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DEVELOPMENT OF CORESPUN SEWING THREADS AND EVALUATION OF SEAM PERFORMANCE

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ABSTRACT

The research refers to the development of a corespun sewing thread to be used in fabrics and garments, but specially designed for garment dye. This corespun sewing thread consists of 70% continuous *lyocell* filaments as the core, and 30% cellulosic staple fibers (cotton) wrapped around the core filaments, thus creating the outer sheath of yarns. The filaments, with a count of 120 denier and 44 filaments, were wrapped to reach a final count of 30 Ne. In a second stage they are twisted in 2 and 3 plies, resulting in a 30/2 Ne and 30/3 Ne. These new sewing threads were compared, in similar counts, with a 100 % cotton staple spun sewing thread, combed gazed and mercerized, in order to evaluate their performance to evaluate their potential to replace the 100% cotton threads. It is also expected that the new sewing threads will reduce the current problems with damaged seams after dyeing and have identical dye affinity. The new sewing threads were assessed in terms of their mechanical properties, dimensional stability, abrasion resistance, friction, sewability, seam strength and dye properties. *Lyocell* filaments and cotton fibers also present an ecological advantage due to considerable water savings during their manufacture and, in the case of *Lyocell*, resulting from a renewable natural material (wood pulp).

INTRODUCTION

Designated as garment dyeing, PPT (Pronto per Tinta), PAT (Pret a Teindre) or RFD (Ready for Dye), all designations refer to the same textile process where garments are sewn together prior to coloring the materials , sewn in “raw” and subsequently dyed as a final assembled garment**.** They are usually made of natural fibers, mainly cotton, or of polyamide for specific applications. Garment dyeing is currently very fashionable and largely used in the textile industry. Most collections have outfits produced in this way, particularly trousers. The unmistakable look and matchless character are much valued. Simultaneously, dyeing provides a high level of flexibility regarding colors, with great advantages in logistics, materials management and supply. However, serious quality problems may arise during dyeing. All the garment components must be made from identical fibers if they are to exhibit the same color after dyeing (West 1993). The conventional sewing thread concept using polyester sewing threads does not make much sense for garment dyeing, unless they are prepared to determine the color of the sewing thread way in advance. Then, the seams and the sewing features will be of the usual quality, but the flexibility as regards color, and thus the actual advantage of garment dyeing is lost. For some producers with an awareness for quality, this can be the right way to go especially if the batches to dye are small and produced sporadically, as it is the fashion industry nowadays, and therefore it is really not worth looking for better alternatives. But for other producers, this solution is not very reasonable. Using corespun sewing threads with polyester filaments in the core and covered with cotton cannot be used because the underlying polyester filaments will not be dyed during the garment dyeing process,resulting in a speckled effect, with the light colored polyester filaments showing thought at regular intervals (West 1993). Sewing threads with good dyeing properties in connection to the material are the alternative. An obvious solution here is the cotton thread range. But *Lyocell* and polyamide sewing threads are an option too. The use of cotton threads has been the usual standard for garment dyeing so far. When cotton materials are sewn with cotton threads, then the later dyeing process is not a problem. In fact, important quality factors like tensile strength, abrasion resistance, and elongation of cotton threads area incomparable to industry-standard polyester corespun threads. This noticeably lower tensile strength has a direct effect on the seam breaking strength, which is reduced: this is a problem for all seams that are exposed to greater stress, such as the back seams on trousers. The significantly lower elasticity of cotton threads compared to polyester threads has a noticeable influence on their sewing characteristics and seam elasticity. In today's production environments, sometimes fully automated with high sewing speeds, the use of cotton threads is difficult. This means a large number of thread breaks if the machines are not set properly. Dyed parts of garments sewn with cotton sewing threads show extremely low seam elasticity at all seams – which is a problem, when the material itself is elastic. The results are broken seams under slight stress when worn. Firstly the mechanical stress during the sewing dyeing and finishing processes and after during the normal wear and tear on the garment – this is really hard on cotton sewing threads. Worn out and open seams, especially at heavily exposed areas, are common consequences. Depending on the dyeing conditions, the drop off in quality is sometimes significant. It is not surprising that dyed garment parts often show damaged or destroyed seams, even when brand new. A large portion of second quality goods, many complaints, and the resulting loss of reputation are a logical consequence.

EXPERIMENTAL

This study used *Lyocell* filaments not twisted and twisted at 120 turns per meter in the "S" direction. The filaments were covered in a *PLATT SACOLOWELL* ring frame and plied in a *MURATA* T.F.O., resulting in samples with counts of 30/2 Ne (30/2T) and 30/3 Ne (30/3 T), with the core of filaments twisted and 30/2 Ne (30/2 NT) with the core of filaments not twisted. These samples were compared with commercially available sewing threads, made of mercerized, combed and gazed cotton in a count of 30/3 (30/3 CO) and 30/2 Ne (30/2 CO).It was observed that the process of twisting the *Lyocell* filaments influences the mechanical properties of the threads, with a decrease of the breaking tenacity and modulus and an increase in elongation at break. Hence, twisting the filaments before the covering process was eliminated. The obtained values are show in Table 1.

Table 1- Comparison of thread properties

Samples	30/2 NT	30/2 CO	30/2 T	30/3 CO	30/3 NT
Count (tex)	41,73	42,88	42,78	64,66	62,86
Breaking Strength (N)	11,48	11,72	11,21	17,21	17,18
Breaking Elongation (%)	7,82	6,28	8,06	7,62	8,35
Tenacity (N/tex)	0,275	0,273	0,262	0,266	0,273
Modulus (N/tex)	4,42	4,13	3,85	3,59	2,81

The new sewing threads present a lower and diameter but similar tenacity to the commercial cotton sewing threads. The elongation at break and the elastic modulus are higher, due to the properties of the L*yocell* core. They do not shrink under dry heat at 180ºC and shrink less under boiling water.The friction values obtained were similar for the two types of threads , resulting in similar sewability performance, due to the obtained similar values of needle thread tension, in a lockstitch sewing machine at 3000 R.P.M.. During high speed sewing, the tensile properties of sewing threads decrease substantially. However, the loss in tenacity and elongatioin at break are lower for the commercial cotton sewing threads. The values obtained for the loop and seam strength were also lower than the equivalent ones for the commercial threads..

CONCLUSIONS

This study showed that the newly developed corespun sewing threads, with *Lyocell* filaments in the core covered with cotton, have improved performance during sewing and increased advantages in ecological terms, dyeing affinity during garment dye finishing and seam resistance.

REFERENCES

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