ECONOMIC EFFICIENCY OF THE TOTAL COST OF OBTAINING THE PRODUCTION BY MODIFYING SOME CHARACTERISTICS OF THE INITIAL PREFORM (II)

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Abstract. *In the second part of the paper will present the effect of changing a characteristic of the initial work piece on the total cost of the production and thus obtaining the economic efficiency of the process. For obtaining optimized version of work piece studies, the final length of the work piece perform allows use without affecting its final destination at the same time, but will et reduction in the mass of raw material used and ultimately a reduction in total cost of raw material, which will be reflected in lowering the total cost of obtaining the production of parts.*

Keywords: *semi manufactured, production costs, total costs, economic efficiency*

1. INTRODUCTION

The producing company has honored to a command to 300 000 parts / year.

In order to achieve an optimization of the total cost of obtaining the production of parts from analyzes performed on the two categories of cost components, it was concluded that one can only get a discount from the total cost of raw material optimization.

Initially preform, non-optimized, having an initial length L_0= 1 550 [mm] and the corresponding blank mass initially have the value M_0 = 7,2 [kg/ piece].

For this was calculated the total cost of obtaining the production of non-optimized benchmarks for the blank value obtained CT_0 = 4 908 800[€].

In this part of the study, the economic efficiency will be calculated on the basis of the reduction of the mass of the blank used in the manufacture of the workpiece of interest.

2. DETERMINATION OF TOTAL COST OF PRODUCTION OF PARTS FOR OBTAINING A BLANK OPTIMIZED - CT_1

The total cost of production for obtaining an optimized blank - denoted by CT_1- is the sum of the total raw material cost optimized - $C_{MP\ -\ 1}$– and the cost of obtaining production landmarks - C, according to the formula 1

$$CT_1 = C_{MP\,-\,1} + C \quad (1)$$

Where:

$C_{MP\,-\,1}$ - the total raw material cost optimized

C - the cost of obtaining production landmarks

2.1 The total raw material cost optimized $C_{MP\,-\,1}$

For the production of pieces/year - denoted by PT, the total cost optimized material – noted $C/_{MP\,-\,1}$- is calculated by formula 2

$$C_{MP\,-\,1} = C/_{MP\,-\,1} \times PT \quad (2)$$

Where:

$C/_{MP\,-\,1}$- unit cost optimized of raw material

PT - the production of pieces/year

PT = 300.000 [piece]

Unit cost of raw material optimized $C/_{MP\,-\,1}$is calculated from the mass of optimized blank table - denoted by M_1– and raw material price paid for a piece of metal sheet from which the blank is made - denoted by P, by formula 3:

$$C/_{MP\,-\,1} = M_1 \times P \quad (3)$$

Where:

M_1– the mass of optimized blank table [kg / piece]

P – raw material price

P = 1,43 [€ / Kg]

To calculate the mass of optimized blank table that are made up the landmark study - denoted by M_1 we using the formula 4

$$M_1 = V_1 \times \rho \quad (4)$$

Where:

V_1 – optimized volume of the blank that are made up the landmark study [m^3]

ρ – density of the material [kg / m^3]

ρ = 7,85 [kg / m^3]

Optimized volume of the blank that are made up the landmark study V_0 is calculated by formula 5:

$$V_1 = \{[(L_1 + l_1) \times h_1\,] / 2\} \times g_1\,[m^3] \quad (5)$$

Where:

g_1= optimized thickness, it can not be modified and will have the same value as that of the blank before optimization

$g_1 = g_0$ =0,65 [mm]

L_1 = optimized length of the blank, which has been determined and verified later stage on the matrix

L_1= 1 540 [mm]

l_1= optimized width of the blank, it will not be modified and will have the same value as that of the blank before optimization

$l_1 = l_0$=1 360 [mm]

h_1= optimized height of the blank, it can not be modified and will have the same value as that of the blank before optimization

$h_1 = h_0$ = 970 [mm]

Substituting the values given in formula 5 and obtained for optimized initial blank:

V_1 = {[(1 540 + 1 360) x 970] / 2} x 0,65

V_1 = 914 225 [mm^3] = 0,914 225 [m^3]

We further calculate the mass optimized blank table that are made up the landmark study - denoted by M_1, replacing the values obtained in formula 4:

M_1 = 0,914 225 [m^3] x 7,85 [kg / m^3]

M_1 = 7,17 [kg/ piece]

Substituting in formula 3 and get the unit cost of raw material non-optimized $C/_{MP-1}$:

$C/_{MP-1}$ = 7,17 [Kg / piece] x 1,43 [€ / Kg]

$C/_{MP-1}$ = 10,2531 [€ / piece]

Substituting in formula 2 and get the total cost of raw material optimized C_{MP-1}:

C_{MP-1} = 10,2531 [€ / piece] x 300.000 [piece]

C_{MP-1} = 3 075 800 [€]

2.2 The production cost of obtaining landmarks - C

And when using workpiece optimized production, cost of obtaining of parts C does not change, it has the same value as that calculated using non-optimized blank, namely:

C = 1 820 000 [€]

3.3 The total cost of obtaining the production of parts for optimized blank - CT_1

The total cost of obtaining the production of parts for optimized blank CT_1 is calculated by substituting in formula 1 values obtained for the total raw material cost optimized C_{MP-01} and the production cost of obtaining landmarks C:

C_{MP-1} = 3 075 800 [€]

C = 1 820 000 [€]

CT_1= 3 075 800 + 1 820 000

CT_1 = 4 895 930 [€]

3. CONCLUSIONS

The producing company has honored to a command to 300 000 parts / year.

In order to achieve an optimization of the total cost of obtaining the production of parts, from analyzes performed on the two categories of cost components, in the first paper it was concluded that one can only get a discount from the total cost of raw material optimization.

Initially preform, non-optimized, having an initial length L_0 = 1 550 [mm] and the corresponding blank mass initially have the value M_0 = 7,2 [kg / piece]. For this was calculated the total cost of obtaining the production of non-optimized benchmarks for the blank value obtained CT_0 = 4 908 800[€].

In the second study, the economic efficiency it was calculated on the basis of the reduction of the mass of the blank used in the manufacture of the workpiece of interest.

Thus, the initial value of the length of the blank L_0 = 1 550 [mm], it was use the optimized blank length L_1= 1 540 [mm].

The blank mass used will decrease from baseline M_0 = 7,2 [kg / piece] to the value M_1= 7,17 [kg / piece], a value optimized by reducing the length of the blank. For this was calculated the total cost of obtaining the production of non-optimized benchmarks for the blank value obtained CT_1 = 4 895 930 [€].

The final value of the length of the workpiece blank allows use without affecting its final destination at the same time but will get a reduction in the mass of raw material used and ultimately a reduction in total cost of raw material C_{MP}, which will be reflected in lowering the total cost of obtaining the production of landmark CT.

The economic efficiency of change on the overall cost of obtaining goods production - denoted by K_{CT} is calculated by substituting values for the total cost of obtaining the production of non-optimized benchmarks for blank CT_0 and total cost of obtaining the production of parts for optimized blank CT_1 in formula 6:

$$K_{CT} = CT_0 - CT_1 \qquad (6)$$

K_{CT} = 4 908 800 – 4 895 930

K_{CT} = 12 870 [€]

This value can be checked using the economic efficiency of the total cost of the raw material - denoted by K_{MP}.

Economic efficiency of the total cost of the raw material - denoted by K_{MP} - is calculated using the formula 7:

$$K_{MP} = K \times P \qquad (7)$$

Where:

K - economic efficiency of the mass of raw material saved

P – raw material price

P = 1,43 [€ / Kg] = 1 430 [€ / tone]

For all production, economic efficiency will be calculated mass of raw material saved - denoted by K - using the formula 8:

$$K = K/_{r} \times PT \qquad (8)$$

Where:

$K/_{r}$ – efficiency in the blank or landmark [kg / piece]

PT - the production of pieces/year

PT = 300.000 [piece]

Economic efficiency per kg. blank or kg. landmark - denoted by $K/_{r}$ - is calculated according to the formula 9:

$$K/_{r} = M_0 - M_1 \quad [kg / buc.] \qquad (9)$$

Where:

M_0– the mass of non-optimized blank table [kg / piece]

M_1– the mass of optimized blank table [kg / piece]

Substituting in formula 9 values previously obtained for the mass initially workpiece workpiece mass landmark and optimized landmark, namely:

M_0 = 7,2 [kg / piece]

M_1 = 7,17 [kg / piece]

$K/_{r}$ = 7,2 – 7,17

$K/_{r}$ = 0,03 [kg / piece]

Substituting the values obtained in formula 8, we obtain the economic efficiency of the mass of raw material saved K:

K = 0,03 [kg / piece] x 300.000 [piece]

K = 9 000 [kg] = 9 [tone]

Substituting values into formula 7, we obtain the value of the economic efficiency of the total cost of raw material K_{MP}:

K_{MP} = 9 [tone] x 1 430 [€ / tone]

K_{MP} = 12 870 [€]

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