

## Use of computer modeling for finding maximum profit

Popovka S.A.

National Aviation University

Scientific advisor – V.I. Trofymenko, Ph D, Associate Professor

Key words: mathematical modeling, maximum profit, Excel, MathCad.

A modern production of all industries of the national economy needs wide application of modeling methods and optimization modeling. It allows to establish dependence of optimization parameters on different factors, predict, and make the most profitable management decisions. During investigating the production process, the last is replaced by a model, in order to save costs (monetary, labor). Mathematical modeling is said to be a complex of dependencies and logical expressions, which reflect characteristics of investigating processes. These methods give opportunities for avoiding expensive experiments, when we consider issues of production organization.

The advantages of mathematical models (mathematical modeling):

- a) low cost of its creation;
- b) rapid obtaining of research results;
- c) the possibility of computational experiments and checking the correctness of the model.

All optimization methods can be divided into classical and modern. Modern methods are linear, non-linear, dynamic, stochastics programming, queuing theory, network planning, game theory and experiment planning.

In this work, use of linear programming in the field of economy is considered. Computer electronic environments are mainly used for finding optimal solutions of economic linear programming problems [1], [2], [3]. In this work, the problem is solved by Excel and MathCad.

Let's consider the economic model of a certain enterprise, which specializes in production and realization of two types of products. Volumes of resources are limited. The main goal is finding a plan for production per month, which provides the maximum profit for the enterprise. Rates for using resources, its stocks and costs per unit of products are in the table, which is located below.

Let's build economic-mathematical model for the problem:

$$F = 300x_1 + 200x_2 \rightarrow \max$$

This problem also has constraints, which should be satisfied:

$$\begin{cases} 9,2x_1 + 4x_2 \leq 520; \\ 3x_1 + 6x_2 \leq 240; \\ 2x_2 \leq 40; \\ x_1 \geq 0, x_2 \geq 0. \end{cases}$$

Types of products	Cost rates per unit of products			Cost per unit of products
	Working time	Iron	Glass	
Vacuum cleaner	9,2	3	-	300
Refrigerator	4	6	2	200
Total resource reserve per month	520	240	40	-

From the last constraint we can see, that variables  $x_1, x_2$  aren't negative, because the number of products can't be negative.

When the problem is solved by the methods of Excel and MathCad, we obtain the result: to have the maximum profit per month, it is necessary to produce 50 units of vacuum cleaners and 15 units of refrigerators, that is  $x_1 = 50, x_2 = 15$ . Also all conditions, which are written above, are satisfied by the solution. Now let's calculate the maximum profit by substituting the obtained values into objective function:

$$F = 300 \cdot 50 + 200 \cdot 15 = 18\ 000$$

Obtained values for optimal plan per month by two different programs Excel and MathCad are the same. Also both programs are vastly convenient for solving problems of this type. The difference of these programs is in data and constraints entering. In Excel we use special formulas for calculations, which need to be located in cells, and also the addition Solver should be used. In MathCad we use only special signs (symbols) during entering data and constraints.

### References:

1. Algoritmi rozv'yazannya zadach optimizatsiyi: Navchalniy posibnik/ Samsonov V.V. - : NUHT, 2014.-300 s.
2. Modelyuvannya protsesiv v ekonomitsi ta upravlinni proektami z vikoristannyam novih Informatsyynih tehnologiy: monografiya / [S.V.Babkin... [ta In. ] ; za zagalnoy redaktsiEyu: V.O.TimofEEva I.V., Chumachenko ].-Harkiv HNURE,2015/-244c.
3. Li, C., Xing, Y., He, F., & Cheng, D. (2018). A Strategic Learning Algorithm for State-based Games. ArXiv.