International Journal of Recent Advances in Multidisciplinary Topics
Volume 4, Issue 3, March 2023
https://www.ijramt.com | ISSN (Online): 2582-7839

Development and Analysis of Knitwear Products Made Using Refibra

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***Abstract*: Cotton is the primary raw material used in the textile and apparel industries. The good hand and soft appearance of cotton add to the appeal of the application. It became extremely capable of absorbing color at high temperatures and turned out to be dangerous. Cotton is a versatile fabric that will combine nicely with different fibres including nylon, lycra, and polyester. Importing and exporting of textile goods plays a major role in global market. In such a case, the Cotton price variation for the past two years, it creates huge demands and insufficient supply over past years. The investors are planned to invest where the affordable is available. It has a significant impact on the apparel business, and as a result, industries are looking for alternate fabrics with similar properties to cotton. For in search, using cutting-edge Refibra technology, cotton waste from pre- and post-consumer cotton textile production is upcycled into cotton scraps. A significant part of 30% is added to the wood pulp once these cotton scraps are converted into recycled pulp. New virgin Tencel and Lyocell fibres are created from these combined raw components. The refibra technique was used to create three fabrics. Lycra Jersey, Single Jersey, and Unbrushed Fleece. Similar testing procedures were used on these fabrics to determine which was most suitable to replace cotton.**

***Keywords*: Refibra, Single Jersey, Lycra Jersey, Unbrushed Fleece.**

1. Introduction

The main raw material utilized in the textile and clothing industries is cotton. The application's attraction is heightened by cotton's smooth feel and appealing appearance of softness. At high temperatures, it developed an extraordinary capacity for colour absorption and proved to be hazardous. Cotton is a versatile material that blends well with a variety of fibres, such as nylon, lycra, and polyester. A significant part of the worldwide market is played by the import and export of textile products. In this situation, the Cotton price fluctuation over the last two years has led to enormous demand and insufficient supply in previous years. Investors intend to put money where it's affordable to do so. Industries are looking for substitute materials with characteristics similar to cotton since it has a big impact on the apparel industry. Cotton waste from pre- and post-consumer cotton textile production is recycled into cotton scraps in search utilizing state-of-the-art Refibra technology. After being turned into recycled pulp, a sizable portion of 30% is added to the wood pulp. Using these combined raw materials, new virgin Tencel and Lyocell fibres are produced. Three different fabrics were produced using the refibra method. Unbrushed Fleece, Single Jersey, and Lycra Jersey. These textiles were subjected to comparable testing techniques to determine which was best suitable to replace cotton.

2. Refibra

A new generation of eco-friendly fabrics called Refibra is constructed of recycled cotton waste from pre and post-consumer cotton waste and Lyocell fibres manufactured from wood pulp. Refibra Lyocell is created by Lenzing using environmentally responsible materials. Their life cycle includes the following steps:

1) Raw material extraction
2) Distribution
3) Disposal

A. Objectives of Refibra

- It is Sustainable to environment.
- Its 30% of content is mainly made of using recycled textile wastages.
- Refibra has lower costs than natural fibres like cotton, which is one of its key advantages.
- Refibra offers a good hand feel and a good appearance. It uses raw materials that are natural and regenerative.
- Manufacturers of clothing has idea to blend Refibra with fibres like polyester, nylon, cotton, spandex.

3. Material and Methods

A. Methodology

To learn about the exporting of clothing over the previous year, analyse the present textile market using information from numerous sources. Recognizing that the price volatility of cotton products causes monetary inflation in the exporting regions. To do that, a new technology must be integrated into present circumstances. After reading through numerous publications and speaking with specialists, it was decided to use the refibra technology rather than cotton while creating new products. As selected the refibra technique, look for the necessary mill to supply the necessary volume of yarn. Contact with the provider in person to discuss the yarn's specifications.

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The mill is contacted for the required amount of yarn a comparison of the qualities of three different types of fabric with cotton fabric is planned.the knitting process has been set up so far to create a variety of materials, including Single jersey, unbrushed fleece, lycra, jersey.

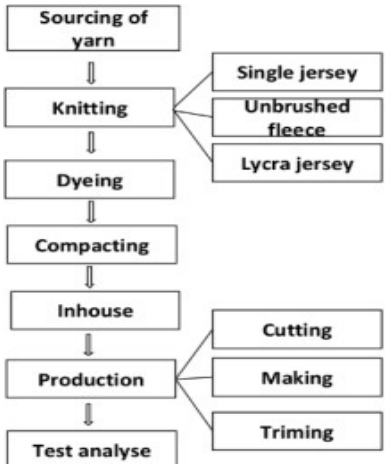

Fig. 1. Proposed methodology

B. *Single Jersey*

Single Jersey is a weft knit fabric sometimes referred to as basic fabric. Using just one row of needles, it is knit. This fabric has a flat loop on one side and a reverse loop structure on the other side and that's why its front and rear sides are distinct from each other. With circular knitting machines, this fabric is created as tubes, but it can also be sliced and utilised as open width. Single jersey fabric can be found in broad widths. This often-used material is typically comfortable, elastic, and simple to wear. It is wrinkle resistant to some extent and is simple to iron.

C. *Unbrushed Fleece*

Fleece is fluffy and soft. The fibres are "brushed" to elevate them and thicken the cloth, giving it a velvety appearance. That is the reason why fleece is so warm. Polyester makes up the majority of fleece materials, making them thin and water-resistant. Since thick fleece offers the most warmth, it is frequently utilised to create outdoor clothes. The negative of being water resistant is that it doesn't absorb moisture from the body.

D. *Lycra Jersey*

A single-knit cotton fabric with a spandex and cotton blend is called lycra jersey. While knitting, we can incorporate the necessary amount of spandex into the jersey fabric. It is renowned for its extreme elongation, softness, and elasticity. Density, fabric thickness, and knitted fabric recovery all naturally increase when Lycra is present in single jersey knitted fabric. T-shirts are often made of jersey fabric with Lycra. It is a cotton and spandex blend of single jersey fabric. Any necessary combination of cotton and spandex can be used to make the fabric. 95 percent cotton and 5 percent spandex is the most typical ratio. Adding Lycra yarn makes knit fabric tighter.

The yarn has been acquired to knitting. The colours selected for dying were pink, light blue, and sky blue. The primary consideration in selecting these tones for the contrast look. The gsm for chosen fabrics were:

1) Single jersey – 160
2) Lygra jersey-200
3) Unbrushed fleece – 200

Fig. 2. Single jersey

Fig. 3. Unbrushed fleece

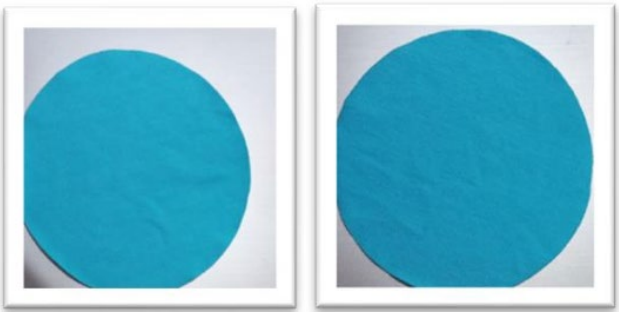

Fig. 4. Lycra jersey

To check for variations in dia, length and gsm, a single jersey fabric was first selected and intended for washing. At first, washing pieces were done using a measuring of 120 cm. Normal surf washing and drying were performed, along with the measurement of dia and gsm. After washing, the single-gsm jerseys can reach 165, although there was a small variance. The same procedure was followed for the remaining fabrics lycra jersey – 205, unbrushed fleece – 210, variations were occurring slightly. For the creation of the garments, the basic t-shirt style was chosen, and with the assistance of the cutting experts, the necessary measurements for the printing are taken. Dark contrast colours and non-pvc colour printing were chosen for the fabrics. The dark colour was chosen since it would be obvious if any breaking were to occur. Each fabric was used to create a total of four pieces. Fabrics are shaped with the use of a band-knife cutting machine. The final shaping of the 12 designed outfits was carried out with the help of the cutting supervisors. While operating the band-knife cutting machine, safety precautions are observed to the letter, such as wearing steel tongs. The next step is to stitch the fabrics in the production area as per the specifications. A perfect output was

obtained by correctly monitoring the production cycle. The garment was put through quality-checking procedures with the assistance of the supervisors.

4. Test Parameters

A. Wash Fastness

When dyeing textiles, the term "colorfastness" refers to how resistant the colour is to fading or running. The phrase is frequently used in reference to clothing interaction. In general, before using bleach or another cleaning solution, clothing should be tested for colorfastness.

The three main ones that are standardised are lightfastness, wash fastness, and sweat fastness. Color fastness refers to a color's resistance to fading or bleeding caused by various agents, such as washing, sunlight, chlorine, perspiration, ironing.

B. Dimensional Stability

A measurement of dimensional stability is the linear dimensional change brought on by temperature exposure. The test indicates if internal stress introduced during processing is uniformly distributed from lot to lot. Typically, sheeting or film produced by extrusion or calendaring techniques are subjected to the test. At reference points, the specimen's dimensions are measured. To create a sandwich-like enclosure for the specimen, talc-dusted paper is placed. The sandwiched samples are heated for a predetermined period of time. The specimens are reconditioned at room temperature for at least an hour after being taken out of the oven. Re- measurements and records of the distances between the reference markings are made.

C. Print durability

A performance testing technique called durability testing is used to analyse a system's characteristics over time and under different loads. By testing, we can determine whether transaction response times are consistent over the course of the test. The Martindale test evaluates a fabric's tensile strength. The tests are done on upholstery fabrics to assess their appropriateness for various usage - i.e., ornamental chairs, heavy-traffic areas or commercial furniture. The test is also known as the 'rub test', and tests for abrasion resistance.

Table 1
Single jersey

FABRIC	SINGLE JERSEY
FABRIC COMPOSITION	100 % REFIBRA
GSM	160
COUNT	30S
DYED COLOUR	PINK
DIA	30

Table 2
Unbrushed fleece

FABRIC	UNBRUSHED FLEECE
FABRIC COMPOSITION	100 % REFIBRA
COUNT	30S
GSM	190
DYED COLOUR	BLUE LIGHT
DIA	30

Table 3
Lycra jersey

FABRIC	LYCRA JERSEY
FABRIC COMPOSITION	96% REFIBRA 4% LYCRA
COUNT	40S
GSM	200
DYED COLOUR	RIVER BLUE
DIA	30

5. Result

Fig. 5. Single jersey

Fig. 6. Unbrushed fleece

Fig. 7. Lycra jersey

6. Conclusion

This paper presented development and analysis of knitwear products made using refibra.

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