

# **New Products from Cleaner Production in Rectilinear Knitting for Fashion Clothing**

*Ana Paula Gentile ([paula.trico@gmail.com](mailto:paula.trico@gmail.com))*

*University of São Paulo, Brazil*

*Francisca Dantas Mendes ([franciscadm.tita@usp.br](mailto:franciscadm.tita@usp.br))*

*University of São Paulo, Brazil*

## **Abstract**

There is a growing concern about the problems caused by solid waste. Aiming to minimize the surplus of knitting raw material generated in the ambit of textile cluster, the craft arises in the Creative Industries, that is, a possibility of new products in the segment of rectilinear knitting using the tools of Cleaner Production.

**Keywords:** Cleaner Production, Surplus of Knitting Raw Material, Production Process

## **Introduction**

Today, there is a growing awareness related to solid waste, and aiming to minimize the surplus of raw material generated in the textile ambit, a possibility of transformation within rectilinear knitting segment arises adding crafts and thinking in developing new products. This research aims to develop products for garment using the alleged waste (yarns) found in micro or small company in this sector.

According to Sissons (2012), in the weft knitting one continuous yarn is responsible for constructing the loops which are successively formed along the length of the fabric (width) forming the course, and perpendicularly to the course there are columns building up the height of the fabric .

According to Callan (2007), knitting fabric refers to garments made with the aid of a machine or manually done, both obtained by the interlacing of cords of wool, cotton or synthetic fibers.

The knitting machines have a variety of fineness that allow the elaboration of thick or thin knitting. The manual industrials machines are considered versatile, and they have two fixed beds. Such machines are called V-Bed Knitting Machine. (Sissons 2012)

The knitting weft has its own characteristics of comfortability due to its construction providing greater elasticity compared to other products. From the product development, the knitting manufacturer notices the surplus of raw materials and according to his practices and familiarity with the production process, directs structures that define and consume a greater whole residue generating atypical visuals.

To Almeida and Giannetti (2006), cleaner production definition should permeate a significant reduction waste, emissions and costs, aiming the improvement, competition and corporate profits having as characteristic a continuous improvement which consequently makes the production process less aggressive to humans and the environment.

Moreover, it becomes necessary a research on the recovery of wastes (raw material) employing them to a production process within the knitting. Thus, it is intended to highlight the maximum consumption of the material avoiding waste, creating new products along with crafts and contributing to researches in the area.

The research methodology addressed to the development of this work is experimental. According to Gil (2002), it is one of the most prestigious designs which can be developed anywhere under manipulation, control and randomization of the study object. He further claims that this type of research can determine the object of study, select the variables and manipulate the experience to achieve the goals.

## **Cleaner Production**

*“Cleaner production is the continuous application of an integrated preventive environmental strategy to processes, products and services to increase production efficiency and reduce risks to humans and the environment.” (DTIE, by Almeida e Giannetti, 2006)*

Cleaner production aims to improve the production process, seeking efficiency, profitability and especially actions that are less harmful to humans while the environment is protected, claim Almeida and Giannetti (2006).

The result of the realization of these CP practices are seen in every action in the purpose of reduction regarding the use of raw materials and energy, preventing or minimizing the generation of waste, enabling increased productivity and resulting in benefits for the company.

Still, Almeida and Giannetti (2006) argue that this concept is mainly focused on continuously analyze the production process, requiring to develop step by step and more and more processes, aiming to improve and optimize the old process and adding partially or completely new processes.

Cleaner production seeks ways to optimize the procedure in the manufacture of a product, for improvements in steps, and the ways this will be generated, thus triggering residue reductions, cost such as raw material and energy spent on the product allowing a margin of profitability High-producer.

In rectilinear knitting it is observed the fact that it starts its production from the manufacturing of its own knitted fabric, that is, it has contact with the raw material, the yarn that originates a certain part, this makes it possible to control, consume and avoid in part generating textile waste. In doing so, it can direct the yarns surplus to numerous creations from the moment that is drawn this fabric with the design, creativity, imagination, insertion of cleaner production minimizing procedures and mainly thinking of reducing environmental impacts.

Thinking of "eco-efficiency" that according to Almeida and Giannetti (2006) can be defined "by the work directed to minimize environmental impacts due to the minimized use of raw materials: “to produce more with less”

According to Dias (2014), the concept of creativity aims to pursue innovation. The understanding of creativity is a result of the generation of ideas within an organizational context in order to understand, correct and conduct these ideas to a high level of adaptability and sophistication, while innovation is defined as the new products and services created, and also new markets all starting from new ways and methods of thinking.

According to Dias (2014), it has increased the pressure on companies and industries to draw their attention to issues concerning the environment due to increased media about the environmental threats to the planet. That way, they can take more responsibility in these matters because the industry generally has as its key feature being the main center of the natural material transformation process into useful products.

Also Dias (2014) states that it is increasingly growing the attention that companies have put on innovation seeking a path to the development of sustainable solutions to answer the growth of the environmental challenges. The innovation that is directed to improvements between business and the environment can be called eco-innovation.

## **Rectilinear Knitting**

### **Contextualizing knitting**

With the emergence of knitting machine, knitting begins to develop continuously and to make constant part of people's wardrobe. Although the knitting technique is very old, the acceptability of the parts resulted in acceptance over time and the evolution with fashion.

Made by hand or with the aid of machine, knitting was already widely used in many styles and contexts, as a leisure clothing or just for protection. The 60s presented knitwear that permeated the fashion for a long time and even today serve as inspiration for others. But the 80s was considered a peek differentiation of patterns.

Today it is very common to use knitting pieces. Nowadays, the growth of knitting and its improvement are stimulated, and there are many technological investments that bring fashion much beauty and versatility.

The pieces are rich in colors, shapes and models diversifying consumer choice, covering a significantly divided market in females, men and children.

### **Fibers, yarns and colors**

The fibers are the essence of clothing training because it is through the combination that you think of something light and fresh as cotton and mixtures thereof. Thus, fibers also offer quality to the product and contribute to changes in fashion.

The formation of yarns mainly depends on the fiber used to give life and essence to the construction itself. The yarn enables effect on the development of fabric depending on its fineness and structure, assigning colors, shapes and textures as in the case of fancy yarn having on its body effect in detail, for example, pelage and embossing which offer a special appearance to the fabric

The colors are important in the creation of any product, especially when it comes to clothing requirements grow and tastes multiply. Knitting in its turn considerably exploits the issue of color palettes, for demonstrates patterns, enables mixtures of materials forming mixed tones and allows the designer to choose any combination beyond a trend to be followed.

There are indications that the knitting has been developing by machines many years ago. The machinery has brought a lot of development, great production, and the improvement of the pieces were being increasingly evolved in the final product issues.

### **The texture development**

The textures are important to the creation of clothing because they attribute different visual to it, density and trim. Thus to construct a given stitching, general characteristics of their product can be controlled.

The development of a product and its manufacture should be duly considered, mainly due to the environmental implications thinking up from the start in the choice of raw materials to the arrival of the product to the consumer. In addition, a variety of concerns such as waste generated in this production must be understood and analyzed. (FILHO, 2009)

Thus, the segment of the rectilinear knitting allows the designer to analyze and direct some of the factors described above, since the development of a knitted product is constituted from its initial planning which is the formation of the fabric by the choice of yarns and texture to finished part.

According Udale (2009) textures and patterns can be created with different yarns, needles or stitching. Stitching perfect "physical quality" Knitted, adding quality in the decoration of it.

The mesh fabric is formed from each stitching being executed. It becomes important because provides the fabric characteristics that can be changed. Failure to stitch formation also adds effect that can be hollow forms. So the point becomes the main element to be outlined before proposing a new knit fabric, for some optimize and others consume much time and raw materials, affecting the profitability of their production and automatically resulting in a change in benefit cost

Sissons (2012) defines stich as a "single loop of yarn inside the fabric." We can understand in this context that the formation of a stitching happens individually so each needle of the machine is responsible for producing a stich and the sequence of these developments form the knit.

The half knit is a stich built in one bed of the machine and presents characteristics of elasticity mainly in its width; is considerably lighter, transparent and its visual appearance is different from the reverse side compared to the right.

Sissons (2012) states that by using a knit of thin yarn it is possible that this has a heavier appearance according to the stitching used. From the moment that the stitching is modified considerable changes become possible both the appearance and trim.

According Chataignier (2006), trim can also be called fall and it is defined as of greater or lesser in density or flexibility present in the fabric flexibility issues.

To construct the knit stitching called full knit the double bed machine is required where the stitch will be formed using the faceplate and the rear of the machine, thereby obtaining a firmer and closed knit fabric and consequently with heavier feature and also having the same look on the right and the fabric inside out.

*"The essence and the beauty of the knit are in the fact that the designer invent everything from scratch; he creates the stitching, the handling, the weight and pick the color deciding the texture and the form at the same time, manipulating their own finishes and details"* (EDELKOORT - SISSONS, 2012)

The ribbing is formed in double bed machine by interspersing needles resulting in a firm structure with enough elasticity and embossed visual making this type of stitching equal both in the right place as in its reverse.

To develop new points in knitted fabric in accordance with Sissons (2012) it allows for expansion the creation of innovative patterns, being able to change existing patterns using an experimental approach.

The creation of patterns depends exclusively on the combined work of the imagination, raw material, yarn and machinery. This way the creator can target numerous possibilities in this context achieving product differentiation and offering something fresh to the consumer.

From the moment it is thought of union of patterns it can reflect better that this segment opens up a wide path in mixtures. For it can still join different textures with different weights and different colors constituting visual contributing to form a single fabric, thus directing to a cutting edge part thought to be unable to produce another like this.

It is important that there are always changes and that they occur naturally and this way it can often ensure a better product, service, and presentation of its activities among others. (Dias, 2014)

### **Vanguard Clothing**

It is possible within the knitting to plan the production of a garment, developing it in order to minimize waste and consume yarn residues that would be future waste. From the moment that uses creativity, more eco-efficiency enables to generate a product designed to be differentiated and cutting edge.

The first step occurs with the choice of raw material by joining all the surplus material from previous production and directs each surplus of yarn to a stitching that will consume it entirety.

The second stage occurs when molding this piece elaborating seams and stitching to prevent to the most the cutting of knit fabric.

The third stage comes when this model can be exploited in its form in a way to be used in two versions, which will result in individuality thus preventing their serial production.

Jones (2005) states that vanguard can be defined as the "fashion or concept that is ahead of its time."

The knitting can be avant-garde for ease the designer to interfere many times during the creation of the piece. Since its origin is through the implementation of the knitted fabric and the stitching itself, the yarn helps to set the trim and the knit will often become differentiated allowing exclusivity.

### **Production Process**

#### **Construction of the part**

For the construction of the part it were used mixed raw materials, composite yarns among them 50% cotton, 50% acrylic, 100% acrylic, 50% acrylic, 50% viscose, in different colors and diverse bond.

The piece was built with tracks at different points and widths, and using the entire fabric by avoiding cutting. For the union of the parts it was used specific machinery for knitting.





Figure 1 - Raw material (different threads compositions)



Figure 2 and 3 - detail wires mixtures making the maximum Stuff the press and forming a new color and folded collar brooch closure



Figure 3 and 4 - five color groups and different points, built horizontally





Figure 5 and 6 - front part where not held court in construction, highlighting the union of different point





Figure 7 and 8 - tracks built in different widths according to the quantity of residue for each color point was chosen to maximize their use.

### **Analysis and Conclusion**

In order to analyze the cleaner production along with knitwear designer in fashion clothing it was proposed the development of a piece of knit that exploited a wide variety of stitching and diverse yarns consuming the raw material as much as possible.

In the construction of the part there is a versatile product in the knitting process united to the craft process, allowing to control, to change and to enhance certain parts of the drawing resulting in different shapes and characteristics.

Analyzing the part and its construction it is highlighted the fact that this did not use the cutting for its trim, thus avoiding alleged waste, and contributing to a cleaner production.

It can be seen that due to the realization of the part construction processes with the use of raw material surplus and mixed it acquires a unique character.

É importante e crescente a conscientização em relação ao resíduo têxtil, e pensando em utilizar os excedentes de malharia, destinando-o a um produto, emerge a ideia da construção juntamente com os processos manuais e o artesanato. Conclui-se desta forma que foi obtido o aproveitamento da matéria prima, de acordo com a produção das peças apresentadas e as expectativas esperadas.

It is important and increasing the awareness of the textile waste, and considering the use of the surplus of knitting, allocating it to a product, it emerges the idea of building it combining manual processes and crafts. In conclusion, the use of the raw material was obtained in accordance with the production of the parts made under awaited expectations.

The awareness of the textile waste becomes increasingly important. Therefore, in this line of thought, it can be said that was obtained a maximization of the raw material generating a special product mainly by minimizing waste.

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