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STUDY ON MAKING SOME PROTECTIVE MASKS BY KNITTING PROCEDURES

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Abstract: *In the midst of the health crisis, we are all trapped in a story that, some time ago, we could not have imagined. Our desire is not to be the witnesses of a history, but the protagonists of a change. This is why we joined the initiative of our colleagues from S.C. Astrico Nord Est S.R.L. Piatra Neamt, and we made a protective mask prototype of 100% cotton which can meet the current needs. This is intended to be a reusable protective mask, as disinfection of the mask can be washed and dried at 700 C, without damaging its properties and shape. This mask was made on the rectilinear knitting machine SIR 123 finness 14, produced by Shima Seiki from Japan. These knitting machines use, for product design, the SDS-One graphics station or the APEX graphic station - the latest generation variant. Using the technological possibilities offered by both the machine and its graphical assistance program, we aimed to attain a production efficiency, which can be achieved by finding methods to reduce the execution time as well as to increase the comfort and quality of the products made. The authors intend to create a product that can cover the needs of ordinary citizens, but also those of the interior of the medical system by giving them these masks that can be disinfected in the hospital autoclave, without the need for such high consumption of raw material, but also once fulfilling the safety conditions of the bearer.*

Key words: *Mask prototype, knitting, SDS-One graphics station, APEX graphic station.*

1. INTRODUCTION

In a world with finite resources, creativity, generating scientific and technical progress is the key to solving any problem [1]. Innovation, as a factor of technical progress materialization is, above all, a social phenomenon [2].
Knits, which have had great popularity in recent years, are among the favorite textile materials for making everyday clothes. Clothing comfort is an important factor because people make their own clothing selections [3].

2. EXPERIMENTAL PART

The mask is a tool used to prevent the transmission of infections by limiting the spread of germs. When a person speaks, sneezes or coughs, small drops of pathogens are released into the air that can infect the surrounding people. It should be noted that these masks can be used to prevent dust inhalation or touching the area around the mouth with hands, but do not provide protection

against Covid 19. The experimental part was done inside S.C. Astrico Nord Est S.R.L.Piatra Neamt. In order to make the product, the rectilinear knitting machine SIR 123 finesse 14 [4] was used, produced by Shima Seiki from Japan, This is a machine with electronic control and selection, with two knitting systems. The machine is equipped with a carriage, with two integrated cam systems. The DSCS device (patented by Shima Seiki) represents the most important improvement in the technology of knitting on rectilinear machines. The device controls and adjusts the length of the used yarn, digitally, aiming to keep it constant, with a tolerance of ± 2%. This device is essential for contour knitting and full knitting, as it allows the constant size of knits to be maintained. The first step in making the mask was the selection of the yard out of which the product was going to be made [5]. This yarn will have to fulfill both the safety conditions of the wearer ensuring a physical barrier around his nasal-buccal area, as well as the conditions of comfort, permeability of the air and vapours of the wearer. The chosen yarn was a 100% cotton yarn, 50/2 finesse to which it was fed, in parallel a Lycra yarn to ensure the firmness of the shape and the necessary rigid aspect. In order to make the knitted product, the dimensions of the product are determined, the knitted structure from which it will be made and the values of knit texture [6]. After establishing them, the product design program was drawn up (Figure 1, Figure 2.) [6]. This was done on the support software of the APEX graphical station, the graphical support stations of the SHIMA SEIKI knitting machines.

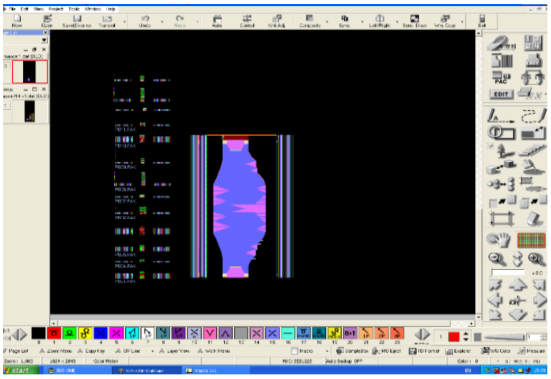

Fig. 1. *The program in which the mask was made - sketch and work packages*

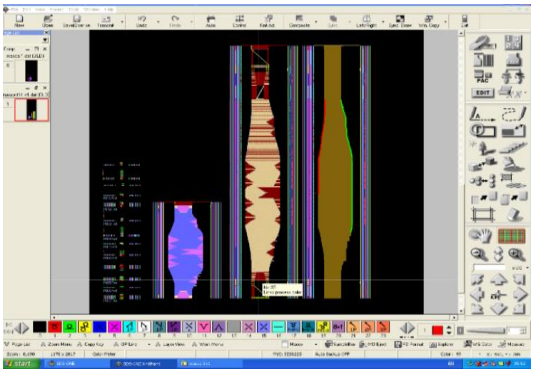

Fig. 2. *The program for working with the mask product*

After completing the design programs for producing the mask, the next phase was processing of these programs. This consists in the translation of the codes from the design program into the actual language of knitting machines, in order to make the products Figure 3.

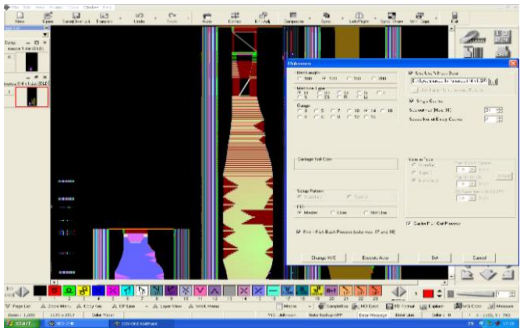

Fig. 3. *The program processing phase for the knitted protective mask product*

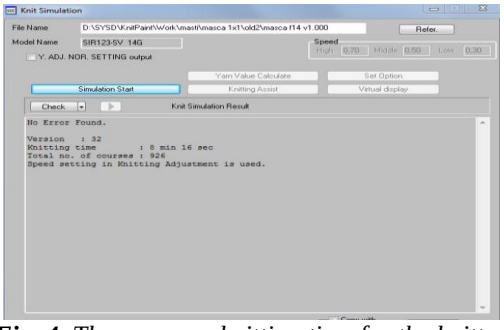

Fig. 4. *The program knitting time for the knitted protective mask product*

The product was made on the Shima Seiki rectilinear knitting machine, model SIR 123, fineness 14, Figure 5, having an execution time of 8 min and 16 seconds/piece, Figure 4.

Fig. 5. *The rectilinear knitting machine SHIMA SEIKI SIR 123 finness 14*

In Figures 6, 7 and 8 you can see the image of the product, the knitted protective mask, made of 100% cotton yarn and lycra.

Fig. 6. *Knitted protective mask - front view*

Fig. 7. *Knitted protective mask - profile view*

Fig. 8. *Protective mask made by knitting process*

5. CONCLUSIONS

We want to create a product that can meet the needs of ordinary citizens, but also those of the medical system by giving them these masks that can be disinfected in the hospital autoclave, without the need for such high raw material consumption, but at the same time fulfilling the safety conditions of the bearer regarding the assurance of a physical barrier in its nasal-buccal area, as well as the conditions of comfort, permeability of the air and vapors of the carrier.

The authors intend to carry out comparative research regarding these properties related to the permeability of the air flow, respectively vapors from the outside to the inside but also vice versa to ensure the comfort of the user.

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