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Review Article

An Innovative Concept in the Design of Embroidered Garments from Stretchable Knits Using Core Sheath Yarns

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Introduction

Embroidery threads are usually made from long staple combed mercerized cotton, viscose and polyester fibers. All these threads are relatively inelastic in nature and thus can easily and effectively be applied on relatively un-stretchable fabric like woven fabrics. When these embroidery threads are applied on stretchable fabric like knitted fabric, the problem distortion of embroidery structure arises due to differential stretch-ability of embroidery yarn and fabric. The fabric tends to lose its natural stretch-ability due to the presence of inelastic embroidery threads. This also causes uneven stretching at different places of fabric body, i.e. where there is no embroidery stretch-ability will be good, but at places of embroidery there will be no stretch-ability. This results in an odd look of fabric/garment. There are also chances of damage of fabric/garment at the point of embroidery due to difference in stretch-ability of embroidery threads and fabrics. Therefore, it is a need to develop such type of embroidery yarn, which shall have stretch-ability to match the stretch-ability of knitted fabric.

Most of the defects in embroidery are dependent on quality of embroidery yarn. There are various types of defects that influenced quality of embroidery. These defects may be due to various elements used during embroideries like embroidery threads, embroidery materials properties and process parameters. In one of the study [1], it was investigated that properties of embroidery threads influence buckling of fabric. The effect of fibre composition, density and structure were also investigated. Some research work has been done on developing of composite yarn. Different types of composite yarns developed by using combining of fibres as core and sheath. In one of the study a stretch yarn comprised of stretchable core covered by an inelastic fibre sheath was developed. The first fibre was an elastomer (spandex) and the second fibre was a polyester based co-polymer, the amount of the second fibres being in the range of 60-90% of the total fibres of the stretchable yarn. The first and second fibres were connected together by known technique such as open or closed intermingling jet. These stretchable composite yarns were used for making woven fabric. In another study [2], a stretch yarn was developed, which comprised a stretchable core covered by an inelastic fibers sheath, the stretchable core comprises first and second fibers that have elastic properties, the first fiber is an elastomer, and the second fiber is a polyester based (co)polymer. In this study, the stretchable multi-component embroidery thread is developed on DREF-3 spinning machine, using elastane filament as primary core, polyvinyl alcohol (PVA) as secondary core and dyed polyester and viscose fibers as sheath, to develop a stretchable embroidery thread.

Technical Details

The yarn used herein comprises of elastane filament as core, with PVA fibre constituting the inner sheath and is wrapped by polyester and viscose as outer sheath fibres. The yarn has thus been produced adopting the sheath core technique and produced using DREF3 system of spinning. The developed embroidery thread is a multilayer structure and temporarily inelastic in nature. At the centre of the yarn, there is a highly elastic filament, and it is covered by two layers of staple fiber sheaths. The inner layer is hot water soluble PVA fiber, and the outer sheath is insoluble fiber like polyester/viscose. The ultimate three-layer structure thus produced is inelastic in nature to facilitate effective embroidery on stretchable fabrics. Subsequently when embroidered fabric/garment is treated in hot water, the water-soluble inner sheath of embroidery thread is dissolved. This result in regeneration of stretch-ability in embroidery thread due to void created between highly stretchable core filament and outer sheath, which result in elastic mobility. This embroidery thread has such a stretch-ability that the applied embroidery thread can follow the elastic

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movement of the stretchable fabric/garment (Figures 1a & 1b). Hand Embroidery and Machine Embroidery was carried out on stretchable knitted fabric using developed stretchable embroidery thread and normal embroidery thread and the embroidery samples were washed and evaluated for their stretch ability at the embroidery area. Physical properties of developed embroidery thread and normal embroidery thread have been compared [3-5].

Figure 1a: Dref spinning machine.

Figure 1b: The yarns produced on the machine.

Comparison of yarn properties

Comparison has been made with the developed embroidery thread and normal embroidery thread. The quality of developed embroidery thread is slightly poor as compared to normal embroidery thread in terms of lower strength, higher unevenness and imperfections due to the use of friction spinning technology. The stretchability of the embroidery thread has been evaluated. The developed stretchable thread and normal embroidery purchased from market were evaluated for their stretch properties. Initially threads were tested for stretch-ability before and after washing. It was found that stretchable thread showed more stretch-ability as compared to normal embroidery thread. The stretchability at embroidery area has been compared [6-8]. Hand Embroidery and Machine Embroidery was carried out on stretchable knitted fabric using developed stretchable embroidery thread and normal embroidery thread and the embroidery samples were washed and evaluated for their stretch ability at the embroidery area. The stretchable knitted fabric was tested for stretch% in wale-wise and

course-wise direction without any embroidery. Then design motif was prepared by hand and machine embroidery using normal embroidery thread and developed embroidery thread. It is found that there is a gain of about 15 - 18% in stretch-ability at embroidery portion, in both directions using developed stretchable embroidery thread as compared to a normal embroidery thread.

The result shows that there is a gain of about 13% - 16% in both directions using developed stretchable embroidery thread as compared to a normal embroidery thread. The performance of the developed embroidery thread on high-speed embroidery machine was slightly poor as compared to normal embroidery thread because of lower strength and higher unevenness and imperfections due to the use of friction spinning technology. The developed embroidery thread was given surface finish with silicon oil, which slightly reduced the breakage rate on the embroidery machine.

Conclusion

Hand embroidery and Machine embroidery samples were evaluated for their stretch-ability at the embroidery area. There is a gain of about 13 - 18 % in stretch-ability at the portion of embroidery in Wales-wise direction and Course-wise direction using developed embroidery thread as compared to normal embroidery thread. In case of hand embroidery, the performance of developed embroidery thread was satisfactory and almost at par with the normal embroidery thread. However, in case of high-speed machine embroidery, thread performance was slightly poor as compared to normal embroidery thread. Therefore, the developed multi-component embroidery thread may be beneficial for embroidering stretchable body-fit garments, especially where the stress and strains are more likely at the embroidery area.

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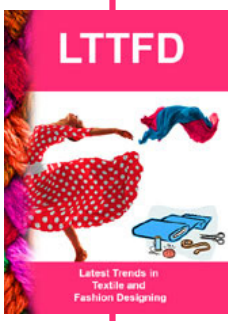

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