RESEARCH THE ACCURACY OF THE GROUP APPROACH FOR RAPID DETERMINATION COST OF THE MACHINING PRODUCT

ИЗСЛЕДВАНЕ ТОЧНОСТТА НА ГРУПОВ ПОДХОД ЗА ЕКСПРЕСНО ОПРЕДЕЛЯНЕ НА СЕБЕСТОЙНОСТТА НА МАШИНОСТРОИТЕЛНО ИЗДЕЛИЕ

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Abstract:*In the publication are presented studies to determine the accuracy of the group approach in calculating the cost of technological engineering products. For this purpose, the cost price of a specific item is calculated by applying the developed approach and the group is compared with the actual cost. The results obtained show that the use of group approach enables a comparatively fast and sufficiently precise calculation of the technological cost of machine products.*

Keywords MECHANICAL ENGINEERING, TECHNOLOGY COST, OFFER

1. Introduction

There are different methods to calculate project cost of the technology of machine products. Each of them has advantages and disadvantages. With approximate methods the results are obtained quickly, but the accuracy is low. The detailed methods can achieve high accuracy, but their productivity is low. Both indicators are highly dependent on subjective factors. At the same time in the development of offer is very important to achieve a high accuracy in calculations in the shortest possible time. It turns out that for some types of production may be appropriate application of the so-called. group approach. The essence of this approach is discussed in [2,4]. Through this publication, the results were obtained in the experimental verification and testing system for calculating cost accounting.[1,3,4]

2. Exhibition

System cost accounting

The system was developed in accordance with the characteristics of products, production program, organization of production and technological equipment of the company SPARKY AD - Ruse.

To implement the approach was made following:

1. Classification and grouping of products.
2. Selection of real or elaboration of imaginary (virtual) complex article for each group.
3. Develop a group process for complex product.
4. Calculation of the technological cost of the complex product.
5. Automated calculate the cost of a particular product using a model.
6. Comparing the results with cost obtained by individually detailed non-automated calculation.

In carrying out the various stages used software utility. For "Disassembly "(fragmentation) of any representative of its component parts used graphics software for 3D modeling SolidWorks. Automated calculations at this stage is perfectly suited WordExel. For testing of the system used several products from the production company. By systematization, classification and grouping elementary details, surfaces and processes, the products are distributed and grouped into groups with conditional designations A, B, C, etc. Individual parts belonging to one group are denoted by two letters (the first name of the group, while the second is symbol P for part) and a number representing the serial number of the product. For example for group A the parts are indications AP1, AP2, AI3, etc. Similarly parts of group B are BP1, BP2, BP3, etc. In calculating cost C_C are reported only the cost of electricity and labor. Labour costs include wage costs and depreciation of used machines. The calculation is performed by three representatives of the company. They are conventionally indicated with X, Y and Z and are not randomly selected.

In case X is the leader of the technology department. He has many years of production experience and good knowledge of design and technological features of each of the selected products.

The employee Y is a technologist in the technology department. He has worked three years in office and partially known structural and technological features of some of the selected products.

The employee Z has experience about 1 year. Due to the minimum practical experience he can rely principally on its theoretical training in education.

The experiment was made in the following sequence.

Initially, each officer calculated C_C cost of products using the system.

The next stage is the cost C_M be calculated as approved and known to all methods.

To assess the effectiveness of the system used two indicators:

Accuracy - The results of both calculations were compared by calculating the relative error. For the "real" accepted value obtained by the traditional method of leader X.

Productivity - For each estimated cost is recorded time T (working hours) that has been spent on the activity by the employee using the system Tc and using traditional methods Tm. It estimates the absolute and relative difference in productivity.

The values obtained are presented in Table 1.

In completing the table used computational respective dependencies.

To calculate the relative error for each employee:

$$K_C(\mathrm{x,y,z}) = \frac{|C_C(x,y,z) - C_M|}{C_M(x)}$$

The absolute difference between spending time using classical methods (T_M) and system (Tc) of each employee (X, Y, Z) is calculated with the relationship:

$$\Delta\mathrm{T}(x,y,z) = |T_{M(x,y,z)} - T_{C(x,y,z)}|$$

Climate productivity at relatively comparing the times of each employee in both methods is obtained dependence:

$$\mathrm{Кт}, i = \frac{\mathrm{Км}, i}{\mathrm{Кс}, i}$$

Depending “i” is X, Y or Z.

Tabl.1

		AP1	AP2	AP3	AP4	AP5	AP6	AP7
Cc, [lv.]	X	359,69	450,66	582,15	596,38	672,11	796,27	571,97
	Y	368,75	462,32	595,26	618,13	661,78	786,28	575,44
	Z	379,2	498,18	638,75	537,26	601,23	847,43	605,12
Cм, [lv.]	X	327,66	455,29	579,67	606,32	646,74	785,34	553,48
Кс	X	0,098	0,010	0,004	0,016	0,039	0,014	0,033
	Y	0,125	0,015	0,027	0,019	0,023	0,001	0,040
	Z	0,157	0,094	0,102	0,114	0,070	0,079	0,093
Тс, [h]	X	0,75	0,75	0,50	0,50	0,50	0,75	0,50
	Y	5,50	5,50	5,00	4,50	4,50	4,00	3,50
	Z	9,50	8,50	8,00	7,00	7,50	7,50	6,50
Тм, [h]	X	9,50	8,00	7,00	7,50	7,50	8,50	8,00
	Y	22,50	24,00	24,50	20,50	22,50	26,50	21,00
	Z	37,50	38,00	35,00	31,00	30,00	36,00	29,00
ΔT, [h]	X	15,75	17,25	17,50	15,50	17,00	18,25	16,00
	Y	17,00	18,50	19,50	16,00	18,00	22,50	17,50
	Z	28,00	29,50	27,00	24,00	22,50	28,50	22,50
Кт	X	11,7	9,7	13	14	14	10,3	15
	Y	3,1	3,4	3,9	3,6	4,0	5,6	5,0
	Z	2,9	3,5	3,4	3,4	3,0	3,8	3,5

3.Conclusion

Analysis of the table gives rise to the following conclusions:

1. The relative error for leader X is dashing R = 0.094.
2. The maximum relative error in the operation of X is below 10% and occurs only in one case.
3. The maximum error for the entire experiment in the work of Z. It was obtained once and is under 16%.
4. The total expenditure of time (all parts) for leader X using system is 4.25 hours, and without system is 56 hours. Therefore, consumption of time is reduced an average of 12.5 times.
5. The total expenditure of time (all parts) for employee Y at using the system is 32.5 hours, but without system is 161.5 hours. Therefore, the cost of time is reduced by an average of 4.1 times.

4.Literatura

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