TENSILE PROPERTIES AND COMPRESSIBILITY OF FINE WOMEN'S HOSIERY

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Abstract

Simple fine women's hosiery is most often made of multifilament polyamide (PA) yarns with the yarn count of 13, 17, 20, 22, 30, 33, 40, 44, 60 and 72 dtex. The main part or the body of the hosiery is made with one yarn and different loop length. The compressibility of the hosiery depends on the structure and the stretch size of knitwear. Hosiery with stronger compression is made by simultaneously knitting with polyamide and elastane yarns in one row. Elastane yarn can be knitted in every row or in just a few rows of knitwear. Six tubular samples with different densities and structures were made. The first group of samples were knitted with PA multifilament yarn with the yarn count of 33 dtex f34. The second group of samples were made with PA multifilament yarn and additional elastane yarn with the yarn count of 22/17 dtex f7 is knitted in every other row. The third group of samples were made with one PA multifilament yarn with the yarn count of 33 dtex f34 and one elastane yarn with the yarn count of 22/17 dtex f7 knitted in every row. In these samples with different density, structure and composition, the structural parameters were analysed and stretchability and compressibility were measured.

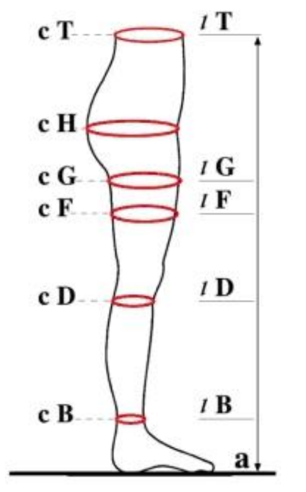
Keywords: fine women's hosiery, polyamide, elastane, multifilament yarn, microfibers, elongation, compression

1. Introduction

There are several factors in projecting fine women's hosiery that have a substantial impact on its size, structure, tensile properties and wearing comfort. Hosiery size is influenced by the size, shape and measurements of the leg hosiery is put on. Each hosiery size fits a certain leg shape. Size, shape and measurements of the female leg vary depending on the age and body type, race, as well as across certain regions, countries and continents. In hosiery construction, average female leg measurements are used due to the continuous changes of female body-proportions [1, 2].

Simple fine women's hosiery or pantyhose is often made of multifilament polyamide (PA) yarns with the yarn count of 13, 17, 20, 22, 30, 33, 40, 44, 60 and 72 dtex, with elongation at break from 20 to 35 %. One yarn of 600 to 1400 mm is inserted into one row in a plain knit structure, [3, 4]. Such great differences in yarn knitting are conditioned by the circumference of the leg-section that hosiery is put on, Tab. 1, [5]. The smallest leg circumference is at the smallest size, it is located in the ankle area and its size is cB = 19 to 21 cm. For comfortable hosiery fit at this section, it is desirable that hosiery circumference be from 15 to 17 cm, or the width of the tubular knitwear from 7,5 cm x 2 to 8,5 cm x 2. In such hosiery, knitwear circumference is around 20% smaller than the circumference of the leg the hosiery lies on.

Table 1: Female leg measurements for certain hosiery sizes; internal measurements, one manufacturer [5]

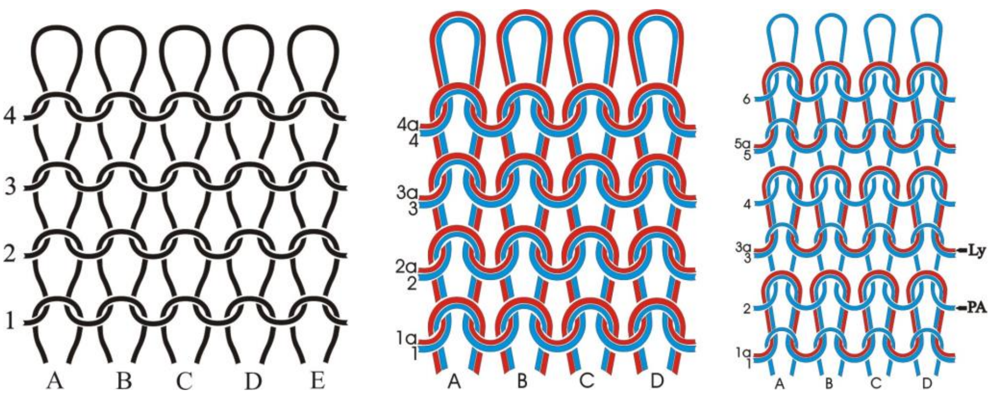


Circumference at a particular leg section, cm					
Size	**S**	**M**	**ML**	**L**	**XL**
cH	80-95	85-100	90-110	95-120	100-130
cG	50-57	53-60	56-63	60-67	64-71
Plus	56-63	60-67	64-71	68-75	72-79
cF	44-51	47-54	50-57	54-61	56-65
Plus	50-67	54-61	56-65	60-69	64-73
cD	29-34	32-37	35-40	38-43	41-46
Plus	35-40	38-43	41-46	44-49	47-52
cB	19-21	20-22	22-24	23-25	25-28
Plus	22-24	23-25	25-28	26-30	27-31
Length of the leg section, cm					
ℓG	62-71	65-74	68-78	71-81	74-84
ℓF	51-58	53-60	56-64	58-66	61-70
ℓD	30-34	31-35	33-37	34-39	36-41
ℓB	8-10	9-11	10-11	10-11	11-12

In the lower-leg area, leg circumference is cD = 29 to 34 cm, and hosiery circumference should be from 23 to 27 cm or the width of knitwear 11,5 cm x 2 to 13,5 cm x 2. If a long thigh-high stocking is made, then its circumference at the upper part of the thigh would be 40 to 46 cm, with the knitwear width of 20 cm x 2 to 23 cm x 2, because the circumference of the leg the stocking lies on is cG = 50 to 57 cm. It is impossible to make the given knitwear widths on a single circular knitting machine, an automatic hosiery machine. Therefore, the loop sinking depth is increased which increases the use of thread in a loop and finally the length of yarn being knitted in a row. The greater length of the yarn which is knitted has greater stretch, thereby providing greater knitwear width which comfortably fits greater leg circumference. These are basic relations between leg circumference and the width of hosiery that fits on a certain section of the leg.

2. Structures for making fine women's hosiery

Certain structures are used to make certain parts of fine women's hosiery. Hosiery is made on circular single-bed knitting machines that in their basic regulation knit in plain structure, Figure 1. The body of hosiery is quite often made with this structure. The most critical loads are at hosiery's tip, which comes into contact with toes, so this part is made in plated structure, Figure 1b. In this case, the loop row is formed with two significantly coarser filament yarns and/or with increased knitting density, i.e. smaller loop sinking depth. When making the body of hosiery, every other row can be made using two yarns, i.e. in partial plating. The basic structure is made with PA filament yarn while elastane yarn is knitted in every other row, Figure 1c. To obtain even higher hosiery compressibility, knitting is done in basic plated structure while the loop row is shaped by one PA and one elastane yarn. By using these structures, different yarn counts and structures, we can obtain different knitwear structures characterized by variable hosiery compressibility on the leg [6, 7].



a) b) c)

Figure 1. Basic knit structures used to make fine women's hosiery: a) plain structure, b) basic plated structure, c) partial plating – plated in every other row

3. Compressibility of fine women's hosiery

Yarn in the knitwear of fine women's hosiery is quite free and stretchable, so great deformations are achieved at low forces. Forces up to 50 N are applied when hosiery is put on the leg. When hosiery is pulled on the leg, it is first stretched transversally and then put on the leg. Then it is stretched longitudinally and this process is repeated until it is finally put on. During transversal stretch, longitudinal shortening of hosiery is significant. When knitwear of tubular shape is put on a certain section of the leg, the forces that work transversally and longitudinally in hosiery take on a balanced position, and their resultant works as a compression force on the leg section. The amount of pressure force applied by hosiery on the leg section is an integral part of rating related to hosiery fit and wearing comfort. Basically, from a medical standpoint, the greatest pressure of hosiery on the leg should be in the foot area and slowly decrease towards the upper section of the leg, Figure 2. It is often not easy to meet this criterion, especially when hosiery is knitted on automatic hosiery machines.

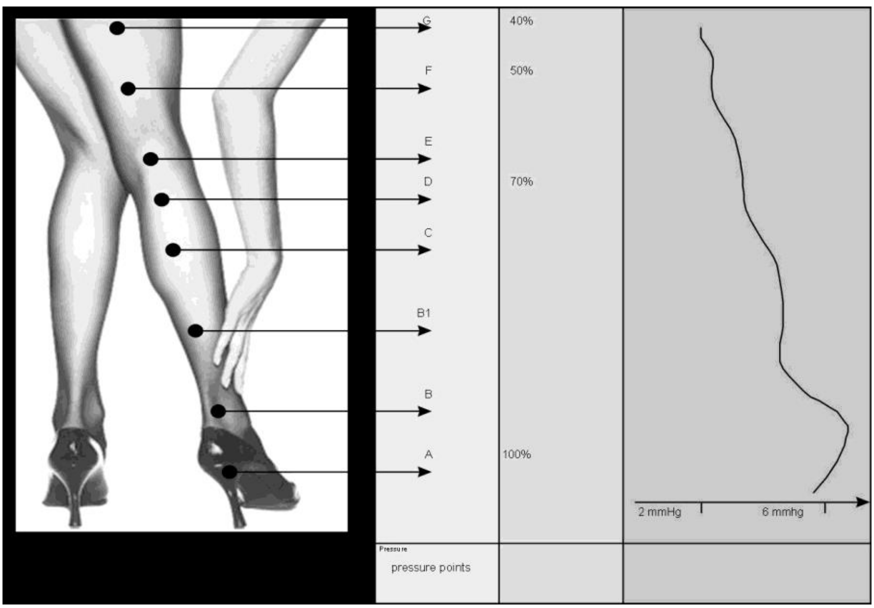


Figure 2. Compressibility of fine women's hosiery, one manufacturer

A lot of data indicates that the lowest pressure of classic hosiery is in the ankle area. In case of sports and medical hosiery, greater attention is paid to a particular section of the leg. In this hosiery, compressibility at certain stretching is very important. The compressibility of classic fine women's hosiery is up to1 kPa or up to 7 mmHg. Many people regard this compressibility as insignificant. Fine women's hosiery of higher compressibility has the compressibility from 1 to 2 kPa or 7 to 15 mmHg. Medical hosiery has the compressibility from 2,4 to 6,5 kPa, and even more, Table 2, [8, 9].

Table 2: Compressibility of medical hosiery [8,9]

Class	**Compression degree**	**Compression, kPa**	**Compression, mmHg**
I	*light*	2,4 – 2,8	18 – 21
II	*moderate*	3,1 – 4,3	23 – 32
III	*firm*	4,5 – 6,1	34 – 46
IV	*extra firm*	6,5 and more	49 and more
1 kPa = 7,5 mmHg; 1 mmHg = 0,133 kPa			

Fine women's hosiery is made on a machine with a cylinder needle bed of constant diameter, which should be used to make tubular knitwear of different widths. Hosiery for adults is most often made on machines with needle bed diameters of 95 or 100 mm, 3 ¾ or 4 inches, and the width of knitwear is 8 cm x 2 to 12 cm x 2. In order to put on such knitwear on the leg in the ankle area where the circumference is around 20 cm, then on the lower-leg muscle, calf, where the circumference is e.g. 34 cm, or on the thigh area where the circumference is 57 cm, it is understandable that knitwear structure in the three given sections must be different. As the leg circumference almost continuously increases from the ankle to the crotch, the hosiery structure should change accordingly. In making simple hosiery, these changes are achieved by the loop sinking depth. At the smallest sinking depth the needle draws the smallest amount of yarn to make a loop and the longest hosiery section is made. At the greatest sinking depth, the needle draws the biggest amount of yarn and the widest hosiery section is made. During a significantly greater stretching of 20%, hosiery fits on the body comfortably.
Depending on the size and model, a single piece of fine women's hosiery is made with 3000 to 4500 loop rows. When making one piece of hosiery with sections of different transversal stretchability, it is necessary to use certain sinking depths during knitting. For example, fine women's hosiery is thus often made on automatic hosiery machines which knit with 400 needles and sinking depths from 0,5 to 2 mm or 200 to 1400 control units. Ten to twenty different sinking depths are used to make a single piece of hosiery. Constructional shape of hosiery is not standardized and is different among hosiery manufacturers, so every manufacturer forms it according to their own estimate. For example, when making the section of hosiery that will lie on the ankle, the sinking depth of around 0,75 mm or 300 control units is used, while the thread spent in the loop is around 1,85 mm, and around 750 mm of yarn is knitted into one row of knitwear. The knitwear width is

around 10 cm x 2. If the lower-leg muscle or leg calf has the circumference of 34 cm, then the greater sinking depth will be used for its production, with the amount of, for example, 1 mm or 500 control units. In this case, the amount of thread spent in the loop will be 2,25 mm, or around 900 mm of yarn is knitted in one row, while the knitwear width will be 12 cm x 2. In the third case, when making the upper section of hosiery, which will lie on the thigh muscle, even greater sinking depth will be applied. For example: 900 control units, while the amount of thread used in the loop will be 3,25 mm so that the knitwear obtained will also be 12 cm x 2 wide or 24 cm in circumference. However, this yarn has to stretch almost 100 % in order to comfortably fit the upper part of the leg. According to the principle given, when making hosiery, hosiery designers use different sinking depths for each number of rows that follows. In hosiery construction, the number of rows with their corresponding sinking depths is specific to each hosiery manufacturer and is considered their secret in making quality hosiery that fits a particular woman, [10, 11].

4. Experimental work

The aim of this research is to obtain the data on the degree of impact of sinking depth, composition and design on the knitwear structure, tensile properties and compressibility of fine women's hosiery. Simple forms of fine women's hosiery found on the market are made with plain structure, while more complex forms of greater compressibility are made with different platings. Therefore, the knitwear samples made in this research were made using the given structures. An automatic hosiery machine of 4e″ bed diameter, knitting with 400 needles on four knitting systems was used to make the knitted samples, Table 3.

Table 3. Features of the automatic hosiery machine used to make knitted samples for fine women's hosiery

Machine gauge, E	Cylinder diameter mm (e“)	Number of knitting systems, S	Number of needles, N_i	Cylinder working speed min^{-1}
32	100 (4)	4	400	250 to 700

The machine is used daily in plant production. On these automatic hosiery machines, it is recommendable to make fine women's hosiery with multifilament yarns with the yarn count of 13 to 72 dtex. Single yarn and different sinking depths are often used to make fine women's hosiery. In this research, samples were made with three sinking depths and unit amounts 550, 700 and 850. PA filament yarn with the yarn count of 33 dtex f34 with breaking force of 145 cN and stretching of 25 % was used to make basic knitwear. Elastane yarn with the yarn count of 22/17 dtex f7 which had the breaking force of 103 cN and breaking elongation of 33 % was used for plating.

5. Results of the knitwear structure parameters

Yarn samples were made on a machine with 100 mm, (4e″) cylinder bed diameter, while the bed circumference was 319 mm. The machine has four knitting systems, which can knit with several different yarns. In the making of the first sample, one PA multifilament yarn with the yarn count of 33 dtex f34 was fed to the knitting system, Table 4. Odd systems were fed S-twist yarn, and the even systems Z-twist yarn. At the sinking depth of 550 units, the knitwear width was 111 mm x 2, while the knitwear shrinkage in the course direction was 30 %. At the sinking depth of 700 units, the knitwear width was greater, being 124 mm x 2, so the shrinkage was smaller: 22 %. At the greatest sinking depth of 850 units, knitwear width was 123 mm x 2, and the shrinkage 23 %.

Table 4: Knitwear structure parameters of the fine women's hosiery samples produced

T_t dtex	Structure	h_k	m, g/m^2	S_p, mm	s, %	m_z, g/cm^3	C	L_{PA}, mm	L_{PA+}, mm	L_{LY}, mm
33	plain	550	51	111	30	0,151	0,57	1012±4		
		700	50	124	22	0,131	0,53	1144±5		
		850	50	123	23	0,125	0,60	1280±7		
33 + 22/17	plated 1+1	550	106	100	37	0,203	0,45	939±2	870±7	537±4
		700	87	103	35	0,190	0,58	1025±5	961±7	575±9
		850	80	102	36	0,173	0,72	1148±6	1101±6	659±7
33 + 22/17	plated	550	144	95	40	0,283	0,46		890±8	746±5
		700	142	98	39	0,245	0,49		1015±5	841±6
		850	138	102	36	0,221	0,52		1115±6	910±6

Where: T_t – yarn count, dtex, h_k – sinking depth, dimensionless number, m – knitwear mass per unit area, g/m^2, S_p – knitwear width, mm, s – knitwear shrinkage after removal from the machine, %, m_z – knitwear density, g/cm^3, C – loop-density coefficient, L_{PA} – inserting the basic, PA yarn into a knitwear row, mm, L_{PA+} – inserting the basic, PA yarn into a knitwear row when plated with elastane yarn, mm, L_{LY} – inserting an elastane yarn into a knitwear row, mm.

Mass per square meter of the produced samples was 50 and 51 g/m^2. The knitwear made in partial plating 1+1, has the previously mentioned PA multifilament yarn with the yarn count of 33 dtex f34 knitted in the base, and elastane yarn with the yarn count of 22/17 dtex f7 knitted in every other row. Due to the insertion of the elastane yarn, the knitwear shrinkage is increased, being 35 to 37 %, knitwear width is decreased, being 100 mm x 2 to 103 mm x 2 and mass per unit area is increased and is within the range of 80 to 106 g/m^2. In making the fully plated knitwear, one PA multifilament yarn and one elastane yarn are knitted in every row.

Elastane yarns that are inserted increase the knitwear shrinkage even more, and it is 36 to 40 %, thereby decreasing the width of the tubular knitwear, which is 95 mm x 2 to 102 mm x 2. With such shrinkage and insertion of two threads in one row of knitwear, a relatively large mass per unit area of 138 to 144 g/m^2 is obtained [12]. The loop lengths of yarns that are inserted are very important for the analysis of hosiery’s tensile properties. When plain hosiery with the sinking depth of 550 units is made, the loop length of PA multifilament yarn is 1012±4 mm, while at the sinking depth of 850 units the loop length is 1280±7 mm, or 21 % more. During partial plating 1+1, a PA yarn is inserted into each row, while in the second row, apart from the PA yarn, an elastane yarn is also inserted. When a knitwear row is formed only by a PA yarn, the loop length is 939±2 mm to 1148±6 mm, i.e. significantly smaller compared to the situation when only a PA yarn is inserted into a loop row. However, when PA yarn is inserted into a knitwear row with elastane yarn, its insertion is even smaller and is 870±7 mm to 1101±6 mm, and elastane thread 537±4 mm to 659±7 mm. In full plating, the loop length of PA yarn is different again and is 890±8 mm to 1115±6 mm, and more elastane yarn is inserted than in partial plating, its length being 746±5 mm to 910±6 mm. When determining the loop length of PA yarn into a knitwear row, preloading was 2 cN/tex, and in the elastane thread 0,5 cN/tex.

6. Results of the knitwear tensile properties

Knitwear stretchability in the course direction, or transversal stretching and stretchability in the wale direction, or longitudinal stretching were measured. The samples were 50 mm wide and 200 mm long in all measuring, while the distance between clamps of the tensile test device was 75 mm. Table 5 shows mean values of knitwear stretching until breaking in the course direction (ε_{tp}) which is 330 to 536 %.
From the knitwear tearing diagram, elasticity area (ε_{ep}) of 120 to 220 % or 29 to 64 % of breaking stretchability was read by estimate. The point of beginning of the plastic area was also read by estimate and is within the limits of 200 to 260 %

taking up 48 to 70 % of the total knitwear stretchability. It is important to note that the share between the end of the elastic area and the beginning of plastic area is 6 to 24 %, while 30 to 52 % is reserved for the plastic area. Elasticity, plastic deformation as well as knitwear breaking stretchability largely depend on the structure used to make knitwear and the loop sinking depth at which loops were formed.

Table 5: Results of knitwear stretchability of fine women's hosiery in the course direction

T_t dtex	Structure	h_k	ε_{ep}, %	$\Delta\varepsilon_{ep}$, %	ε_{pp}, %	$\Delta\varepsilon_{pp}$, %	$\Delta\varepsilon_{pp}$ - $\Delta\varepsilon_{ep}$ %	ε_{tp}, %	$\Delta\varepsilon_{tp}$ - $\Delta\varepsilon_{pp}$ %
33	plain	550	190	58	220	67	9	330	33
		700	220	64	240	70	6	343	30
		850	200	53	260	69	16	378	31
33 + 22/17	plated 1+1	550	120	35	200	58	23	343	42
		700	150	41	240	65	24	370	35
		850	160	39	260	63	24	412	37
33 + 22/17	plated	550	120	29	200	48	19	415	52
		700	180	39	260	56	17	463	44
		850	200	37	320	60	22	536	40

Where: ε_e – knitwear stretchability to the end of the elastic area, %; ε_p – knitwear stretchability to the beginning of the plastic area, %; ε_t – knitwear stretchability in the moment of breaking, %; $\Delta\varepsilon_e$ – the share of elastic area in relation to total extension, %; $\Delta\varepsilon_p$ – the share to the beginning of plastic area in relation to total extension, %; $\Delta\varepsilon_p$ - $\Delta\varepsilon_e$ – the share between plastic and elastic area, %; $\Delta\varepsilon_t$ - $\Delta\varepsilon_p$ – the share between breaking point and beginning of the plastic area, %; course direction is labelled with the index *p*– transversally, and in Table 7, the longitudinal direction is labelled with the index *u*.

Table 6 contains mean values of knitwear stretchability to breaking in the wale direction (ε_{tu}) which are similar to knitwear stretchability in the course direction and are 268 to 582 %. The share of knitwear elasticity (ε_{eu}) takes up 30 to 66 % of the breaking stretchability and decreases with larger insertion of elastane yarn into the knitwear. The share of plastic deformation in the total knitwear stretchability is 25 to 43 % and is smaller than in knitwear stretching in the course direction where it is 30 to 52 %.

The three stretchability areas that were analysed: the elastic area, plastic area and the area between the end of elasticity and the beginning of permanent deformation, as well as their relations in knitwear stretching have a significant impact on hosiery compressibility at a particular leg section, and thereby on hosiery wearing comfort.

Table 6: Results of stretchability of fine women's hosiery in the wale direction

T_t dtex	Structure	h_k	ε_{eu}, %	$\Delta\varepsilon_{eu}$, %	ε_{pu}, %	$\Delta\varepsilon_{pu}$, %	$\Delta\varepsilon_{pu}$ - $\Delta\varepsilon_{eu}$ %	ε_{tu}, %	$\Delta\varepsilon_{tu}$ - $\Delta\varepsilon_{pu}$ %
33	plain	550	170	63	200	75	11	268	25
		700	200	66	220	73	7	302	27
		850	170	57	220	73	17	300	27
33 + 22/17	plated 1+1	550	150	32	270	57	25	472	43
		700	140	33	250	59	26	423	41
		850	120	30	240	60	30	402	40
33 + 22/17	plated	550	180	41	320	74	32	435	26
		700	220	38	360	63	24	576	38
		850	240	41	380	65	24	582	35

7. The results of measurement of hosiery compressibility

Measuring of compressibility of tubular knitwear samples was conducted by the PicoPress device [13] on six hard cylinders with diameters 75, 110, 125, 160, 205 and 250 mm whose circumferences were 240, 350, 395, 505, 630 and 790 mm. Cylinder circumference simulated leg circumference at a particular section, Table 1. The first group of tubular samples were made with PA multifilament yarns of the yarn count of 33 dtex f34 with three different loop sinking depths; 550, 700 and 850 units, with 1012 to 1280 mm of yarn being inserted in a knitwear row, Table 4. The compressibility of such knitwear is 1 to 6 mmHg (0,13 to 0,8 kPa), Figure 3b. The second group of samples were made in partial plating 1+1, while each knitwear row was made with PA multifilament yarns of the yarn count of 33 dtex f34, and every other row of this knitwear had an inserted twisted elastane yarn of the yarn count of 22/17 dtex f7. The compression of such samples is from 1 to 6 mmHg (0,13 to 0,8 kPa), but as the stretchability increases, the compressibility increases more intensively, Figure 3c. The third group of samples was made in full plating, while each row of knitwear was made with PA multifilament yarns of the yarn count of 33 dtex f34 and a twisted elastane yarn of the yarn count of 22/17 dtex f7. In this way, a significantly fuller knitwear structure with an increased shrinkage is obtained, and a significantly larger mass per unit area as well (Tab. 4). This structure achieves a significantly larger compressibility of 4 to 13 mmHg (0,5 to 1,7 kPa), Figure 3d.

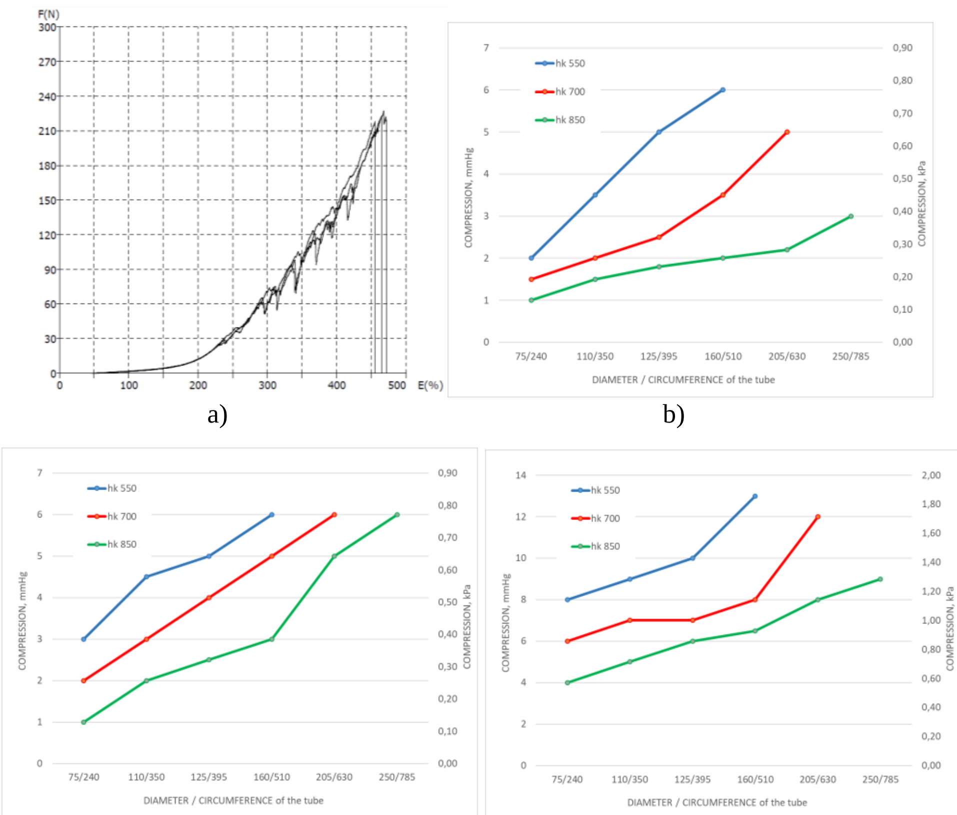


Figure 3. The Results of stretchability and compressibility measuring of the tubular knitwear samples;

a) force/stretchability diagram, with stretchability of the plated knitwear in the course direction – transversally, b) compressibility of the tubular knitwear samples knitted with PA filament yarn of the count of 33 dtex f34, c) compressibility of the tubular knitwear samples of the partially plated knitwear 1+1 knitted with PA filament yarn of the count of 33 dtex f34 and elastane yarn of the count of 22/17 dtex f7 and d) compressibility of the tubular plated knitwear samples knitted with PA filament yarn of the count of 33 dtex f 34 and elastane yarn of the count of 22/17 dtex f7

When knitting using plated structure and the smallest sinking depth of 400 units, 890 mm PA yarn and 746 mm elastane yarn are inserted into a knitwear row. If such tubular knitwear is put on a cylinder whose diameter is 75 mm or circumference 240 mm, corresponding to the leg circumference above the ankle, the knitwear compression is 8 mmHg (1,1 kPa). When knitwear is put on a cylinder whose diameter is 110 mm or circumference 350 mm, corresponding to the circumference under the knee, the compression is 9 mmHg (1,2 kPa). Such knitwear can be put on a cylinder of 160 mm in diameter, or up to 505 mm in circumference, corresponding to the leg circumference above the knee, while the compression achieved is 13 mmHg (1,7 kPa). Samples made with the sinking depth of 700 units have 1015 mm of PA yarn and 841 mm of elastane yarn inserted into a knitwear row so they can be extended more and put on a cylinder whose diameter is up to 205 mm and circumference 630 mm at which point hosiery compression is 6 to 12 mmHg (0,8 to 1,6 kPa). With the sinking depth of 850 units, 1115 mm PA yarn and 910 mm elastane yarn are inserted into a knitwear row, and the knitwear achieves the compression of 4 to 9 mmHg (0,5 to 1,2 kPa) at leg diameter of 75 to 250 mm or circumference 240 to 785 mm. As can be seen in the diagram, the compression of tubular knitwear of 8 mmHg (1,1 kPa) can be achieved at the sinking depth of 400 units and the circumference of 240 mm, or the sinking depth of 700 units and the circumference of 510 mm, or the sinking depth of 850 units and the circumference of 630 mm. Or, on the leg circumference above the knee which is 510 mm, the biggest compression of 13 mmHg (1,7 kPa) is achieved by knitwear made with the sinking depth of 400 units. Lower compression of 8 mmHg (1,1 kPa) is achieved by knitwear made with the sinking depth of 750 units, and the lowest which is 6,5 mmHg (0,9 kPa) is achieved with the knitwear made with the sinking depth of 850 units.

8. Conclusion

Fine women's hosiery or pantyhose are most often made by using PA multifilament yarns in plain structure. Hosiery of a greater quality is made from microfilament yarns. Hosiery with increased compressibility is made by partial plating, most commonly 1+1, i.e. all loop rows are made from PA yarns and every other row is reinforced with an elastane yarn. In a simple combination like this, the greatest hosiery compressibility on the leg is obtained if one row of loops is formed by two yarns: one PA and one elastane. Hosiery compressibility is related to hosiery stretching which depends on the loop length in the row of knitwear. By increasing the loop sinking depth, the insertion of yarn into the row of knitwear also increases, which leads to compressibility decrease at the constant leg circumference. Breaking stretchability of the knitted and analysed hosiery samples in the course direction was 330 to 536 %, and in the wale direction 268 to 582 %. The compressibility of hosiery made with PA yarns is 1 to 6 mmHg (0,13 to 0,8 kPa), and compressibility of hosiery made with plating with PA and elastane yarns is higher and is 4 to 13 mmHg (0,5 to 1,7 kPa). Hosiery compressibility is also influenced by yarn structure and count as well as the knitting structure. In the future, there is expected to be an increase in the so called personalization of fine women’s hosiery production, i.e. hosiery production according to the measures of a particular leg and desired compressibility demanded by the hosiery wearer.

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