

Section 02. Geotechnical Systems Stability

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Comparative Analysis of the Results of Computer Simulations in the Elastic and Elastic-plastic Productions

Global industrial coal reserves amount to over 1 trillion tons, significantly outperforming the reserves and resources of all other forms of energy. This fact makes coal the major energy source that can meet the ever increasing demand for energy, not covered by other available sources. In connection with this, PAO "DTEK Pavlogradugol" focuses on carrying out a series of measures to ensure stable production growth. However, the resulting significant increase of production volumes results in a number of difficulties. In complex geological conditions of the Western Donbass, where coal hardness is often higher than the hardness of enclosing rocks, with increasing length of the excavation panel the length of development workings increases simultaneously which leads to serious fastening problems.

One of the most illustrative examples are the difficulties associated with the extraction of C5 coal seam at "Samarska" mine, PAO "DTEK Pavlogradugol" where airway drainage drift at the depth of 8-9m from the coal seam was held to eliminate the effects of severe water influx into the lava. As the result, the stability of the working is affected by a series of negative factors. It is necessary to develop new options that fully meet the specifics of developing drifts in complex geological conditions, taking into account the overworking influence and presence of water in the roof.

The technology of spatial modelling ensures the possibility to create the elements of different complexity for making a model that corresponds to real conditions. The vast opportunities for changing the boundary conditions allow the model to meet real life conditions at most. One of such most wide-spread complexes nowadays is the ANSYS programme which uses the method of final elements. The main approach to the choice of initial parameters of the model was its maximum correspondence to real geological conditions of the specific workings and also to the fastening system of drainage drift.

In the computational experiment diagrams of the stress distribution and deformations of the coal-bearing rock massif and support system of the drainage drift for two cases of calculation were obtained. Zones bearing pressure in the massif were found in extraction works and around the drainage drift. Close proximity of these zones resulted in their interdependence. Comparative analysis of the solution of the problems in the elastic and elastoplastic formulation showed that using both results is the optimal condition for obtaining objective conclusions. The results can be used to develop a methodology for determining the rational parameters of fastening development drift in overworking conditions.