

## RESOURCE EVALUATION OF MINE TECHNOLOGICAL SCHEMES

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Directions for evaluating the parameters of technological schemes of coal mines in terms of susceptibility to innovations are shown.

**Introduction.** Over the past century, 9.4 billion tons of coal were mined in Ukraine, that is, almost a third of the available reserves. It is quite natural that layers with relatively the most favorable conditions were developed. Today, Ukraine inherits not only explored coal reserves, but also a mining fund with pre-revolutionary, pre-war and post-war construction enterprises. Newly built large mines are calculated in units, as evidenced by the average production capacity of Donbas mines – 500,000 tons/year. Donbas is faced with the alternative of closing most of the unprofitable mines, which have practically exhausted the balance reserves. At the same time, the harmful consequences of age-old underground coal mining with storage of rock on the surface, unsystematic discharge of highly mineralized mine waters and other aspects of activity without regard to the state of the environment were fully manifested. The categories of «problem regions» and «unstable territories» began to sound more and more often as a natural finale to the mass closure of mines.

**Formulation of the problem.** With regard to the region with a rather worn-out mining fund and the presence of significant volumes of man-made waste, we will consider two alternatives. One of them involves the deployment of large-scale works on the processing of waste from mines and beneficiation factories, and the second - the continuation of the operation of a group of unprofitable mines for which the possibility of closure is being considered [1]. Approximately equal amounts of capital must be invested in each of these alternatives. Then the economic effect per unit of final products will be different depending on the degree of favorability in terms of the natural quality of the remaining reserves and reserves of man-made areas. This is the basic formulation of the question.

In relation to coal mines, there is practically no system of quantitative assessment of the state of technological schemes, and the existing disparate characteristics of the schemes are characterized by fundamental errors, namely the advantage of extensive reproduction to the detriment of innovative advantages. The internal potential of technological networks is one of the most important parameters for assessing the state of coal mines. Its formation is the result of the influence of a complex of factors that determine the efficiency of underground mining and, above all, the property of a coal mine – development in space.

The aspiration of the technological scheme of any mine in the conditions of completion of the reserves of the mine field to the state of bifurcation stability [2] is explained by attempts to process previously left areas of the mine field or transition to the work of off-balance reserves. That is, the study of the state of the technological

network should take place within the framework of the structural-dynamic theory, from the standpoint of sustainable development and change. So, on the one hand, several elements of the system may be responsible for solving a certain task of planning the development of mining operations, on the other hand, one element of the technological scheme can provide the solution of several tasks. Based on this, the efficiency of task execution is determined not only by the efficiency of the mine's subsystems, but also by the interrelationships in the system and between the tasks that require a solution.

**Presentation of the main material.** Each of the factors is characterized by one of the parameters «the ratio of the throughput capacity of technological varnishes», «the limited capacity on the factor of ventilation» and «the density of productive streams», respectively. Optimization of the target indicator «technical and economic sustainability of the mine's technological network», which characterizes the mine's potential for innovation, is the result of the interaction of these factors and second-order factors that determine the formation of several key indicators. It can be argued that the stability of the technological network is the ability to maintain its integrity and the mission of a supplier of coal products, to function in a given mode in conditions of uncertainty of internal and external factors, regulating its throughput in the mode of simple or extended reproduction. Therefore, it can be stated that the technical potential of the technological network of the mine is the result of many simultaneous and interdependent factors of the first and subsequent orders.

To establish their influence on the formation of this parameter, it is advisable to use the method of statistical analysis and establish the relationship between the indicator of technical potential and a number of independent indicators of the production and economic activity of the mine.

To build a multiple regression equation describing the «technical potential» indicator, a step-by-step method of including variables was used. Thus, the determination of the maximum achievable amount of economic added value created by a mine is one of the varieties of a multi-criteria problem with four criteria, which must be reduced to a single-criteria problem with the objective function (1).

$$k_k = -\alpha L + \beta P + \gamma V - \mu S \rightarrow \max, \quad (1)$$

where  $k_k$  is a composite indicator of the internal potential of the production network;  $L$  is a parameter that characterizes the length of the mine workings and the length of the cleaning line;  $P$  – productivity of the mining worker, t/month;  $V$  – annual advance of the cleaning line, m;  $S$  is the production cost of 1 ton of coal.

Since the formation of the technical potential of the technological network of the mine is described by equation (1), it is obvious that the achievement of its maximum value depends, first of all, on the ratio of the values of  $L$ ,  $P$ ,  $V$  and  $S$ . In addition, one should take into account the fact that the maximization of the indicator «technical potential» is achieved under the conditions of capacity limitation due to the ventilation factor and the density of productive flows, respectively. Therefore, the task of maximizing the parameter  $k_k$ , which is the main measure of the potential of the

technological scheme of the mine, is reduced to finding a compromise between the values of the four main factors (1).

**Conclusions.** The formation of the potential of technological networks of mines is a symbiosis of the interaction of the factors of the level of concentration of mining operations, the stability of ventilation and the influence on the formation of productive flows of the enterprise. The optimization of the target indicator «technical and economic potential of the technological network of the mine», which characterizes the receptiveness of the mine to innovations, is the result of the interaction of these factors and factors of the second order, which determine the formation of several key indicators.

### **References**

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