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Influence of Chemical Treatment on Elastic Properties of the Band Cotton Crepe 100%

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***Abstract*—**The manufacturing technology of band cotton is very delicate and depends to choice of certain parameters such as torsion of warp yarn.

The fabric elasticity is achieved without the use of any elastic material, chemical expansion, artificial or synthetic and it's capable of creating pressures useful for therapeutic treatments.

Before use, the band is subjected to treatments of specific preparation for obtaining certain elasticity, however, during its treatment, there are some regression parameters. The dependence of manufacturing parameters on the quality of the chemical treatment was confirmed.

The aim of this work is to improve the properties of the fabric through the development of manufacturing technology appropriately. Finally for the treatment of the strip pancake 100% cotton, a treatment method is recommended.

***Keywords*—**Elastic, cotton, processing, torsion.

I. Introduction

THE twist ensures cohesion between the yarn fibers and can also change its appearance when twist is applied beyond usual values. It creates crepe effect and characterizes the manufacturing art of crepe band. The mechanical properties of yarns are closely related to importance and regularity of torsion, which implies a good choice and precise control of this parameter, but the poor performance of technological process of torsion is a disadvantage for industrial scale manufacturing [1]. It is know that narrowing of yarn is directly linked to its twist rate, so crepe yarn productivity is inversely proportional to the twist rate. In addition, over the yarns are twisted, higher their maniability becomes more difficult. It is clear that strong twists are not economical, which requires twist rate reduction of the warp yarns up about 800 tr / m. As the twist rate is dependent on yarn diameter, it is clear that the use of large yarn diameter is better without neglecting other properties of material than it can affect the cost. These are the carded yarns of medium linear density which must be adapted for their acceptable mechanical properties, their market availability and their affordability [2]. In this study, it has chosen metric yarn number equal to 28 m / g (36 Tex) for warp yarn production. The distance between two adjacent weft yarns is the main cause of warp yarn withdrawal. This withdrawal is a mechanical characteristic quite different from withdrawal provoked by a chemical treatment. In this case, yarns warp twisted too presents them under a low tension because the wefts are not tight against each other and therefore they form loops (spins) as a result of relaxation by wetting the fabric [3]. Thus, cotton fibers swell, the compressive stresses increase between fibers and yarn. The yarn of crepe band wraps around it to form even loops. Observing the influence of the weft on main properties of the tape crepe, notes that:

- The weft density exerts greater influence on the value of the elongation relative to the diameter of weft
- Elastic recovery depends to weft account and yarn diameter.
- The weft withdrawal depends mainly on its diameter.
- The twist of the weft involves the reduction of weft shrinkage, consumption and the increase to elongation but its influence is very low and use of simples yarn is more profitable for weft.

It is necessary to reduce the weft account up to 54 yarns/10 cm and increase diameter up to 33 Tex (N30). As the wefts yarn are duplicated on the loom, we must use a weft yarn 33/2 = 16.5 Tex (N60) to get wefts with a chosen finesse.

All textile materials contain impurities of different origin. The textile material of plant origin contain natural impurities such as debris capsules of blackish color, small spots, fats and waxes that interfere through regular impregnation by aqueous solutions, which makes them use difficult in the pure state [4], [5].

The scouring used to remove impurities accompanying cellulose, particularly waxy materials, for obtaining a hydrophilic fabric. Studies have shown that the waxes as well as many other impurities are located on the surface of the fibers in the primary membrane, which facilitates their removal. Cotton wax contains about 25% of saponified esters, the remainder being unsaponified matter and removed by emulsion with tensioactive substance [6]. To keep a soft touch, we should not eliminate all natural waxes.

The scouring cotton consists in subjecting to an alkali treatment in medium containing caustic soda at a temperature greater than or equal to 100°C. After scouring, some impurities are dissolved and dispersed in other medium. It is recommended to cool gradually to avoid risk of breaking the emulsion and therefore precipitate impurities to surface of the fabric. The bath scouring is composed of main products (NaOH and STA) and auxiliaries ($NaHSO_4$ and Na_2SiO_4).

Bleaching is intended for destruction of the natural colorants present in cotton and bleaching capsules scrap present in the tissue sheet as a "black chips". As bleaching agent are used various organic and inorganic oxidants. It should be noted only the bleaching action is usually caused by

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transformation products of these agents [7], [8]. These products may be various processing forms of oxygen, the active radicals and ions. For whitening the crepe strip, hydrogen peroxide is used because in addition to advantages it offers relative to other oxidants, it is used for the disinfection of wounds, so even if there are traces of H_2O_2, on the fabric, there will be no negative consequences like other oxidants such as NaClO and $NaClO_2$. The oxygen of peroxide is a low acid dissociation constant is equal to $1.55x10^{-12}$ at a temperature of 20°C [8].

II. Materials and Methods

The bleaching is performed in alkaline and neutral pH, between 10 and 11.5%. It is composed of following chemicals: H_2O_2, NaOH, Na_2SiO_3 and wetting agent and emulsifier. For treatment of the elastic band 100% cotton, we opted for simultaneous treatment of scouring and bleaching for following reasons:

- Quality reason: The tape does not require a high degree of whiteness; the most essential factor is the decrease of the elastic properties with increasing processing time (case of scouring and bleaching separately).
- Economic reason: A gain of water about 67%, a gain of about 69% steam, electricity gain of about 70%, an improvement of the productivity chain pretreatment and reduction labor. We used a band elastic crepe, 100% cotton carded made university, Processing Laboratory and forming Polymers fibrous whose main characteristics are presented in Table I.

TABLE I
Characteristics of Weaving Crepe Strip 100% Cotton

Characteristics	Unit	Value
Warp yarn title with S twist	Tex	81
Warp yarn title with Z twist Warp yarn title with Z twist Warp yarn title with Z twist	Tex	93
Account warp of the raw sample	Thread/10 cm	85.5
Account weft of the raw sample	Thread/10 cm	54
Warp yarn title	Tex	30
Twist rate warp yarn with S twist	Tr/m	950
Twist rate warp yarn with Z twist	Tr/m	800
Weave	plain weave fabric	

Chemicals used in the treatment of fabric are given in Table II.

TABLE II
Chemicals Used in the Treatment of Fabric

Products	Constitution	Molecular Weight (g/mol)	Degree of purity (%)
Caustic Soda	NaOH	40,00	Chemically pure
Hydrogen Peroxide	H_2O_2	34,016	35
Sodium silicate	Na_2SiO_3	104,094	Chemically pure
Sodium carbonate	Na_2CO_3	106	Chemically pure
Potassium bicarbonate	$K_2Cr_2O_7$	294,19	99,8

Caustic soda is soluble in water with evolution of heat. It is the main scouring agent saponifying waxes, hydrolyzing proteins and dissolving pectin [9].

Hydrogen peroxide H_2O_2 is a colorless, volatile liquid and rapidly decomposes under the action of light and heat. It is advisable to store the liquid in dark places because it is the main bleaching agent.

Sodium silicate is used in the white powder form and acts as stabilizer of H_2O_2 decomposition.

Sodium carbonate is presented in the white powder form used in wash solution with surface active solution.

Potassium bicarbonate is a product soluble in water and used for the capillary control. The surface active solution Kieralon ED 08 is in form of clear, viscous and colorless liquid with mild odor. It is a wetting character emulsifier used to remove unsaponified wax agent [10].

A. Methods of Treatment

Treatment of crepe bands requires a set of operations that include: The relaxation, scouring, bleaching steaming, washing and drying. In relaxation and scouring part, we studied separately the influence of operations according to a diagram. After each operation, the elastic and hydro files properties of the strip are analyzed. The relaxation of the fabric is performed in a solution containing a surfactant in hot substance. To study the influence of this parameter, we performed impregnation at different temperatures 20, 45, 60, 75 and 90°C. During simultaneous bleaching and scouring the band is treated at 100°C for 45 min with a solution containing 20g (H_2O_2), 6g (NaOH), 10g (Na_2Si0_3), and 2g STA. The influence of each product is analyzed separately. Once the optimized recipe, the influence of steaming time is studied.

After scouring and bleaching, the strip is washed with a hot solution containing the surfactant solution and the sodium bicarbonate and then dewatered before being dried. To better study the wringing, we performed the analysis on a gray fabric relaxed, drained and no drained. After each treatment, an analysis of the change of elastic properties and absorption was carried out according to the immersing principle the sample in a solution containing 2 g / l ($K_2Cr_2O_7$). It is concluded that studied textile is hydrophilic.

Washing is carried out in a vessel containing a soap solution at 40°C. The specimens are cut according to the standards 5 cm x 20 cm and elongation is analyzed on an extensometer at load intervals 50 g.

III. Experiences and Discussions

The main feature of the pancake band 100 % cotton is elasticity. The pancake band is used in the medical field and in contact with skin. A good hydrophilicity and the whiteness are required. This product cannot be used in greige state because of its poor quality. A preparatory treatment is conducted for the acquisition of sorption properties and hygienic, leading to a loss of elasticity. Studies have been conducted on the treatment of this band, but they have not been able to implement a method with obtaining adequate elastic properties. Thus the factor causing the loss of elasticity remains ignored. But this does not prevent evidence that these studies have produced encouraging results in the continuation of this work.

At first time, we became interested in studying the influence of chemicals used in the treatment of preparation. It was recommended that a simple wash at 40°C, produced a considerable decrease in the strip elasticity. In second time, it has been studied influence of process elasticity of strip. Three bands was used with different characteristics, an appropriate general method was implemented. In the context of this study, the conclusions and recommendations of previous work and objectives have been drawn. The first consists in optimizing the process recipe. This optimization includes the study of influence of the chemicals used and the process parameters (impregnation temperature and steaming spin time). The second objective is study the possibility of making pancakes bands to high contention by introducing synthetic element (spandex).

The development of the technology for the preparation of crepe tape 100% cotton continuously remains the third objective.

A. Elasticity of Ecru Sample

The elasticity of raw sample is used as reference to determining the elasticity loss according studied parameters.

The elasticity loss is determined according to the following method:

1. The sample was treated using the method: relaxation, drying, elasticity analysis at T = 45°C, T = 80 to 100°C, and STA = 1g / l.
2. The sample is treated according to other method: relaxation, steaming, drying, analysis of elasticity at 100°C for 45mm.

The results obtained are shown in Tables III and IV.

According to the results, there is a loss of elasticity of the sample with steaming. This loss of elasticity is due to breaking of intermolecular bonds. An untwisting of the thread leading to a loss of elastic properties

The preparation of the crepe tape is made by the following method: relaxation, scouring and simultaneous bleaching, steaming, washing and drying.

B. Relaxation

Before textile processing, is carried relaxation. Relaxation is to soak the strip in a hot solution containing 1g / l STA for 5 min, and for more effective relaxation, we treated the band at different temperatures: 20, 45, 60, 75 and 95°C. The results are shown in Tables V and VI and in Fig. 1.

These results show that as far as the temperature increases, an elasticity loss is observed. The elongation decreases to 12.37% for temperature of 20°C to 75°C, while the loss is considerable at 95°C although the elongation reaches 114 mm (see deformation). This can be explained that during the impregnation, there rupture intermolecular bonds (physical and hydrogen), and with increasing temperature, this rupture is irreversible. The best results of elasticity are obtained at temperature 20°C. The temperature selected is that of 45°C. The impregnation at 20°C is more difficult, because the solution is viscous and fiber is hydrophobic, so there will be a poor penetration of solution inside the fiber. Impregnation cold (20°C) requires more room of fabric into the steaming chamber to 100°C and a significant risk of vapor condensation leading to dilution of solution absorbed by the fabric.

C. Scouring - Bleaching Simultaneous

The treatment is composed of solution H_2O_2 (20g / l); NaOH (3 g / l); Na_2Si0_3 (10 g / l) and STA (2 g / l).

The treatment is carried out according to following procedure:

- Impregnation in different solutions (depending on product to be studied)
- Steaming at 100°C for 45 minutes.
- Washing at hot solution of STA (2g / l) and Na_2C0_3 (3g/l) and cold water.
- Drying at 100°C. The solution treatment consisted H_2O_2 (20g / l), NaOH (3 g / l) Na_2Si0_3 (10 g / l) and STA (2 g / l).

1. Influence of STA Concentration

The raw strip is treated inside four identical bathrooms with STA concentration (1, 2, 3 and 4g / l). The results obtained are shown in Tables VII and VIII and Fig. 2.

From the obtained results, it is found that raising the concentration of STA improves sorption properties of the band (1 to 2g / l). Beyond 2g / l, this improvement is less significant.

The elastic properties are improved with increase of STA concentration. The optimum concentration of STA is 2g / l. This optimal value should not be exceeded because the desired properties become weak.

TABLE III
LOAD - ELONGATION OF TEXTILE VAPORIZED AND UNVAPORISED

Load (g)	Sample					
	Drained and sprayed		Not drained and unvaporised		Vaporized not drained	
	Load	Dump	Load	Dump	Load	Dump
0	0	2,72	0	2,62	0	2,66
100	3,44	8,16	4,94	10,04	4,3	9,98
150	4,26	9,2	5,76	11,18	5,65	11,23
200	5,3	9,76	7,06	11,78	6,98	12,1
250	6,32	10,14	8	12,22	8,31	12,61
300	7,28	10,2	9,22	12,5	9,56	12,85
350	8,2	10,52	10,16	12,6	10,53	13,01
400	9,02	10,62	11,06	12.74	11,4	13,13
450	9,84	10,62	11,88	12,78	12,3	13,13
500	10,62	10,62	12,78	12,78	13,15	13,15

TABLE IV
TWO STATES DEFORMATION OF STRIP PANCAKE

Characteristics	Vaporized state	Unvaporized state
Maximum elongation A (mm)	127,8	131,5
Instantaneous deformation (mm)	101,6	104,9
Elastic deformation (mm)	23,2	23,0
Plastic deformation (mm)	8,4	4,0
Elasticity modulus E (cN / Tex)	52,62	51,14

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TABLE V
LOAD-ELONGATION DEPENDING TO RELAXATION TEMPERATURE

Load (g)	Temperature (°C)									
	20		45		60		75		90	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	3,62	0	3,85	0	3,8	0	3,65	0	4,5
100	3,45	8,475	3,125	8,17	2,9	7,625	2,47	7,52	3,425	9,425
150	4,25	9,125	3,85	9,4	3,7	8,8	3,15	8,32	4,275	10,075
200	5,25	9,375	4,85	9,85	4,625	9,35	4,025	8,82	5,4	10,225
250	6,15	9,8	5,9	10,075	5,6	9,62	5,17	9,02	6,925	10,775
300	7,05	9,95	6,925	10,325	6,525	9,85	6,02	9,2	7,55	11,2
350	7,95	10,025	7,925	10,45	7,5	9,95	6,92	9,27	8,6	11,32
400	8,6	10,1	8,775	10,5	8,37	10,05	7,77	9,35	9,579	11,37
450	9,6	10,125	9,62	10,52	9,22	10,12	8,65	9,42	10,5	11,4
500	10,75	10,75	10,52	10,52	10,12	10,12	9,42	9,42	11,4	11,4

TABLE VI
SUMMARIZING OF RELAXATION TEMPERATURE STUDY

T° (°C)	Maximum elongation A (mm)	Elastic deformation (mm)	Permanent deformation (mm)	Elasticity modulus E (cN / Tex)	Instantaneous deformation (mm)
20	107,5	33,2	3	63,02	71,3
45	105,2	34,5	4	64,37	66,70
60	101,2	34	4	66,94	63,20
75	94,20	31,5	5	71,92	57,70
95	114	39	6	59,43	69

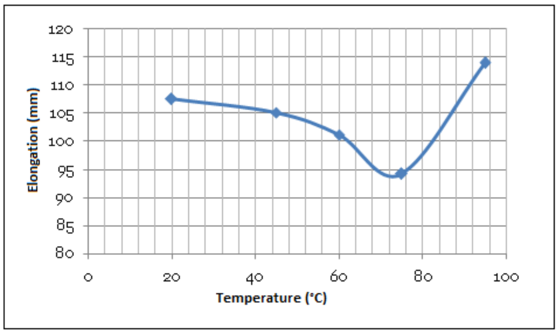

Fig. 1 Elongation according to relaxation temperature

TABLE VII
LOAD-ELONGATION DEPENDING TO STA CONCENTRATION

Load (g)	STA Concentration (g/l)							
	1		2		3		4	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	2,7	0	3,025	0	3,4	0	3,4
100	3,33	8,2	3,525	9,9	3,56	9,06	3,58	9,44
150	4,1	9,26	4,27	10,02	4,1	10,2	4,8	10,4
200	5,2	9,83	5,42	10,62	5,2	10,5	6,08	10,88
250	6,1	10,06	6,45	10,85	6,53	10,9	6,94	11,18
300	7	10,23	7,45	11,02	7,3	11,2	8,04	11,36
350	7,93	10,33	8,47	11,12	8,4	11,3	9	11,46
400	8,73	10,43	9,4	11,2	9,7	11,4	9,9	11,56
450	9,63	10,43	10,3	11,2	10,1	11,4	10,82	11,56
500	10,43	10,43	11,2	11,2	11,42	11,42	11,56	11,56

TABLE VIII
SUMMARY OF INFLUENCE TO STA CONCENTRATION

S.T.A (g/l)	1	2	3	4
Maximum elongation A (mm)	104,3	112,0	114,2	115,6
Elastic deformation (mm)	24,20	28,90	30,5	30,5
Permanent deformation (mm)	2,75	3,60	3,50	3,50
Elasticity modulus E (cN / Tex)	64,95	60,49	59,32	58,60
Instantaneous deformation (mm)	77,30	78	80,20	81,60
Capillary (cm)	4,50	6,50	7	8,50

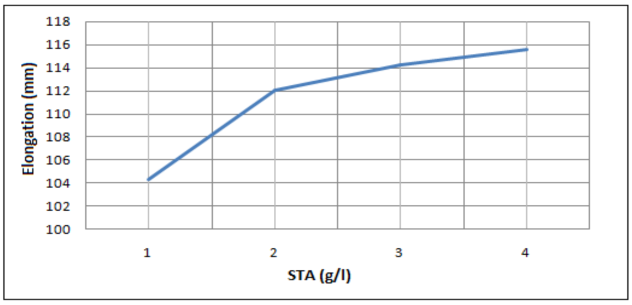

Fig. 2 Load - elongation according to STA concentration

2. Influence of NaOH Concentration

NaOH is the essential product favoring hydrophilicity and the alkaline environment for bleaching. The study of the optimal concentration providing a better result whiteness and hydrophilicity (as needed) with less loss of elasticity is essential. In this context, we used different caustic soda concentrations (3, 5, 7 and 10 g / l). The analysis results are shown in Tables IX, X and Fig. 3.

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TABLE IX
LOAD-ELONGATION ACCORDING TO NAOH CONCENTRATION

Load (g)	NaOH Concentration (g/l)							
	3		5		7		10	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	3,2	0	3,2	0	2,95	0	2,84
100	3,27	9,1	3,45	8,97	3,35	8,45	3,7	8,82
150	4,02	10,05	4,2	9,87	4,47	9,3	4,6	10,04
200	5,25	10,52	5,5	10,37	5,6	9,95	5,92	10,72
250	6,37	10,8	6,42	10,7	6,57	10,22	6,92	11,02
300	7,4	10,95	7,4	10,82	7,47	10,37	7,94	11,26
350	8,4	11,07	8,37	10,97	8.3	10,4	8,92	11,44
400	9,4	11,12	9,22	11	9,12	10,6	9,84	11,58
450	10,27	11,12	10,07	11	9,82	10,6	10,72	11,58
500	11,12	11,12	11	11	10,6	10,6	11,58	11,58

TABLE X
SUMMARY OF INFLUENCE TO NAOH CONCENTRATION

NaOH(g/l)	3	5	7	10
Maximum elongation, A (mm)	111,20	110	106	118,20
Elastic deformation (mm)	27	28	25,30	19,40
Permanent deformation (mm)	5	4	4,20	4
Elasticity modulus, E (cN / Tex)	60,92	61,59	63,91	57,31
Instantaneous deformation (mm)	79,20	78	76,50	94,80
Capillary (cm)	5	10,5	10,5	11

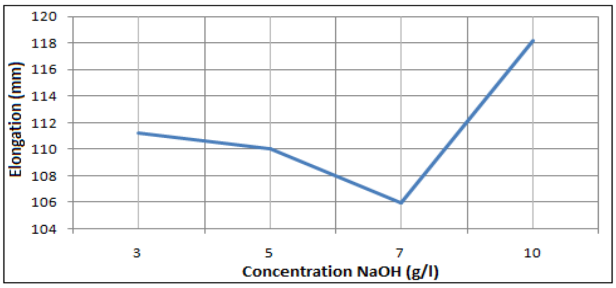

Fig. 3 Load - elongation according to NaOH concentration

The results analysis shows that increase of NaOH concentration (7g / l) causes degradation of the elastic properties.

A 10 g / l, improvement of properties is detected and may be due to the formation to the alkali cellulose. Increasing the area to amorphous alkali cellulose promotes elongation and elasticity.

The optimum NaOH concentration is 5 g / l. Beyond this value, improvement elastic properties and capillary are not sufficiently large compared to the amount of NaOH (10 g / l).

3. Influence of H_20_2 Concentration

Hydrogen peroxide is used to improve the band aesthetic properties (whiteness). As elasticity is priority compared to whiteness, we try to obtain a better elasticity with acceptable whiteness. For this, a study of the influence to H_20_2 at different concentrations (10, 15, 20 and 25g / l) was made using the optimized values of NaOH and STA.

The results obtained are shown in Tables XI, XII and Fig. 4.

TABLE XI
LOAD-ELONGATION ACCORDING TO H_2O_2 CONCENTRATION

Load (g)	H_2O_2 Concentration (g/l)							
	3		5		7		10	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	3,28	0	3,25	0	3,25	0	3,2
100	3,52	9,5	3,45	9,6	3,45	8,97	3,11	8,5
150	4,84	10,56	4,67	10,75	4,2	9,87	3,9	9,4
200	6,1	11,18	59,3	11,25	5,5	10,37	4,7	9,8
250	7,3	11,52	7,07	11,62	6,42	10,7	5,9	10,1
300	8,32	11,78	8,07	11,7	7,4	10,82	6,8	10,3
350	9,36	11,94	9.32	12	8,37	10,97	7,5	10,5
400	10,3	12,04	10,3	12,12	9,22	11	8,42	10,7
450	11,66	12,04	11,2	12,12	10.1	11	9,56	10,7
500	12,04	12,04	12,1	12,12	11	11	10,7	10,7

TABLE XII
SUMMARY OF INFLUENCE TO H_2O_2 CONCENTRATION

H_2O_2(g/l)	10	15	20	25
Maximum elongation, A (mm)	122	121,2	110	107
Elastic deformation (mm)	28 ,5	28,7	28	26,9
Permanent deformation (mm)	4	3,8	4	4,1
Elasticity modulus, E (cN / Tex)	55,53	55,89	61,59	63,31
Instantaneous deformation (mm)	89,5	88,7	78	76
Capillary (cm)	7,9	10	10,5	10,8

The analysis shows that hydrogen peroxide has a negative effect on the elasticity which is due to the degradation of cellulose by the non uniform release of molecular oxygen in the bath. The optimum concentration of H_20_2 is 20 g / l. Below this value the whiteness is insufficient. Beyond this value there was a considerable degradation of the elastic properties.

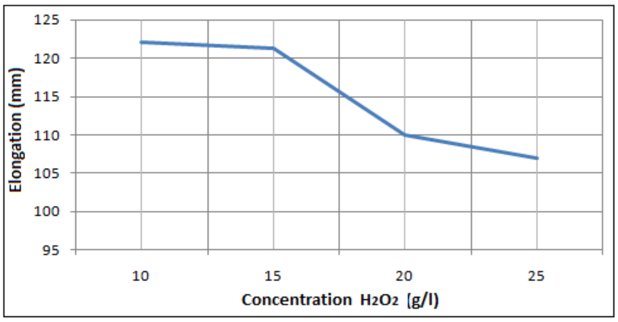

Fig. 4 Load - elongation according to concentration of H_20_2

4. Influence of Na_2Si0_3 Concentration.

The optimized concentrations of other products were used to varying concentrations of sodium silicate (5, 10, 15 and 20 g / l). The results obtained are shown in Tables XIII, XIV and Fig. 5.

TABLE XIII
LOAD-ELONGATION ACCORDING TO Na_2Si0_3 CONCENTRATION

Load (g)	Na_2Si0_3 Concentration (g/l)							
	5		10		15		20	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	3,32	0	3,27	0	3,27	0	10,37
100	3,4	9,82	3,4	10	3,9	10,12	2,75	10,37
150	4,94	10,92	4,92	11	4,77	11,02	3,8	10,27
200	6,2	11,62	6,05	11,62	6,02	11,4	4,95	10,1
250	7,35	12	7,17	11,95	6,8	11,65	5,9	9,97
300	8,5	12,25	8,35	12,3	8,27	11,8	6,82	9,72
350	9,6	12,37	9,5	12,35	9,17	11,9	7,75	9,27
400	10,65	12,5	10,57	12,42	10,2	12,02	8,57	8,42
450	11,55	12,5	11,5	12,42	11,1	12,02	9,52	3,2
500	12,5	12,5	11,42	11,42	12	12,02	10,37	10,37

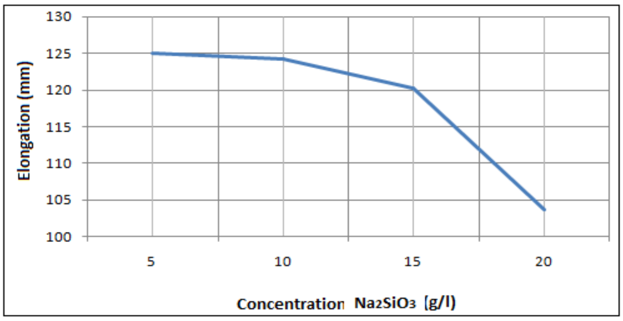

Fig. 5 Load - elongation depending to Na_2Si0_3 concentration

TABLE XIV
SUMMARY OF INFLUENCE OF SODIUM SILICATE

Na_2Si0_3 (g/l)	5	10	15	20
Maximum elongation, A (mm)	125	124,2	120,2	103,7
Elastic deformation (mm)	29,2	28,7	27,7	26
Permanent deformation (mm)	4	4	5	6
Elasticity modulus, E (cN / Tex)	54,2	54,54	56,36	65,33
Instantaneous deformation (mm)	91,8	91,5	87,5	71,7
Capillary (cm)	9,9	9,5	8,7	8

5. Influence of Time Steaming

Given results of previous analyzes, a recipe with optimized values of concentrations was developed. In this part, influence of duration of steaming was studied. The steaming process was prepared as follows:

- Impregnation of fabric at a temperature of 45 ° C for 5 minutes in solution at concentrations of H202 to 30% (20 g / l); NaOH (5 g / l); Na2Si03 (5 g / l) and S.T.A (2 g / l).
- Steaming at durations of 15, 30, 45 and 60 mn.
- Washing and drying.

The results are shown in Tables XV and XVI and Fig. 6.

The results analysis shows that difference of whiteness degree and capillarity between 15 and 30 minutes is quite considerable. Beyond 30 minutes, the improvement these properties are not significant. Regarding the elasticity, it is found deterioration with increasing duration of steaming. This phenomenon is due to the deformation of the aspect of the yarn under action of high temperature steam (Swelling action on the twist rate).

TABLE XV
LOAD-ELONGATION DEPENDING TO DURATION OF STEAMING

Load (g)	Steaming time (mn)							
	15		30		45		60	
	Load	Dump	Load	Dump	Load	Dump	Load	Dump
0	0	3,12	0	3,45	0	3,53	0	3,37
100	3,02	9,75	3	9,37	3,66	9,56	2,47	8
150	4,67	10,72	4,25	10,3	3,43	10,43	3,42	8,6
200	5,82	11,32	5,52	10,6	5,63	10,7	4,6	8,9
250	6,9	11,72	6,57	10,8	6,73	10,9	5,52	9,07
300	8,2	11,95	7,62	10,97	7,6	11	6,42	9,45
350	9,2	12,05	8,5	11,07	8,63	11,23	7,17	9,52
400	10,27	12,15	9,47	11,17	9,53	11,23	7,9	9,57
450	11,3	12,15	10,4	11,17	10,5	11,23	8,77	9,57
500	12,15	12,15	11,17	11,17	11,2	11,23	9,57	9,57

TABLE XVI
SUMMARY THE RESULT TO INFLUENCE OF STEAMING

Steaming time (min)	15	30	45	60
Maximum elongation, A (mm)	27,85	30,50	31	29
Elastic deformation (mm)	3,40	4,40	4,60	4,70
Permanent deformation (mm)	121,50	111,70	112,30	95,70
Elasticity modulus, E (cN / Tex)	55,76	60,65	60,33	70,79
Instantaneous deformation (mm)	90,25	77,20	77	62
Capillary (cm)	7	10,20	10,50	11

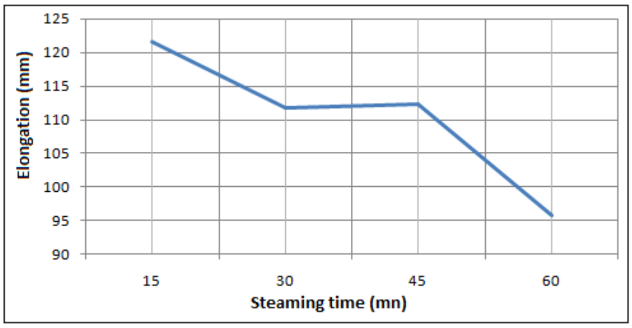

Fig. 6 Load elongation depending to steaming time

6. Influence of Wringing

To activate the drying process, must be reduced by wringing the water rate absorbed by the fabric. To study the influence of wringing, we used a scarf to a small degree equal to 100%. The analysis is performed on a relaxed gray fabric. The results obtained are shown in Table XVII and Fig. 7

TABLE XVII
RESULTS SUMMARY WRINGING

Sample	Drained	Not drained
Maximum elongation A (mm)	106,20	127,80
Elastic deformation (mm)	19,20	17,80
Plastic deformation (mm)	8	8,40
Elasticity modulus E (cN / Tex)	63,32	52,62
Instantaneous deformation (mm)	79	101,60

From obtained results, we note that wringing negatively affects the elasticity because this is a partial stretching of fabric between the wringing rollers. As the cotton is in wet state, deformation will be increased. Since, the fabric is dried with hot air, it retains the stretched form during wringing and hence elasticity decreases (8% elongation is observed after wringing).

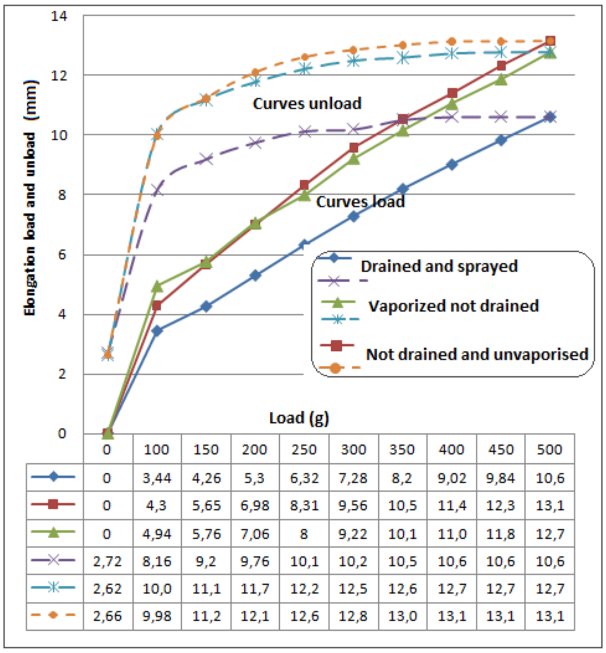

Fig. 7 Load - Elongation depending to the wringing and steaming of the raw sample

IV. Conclusion

The stretchable band 100% cotton crepe is a textile article totally different from other textiles that requires great care during treatment. The slightest neglect negatively affects final characteristics of the band and particularly elasticity.

This study shows the dependence of the production parameters on quality to the finished strip. Since, the elastic band loses its partially properties in the finished state, particulary by processing a plurality of individual phases. A method for simultaneous scouring treatment and economical bleaching was chosen.

Consideration that the hydrophilicity is a secondary parameter with respect to elasticity, the technological parameters were chosen for best elasticity and hydrophilicity with an acceptable whiteness.

Relaxation is first processing operation; its smooth running determines the final state of elasticity. It was note that higher the relaxation temperature increases, the elasticity tends to decrease. The analysis of this parameter led to choose a temperature of 40°C.

The chemicals used have a negative influence on elasticity depending to duration of treatment. For this, the most economical recipe possible with a lesser loss of elasticity was chosen. From The study of the deterioration of the tape after use depending to number of washes, we note the following conclusions: four times washing at 40°C and 50°C causes a loss of elasticity of 13.8%; three times the washing at 60°C causes a loss of 14 % elongation. From the first wash at 95°C, there is a considerable loss of elasticity.

For this purpose, it is recommended washing bands with no high enough temperatures

In order to reduce the weight of the sample for economic and convenience reasons, we investigated the possibility of replacing some warp yarn by simple yarns small twists. The tests have not yielded satisfactory results (decrease of 7% weight max). To achieve this objective, it is recommended to use even finer yarns. Replacing warp yarns by elastic yarns with synthetic rubber core has given good deformations. Permanent deformation and elastic does not exceed 2 cm instead of 3.5 cm for ordinary band.

The study of the wash cycle for this band gave better results for both permanent and elastic deformation with elongation values which adjoin those of ordinary band. We notes say that the introduction of synthetic element improves the elastic properties and use of the band. Finally, for the treatment of strip pancake 100 % cotton, the recommended method is presented to Table XVIII.

TABLE XVIII
Method Recommended for the Treatment of Strip Pancake 100 % Cotton

Relaxation and impregnation into processing solution	Values	Steaming	Washing	Drying
NaOH (g/l)	5	-	-	-
Na_2CO_3 (g/l)	-	-	3	-
$3H_2O_2$ (g/l)	20	-	-	-
Na_2SiO_3 (g/l)	5	-	-	-
STA (g/l)	2	-	-	-
T °C	40	100	-	100
Time (min)	5	30	2	-

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