

Section 02. Geotechnical Systems Stability

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Substantiation of the Efficiency and Expediency of Selective Coal Mining Technology

The advanced longwall mining with the full roof caving behind the face is used widely at the Western Donbass mines. The average dynamic thickness of coal seams is 0.85 m. Coal extraction is carried out traditionally with the wall rock undercutting and further contaminated rock mass treatment on the surface. The existing practice of mining operations sharply deteriorates the quality of extracted coal, increases the enrichment costs, the cost of transportation and waste dumps maintenance, leads to underworking of large areas of fertile land, etc.

The application of selective mining of coal seams and wall rock undercutting, instead of their bulk mining allows to increase the quality of coal in the process of its extraction and leave the waste rocks from wall rock-cutting in the mine, rather than transport and store them on the surface.

The economically expedient area and volumes for application of selective coal mining technology in the conditions of Western Donbas mines based on the economic and mathematical modeling were determined. The task was performed by comparing calculated options based on the optimization criterion. Calculations were performed for the coal seams thickness of 0.6 – 1.0 m. The accepted thickness of wall rock-undercut while mining specified seam thickness with the help of mechanized complexes is 0.05 – 0.45 m using bulk mining and 0.20 – 0.6 m for selective one. Thus, the minimum extracting seam thickness in investigated conditions is 1.05 m for bulk mining and 1.20 m for selective technology.

The economic and mathematical analysis of the thin and very thin seam mining scheme options has shown that from the economic point of view for the accepted conditions the most expedient is the selective coal mining technology with floor rock undercutting of more than 0.15 m.

The results of the economic feasibility analysis have shown that the profit of the mine in the case of stopping face transition from bulk mining to selective technology will be almost the same, 2.7 bill UAH per year, with the use of both bidirectional and unidirectional schemes of selective mining (difference is about 1% in favor of the latter).

The results of the rational volumes analysis of selective technology application has shown, that the most expedient is the variant where three stopping faces work using selective mining on coal seams with thickness of 0.6 – 0.8 m, and the other two work with bulk mining on seams with thickness of 0.9 – 1 m.

Thus, the maximum economic effect of €3.1 and €3.2 per year respectively will be achieved with the use of bidirectional and unidirectional schemes of selective technology.