- The lateral jaws are fitted with machine mounting systems, closing and opening systems, centring and feeding the cavity, etc. These systems can by typified on last models and machine models.
- The moulds with versatile cavities can be mounted on the same machines as the moulds with unique cavities. These moulds can replace the classical ones or can be used in the same time with the classical ones.
- A brief analysis on the technological processes for manufacturing moulds with versatile cavities reveals a significant lowering of the manufacturing time for moulds in which will be obtained other sole models. The manufacturing time for this type of moulds, depending on their complexity, is lowered up to 25-40% on each mould. This is due to the fact that some of the mould parts are reused. Extending the analysis over the entire moulds set reveals consistent savings.
- A great advantage of using moulds with versatile cavities consists in the fact that the producers that chose this type of moulds can launch on the market new models in a shorter

time and at lower prices.

- The moulds with versatile cavities can be exploited till the physical outwear without risking the moral outwear. In this respect, the activity of fabrication of a large range of sole models can become profitable even for the smaller sole producers.

5. CONCLUSIONS

- Versatile solutions designed moulds authors, enable the producer to launch in fabrication new sole models in a shorter time and with much lower costs.
- These molds can be used independently or in parallel with classical moldings, the same types of equipment.
- The manufacturing solutions for versatile cavities are applicable to the same extent to the moulds in which the soles are formed directly on the uppers, whatever the nature of the polymeric blends and thermo chemical forming processes.

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ANNALS OF THE UNIVERSITY OF ORADEA
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PREPARATION AND CHARACTERIZATION OF TIO_2-SILICONE NANOCOMPOSITE OBTAINED BY SOL-GEL METHOD

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Abstract: *The sol-gel process is attractive for the nanocomposite preparation due to its unique advantages such as low temperature processing, high homogeneity of final products and its capability to generate materials with controlled surface properties. The preparation of TiO_2-Silicone nanocomposite by sol–gel method, which is efficient at producing thin, transparent multi-component oxide layers, was considered due to its possible application as finishing coating on leather. In this study the preparation and characterization of TiO_2-Silicone nanocomposite were investigated. TiO_2-Silicone nanocomposite was prepared from titanium n-butoxide (TBO) and tetraethoxysilane (TEOS) catalyzed with acid. The chemical structure of the composite was evaluated by means of Raman spectroscopy. Atomic Force Microscopy (AFM) was employed to characterize the surface properties of composite films. In summary, the colloidal TiO_2–Silicone nanocomposite solution was successfully synthesized using the sol-gel method. The turbidity value of the TiO_2–Silicone nanocomposite solution was 12.7 ntu. The TiO_2–Silicone nanocomposite was mildly acidic with a pH value of 5.2. It was determined that the viscosity of the TiO_2– Silicone nanocomposite solution was approximately equal to 1-3 mPa.s. The particles sizes were approximately 5.4 nm, with the coatings being approximately 0.06 µm in thickness. From the results obtained it was revealed that the TiO_2-Silicone nanocomposite can be used as coating in leather fninshing process.*

Key words: *TiO_2-Silicone nanocomposite, Sol–gel, Leather, Coating, Finishing process.*

1. INTRODUCTION

The sol-gel process is attractive for the nanocomposite preparation due to its unique advantages such as low temperature processing, high homogeneity of final products and its capability to generate materials with controlled surface properties [1, 2]. The sol-gel process can be classified as a wet-chemical technique as it used chemical solutions (sol) as a precursor for an integrated network (gel) of either discrete particles or network polymer in order to fabricate materials (typically metal oxide) [3].

Thin transparent layers containing TiO_2 have been intensively studied due to their interesting application potential [4]. The physical and chemical properties of TiO_2 crystallite size can be controlled by adding second semiconductor into the TiO_2 matrix [5]. Silicon dioxide (SiO_2) which has high thermal stability and excellent mechanical strength being incorporated into the TiO_2 matrix helps to create new catalytic active sites due to interaction between TiO_2 and SiO_2. And at the same time, SiO_2 acts as the carrier of TiO_2 and helps to obtain a large surface area as well as suitable porous structure [6].

There are a limited number of studies related to the preparation of nanocomposites for leather finishing, where mostly nanolayered silicates and nano SiO_2 were used as inorganic fillers for binders which resulted in improved physical, mechanical and rheological properties of the materials or finished leathers [7, 8, 9, 10]. In addition there is no information about TiO_2-silicone nanocomposite used as a coating in leather finishing.

In this study, we propose to prepare TiO_2-Silicone nanocomposite via sol-gel method at ambient temperature. The chemical structure of composite was characterized by using Raman spectroscopy and surface property of the composite film was observed with Atomic Force Microscopy (AFM). Particle size was measured by a particle sizer.

2. EXPERIMENTAL

2.1 Materials

Tetraethyl orthosilicate (TEOS) was purchased from Aldrich. Titanium n-butoxide (TBO) was provided by Merck. All of these materials were used as received. Distilled water for hydrolysis of alkoxides and acetic acid (100%) as catalyst were used. Ethyl alcohol (Merck), analytical grade, was the solvent for the sol.

2.2 Preparation and Characterization of TiO_2-Silicone nanocomposite

The TiO_2-SiO_2 composite solution was produced in the following way: the amounts of required ethanol, acetic acid, distilled water and TEOS were mixed in the round-bottomed flask with stirring condition. Into this solution required amount of TBO was added dropwise. The mixture was stirred for 30 minutes to complete hydrolysis process of SiO_2 and TiO_2. The ultrasonic treatment was applied under 15 kW power. The final transparent sol was then aged to obtain gelous dispersion. To investigate the property of TiO_2-SiO_2 composite film the prepared solution was poured on glass slices (3x7 cm) at room temperature.

To determine the solution characteristics the turbidity, pH value and viscosity of the prepared solution were measured. The turbidity of the solution was measured using a Delta OHM Turbidimeter (Italy) according to the ISO 7027 nepheometric method. The measurements were taken in the range of 0–1000 nephelometric turbidity units. The pH value of the solution was measured to determine its acidic and basic characteristics with a standard pH meter (WTW Inolab, Germany). The viscosity was obtained with a Rheosys Merlin VR digital rheometer (USA). Raman Spectroscopy (Thermo DXR, USA) and Atomic Force Microscopy (XE–Nanomagnetics Instruments, UK) were employed to characterize the chemical structure and surface property of nanocomposite film. Raman spectra were obtained in the range of 4000 and 400 cm^{-1} at a resolution of 2 cm^{-1}. Particle size was measured by a particle sizer (Malvern Mastersizer 2000, UK).

3. RESULTS AND DISCUSSION

Table 1 presents the turbidity, pH and viscosity values of the prepared solution. Turbidimetric measurements were made to reveal the complete dissolution of the precursors in the solution. The turbidity value was at 12.7 nephelometric turbidity units, indicating that the chemical precursors had completely dissolved in the solution. The pH value of composite solution has a mildly acidic pH value of 5.2. It was determined that the viscosity of the TiO_2- Silicone colloidal solution was in the range of 1–3 mPa.s. The viscosity value of the solution is a key factor in controlling the film thickness. In our case, TiO_2-Silicone nanocomposite was obtained with low-viscosity. The particles were approximately 5.4 nm in size.

Table 1. *Main characteristics of TiO_2-Silicone nanocomposite solution*

TBO/TEOS (mol ratio %)	Turbidity, ntu	pH	Viscosity, mPa.s	Particle size, nm
50/50	12.7	5.20	1-3	5.94

To gain better understanding of structure of composite, we measured the Raman spectrum of TiO_2– Silicone nanocomposite. The Raman spectrum of TiO_2– Silicone nanocomposite composite is given in Fig. 1. The sharp peak at 146 cm^{-1} is indicative of the presence of TiO_2 in the anatase phase. Although the rutile phase also exhibits a peak around this area it is a normally very weak signal, therefore this peak is due to the presence of the anatase phase [11]. The SiO_2 peaks are also quite weak and hard to distinguish in this spectrum however the broad peak centered at 300 cm^{-1} in the spectrum indicates the presence of a SiO_2 shell [12].

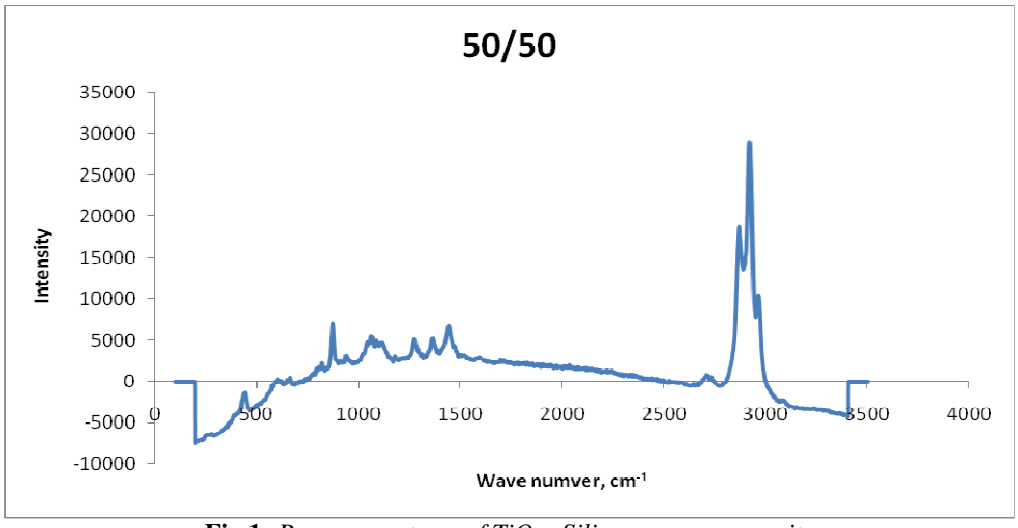

Fig 1: *Raman spectrum of TiO_2– Silicone nanocomposite*

AFM was used to characterize the surface morphology of nanocomposite film. Fig. 2 shows AFM images of the surface of the TiO_2-Silicone nanocomposite thin film. It can be seen from the Fig. 2 that films have granular microstructure. AFM gives the thickness value of TiO_2-Silicone nanocomposite film as 0.06 µm. In fact, the coating was evenly and homogenously distributed throughout the surface. Thus, it was observed that we have benefited from the advantages of the sol-gel method such as good homogeneity, ease of composition control and low processing temperature and obtained a thin, transparent and evenly distributed film on substrate.

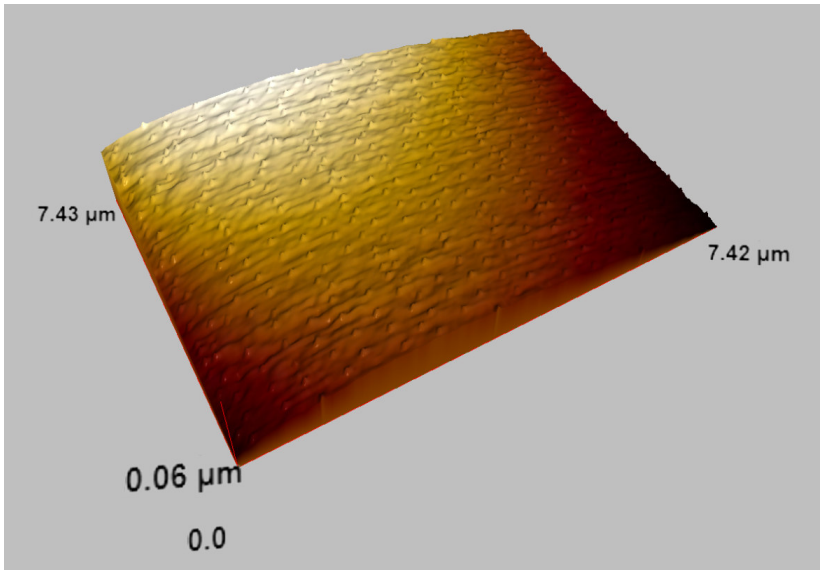

Fig. 2: *AFM image of TiO_2– Silicone nanocomposite film*

Within this framework, further studies are focusing on the investigation of the performance of colloidal TiO_2– Silicone nanocomposite as finishing coating on leather material.

4. CONCLUSIONS

In summary, the colloidal TiO_2–Silicone nanocomposite solution was successfully synthesized using the sol-gel method. The turbidity value of the TiO_2– Silicone nanocomposite solution was 12.7 ntu. The pH value of TiO_2– Silicone nanocomposite was mildly acidic with a pH value of 5.2. It was determined that the viscosity of the TiO_2– Silicone nanocomposite solution was approximately equal to 1-3 mPa.s. The particles were approximately 5.4 nm in size, with the coatings being approximately 0.06 µm in thickness. The thin and transparent coating obtained from the composite was evenly

distributed. It was revealed that the TiO_2-Silicone nanocomposite can be used as leather coating material.

Acknowledgement

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

THE METHOD OF DESIGNING ASSISTED ON COMPUTER OF THE FOOTWEAR'S SOLES

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Abstract: *To the base of the footwear soles designing, is the shoe last. The shoe lasts have irregular shapes, with various curves witch can't be represented by a simple mathematic function. In order to design the footwear's soles it's necessary to take from the shoe last some base contours. These contours are obtained with high precision in a 3D CAD system. In the paper, it will be presented a method of designing of the soles for footwear, computer assisted. The copying process of the shoe last is done using the 3D digitizer. For digitizing, the shoe last spatial shape is positioned on the peripheral of data gathering, witch follows automatically the shoe last's surface. The wire network obtained through digitizing is numerically interpolated with the interpolator functions in order to obtain the spatial numerical shape of the shoe last. The 3D designing of the sole will be realized on the numerical shape of the shoe last following the next steps: the manufacture of the sole's surface, the lateral surface realization of the sole's shape, obtaining the link surface between the lateral side and the planner one of the sole, of the sole's margin, the sole's designing contains the skid proof area. The main advantage of the designing method is the design precision, visualization in 3D space of the sole and the possibility to take the best decision viewing the acceptance of new sole's pattern.*

Key words: footwear soles, moulds soles, CAD methods designing

1. INTRODUCTION

To the base of the footwear soles designing, is the shoe last. Nowadays there are specialized soft equipped with the necessary parts to develop a designing activity, computer assisted that allow the introduction of the shoe last's contour in 3D, dressing the shoe last in the footwear's faces, designing the shoe last sole in 3 D, diversifying the sole's patterns witch can be put on the same shoe last, the design of the matrix, obtaining and multiplying the samples necessary for the matrix execution, the 3D graphical visualization of the sole's shapes and matrix, the determination of the polymeric jointing volumes necessary to obtain the soles in different numbers and sizes [1],[2]

In the paper, it will be presented a method of designing of the soles for footwear, computer assisted.

2. EXPERIMENTAL PART – CASE STUDY

2.1. The mathematic modeling and graphical visualization of the shoe last

To the sole's designing for footwear, will be followed the next steps: the shoe last's designing, the reconstruction of the shoe last dressed with the footwear faces, the sole's drawing in 2 D, sole's designing in 3 D, attaching the sole to the faces from the shoe last [3].

The shoe lasts have irregular shapes, with various curves witch can't be represented by a simple mathematic function.

In order to design the footwear's soles it's necessary to take from the shoe last some base contours: the section through the posterior- anterior longitudinal vertical plan, some transversal

sections through the shoe last, the shoe last planer surface, developed, the projection in horizontal plane of the shoe last planer surface. These contours are obtained with high precision in a 3D CAD system, due to the HARD possibilities offered by the actual technology. The copying process is done using the 3D digitizer or using the machine type Atos scanned. For digitizing, the shoe last spatial shape is positioned on the peripheral of data gathering, witch follows automatically the shoe last's surface, drawing in the same time some curves on the shoe last [4], like in the Fig 1.

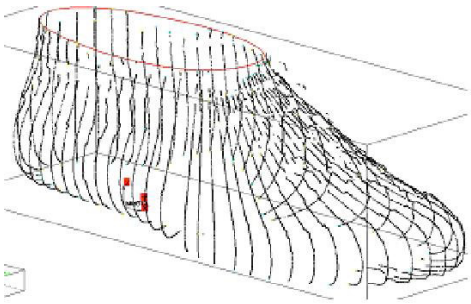

Fig. 1: *The shoe last copy, drawing the curve network*

The wire network obtained through digitizing is numerically interpolated with the interpolator functions in order to obtain the spatial numerical shape of the shoe last. The shoe last obtained is manufactured with soft systems in different shapes and colors to suggest as well as possible its spatial image [1],[5], like in the Fig 2 .

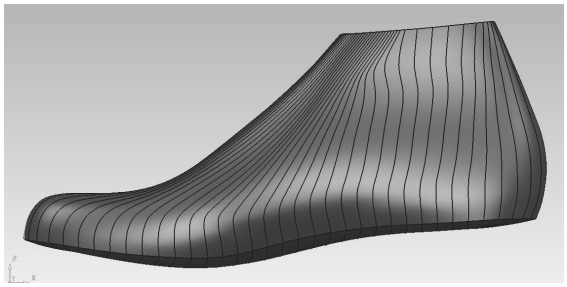

Fig. 2: *The shoe last's image manufactured with soft systems*

2.2. The reproduction of the shoe last dressed with the footwear's faces in 3 D

The reproduction in 3D of the shoe last witch is dressed with footwear's faces, is made with a scanning machine 3D Atos which is integrated to the computer, like in the Fig.3.

Fig. 3: *The copying process in 3 D of the shoe last with the faces pulled with the scanning machine*

The shoe last dressed with the faces, as shown in Fig.3, is introduced in the scanning machine for copying. Before the introduction, on the faces are applied different types of adhesives.

The machine allows photographing the entire area of the footwear through the faces pressing on the device that gathers numerical data. The machines presses the effaces on the device that gathers numerical data to decrease as possible the error introduction, determined by the shoe lasts thicknesses witch compose the faces. The shoe last has the possibility to rotate gradual, to allow photographing of

the entire volume. The pressing process and the gathering data one, starts from one of the limit parts of the shoe last, it continues with the planner area that with the other limit part until the shoe last comes in the horizontal position. To the copying process a lot of attention needs to be accorded to the area that marks the shoe lasts edge where the faces have been pulled, because this area is hard to be recognized by the machine. The numerical data gathered through pressing, are introduced simultaneously in the computer's program as a point cloud of the pressed shape [1], [3]. The resulted shape is represented in the Fig 4.

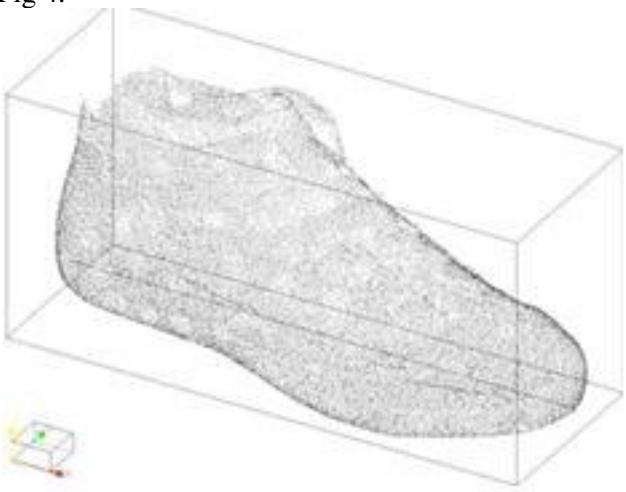

Fig 4: *The copied shape as a point cloud*

The 3 D designing of the sole will be realized on this shape from, following the next steps: the manufacture of the sole's surface, the lateral surface realization of the sole's shape, obtaining the link surface between the lateral side and the planner one of the sole, of the sole's margin, the sole's designing contains the skid proof area [6],[7].

In Fig. 5 is presented the 2D model of a bicolor soles to be projected 3D according to the method of work.

Fig 5: *The sole's designing in 2D*

2.3. Designing the sole's planner surface

In the Fig 6, it's been presented in 2 D, using the interpolator method through Spline functions, designing the planner surface of the shoe last increased with the faces [1],[8].

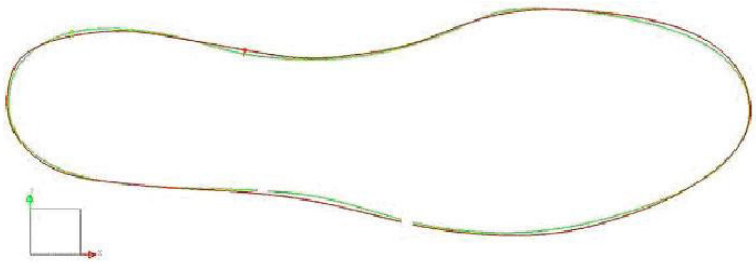

Fig 6: *Designing the planner surface of the sole pulled through interpolator and Spline functions*

To obtain the sole's shape in 3D, there will be drawn, like in the Fig 7, the transversal section of the surface [1],[4].

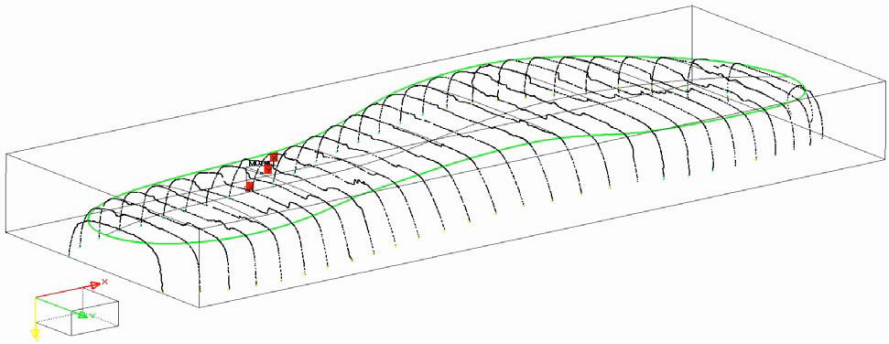

Fig 7: *Obtaining the sole's pick*

The transversal sections are realized from the point cloud, the plans parallel and equidistant direct on the planner surface of the shape in the Fig 5. These sections that have been drawn through points have to be corrected. So, there are constructed Spline curves, which have to cut the imperfections. On the Spline curves corrected, is drawn the planner surface of the sole from the Fig.8.

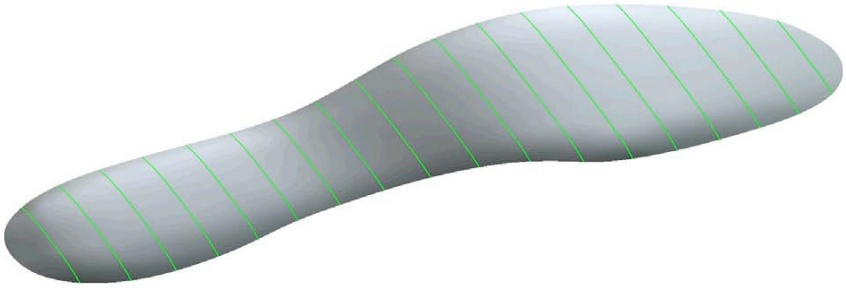

Fig 8: *The planner surface of the sole that comes in contact with the shoe last*

After drawing this surface, it is analyzed again and where has appeared inequalities between the parallel sections of the sole's surface, are done point corrections.

2.4. Designing the lateral surface of the sole

So created the planner surface, next to be constructed will be the sole's lateral surface [1],[9]. This construction will be realized on the network from the Fig 5, following the next steps:

- In the first step is being obtained a section in the upper area of the shape hence will be constructed a 2D Spline curve line. The shape is sectioned with radial plans, are obtained point lines that are constructed Spline curves witch serve to generate the lateral surface. Not all the sections are used in the surface construction. The density of necessary sections will be directly proportioned with the surface complexity. So, for the heel and toe areas will be necessary more sections and for the rest of the surfaces will be necessary fewer sections.
- In the second step, will be draw the lateral surface through analyzing and correcting the points. The surface is constructed using 2D Spline functions resulted from the radial sections. The surface obtained has to be controlled to eliminate the imperfections. The way of realizing the contour are different and have as target the improvement of the surfaces. These corrections can be made on sections like the correction of the sole's planner surface. The sections plan has to be chosen considering the surface area that has to be improved or rotating the image so that it can be obtained the light reflection movement on the surface to relieve the points that have to be modified. Working this way, are relieved the areas where the point distancing took place. Once individualized the areas that

have to be corrected, it can be modified the control points of the surface. In the end is obtained the contour like in the Fig 9.

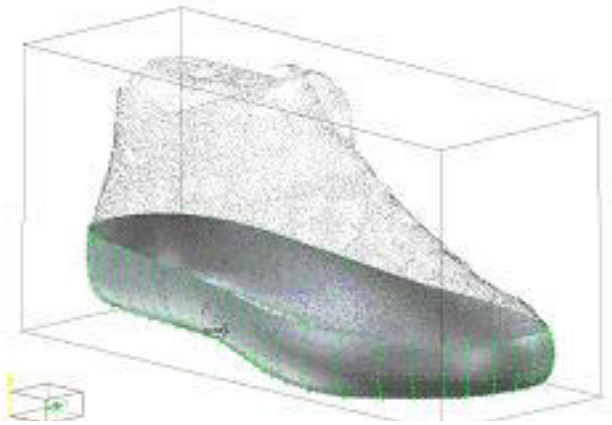

Fig9: *Realizing the lateral surface of the sole's shape*

Obtaining the link surface between the lateral side and the planner one of the sole, the sole's margin, is realized through the intersection of the points that pass through its planner surface of the lateral shape and surface

In the Fig 10 have been represented point sections with surfaces and cloud point with surfaces.

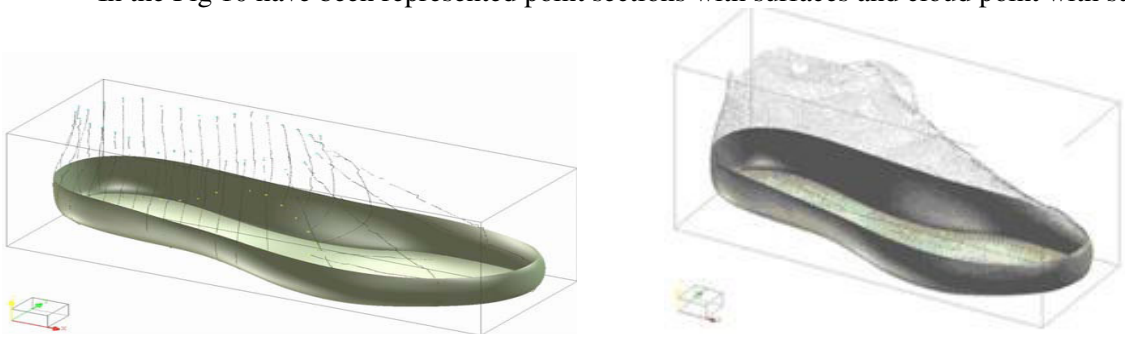

Fig.10: *Point sections and cloud point with surfaces*

In this step was realized the mathematic pattern of the shape, obtaining the shape in 3D, it represents the intermediary phase when the mathematic pattern of the product has been realized. This pattern will be used forward to obtain the sole's exact pattern.

2.5. Designing the exterior sole, with skid proof area

The exterior sole is designed [1],[4] on the fond surface in the Fig 10 using 3D Spline functions, like in the Fig 11.

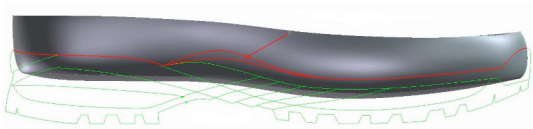

Fig 11: *The sole's drawing with skid proof area*

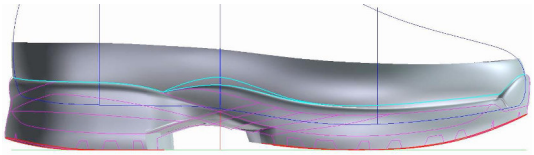

Fig 12: *Separating the two soles*

As the sole is bicolor, it will be considered that the interior sole the one without the skid proof area and the exterior sole that has skid proof area. Being obtained both soles mono-block, it can be studied the evolution of the surfaces that limit the two soles by introducing some sections in the important points that separate them , like in the Fig 12.

The skid proof areas are designed on the exterior contour of the sole. It has the role to avoid the foot slipping on the support plan during the walk. The skid proof area has to be designed so it can be perpendicular on the slipping directions to the contact with the ground, to the foot's rolling and to the feet propel. The skid proof areas in the sole's case that is being studied in this paper, are negative because are included in the sole's thickness.

To draw the decorative lines from the lateral side of the bi-dimensional sole is designed on smooth surfaces. For a correct construction of the esthetic lines, they have to be continued from the skid proof area to the lateral surface. The final shape of the sole is represented like in the Fig 13.

Fig 13: *The final shape of the sole in 3 D*

3. CONCLUSIONS

The main advantages of the presented design method are:

- design precision,
- visualization in 3D space of the sole,
- the possibility to take the best decision viewing the acceptance of new sole's pattern.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

VISIONS FOR FOOTWEAR TIP SHAPE ACCORDING TO THE CONFIGURATION FINGER

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Abstract: *Compatibility between the consumer and the interior leg permanent footwear raises a number of issues. And any new form of footwear is time for a new silhouette last. Fashion is a factor in determining the shape of the last significant role. The most important influence on fashion in footwear that has at one time is found in peak shape. During registered a variety of forms leading to the last, for example, pointed, oval, round, square, asymmetrical, curved, trapezoidal, etc. Each has added a tip top recommended. The paper analyzes the morphofunctional characteristic, namely, finger configuration. The configuration of the fingers is determined from the positions of all the fingers of one another, as are six variants. Analysis of the shape and configuration of the arm fingers allow us to make the following recommendations to consumers: people showing finger configuration as in variant V and VI are advised not to wear pointy shoes because of the limited movement of the foot, which favors the diversion finger I exterior and deformed finger V; persons who fall within I-IV variant can procure pointy shoes; a round-tipped shoes, square, curved or asymmetric may be purchased by any consumer regardless of the configuration of the fingers; shoes with cut edge must be present only in garderopa people in variant I and II; consumers whose configuration is like finger-VI and III variants are awkwardly shaped fingers can buy shoes closed in the previous summer, but of different perforations or overlapping strips.*

Key words: *foot, last, shoe, feature, added, form.*

1. INTRODUCTION

Currently shoes is made of different materials, shapes of the sole, heel and tip varied. The main role of footwear is to keep natural aesthetic shape of the foot without causing discomforts, sprains, corns etc. The design and implementation of internal shape of the shoe is necessary that the shape and dimensions correspond to the shape and size of the foot. In this respect it puts emphasis on the rational design of the shoe shape and specifically the plantar surface [1].

We know that comfort is directly influenced by the shape and dimensions interiors shoe / shoe shape, the material properties of the component parts is performed, the peculiarities of manufacturing technology. A comfortable footwear in operation must perform a number of basic requirements such as [2]: the shape and internal dimensions correspond to the foot shape and size of the consumer; reduced mass and stiffness; ensure adherence sole ground that touches on mersstabil; maintain an optimum microclimate in the foot; be safe and harmless; to allow removal of static electricity accumulated on the surface of the foot.

Compatibility between the consumer and the interior leg permanent footwear raises a number of issues. And any new form of footwear is time for a new silhouette lasts. Therefore, the designer must know the anatomy and lasts foot anthropometry, biomechanics understand the laws governing driving leg to evaluate changes in various stress conditions thereof [3].

2. RELATIONSHIP BETWEEN FOOT, FOOTWEAR AND LASTS

The shape of the shoe is directly influenced by the shape of the last used both in the design and the manufacture.

The relationship between foot, shoe and last can be presented graphically as in figure 1 [3].

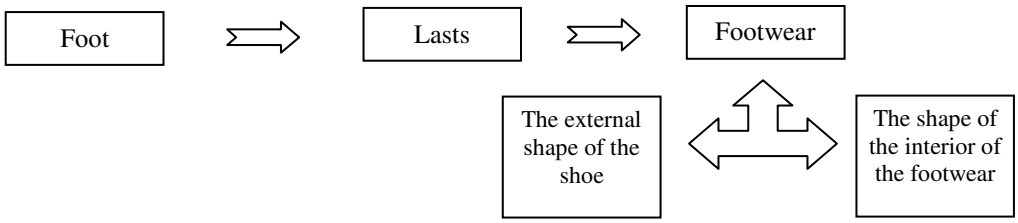


Fig. 1: *The relationship between foot – lasts - footwear*

The shape and size of the shoe shape are determined from the average foot size representative statistical population level, dimensions determined by anthropometric measurements. Firms producing lasts its follow their own design process, which is reflected in the development of collections according to fashion trends. Building on the tradition and experience, creating a new shoe lasts silhouettes starts from a model already checked functionally. Changes made pertaining to the tip and shank. Typically, the heel remains unchanged to preserve some parts unchanged (for example, backdrop, shank, heel) [3].

Fashion is a factor in determining the shape of the last significant role [2]. The most important influence on fashion in footwear that has at one time is found in peak lasts (fig. 2) [4].

Fig. 2: *Shoe shape and appearance of the shoe tip*

Over the years a variety of forms attested to top of the shoe lasts (fig. 3), for example, pointed, oval, round, square, asymmetrical, curved [2-4].

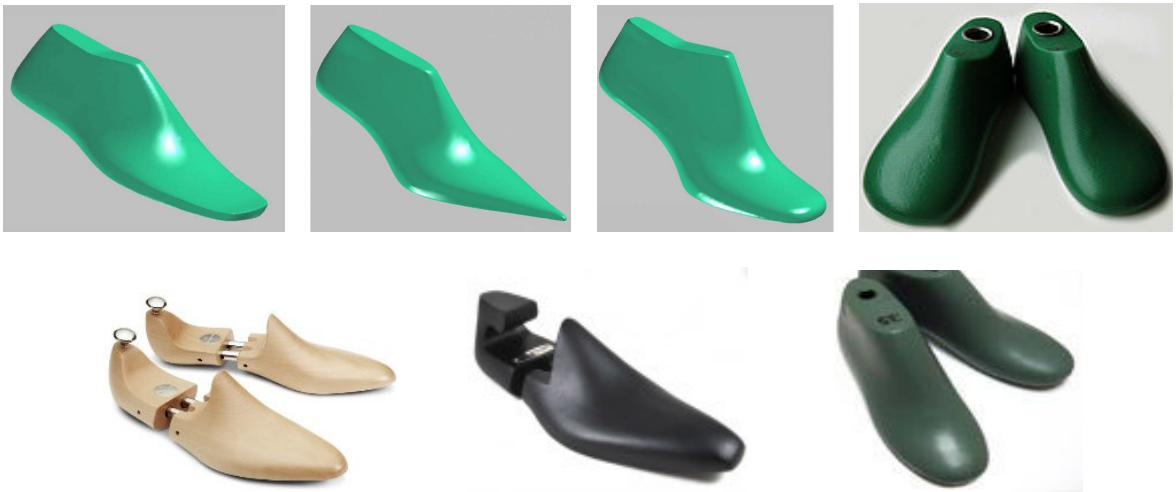


Fig. 3: *Forms of peak shoe lasts [4]*

Each has added a tip top recommended [2]. To the product of footwear to fit the consumer's foot, anthropometric studies are needed. An adaptation as good shoe leg configuration requires its release high pressure points. If the footwear is tightly packed, and the forces exerted by the pressures affecting the skin tissues. And if the shoe is too wide, it may occur dislocations, sprains. In both cases one can speak of discomfort, pain or injury [3]. Businesses shoe lasts of Moldova attorney in Ukraine or Turkey, and the number of dissatisfied consumers increases from year to year.

The role of anthropometric research is precisely to timely notify dimensional parameter changes in the evolution of the human body to establish a set of representative environmental dimensions [3]. These studies are conducted in Moldova, due to misunderstanding by some people the importance of this research. The Technical University of Moldova, Faculty Textile Industry is made small studies, the results are presented at various conferences.

3. ANALYSIS OF DEFICIENCY OF FOOTWEAR

Creating products with a high degree of functionality is a prerequisite for consumer satisfaction with comfortable footwear. A faulty construction of the shoe leads to an incorrect position of the foot, limiting shock-absorbing function, its overload, the disruption of operation and, finally, the emergence of structural abnormalities and / or function of the foot, with repercussions on the state consumer health. And a fashionable shoes, but not conforming to the shape of the foot, as it may cause severe deformities [2].

The main weaknesses of footwear are determined by the construction of shoe shapes annatto inadequate morphological peculiarities of consumer legs, use of materials with poor hygiene or even introduce errors in the design or manufacture of the product technology. For example [2]:

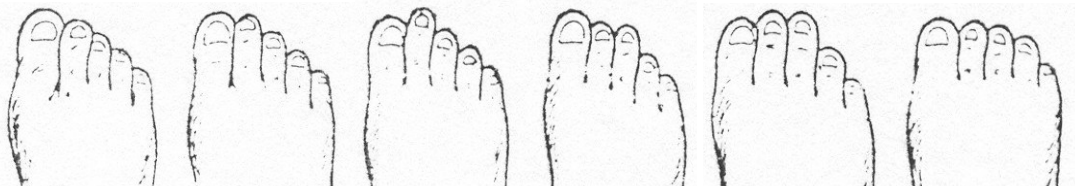
1. The longitudinal axis of the shoe do not coincide with the longitudinal axis of the foot.
2. The bottom of the shoe lasts curve does not correspond to the configuration of the foot.
3. Footwear with only one width.
4. Cutting unsuccessful peak area.
5. Depth of neck too high heeled footwear.

4. CASE STUDY

Literature review on morpho-functional feature of the legs of identified 11 characteristics, namely [5, 6]:

1. The general appearance of the foot.
2. The shape of the foot.
3. Position your finger I.
4. Position your fingers.
5. Configuration fingers.
6. Position the heel.
7. Foot vault.
8. Position the foot.
9. The curvature of the medial heel footprint.
10. The curvature of the heel indentation on the side.
11. The mutual position of the joint metatarsophalangeal joint metatorsofalongiene I to V.

Further analyzes morphofunctional characteristic, namely, finger configuration. The configuration of the fingers is determined from the positions of all the fingers of one another, six variants were identified (fig. 4) [6].



I	II	III	IV	V	VI
1, 2, 3, 4, 5	1=2, 3, 4, 5	2, 1, 3, 4, 5	1, 2=3, 4, 5	1=2=3, 4, 5	1=2=3=4, 5

Fig. 4: *Configuration fingers*

A study conducted on a total of 130 subjects from Moldova, female and male, showed that 80% of subjects presenting fingers in variant configuration I, 12% - version II, 2% - version III, 3% - version IV, 2% - V version, and 1% - version VI.

When designing insole is taken into account static and dynamic foot position, and morphofunctional characteristics of the foot [7]. The literature lists several design methods of the insole, ie, schema G, K method, the method AKA-64, Method Research Institute of Leather - Footwear - Bucharest; method of Kiev Research Institute etc. all have a goal to achieve a comfortable footwear [2]. Insole length (Lb) is determined taking into account leg length (Lp), considering the magnitude of posterior curvature of the shoe shape (S) and a decorative addition - constructively with the tip. Addition decorative - construction (Adc) correlates with peak shape imposed fashioned shoe shape, since the tip is sharp, the value addition (R3) should be higher. The point of the tip must be built beyond the stretch of fingers went [2, 8]. When designing insole is necessary to take into account the length of the foot during walking (R1), which under the pressure increases and the people while wearing shoes that have not reached a certain age, foot sizes are increased (R2) in result of increasing individual. R2 value is calculated for six months [8, 9].

$$L_b = L_p + Adc - S \quad (1)$$

where L is the length of the insole; Lp - leg length; Adc - decorative addition - constructive; S - the amplitude of the curvature of the back of the last.

So decorative and constructive addition is calculated as follows (fig. 5 and 6):

adult:

$$Adc = R_1+R_3 \quad (2)$$

for children:

$$Adc = R_1+R_2 \quad (3)$$

for teens:

$$Adc = R_1+R_2+R_3 \quad (4)$$

Value additions for:

- R1 is 5 mm is recommended to open the shoe shapes, summer and loafers and from 10 mm to shoe shapes for other types [1, 2, 8-11].
- R2 is recommended to 1,5-4,5 mm, depending on the age of the consumer. The maximum value is given to children aged 1-2 years, and the minimum age for children from 9-12 years [9, 10].
- R3 is adopted according to the shape of the tip, a rounded tip and square the value of R3 is 0 mm convex; and for a sharp, asymmetric and oval value of R3 is 15-25 mm [8, 9].

$$S = 0,02*L_p + 0,05*h_{toc} \quad (5)$$

where is h_{toc} heel height.

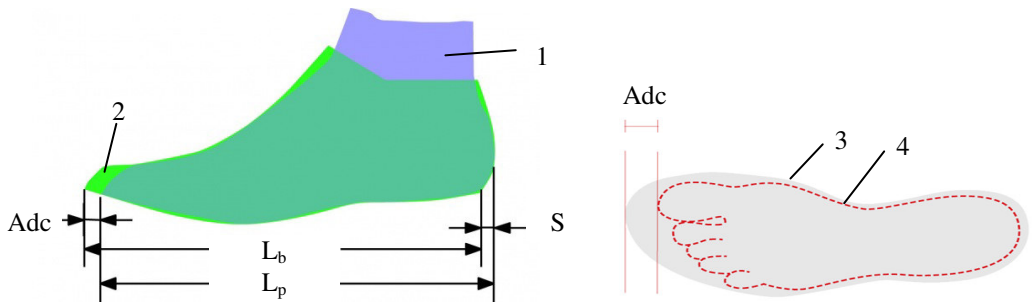


Fig. 5: *Addition decorative constructive [12, 13]*

Adc - decorative addition constructive; Lb - length insole; Lp - leg length; S - amplitude posterior curvature of the shoe lasts; 1 - foot; 2 - last; 3 - contour insole; 4 - foot contour gauge

Figure 6 is analyzed as insole and finger configuration.

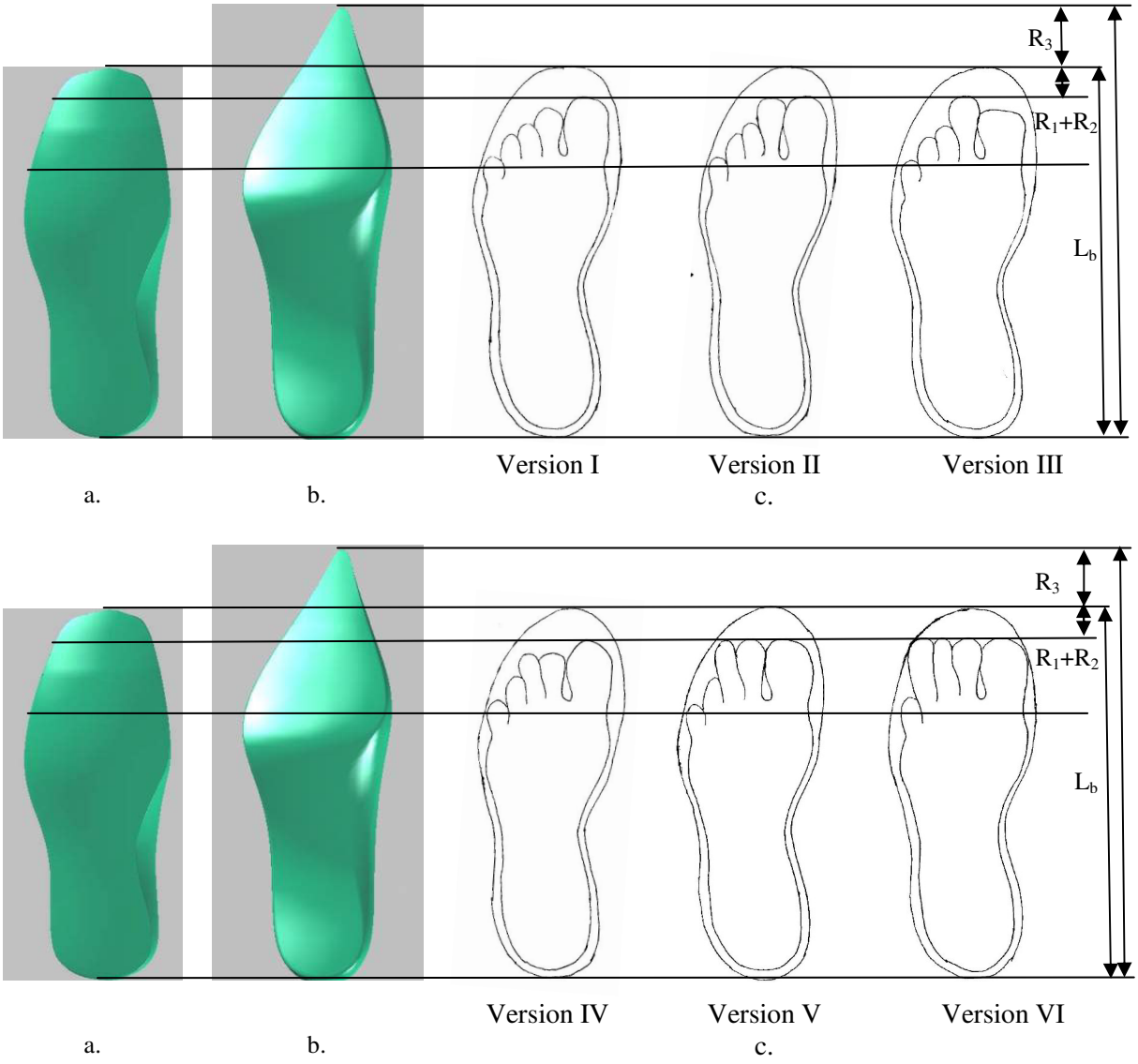


Fig. 6: *Comparative analysis of arm configuration fingers*

a - last tipped square / round; b - last pointy; c - finger configuration

Comparative analysis of figure 6 shows that:

- The lasts with square top, round etc. allow correct positioning of the fingers inside the shoe and allows full use of the natural foot support surface;
- The lasts with a sharp point is fashionable but not always match the shape of the foot, which is why shoes made with this block must be carefully chosen by consumers.

5. CONCLUSIONS

1. Considering the fact that in Moldova there legs anthropometric estimates of population characteristics, morphological and functional features for different age groups, sex, etc., which would serve as a basis for designing and making appropriate shoe shapes is proposed:

- initiate a comprehensive study and awareness of the importance of everyone;
- checking existing data obtained lasts of footwear enterprises in Moldova since the block is imported from foreign countries;

- adapting the shape and size shoe lasts according to the anthropometric characteristics of feet population in Moldova.

2. For a shoe to be comfortable to wear is required:

- consumer education on correct determination of the size of the foot;
- proper design of the insole, and other component parts of footwear;
- avoid shoes, both narrow and wide, because in both cases one can speak of discomfort, pain or injury;
- peak shape right choice considering the configuration of the fingers;
- decorative addition - constructive to draw ultimate elongation after finger while driving insole design.

3. Recommendations to consumers:

- people showing finger configuration as in variant V and VI are advised not to wear pointy shoes because of the limited movement of the foot, favoring the transverse arch flattening previous outward deflection and deformation finger I finger V;
- persons who fall within I-IV variant can procure pointy shoes;
- a round-tipped shoes, trapezoidal, square, curved or asymmetric may be purchased by any consumer regardless of the configuration of the fingers;
- shoes with cut edge must be present only in garderopa people in variant I and II;
- consumers whose configuration is like finger - VI and III variants are awkwardly shaped fingers can buy shoes closed in the previous summer, but of different perforations or overlapping strips;
- a new shoe that gives a feeling of discomfort should not be purchased because it may or may not expand after some time, and while widening "expected" various health problems may occur. A solution would be to purchase footwear enlargement devices.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

ETHICS AND COMPLIANCE IN BUSINESS

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Abstract: *In this paper, we have studied the evolution of the business ethics concept through the prism of definitions from some renowned authors in the field and through the approach model of the business ethics and by implementing it in the company level. We have found out that in the last 40 years this concept has evolved from a theoretical aspect, as well as a practical one. Companies are motivated to implement ethics and compliance programs in business so that they can manage the changes that come from society. If, until recently, all that mattered for a company was profit, in the last decades, the situation changed. In order to develop a durable business, it is essential to have a good reputation. Owning and implementing an ethics and compliance program in business has become an imperative for companies, regardless of their activity sector. The role of the compliance department becomes more pregnant in each company: the employees need safety, the existence of communication lines provides comfort. From the partners in business' point of view, owning such a program is a necessity, a condition, and not conforming to the principles of business ethics can lead to the isolation of the company. The ethics and compliance programs in business are instruments that protect the company by implementing certain proactive identification mechanisms that ensure the development of an ethical organizational culture.*

Key words: *business ethics, compliance programs, companies.*

1. INTRODUCTION

Business ethics appeared recently in the USA, followed by Western Europe countries. It is a new concept but, in the last decades, it has become an imperative in successful companies. In order to remain competitive in a continuously evolving society, companies need to update the way in which they act in conformity with new changes that arise at an international level. Companies have surpassed the role of simple economic agents, they are citizens of the society in which they belong and thus need to act according to its regulations

2. EVOLUTION OF THE BUSINESS ETHICS CONCEPT

The term of business ethics is a relatively new term, which appeared in the USA in the 60's once with the rise of social problems regarding workers' right to a decent pay and proper working conditions, pollutions, nuclear and toxic waste disposal issues. [1]

Business ethics was the answer of businessmen to these problems that affected the society. In the 70's, this movement extends more and more in the society and the interest shown to this concept increases.

Because the fact that the consumerist movement extended in the 70's, business schools and universities have come up with an answer by organizing conferences and meeting of businesspeople with the academic staff where these issues were discussed. [1] Gradually, the courses were introduced in universities, the collaboration between the business environment and the academic one heading in that direction.

Companies become interested and answer society by introducing ethics codes in which sensible issues referring to business conduct are approached.

In the 80's, business ethics becomes a movement, the activity in this field increasing significantly. [2] Companies introduce ethics codes and phone lines where employees could report conduct cases that broke ethic principles of the company; the companies organized training programs to come to the aid of the employees, to answer to some of their questions and to guide them in their behavior.

In the 90's, the American government issued laws referring to deeds done by companies in this field, and in 1991, the American Congress decrees the Federal Sentencing Guidelines, a set of rules that are applicable to companies.

Business ethics has transformed from a movement into a part of the business landscape. The concept has been approached by many authors. We will try to detail a few approaches of some of the most renowned authors.

The definition given by R. T. De George to business ethics is: "the ethics perspective, either implicit in attitude, either explicitly stated, of a company or of an individual that conducts business", [2] captures the descriptive part of ethics, leaving it to be understood that there can be two approaches, a declarative one and an effective one, while a company can own a set of rules at the declarative level, but also its behavior can be different from the rules.

A. Crane and D. Matten in "*Business Ethics. A European Perspective"* propose a different definition: "Business ethics is the study of situations, activities and decisions in business in which problems related to what is morally good and evil are discussed." [3]

Shaw and Barry consider that business ethics is a study belonging to applied ethics on what is correct or incorrect in the business field. [4]

In "*Business Ethics. Concepts and Cases",* Manuel Velasquez defines business ethics as being "a study in which moral standards are applied to the behaviour of individuals involved in organizations, through which the modern society produces and distributes goods and services". [4]

The moral standards of the individual should refer to problems that present importance to the individual; to exist from their beliefs and not to be changed through policies and rules; to cross over the personal interest; to be objective and impartial and to determine emotions, pleasures or satisfactions when a person acts with morality and guild or disappointment when a person breaks their own moral standards. [5]

In the work "*Business ethics*", [6] the authors make the following statement: "ethics is the theoretical discipline through which ideas of Good, Evil, Duty, Justice, or attitudes, characters, customs are studied, in a word: people's morality".

Lewis (1985) [7] define business ethics as being "that set of principles or arguments that should govern business conduct, either at an individual level, or at a collective one".

By analyzing only some of these definitions reproduced above belonging to well-known ethicists, we can see that there are at least two different approaches to the concept: that of De George, which situates ethics at a declarative level, of a description of what a company should do reported to certain ethic attitudes, and a second approach (Lewis) which considers that ethics in business refers to what economic agents should or should not do in business.

Thus, in the 90's, a new movement manifested in companies, a practical approach to ethics. Corporations started to implement the concept of business ethics by elaborating Ethic Codes, by creating compliance officer positions, and by organizing committees and training sessions.

At an international and national level, a series of measures have been adopted, meant to create the judicial instruments for implementing defining rules regarding ethics in business. From the most well-known regulations, we mention:

a. The law regarding foreign corruption practices - F.C.P.A - Foreign Corrupt Practice Act; [8]
b. Regulations contained in the 1991 Guidelines regarding federal sanctions applicable to organizations; (FGSO)
c. Regulations contained in the 2002 Guidelines;
d. U.K. Bribery Act. [9]

Taking into account all the new changes that have since appeared in the legislative and in the society, companies have answered by implementing ethic and conformity programs in their organizations.

3. COMPANIES ETHICS AND COMPLIANCE PROGRAMS

A larger and larger number of managers put into action compliance and ethics programs in their companies.

The compliance program can be defined as" the ensemble of processes, regulations and business instruments through which a company ensures its conformity with the national and international legislation, as well as with the internal provisions". [10]

In order to be efficient, such a program should be interconnected with the company's vision on ethics and conformity; companies need to ensure that their program is in accordance with the requirements of the international legal framework, including the United Nations Convention against Corruption. [11]

Companies should report their efforts of fighting against corruption in a public way. Public reporting is an important mean of demonstrating sincerity and seriousness, the company's involvement in preventing and fighting against corruption and its promise of respecting the fundamental values of integrity, transparency and responsibility towards the employees, business partners and other interested parties.

This commitment should start from the top management of the company. The management needs to declare zero tolerance for corruption and needs to be backed up by policies and procedures that will help put this commitment into action. This type of commitment plays a critical role in creating a culture based on fundamental values, such as integrity, transparency and responsibility. "The tone from the top" influences the norms and values with which the company operates and to which all employees and relevant business partners are expected to follow. The tone from the top is sent from the superior management of the company.

Developing and putting into practice of an anti-corruption program needs the active participation of each employee and relevant business partner. In order to manage the program, the whole organization needs to be involved and every responsibility has to be clearly determined. These responsibilities should make sure that the program is constantly implemented, executed and supervised.

We consider that it is important for each employee and business partner to respect and support the compliance program, so that it can be efficient and effective.

The top management's involvement for preventing corruption, developing an anti-corruption program and overseeing it should be translated into the company's own policy of forbidding corruption. This program should be clear, concise and accessible to all members of the organization so that all employees and business partners should adhere to these principles.

Companies elaborate their standards and procedures according to present regulations but also following their policy. All these can be implemented in the organization by including them into a Code of Conduct of the company, which would allow it to detect potential compliance incidents, but especially to prevent the advent of such incidents.

We consider that the main role of ethics and compliance programs is the prevention of incidents. In case that ethic accidents occur, the role of the compliance department is to detect them and offer feed-back to the organization. The answer can be in the form of consequences for violation of the rules, monitoring in the non-conformity cases, but also implementing means of remedy in case the rules of conformity are broken. [7]

Business conduct needs to be based on mutual trust. Trust is essential between the management of a company and their employees for a motivating work environment. In a similar way, it is important that trust exists between a company and its partners. The employees and partners need to do their activities according to the ethical values of the company, even in situations that are not clearly defined by the policies and procedures.

The companies that implement an anti-corruption program need to make sure that not only the employees and business partners are aware of the policies and procedures, but also that they have the information and abilities needed to identify corruption-related issues. Communication and forming activities play a key role in increasing the awareness level and implementation of an efficient anti-corruption program.

We consider it to be useful to the efficient implementation of ethics and compliance programs that the management of the company organizes trainings and informing programs, on a periodical

basis, in which all employees should take part in order to correctly understand the provisions of the code, thus promoting an adequate organization culture.

Professional detection and investigation as well as sanctioning rule breaks are central elements of an efficient ethics and compliance program.

Companies also need to offer ways for the employees and business partners to ask for assistance in reporting rule violations made by a person or by third parties.

The ethics and compliance department of a company has the task of offering guidance to all employees of the company; representatives of this department use direct communication methods.

The fact that breakings in the conduct the company asks of its employees are reported should not be considered a negative element. Reports only show the management of the company that the system works and the members of the organization have understood the role of the compliance program.

We consider that all ethics and conduct codes need periodical updates, due to legislative and economic changes that take place in our society.

4. CONCLUSIONS

Globalizing has affected the entire society, which determines a greater and greater dependency to international-set regulations. Because of this system, companies need to conform to these international rules, to adopt and implement them in their organization. This is the only way in which they can become competitive in a continuously evolving world.

Corruption affects the whole of society and the state cannot fight alone against it. Companies, as citizens in the society they take part, need to join the state in fighting corruption. The role of companies in present-day societies is overwhelming and they can, by implementing ethics and compliance programs, form a partnership with the public sector, satisfying the expectations regarding company responsibilities.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

WHAT IS "LUXURY" TO GENERATION Y?

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Abstract: *In the last decades, numerous articles have been written on luxury products (goods and services), their importance in terms of consumption, the growth of this market segment, their importance in the eyes of the consumer, etc. Yet one thing remains elusive: what exactly is a luxury product?*
If one is to believe the existing literature, luxury products range from anything (and everything) a producer wishes to make us believe is "luxurious": the rarest of items (an original masterpiece from a renaissance painter, for example), a high quality handbag made of the finest materials and selling for thousands of dollars, an horrendously overpriced piece of clothing bearing the name of an unknown (yet French or Italian sounding) designer that is made in China or Bangladesh. The current paper looks at the most important future clientele of luxury products: members of Generation Y. It identifies what, in their eyes, make a product/brand "luxurious". Through a literature review, we first review the most generally accepted definitions of luxury. We then proceed to present the results of our quantitative research conducted in Québec which highlight the characteristics that members of this subgroup consider to be necessary components of a luxury brand or product.
This paper concludes on some possible avenues to an acceptable definition of "luxury" and recommendations to participants in this industry on the points to emphasize in their brand promotion and product design and production.

Key words: *Gen Y, Luxury, Marketing*

1. INTRODUCTION

The present paper has roots in two different literature streams.

The first deals with the definition of "luxury". The literature is replete with articles dealing with the design, production, and marketing of luxury products, yet the definition of what constitutes a luxury product or brand varies from one author to the next. Many, to avoid the argument as to "what is" and "what is not" simply take for granted that all readers will know exactly what they are referring to.

The second literature stream that is of interest pertains to the actual markets for luxury products. Whereas some segment on a geographical basis (Asia versus Europe versus America, for example), others will focus more heavily on consumer types (e.g. fashionista, social wearer, megacitier, etc.), and others yet on age groups.

2. LITERATURE REVIEW

What is luxury? In a recent article [1] The Economist pointedly asserted that this concept is, to use their words, *slippery and divisise*. Andrea Doyle, in an article in Incentive [2] put it simply: *Luxury means different things to different people*. As both articles state, a number of words are repeatedly used when authors define luxury products: "authentic", "absolute", "aspirational" or "affordable".

Turunen and Leipämaa-Leskinen [3] identify three dimensions to luxury (1) functional (utilitarian), (2) experiential (hedonic), and (3) symbolic (status). The Bernstein Research Report [4] looks at it from a more practical pint of view and looks at it more from a "what it takes to win" (to paraphrase the report) than from a definitional point of view. They come up with a number of criteria,

two of which are particularly important to the definition of a luxury brand/product: intrinsic value and "made-in" (country of origin).

When it comes to current and future buyers of luxury, most researchers agree that we are looking at a democratization of luxury (younger and less affluent buyers) [5] and that the future consumer will come from Asia [2] and America where Gen Y already accounts for 60% of those purchases in 2011 [6].

3. METHODOLOGY

We developed two questionnaires comprised of 16 questions each of which 7 pertained to socio-demographic information. Of the other 9 questions 3 focused on the respondents' purchase of luxury items in the past 2 years and were identical on the two questionnaires. The last 6 questions differed slightly.

On the "luxury brand questionnaire" they asked the respondents to indicate their level of agreement (on a scale of 1 to 5) with statements (3 for each point) on (1) what the history of a luxury brand should, (2) what its marketing communication should be, (3) whether a luxury brand must originate from a specific region, (4) where luxury brands should be distributed (what types of retail outlets), (5) the social recognition conveyed by a luxury grand to its buyer, and (6) the level of quality that products from a luxury brand should have. On the "product questionnaire" the 6 questions (again asking for the level of agreement on a scale of 1 to 5 for 3 statements) focused on: (1) product quality, (2) manufacturing processes, (3) price, (4) distribution (types of retail outlets), (5) social recognition conveyed, and (6) the importance that a luxury product be manufactured by a recognized luxury brand. The "brand" questionnaire led to 1779 valid responses whereas the "product" questionnaire gave us 1468. The questionnaires purposefully did not offer a definition of either a luxury brand or a luxury product in order to let the respondents totally free in his/her perception of that concept. As an example one sub-question asked the respondent for his/her level of agreement with the following statement "A luxury brand only offers products produced in a limited quantity". This approach, we felt, enabled us to acquire the individuals' true perception of luxury.

The survey was limited to the province of Québec for convenience purposes. Our samples were non-probabilistic using a snowball, or chain sampling, approach. It was passed on the internet during the month of October 2014 using Survey Monkey, with the help of two of ours students' groups who were asked to transfer the surveys to as many people as possible in these age groups with the only caveat that they must not be related to the Fashion School. The data were analyzed with SPSS.

4. RESULTS

We first looked at raw frequencies; we present the most interesting ones (where over 70% of our respondents agreed or very much agreed (4 & +) or disagreed / very much disagreed (2 & -) with a statement) in Tables 1 and 2 respectively focusing on the results for our brand survey and for our product survey. Two conclusions immediately stand out from these raw frequencies, in accordance with the Bernstein Research referred to above [4]:

- the "made-in" is a strong determinant of luxury;
- intrinsic value is important to the coming generation of luxury buyers.

Table 1: *Brand Survey*

Frequency		
	Score	
The origin of a brand determines whether it is a luxury brand or not.	70.3	2 et -
All European brands are luxury brands.	83.6	2 et -
A high level of quality in the manufacturing of a product determines whether a brand will be perceived as a luxury brand or not.	73.9	4 et +
The use of high quality materials in the manufacturing of its products determines whether a brand will be perceived as a luxury brand or not.	75.0	4 et +

Table 2: *Product Survey*

Frequency		
	Score	
A luxury product never includes non-noble materials (i.e. fake leather or fur, synthetics, etc.).	82.6	4 & +
High quality in the materials used is one of the characteristics used to identify a luxury product	70.1	4 & +
A luxury product is easily recognizable by the apparent quality in its production.	81.1	4 & +
Luxury products always are expensive.	78.8	4 & +
A luxury product can never be purchased on the Internet.	83.5	2 & -
A luxury products come from European brands.	83.7	2 & -

In tables 3 and 4 we present those results where a significant difference exists between our male and female respondents. The first thing that stands out is that there are relatively few significant differences between males and females when it comes to what makes a luxury brand or product. One can only note that women place a bit more emphasis on the intrinsic quality of the product. More importantly, women appear to give a higher level of importance to (1) the relationship between brand and product and (2) the presence of a creator at the helm of a luxury brand.

Table 3: *Brand Survey*

T-test Sex			
	t	Sig	Score in % F-M
A luxury brand bears the name of its creator (ex. Dior, Armani, Chanel, etc.).	0.024	-2.261	56.3-48.3
A luxury brand is managed by a highly renowned designer.	0.007	-2.708	65.3-55.1
The origin of a brand determines whether it is a luxury brand or not.	0.040	2.051	71.7-65.8
All European brands are luxury brands.	0.020	-2.337	83.2-74.9

Table 4: *Product Survey*

T-test Sex			
	t	Sig	Score in % F-M
High quality in the materials used is one of the characteristics used to identify a luxury product	0.000	-3.834	73.3-61.2
Luxury products always are expensive.	0.000	-5.567	82.1-69.6
A luxury product can never be purchased on the Internet.	0.004	-2.905	82.6-86.1
A well-known brand (i.e. Chanel, Dior) only offers luxury products,	0.000	-6.798	57.6-34.2
A product's brand tells whether it is a luxury product or not.	0.000	-3.529	59.9-51.9

Although we tested for differences between three age subgroups of Gen Y consumers (18-24, 25-29, 30-34) we could only find very few variations in our brand survey: all pointing to what appears to be a more subdued perception on the part of the older subgroup (Table 5). It therefore appears that Gen Y constitutes a fairly homogeneous group, both in terms of age and sex, when it comes to its perception of luxury.

Table 5: *Product Survey*

Anova Age			
	F	Sig	18/24-29/34
A luxury brand bears the name of its creator (ex. Dior, Armani, Chanel, etc.).	3.946	0.019	53.8-61.9
A luxury brand is managed by a highly renowned designer.	3.637	0.027	63.9-59.9
A luxury brand necessarily originates from Europe.	3.618	0.027	63.2-71.3
Luxury brands are only sold through a limited number of high end retailers.	5.392	0.005	58.7-53.3
Apparel/accessories of a luxury brand are always manufactured in very limited quantities.	4.521	0.011	39.5-35.1

Before closing this section we should note that although we tested for concepts such as the image conveyed to the wearer by a luxury brand, the consistent perceived high prices (and non-availability of discounts), or the distribution (or non-distribution) on the internet, Gen Y members do not place much emphasis on these points in their determination of what constitutes a luxury brand/product.

5. CONCLUSIONS AND RECOMMENDATIONS

The results presented above show that, in the 18-34 age group, two factors stand out in determining if a fashion brand/product falls in the luxurious category: intrinsic quality of the product and country of origin. We could also add that, for women, the presence of a reputable designer at the helm of the fashion also constitutes and element.

In light of our original question as to "what is luxury", the above findings are of interest as, in spite of the numerous articles written on the subject, there appears to be a rather straightforward answer to the question from a Gen Y point of view: **a luxury product or brand is something of constant high quality offered by a reputable fashion house**.

In light of these findings three recommendations stand out to the Romanian leather producer: (1) target the Gen Y consumer who represents an important part of the future of luxury, (2) emphasize its European origin, and (3) its product quality.

An important weakness of our research is that it was conducted only in the province of Québec. Yet other research has shown that the results found in Québec are partially generalizable to the rest of the country and from there to the rest of North America. We attempted to conduct similar research in the Eastern U.S.A. yet the low response rate we had does not permit us to confirm this generalizability.

A number of interesting research avenues arise from our findings. The first is on the pertinence of clearly defining "luxury" to the value of future research as well as recommendations to the industry: i.e. are we better off leaving the concept a bit fuzzy or should it be clearly defined? In the case of a positive answer to the previous question a corollary would be on finding a generalizable definition through the sexes, ages, and countries of origin of the respondents.

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

CORPORATE GOVERNANCE IN DEVELOPING ECONOMIES: CASE STUDY OF A ROMANIAN TEXTILE COMPANY

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Abstract: *This article explores corporate governance issues like ownership structure, gender diversity accountability, risk management and internal audit at managerial level of a textile company listed on the Bucharest stock exchange. For this reason, secondary data was used as information collection tool. Results of the study underline the conclusion that, corporate governance is being implemented in companies belonging to the textile industry of Romania although correlated with some weaknesses. Analyzed documents confirm that the chosen textile company is trying to implement various accepted corporate governance policies, to stay competitive. The manufacturing processes were constantly improved involving a variety of techniques, with the purpose for diminishing environmental negative impact by eliminating waste. The board of directors as well as the top-management has a good understanding of the responsibilities for each member in order to ensure good corporate governance. The lack of a trade union could be the causative factor of wage inequality and loss of a stronger worker voice. Although the result of external constraints, we identified a process for constant enhancement of corporate governance in the company. The implementation of the code of corporate governance contributed to improvement in performance especially share value. Future research directions aimed extending the sample by selecting several other companies from different industries, for comparison.*

Key words: *corporate governance, textile industry, ownership structure, accountability, director's remuneration, risk management, internal audit.*

1. INTRODUCTION

Despite the fact that, in Europe, the textile industry is relatively robust and competitive due to innovation, the textile industry from Romania was weakened by the financial crisis. An important aspect that was revealed was the shortcoming in corporate governance. Because the costs of governance standards implementation are at the beginning higher than the benefits, a lower operating performance will follow discouraging the management. The term of corporate governance, can be defined as "the system by which companies are directed and controlled" [1]. There is a degree of comprehensiveness and detail-richness around the definition offered by the OECD "corporate governance involves a set of relationships between a company's management, its board, its shareholders and other stakeholders, offering at the same time ways of monitoring performance [2]. Seven elements of corporate governance like discipline, transparency, independence, accountability, responsibility, fairness and social responsibility are important. The definition of the ownership structure refers primarily on the equity allocation. This process is determined by the investments or number of votes of the different shareholders or equity owners. Hence corporate governance must ensure transparency, it realizes that through internal and external mechanisms such as board composition [3], the shaping of responsibilities and the establishing of board of directors functions, and immoral activities are limited. Simon, Evans and Pruzan (2013) state that accountability is concerned with analyzing of an existing correlation between the performances of the company compared to the established goals and objectives publically available [4]. A vivid discussion on the subject of corporate governance is caused by the topic of board director's direct and indirect remuneration. The framework presented predominantly in the literature regarding company's risks

consists of: political, economic, financial and operational risks [5], sometimes tailored after the country's and companies environmental conditions. The main problem encountered in companies is the agency problem that can be solved through an audit allowing the protection of the investor's interest [6].

2. RESEARCH METHOLODLGY

In order to verify corporate governance principles, financial position and performance in textile companies the case study method was chosen providing in depth insides into the annual activities of the company based on data gathered from the financial statements between 2003 and 2014, which are available on the site of the Bucharest Stock Exchange (www.bvb.ro).

3. CORPORATE GOVERNANCE IN A TEXTILE COMPANY

Conted S.A. is a joint stock company listed and traded on the stock category II of the Bucharest Stock Exchange with legal personality from the city of Dorohoi, registered in 1991, although it existed since 1-st December 1963, therefore having an experience of over 40 years in the textile and garment industry.

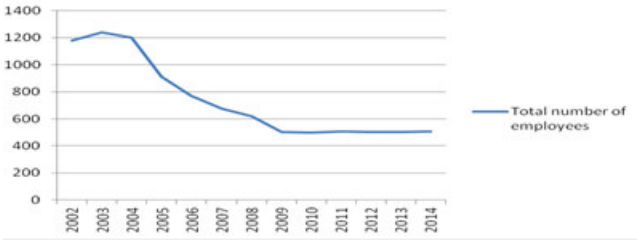

Fig. 1: *Evolution of total numbers of employees.*
Source: own elaboration based on financial statements of the Bucharest Stock Exchange

The main activity is the production and distribution of textiles, employing 505 people in 2014. In the above figure, one can distinguish the evolution of the employees in numbers from the year 2002 (1179 employees) to 2014 (505 employees). Financial constraints, migration and industry evolution can explain the drastic decline of ca. 43%. The used production system is the lohn system [7], [8]. They are producing garments for women, men and children, focusing on both domestic market (in 2013 - 12,363,711 lei) and foreign market. EU countries like France and Italy play the main role. In the future the company wants to open its own shop and facilitate the distribution of its products diminishing legislative and exchange risk through a flexible buying form adjusted to different market conditions and forward contracts. Garments imported from France, Italy, Spain and Turkey will be used for the own collection. Export in 2013 was ca. 33.83% percentage of turnover. In 2009 and 2010, the company registered the largest exports share of 61.47% and 57.07%. Since 2011, domestic sales have exceeded exports. The capital of the company was 2,284,360.06 RON in 2013, fully subscribed worth 9.53 RON / share, granting equal rights to shareholders for each share. For several years the Romanian company managed shares most profitable in terms of percentage, on the Stock Exchange.

Unfortunately financial profitability measured by several indicators recorded a negative evolution, to the level of the year before: Sales revenues in 2013 - 21.299.967 and 19.231.926 - 2014 and Gross Profit was 3.195.651in 2013 and 1.977.526 in 2014. This situation will definitely influence the assessment of each management option in terms of economic therefore cost criteria. Because the monthly production capacity is about 18.000 coats and 12.000 trousers, the company managed a vast portfolio composed of the following customers: Again Textile Team LLC Brasov, SC Formen's LLC, S.C., Esprit, Patrizia Pepe, Mazonetto, Kim Otto, and Piere Cardin. Covering an international perspective of the fashion industry, the studying of fashion trends is a necessity that can offer the possibility of creating new patterns according to different age or gender characteristics [9]. The focus on corporate governance issues grew with the number of important clients.

In the year 2013 the number of personnel was 502 people. Regarding the level of education, it shows a different pattern in a number of respects in comparison with the situation before 2005, the year the quota system for the imports of textiles was abolished [10]. Only 21 employees have higher

education, which is a normal percentage taking into account the field of activity of the company. A number of 142 persons of the total employees of the company are unskilled workers, on account of the existing market gap of qualified personnel in textiles. This is the case for engineers, mechanics but as well for confectioners. They have graduated from secondary schools, and vocational schools. A number of 76 people have a minimum qualification in the textile industry in which they perform their activity. Consequently, the company tries to ensure quality through a training period of 2-3 months, helping them to adapt better to the workplace. Sometimes it is a risky decision because the company must provide the minimum wage for them. Interestingly the company does not mention the existence of worker unions in recent years, which suggests a limited involvement of the workers in the process of change and transition [11]. In 2005 the percentage of workers joining at that time, existing union was 30%.

Evaluation of the company's activity regarding the risks management reveal that activities regarding assessments on risk related to capital, exchange risk, liquidity and cash flow risk, risk of price reduction, risk of lohn system, political and legislative risk, risk of losing some markets, and operational risks, take regular place. From the risks within the company mentioned before, the liquidity risk is minimal. The management developed risk maps and tried to establish an importance ranking. On today's highly competitive market specialization of the workforce is required. Difficulties in attracting qualified personnel are high risks that affect negatively the daily activities performance.

In order to be able to correctly evaluate for instance the impact of the companies' activity on the environment, a constant monitoring of the delivery and storage of waste, in partnership with specialized companies like S.C. Pandora Prod S.R.L. Focşani, or S.C. Roxy Textil S.R.L for textiles, paper and cardboard, or plastics, was organized. Striving to improve the overall situation of the company is the Board of Directors. It is responsible for examining and approving the strategic plan, the company's operational, financial, and corporate structure assuring a balance between business continuity and shareholder expectations. In order to verify the adopted research questions we will further examine other corporate governance issues. To reduce unnecessary costs some equipment is for sale.

In accordance with the Law no. 31/1990, SC Conted S.A. Dorohoi, is administered under a unitary system. For an audit, the establishment of the remuneration of directors, managers, staff, or the nomination of candidates for different management positions the board of directors may create advisory committees. This advisory committee assists the board of directors in the establishment of internal rules. The current board of directors is composed of three members, elected in 2011 for a mandate of 4 years. Non-executive directors are also been elected and between administrators there is no agreement, understanding or family connection. The first two persons mentioned in the table below highlighting some important board members characteristics like age, gender, education and experience were members together with Tudor Ioana, an economist, 52 years old, with an experience of 35 years since 2005. The majority of the board members fall under the age bracket of 58-64 years old, their education is primarily based on engineering. It is important that at the level of board women are represented. Although the situation in the company concerning the number of women as members in the board is aligned with the general situation of Romanian companies, the commitment towards gender diversity must be more present in companies belonging to the textile and garment industry not only because female workforce is predominant but also due to their active involvement in business activities and not least because of the female customers.

Table 2: *Composition of the board*

Name	Age	Profile	Experience in Years
Popa M.	62	engineer - profile technology and textile chemistry	36
Negreanu V.	64	economist - the economy specialty industry	36
Pujin N.	58	engineer-profile technology and textile chemistry	21

Source: own elaboration based on financial statements of the company on the Bucharest Stock Exchange

The individuals that claim ownership of the company's capital are Manole Popa, Negreanu Valeria and Pujin Nelu. Manole Popa participates with a percentage of 25.53%, followed by Pujin Nelu with 20.25% and then Negreanu Valeria with a percentage of 10.00%. The CEO has the power to take decisions regarding the company's management in order to ensure and maintain economic efficiency and manage the business-relations with third parties. One of the most important tasks are

the selection, hiring and firing of employees, also leading the negotiation of the collective labor agreement but also individual contracts of employment;

4. CONCLUSIONS

This study was established with an aim to identify some aspects of corporate governance at company level of the Romanian textile industry, about implementation of corporate governance codes as whole and also about ownership structure, accountability, risk management and internal audit. Regarding ownership structure we agree that the board of directors is being informed about all the significant company matters. This situation is a result of a clearly defined management structure, especially regarding functions of the board and management members and their commitment with corporate governance practices. No data was available on board of directors' remuneration or compensation package. Therefore we could not give a detailed answer if financial gain is based on financial performance and efficiency of the company. Results revealed that there is an internal audit which is being reviewed by external audit controlling the accuracy of financial information considered within the internal audit. The management proved to have appropriate knowledge on managing risks, by using forward contracts and their impact on performance of the organization. Financial performance including accounting practices is also fairly presented. Still there is a need for more gender sensitivity for all the parties involved in the industry

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ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK

FISCAL FRAUD IN TEXTILE AND CLOTHING IMPORTS

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Abstract: *We have appreciated that this paper can be structured in four chapters that will explain the inevitable negative effects generated by tax and fiscal fraud, which are felt in the level of fiscal revenue, determining major malfunctions in the mechanism of the markets. In the economic reality and in the rise of the tax fraud phenomenon, in the contemporary fiscal doctrine it is stated that the public desiderate of "loyal collaboration between the tax payer and the revenue agency" with the purpose of correctly setting taxes and tariffs and other required fund needed for creating public interest monetary funds. The economic, social and political globalization tendencies of the last decade have stimulated and supported actions relating to eluding the fiscal dispositions, actions which have moved more and more from the center of the national fiscal system towards the exterior, outside the field of action of the national fiscal law.*
In this regard show that reducing fiscal evasion, allows the creation of budgetary resources, necessary for funds allocation for economical growth. In Romania, one of the basic economic problems is the lack of investment resources allocated, these being the main contributor to economic growth, in which the reduction of fraud and tax evasion is the solution to increase this allocation which can be rated as one of the priority tasks of the state.

Keywords: *tax evasion, fiscal fraud, VAT, textiles, import operations*

1. INTRODUCTION

Most often, fiscal fraud designates, *stricto senso* a violation of the law and it is distinguished from the tax evasion which is defined as being an able use of the possibilities offered by the law.

The first definition of fiscal fraud has been given between the two world wars. According to it, this fraud wars an extended concept, the notion of fiscal evasion being included in the fraud notion. The most well-known sense given to fiscal fraud is "the art of avoiding the fall in the field of attraction of the fiscal law" [1], a concept that belongs to M.C. de Brie and P. Charpentier.

Fiscal fraud is fraudulent when the taxpayer that is obliged to further provide details in support of his fiscal declaration will dissimulate the taxable object, by under-evaluating the quantum of the taxable material or by using other means of not paying the tax that is due. Fiscal fraud is a generic term and represents the running away from taxes attitude. This is a broad definition of fiscal fraud, which today composes fraud as well. Fiscal fraud is made up of, incontestably, by all omitted and committed facts made by entities subjected to taxation, which represent wrongdoings made against fiscal legislation due to their grave financial consequences.

Tax evasion has a direct and immediate effect on levels of tax revenue, which leads directly to imbalances in market mechanisms and unlawful enrichment of the practitioners of this method of cheating that affects the state and ultimately, each of us, honest taxpayers.

Due to the Romanian legislation in the field, supporting the existence of a legitimate (or legal) tax avoidance and of an illicit (or illegal) tax avoidance lacks legal basis.

2. TEXTILE AND CLOTHING IMPORT

Immediately after 1989, the Italian producers were the first which came in Romania and gave a boost to the local textile industry. Other producers from Turkey soon followed on the accessories and fabrics, China (confections), Germany or Greece (clothing).

After it has reached the top of clothing and shoes manufacturers and after these two industries have got to representing almost half of the exterior commerce of Romania with the EU, their decline started in 2004-2005, due to the unfavorable conjuncture of the increased EURO-LEU exchange rate and because of the liberalization of the European market towards the Asian exports. This decline had been predictable, given the fact that on the road towards the EU, which supposes the nominal and real convergence, loss of jobs and market shares in cheap workforce industries. Through this process other countries have passed, all great textiles and footwear exporters, such as Spain and Poland, when they joined the EU.

The great retailers that came to Romania have looked for cheap qualified labor, low pay and vicinity to the great markets of the EU. After Romania joined the EU, it has lost the fight with the Asian markets, in regards to costs, the factories of China, Bangladesh, Mexico or Pakistan becoming more interesting from this point of view. Besides these aspects, the economic-financial crisis led to the Romanian factories losing their most important clients and finally, thousands of employees losing their jobs. Some factories were obliged to shut down production.

On January 1st 2007, Romania joined the EU. Since then, customs taxes on textiles and clothing have decreased by 10%, to a value of about 7%. In this context, the imports and re-exports from Hong Kong and China were expected to grow.

Chinese corporations declare that the volume of their own investments in the Romanian economy total around 254 mil. USD, but the concrete load of these investments on the textile industry is unknown.

With the integration of our country into the European Union, some operators in Romania quickly assimilated criminal fraud practices of tax obligations used successfully for many years in the Community. The mechanism itself is structured in the current transitional arrangements for the taxation of intra-Community trade, which requires, as a general rule, the taxation of intra-Community goods carried between taxable persons, in the Member State of destination.

During 2010-2011, many textile imports have been identified, originating from China. The importers are limited liability companies from Romania, many of them having their social headquarters in the west of the country. Many of these companies have declared the simultaneous introduction into use of the goods they imported into another member state and putting them into free circulation.

Some importing companies have rapidly assimilated the criminal fraudulent fiscal obligation practices, successfully used for a number of years in the European Union. Thus, the mechanism is based on the moving of good from the customs office through which they entered in the EU towards a certain customs office of a member state, where the goods are declared in a certain custom regime on import, without putting the goods into free circulation in that state, the customs taxes are paid for those declared products, VAT-exempted, which is to be paid in the member state in which the goods will be put on sale.

3. FISCAL FRAUD ON TEXTILE AND CLOTHING IMPORTS

Since Romania joined the EU, customs regulations are applied according to the Community Customs Code, which supposes the usage of a community customs tariff, as well as other community commercial policy regulations.

From case to case, the textiles and clothing that are bought, in part from China, have been imported in Romania by commercial companies that had as unique associate and administrator people with a low level of knowledge and who did not understand what the implications of the societies they have registered are.

Thus, besides fraud in textiles and clothing, consisting of undeclared production, undeclared imports, under-evaluated imports, fictive exports, not including goods in the taxing base, in 2010-2011, profiting from the customs possibilities offered by the new regulations, the textiles and clothing imports from China have been released into free circulation on Romania's territory without paying required fiscal taxes, especially VAT, by simulating the delivery to a different member state.

As we have shown above, the fraud methods in this field are multiple, but the ones that are the object of a concrete analysis in this paper are those identified as entered in Romania in a non-taxable transit for which custom clearances have been made at an office in the West of Romania, a special customs regime being solicited – the codified customs regime 42.

This codified regime 42 represents the releasing into free circulation of goods and introducing into consumption of goods that are part of a VAT-free delivery to a different member state, and, depending on the case, tax-free.

The exempt of taxes and VAT is given because the import is followed by a delivery or an intra-community transfer of goods towards a different member state. In this case, VAT and the customs tax will be paid at the destination, in that member state. In order to use this regime, operators need to fulfill some conditions. These operations are regulated by art. 143, paragraph 2 from the 2006/112/CE Directive, and, by case, art. 17, paragraph 1, letter d from the 2008/118/CE Directive.[2]

Based on article 143, paragraph 1, letter d from the VAT Directive, goods can be imported VAT-free only through a commercial agent which is registered as a VAT payer in the country where the goods will be sold or a fiscal representative (which is a representative according to article 5 of the CVC) in that country.

The goods are put into free circulation in a member state, but are destined to an economic operator from a different member state. The VAT formalities are made by a commissioner in the customs, which is a fiscal representative in the intra-community VAT system – his VAT number and the VAT number of the economic operator are declared in box 44 from the customs declaration, together with the relevant TARIC codes.

Thus, in 2010-2011, a number of 733 customs transit operations have been identified, with goods coming from outside the community – China – being introduced on the customs territory of the European Community and put in a tax-free system, destined for two commercial companies with limited liability from the west of Romania.

The customs transit operations have been closed at the customs office from the area where the two companies operated, where the import declarations have been registered and deposited, in the customs regime, described above, 42. The 733 transit operations were made up of clothing for children, women, men – comprised of trousers, skirts, blouses, jackets, t-shirts, dresses, mackinaws, pullovers, vests, pajamas, twinsets, lingerie, scarfs, robes, etc., made from cotton, wool, synthetic fibers in various mixture proportions.

The total quantity of the goods that made up the 733 transports was of 12.471.334 pieces (4.146 tons), the value of these goods in the customs being of 13.624.820 lei (3.214.993 euro equivalent). For the textiles and clothing that have been analyzed according to the specific tariff code, custom taxes totaling 5.278.573 lei (1.245.563 euro equivalent).[3]

The importing company has declared, through the solicited customs regime, that the goods will be put into free circulation and introduced into consumption in Hungary, the situation respecting the procedure while the VAT for these goods was to be paid in Hungary.

In this situation, the competent customs authority was to keep in its registry the operations until presenting documents that prove that the goods have left the Romanian territory, which usually are transport confirmation documents from the recipient (in this case CMR, because the transports were made exclusively on roads) or other relevant documents.

From the inspection made by specific control services, it has been shown that the vehicles have not left the Romanian territory, a situation in which it is supposed that they were sold on the Romanian territory with smaller prices, without paying the fiscal obligations, which led to a prejudice for the State budget, consisting of VAT and profit tax.

The taxing base for VAT has been determined based on the information available, by this formula:

$$\textit{Tax base VAT} = \textit{value in the customs} + \textit{customs tax} \quad (1)$$

In order to determine the VAT, the 24% quote has been applied to the tax base calculated by the formula above. After calculating the VAT obligation, it has resulted that through this engineering, the payment of the
4.536.814 lei (1.070.534 euro equivalent) have been avoided, representing VAT for the consolidated state budget of Romania. [4]

Based on the data provided by the National Institute of Statistics, it is clear that tax evasion is at a very high level in Romania, accounting for 13.8% of GDP in 2012. The NIS data show that about 60% of tax evasion is generated from VAT, in 2010 representing 9.6% of GDP, the same level as in 1996. It is worth noting that in 2010, tax evasion increased from 8% to 9.6% of GDP, while in 2010 the rate of VAT increased from 19% to 24%, in which case, normally, the levels should have lowered. The evolution of tax evasion is shown in Table 1.

Table 1. *Evolution of tax evasion on the main taxes (% of GDP)*

Year	**2007/% of GDP**	**2008/% of GDP**	**2009/% of GDP**	**2010/% of GDP**	**2011/% of GDP**	**2012/% of GDP**
Income tax	0.57	0.58	0.87	0.97	0.98	1.01
Profit tax	0.87	0.96	0.71	0.83	0.84	0.85
HIC	1.93	1.82	2.8	3.13	3.15	3.24
VAT	7.1	7.4	8.0	9.6	8.4	8.3
Excises	0.74	0.42	0.55	0.67	0.45	0.39

Source: NIS

4. CONCLUSIONS AND PROPOSALS

By selling these goods in Romania, a prejudice has been caused to the state budget, consisting of VAT and profit tax. Through accepting at the customs very small declared values for the goods, the resources of the general budget of the European Communities (European Union) have been illegally diminished, by not paying custom taxes related to the real value of these goods. In order to increase the collection of taxes, a profound reform of how taxes are administered in Romania is absolutely necessary. Due to the Romanian legislation in the field, supporting the existence of a legitimate (or legal) tax avoidance and of an illicit (or illegal) tax avoidance lacks legal basis.

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