CUTTING DESIGN OF ANTI-VIBRATION SANDWITCH CONSTRUCTION KNITTED GLOVES

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Abstract:

Protective gloves are an important part of safety clothing. When designing protective gloves, the most important requirement is the design of optimal protection and consideration of aesthetic, ergonomic, physiological and functional requirements. The research goal is to properly design of anti-vibration gloves. The shaped knitted gloves made of 100% Kevlar and Dynetex yarn, these gloves have cut and heat resistant properties. To improve the gloves' anti-vibration properties, a sandwich structure is required. The gloves are achieved two or three-layer construction.

The anti-vibration layer is made of different types of materials using the confection technology. The anti-vibration layer pattern was designed by Morgan CAD software. The design of the patterns of the anti-vibration layer depends on the technology of the joining of the 2 and 3 layers, the thickness of the materials, the air permeability, the elasticity, etc. which parameters are tested on 23 types of 3-layer samples at the BME Laboratory of Acoustics and Studios.

The research continues with further research on the prototypes that have been developed.

Keywords:
anti-vibration knitted gloves, Morgan CAD software, sandwich structure.

1 INTRODUCTION

The topic of research is actual as millions of people work with work equipment that emits vibration. Developing health and safety equipment, and combining aesthetic, ergonomic, and usability functions is a great challenge for the development engineer. In the case of protective equipment, functionality is determined by serious requirements.
Different patterns were made of the selected materials. The knitted gloves can be digitized by Morgan Visual photo digitized system. The gloves are sized according to the size chart, which forms the basis of the grading for the garment industry. The gloves of the selected size have an anti-vibration layer, which can be cut with a laser cutter to an accuracy of one hundredth of a millimetre.

2 GLOVES PREPARATION

Different, 100% Kevlar, 100% Dyneetex and in inner layer 100% cotton knitted protective gloves were obtained from the Glovita LTD, Hungarian partner company. [1] The Kevlar material is resists for heat and cut and Dynetex is resist in cut. It is tested by INNOVATEXT. Coup Test" according to the EN 388 standard and the "TDM-100 Test" according to MSZ EN ISO 13997:2000 was performed to evaluate mechanical risks for hand protection. Test of heat resistance was performed according to MSZ EN 407:2004 . [2] The gloves is produced according to technical sheet in different sizes.

2.1 Gloves pattern based on digitized technic

Morgan CAD Garment Manufacturing Preparation Software is capable of digitizing existing patterns based on photo, modeling and editing new patterns, grading and layouts. [3,4,5] The basis of the research work is the knitted glove produced by Glovita Kft. Finished knitted gloves are suitable for digitization. (Figure 1)

Figure 1: Knitted glove

The Morgan CAD software includes a photo digitizer, sketches and digitally displays the "cut pattern". (Figure 2)

Figure 2: Morgan photo digitizer

Figure 3 shows a cut pattern of the digitized, 8-size Kevlar knit model 116773-064060 in Morgan Pattern Design.

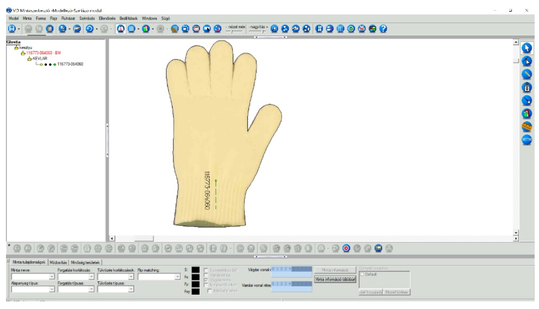


Figure 3: 8 size glove pattern

Figure 3 shows that the glove can be visualized based on the digitization, but the pattern is slightly distorted due to the glove's knitting structure. Based on the glove technical sheet, the dimensions of the finished product can be accurately determined by size.

2.2 Gloves pattern based on Morgan CAD construction

In the Morgan CAD system, not only can we work with the digitized patterns. It is also offers the construction and grading of a gloves pattern. The Pattern Design program allows you to customize the size of the medium as defined in the glove documentation. The program allows 1-to-1 editing. During the drawing, the fingers, the palm and the wrist are edited separately (Figure 4).

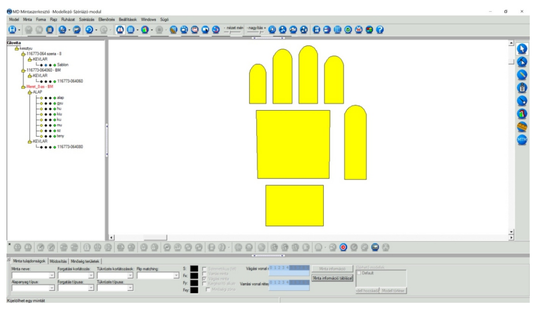


Figure 4: Knitted gloves constructed pattern

Figure 5 shows the assembled parts assembled into a glove with respect to proportions and dimensions. The figure of the digitized glove (Figure 6) was used for proper placement.

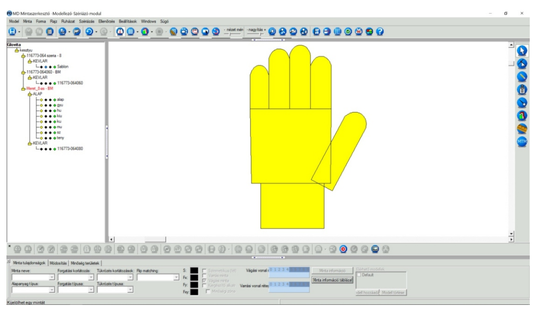


Figure 5: Glove constructed pattern

The digitized glove has a slight distortion due to the knitting pattern, but it is useful for checking the proportions (Figure 6).

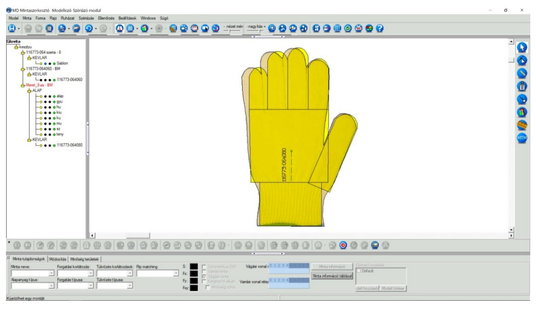


Figure 6: Digitized and constructed golves

The gray constructed pattern is shown in Figure 7 is also proportional to the metal templates used to make the glove, to which the glove is pulled during shaping for further processing.

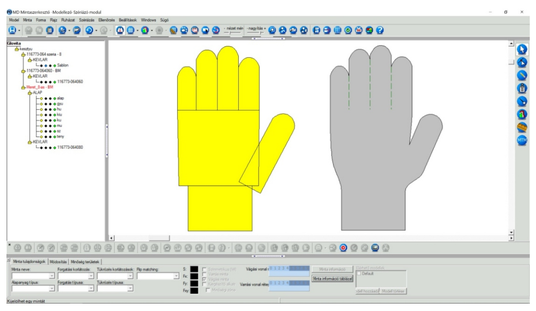
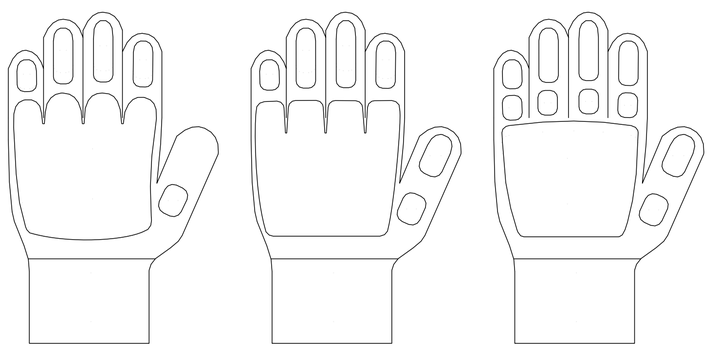


Figure 7: Digitized and constructed golves

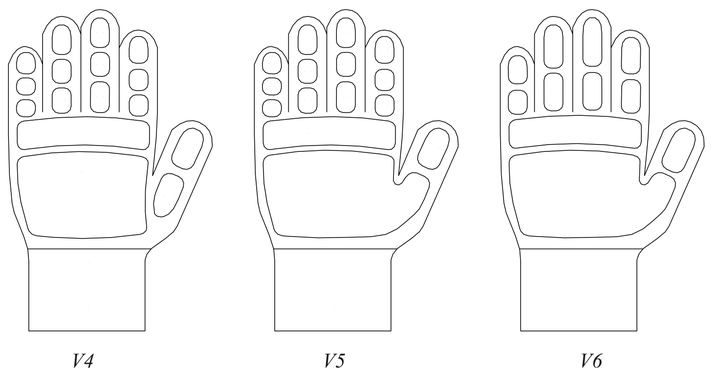
3. DESIGN ANTI-VIBRATION LAYER TO THE GLOVE

For further work, we used the basic glove pattern (Figure 8). A sponge layer suitable for vibration protection was designed and constructed for this pattern.



Figur 8: Sponge layer places for vibration protection

The variations V1-V2-V3 shown in Figure 8 were used to determine the palm surface and sponge dimensions.



Figur 9: Sponge layer places for vibration protection

Finally, considering the shape of the working palm, we chose the V6 version for further examination.

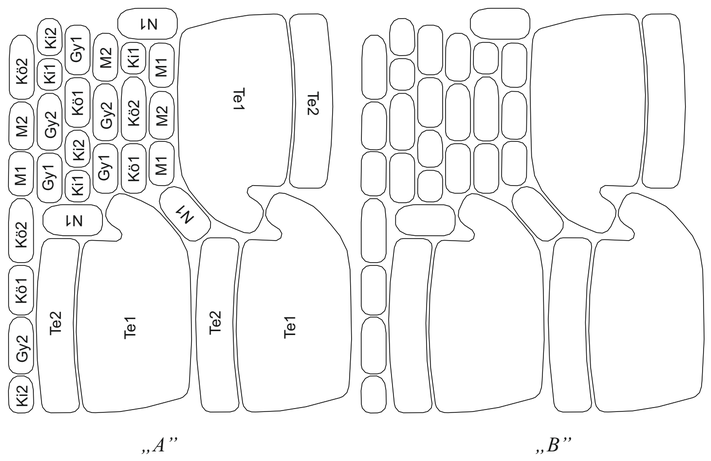


Figure 10: Sponge layers "A" marked "B" cutfile

The component locations shown in Figure 10, Figure 11 have been laser cut as shown in Figure „B". The caption in Figure „A" is used to identify the finger sections. To carry out the tests, the cut pieces are placed on the glove using a variety of gluing techniques. One of the possibilities is the use of a double-sided adhesive grid, which is used to glue the vibration damping material to the glove serving as a liner (Figure 12). The bonding conditions were determined at 120°C for 20 sec at 1 bar.

Figure 12: Glove glued with anti-vibration material

4. CONCLUSION

The aim of the project is to develop a new type of protective gloves made from existing yarns using special yarns (Kevlar, Nomex, Dyneetex). For existing gloves, a sandwich structure is provided to have an anti-vibration function. For this purpose, some special materials are used which can provide protection against vibration. For further tests, pieces of 7 different vibration damping materials were cut, based on the layout of Fig. 10, from which the vibration damping layer was applied to the gloves using different adhesive technologies. From 3 materials, 7 different vibration damping layers will be tested in further in this research.

5. ACKNOLEDGEMENT

TThe research was performed by the consortium consisting of a Hungarian glove manufacturer GLOVITA Zrt, a textile testing institute INNOVATEXT Zrt. and a university laboratory of BME, undertaking the complex task and supported by the EUREKA program in the framework of the ProTexSafe project ID 9918 Functional Textiles for Vibration Protection, Safety and Well-being. We are join to this project as a garment industrial expert.

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