

**PROPOSAL FOR FABRICATION OF KNITTED UPPER
USING THE CIRCULAR ECONOMY MODEL**

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1 INTRODUCTION

The growing concern with social and environmental aspects has aroused the interest of consumers, who have been looking for differentiated products, especially about sustainability. The adoption of an ecologically and socially correct positioning is a worldwide trend and is being widely disseminated by the business environment. The materials used in the manufacture of shoe uppers, produced based on the circular economy model, enable the production that meet users who seek sustainable consumption.

According to Morseletto (2020), the circular economy can be defined as an economic model aimed at the efficient use of resources through the minimization of waste, reduction of exploitation of primary resources and closed cycles of products, product parts and materials within the limits of environmental protection and socio-economic benefits.

The conventional production process of footwear manufacturing – named linear model - requires a large number of steps to manufacture the final product, presents low complexity, uses simple technologies, which can be characterized as artisanal, with the massive use of labor and generates solid waste (fabric scraps). The production process of seamless knit upper shoes reduces working time by producing virtually complete uppers models, requiring no or little sewing and producing different patterns on the same product.

The main objective of this article is to evaluate the technical feasibility of manufacturing seamless knitted uppers, made in rectilinear knitting machines, using as raw materials fibers from fabric scraps, knits and non-woven fabrics discarded from the industries in the city of Ibitinga (São Paulo, Brazil).

The present study was designed to be applied in the city of Ibitinga (São Paulo, Brazil). Ibitinga was chosen because it has a vertical industrial park, with industries that manufacture textile yarns, weaving and knitted fabrics, dyeing, confections and sale of ready-made products.

The raw materials used by confections are generally weaving and knitted fabrics that can be of natural origin - made from fibers obtained from renewable sources and decompose quickly in the environment - or of chemical origin - produced from natural polymers (artificial fibers), renewable raw materials that decompose quickly in the environment or from synthetic polymers (synthetic fibers) non-renewable raw materials, mostly petroleum-based, and take decades to decompose in nature.

2 MATERIAL AND METHODS

The following raw materials were used to manufacture the yarns: recycled polyester fibers from PET bottles and shredded polyester fibers. The recycled polyester fibers were purchased and the shredded fibers, with a 100% polyester composition, were removed from the scraps of fabrics, knits and non-woven fabrics supplied by the clothing companies in Ibitinga.

Tissue scraps were cut in an automatic cutter and shredded in a shredder. First, the selection of the shavings to be shredded is performed. Then the selected fabric, knitwear and non-woven fabric scraps are cut to standardize the material to be processed. The shredded material is processed by a shredder to transform the clothing scraps into sheets of shredded fibers, which will be sent to the spinning mill and used in the manufacture of a new product (AMARAL, 2016).

The raw materials used in the manufacture of the yarns were 50% defibered polyester fibers and 50% recycled polyester yarns, yarns with linear density 19.7x1 tex (Nec 30/1) were manufactured in ring spinning (conventional).

3 CONCLUSION

The use of recycled raw materials, replacing virgin materials, will contribute to the reduction of CO₂ emission rates in the fiber extraction and manufacturing processes and in the use of large amounts of chemical products and water, for the manufacturing and dyeing of yarns or fabrics, because as colored fabric scraps were used, the yarns produced from the scraps of weaving fabrics and knits do not require dyeing.

By adopting materials with low environmental impact and new technologies for the production of seamless knitted shoe uppers, it is possible to reduce the disposal of solid waste from the clothing and footwear industries, the emission of CO₂, the use of chemicals and the use of water in the manufacture of new products.

In the manufacturing process of seamless knitted shoe uppers, when compared to the conventional process, there is a reduction in shoe manufacturing steps, as the shoe uppers are made in rectilinear machines in the final format and without generating waste. In this process, to complete the manufacture of sneakers, only the application of the sole will be necessary, in this way, there will be a decrease in the steps of the production process of the footwear industry, with increased competitiveness, reduced costs, increased production, and decreased human errors.

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