RESEARCH REGARDING THE PARTS CUTTING QUALITY FROM FOOTWEAR UPPERS COMPOSITION AND THE QUANTITY OF WASTES OBTAINED

SECAN Cristina[1], DOBLE Liliana[1]

[1] University of Oradea, Romania, Department of Industrial Engineering and Management in Textile Leather, Faculty of Energy Engineering and Industrial Management, B.St.Delavrancea Str., nr 4, 410058, Oradea, Romania, E-Mail: cris_secan@yahoo.com, liadoble@yahoo.com

Corresponding author: Secan Cristina, E-mail:cris_secan@yahoo.com

Abstract: *This paper highlights the importance of cutting of flexible parts that are part of the upper assembly of a footwear product, so that we should take into account both the quality of cut parts and the amount of waste produced during cutting.With regard to the quality of the parts being cut, it is useful to consider the directions of the minimum stretch of the hide, as well as the defective areas of the hide that should be avoided. An important role is played by the quality and condition of the blades, cutting hubs, adjusting the machine and last but not least the worker's qualification. The amount of waste resulting from cutting should be as small as possible, because only in this way we can insure a good usage index of the hide, as well as a reduced consumption norm.To highlight these aspects we considered two models of footwear for women. We have to calculate the amount of waste resulting from cutting. We will make practical and theoretical arrangements so as to obtain an arrangement factor as high as possible, which can exceed 70%. Can be concluded that the quality of the cut parts is particularly good as it is obtained with a smaller amount of waste. To ensure an optimal cutting it is recommended to have highly skilled workers so that they conform to the rule of cutting, according to which the parts are arranged so that the maximum stress direction coincides with the minimum stretch of material.*

Key words: *qualit, cutting, leather, defect , model.*

1. INTRODUCTION

Rational use of materials during cutting the flexible parts [1] from the surface of the leather plays an important role in terms of obtaining a reduced consumption of material during cutting, but we must also consider the quality of the parts, semi-products which is reflected in the quality of the finished product [2].

In order to ensure the quality of the parts during cutting, it is intended to verify the knives used for cutting, pressing surfaces, adjusting the equipment, preparing the hide parts according to area, thickness, colour, defects [3].

During cutting we should take into account the basic rule of cutting, namely that: the direction of maximum stress of the part must match the direction of minimum stretch of the hide. In support of this claim we must keep in mind that parts are subjected to various stresses, both during manufacture and also during wear [4], [5].

For an efficient cutting, we will place in the area of the bend vamps and braids, given that the directions of minimum stretch of the leather are parallel and perpendicular to the spine, and the band has a denser structure and uniform properties.The top bands will be cut out of leather, being arranged along them [6].

2. EXPERIMENTAL PART

To highlight how the cutting of parts influence the quality of the finished product obtained we shall be make arrangements, both practical and theoretical using AutoCAD 2007, for each part in the composition of footwear models taken from various footwear factories, aiming both to avoid existing defects on the hide surface and also to obtain an arrangement factor leading to a good hide usage index [7].

The models studied, namely, footwear for women, are illustrated in the figure below:

Fig.1: *Model produced 1*

Fig.2: *Model produced 2*

Arrangement factor of each part from the composition of the model was calculated according to the formula [8]:

$$F_a = \frac{nA_r}{A_p} \cdot 100 \tag{1}$$

where: A_r-area of the part's surface;

n-number of parts included in the parallelogram;

A_p-area of the parallelogram's surface.

Average arrangement factor was calculated with the formula:

$$F_a = \frac{A_{set}}{A_{parale\log ram}} \cdot 100 \text{, in \%} \tag{2}$$

where: A_{set}- sum of the set's areas

$A_{paralelogram}$- sum of the parallelograms areas which include the set's parts.

Area of normal wastes, through marginal and printing decks, namely the area of the total wastes are presented in table 1. area of marginal and printing wastes was calculated for the hide surface area of 250 dm^2.

Table 1: *Variation in area wastes for the two models*

No. model	n_s	A_s [dm^2]	P_s [dm]	F_A [%]	Area of normal and decks wastes		Area of marginal and printing wastes
					[%]	[%]	[%]
V_1	18	8,04	80,18	67,84	32,16	9,97	7,99
V_2	12	8,58	49,64	79,22	20,78	5,76	9

In Table 2 are presented **the consumption norms for 2nd quality hides and usage yields** resulting from use theoretical arrangements.

Table 2: *Variation of consumption norm and usage index*

Model variant	n_s	A_s [dm^2]	Area of total wastes a_{dt}[%]	U [%]	N_c [dm^2/per.]
V_1	18	8,04	50,12	49,88	16,11
V_2	12	8,58	35,54	64,45	13,31

To estimate the consumption norm we used the formula:

$$N_C = \frac{A_s}{U} \cdot 100 \text{, in } dm^2\text{/per} \quad (3)$$

where: A_s- area of parts from the pair, in dm^2;
U- hide usage percentage, in %.

3. RESULTS AND DISSCUTIONS

Exemplifying the results obtained by calculation will be performed with the help of graphs using Excel software package.

In Figure 3, for each variant of the pattern whose number of parts from the set varies, we present the variation of the arrangement factor and the size of the set area:

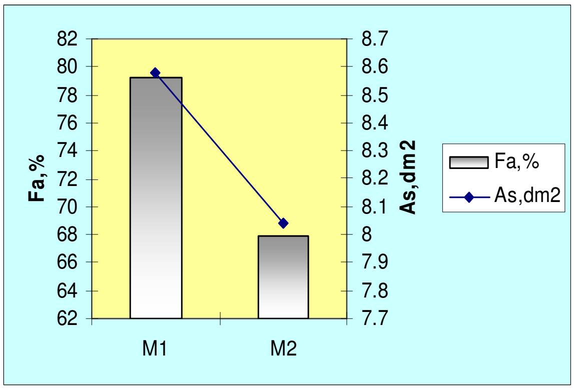

Fig.3: *Variation of the arrangement factor*

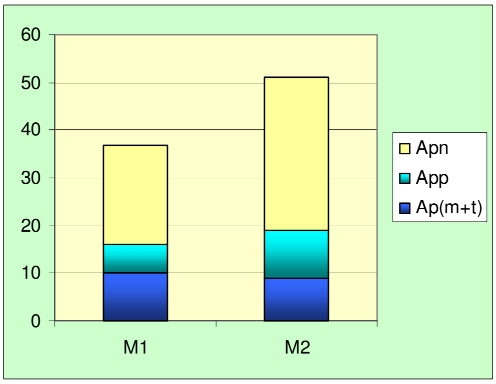

Fig.4: *Variation of total technological wastes*

For M1 model variant (ns = 9) has resulted the highest value of the average arrangement factor and model M2 (ns = 6) it has resulted the lowest value.

Figure 4 shows the variation of total technological wastes, in %, as the sum of normal wastes, through marginal and printing decks.

For the second model, the value of total wastes is 51.11%. This is explained by the higher value of normal and decks wastes, as compared with the case of the one other model. In the case of model 1 the total wastes value is: 36.77% the lowest value.

Figure 5 shows the variation of consumption norm as compared with the size of the total technological wastes.

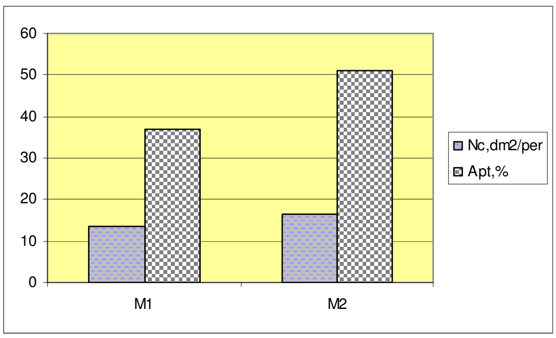

Fig. 5: *Variation of theroretical consumption norm*

Figure 6 shows the variation in utilization percentage of hide. Among the models analysed the highest value of the usage percentage of hide is registered with model 1, namely 63.23%, due to a superior average factor of arrangement.

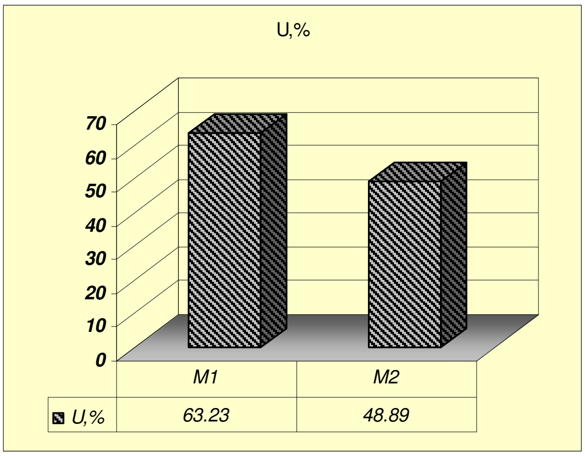

Fig. 6:*.Variation of hide usage index*

4. CONCLUSIONS

In the case of the the two models analysed we notice the significant influence of component parts configuration and the method adopted for arrangement on the utilization percentage of hide, respectively on the quantity of waste produced, that is why it is recommended:

- combined arrangement of patterns of the same model or different models (ie different sizes) in order to minimize normal wastes

-the use of the hide with larger surface for cutting in order to reduce marginal and printing wastes

-estimating specific consumption beginning with the creation of models, in order to intervene on the parts configuration so that normal wastes are reduced

- the quality of the material which is reflected by the quality index of the hide, it is an important factor in the rational use of the hide during cutting the flexible parts

-the parts obtained subsequently must resist the tensile forces during the manufacturing process of the product and the time during wear.

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