

ABSTRACT

Evaluation of Longwall Face Stability Using Finite Element Analysis and Statistical Models

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Failures of longwall panels in India are the major cause of concern for the company, government agencies, researchers and academician. The major causes of failure identified so far are the lack of understanding of Indian geomining condition for successful implementation of longwall panels, inadequate selection of powered support, unavailability of spare parts and lack of knowledge to operate longwall panels. Thus, in this research, the focus of the study is to identify and understand the strata behavior at longwall face for Indian geomining condition.

Based on field condition, 324 finite element models were developed to analyze the interaction of surrounding strata with 4-legged chock-shield support, the popular powered support in India. Models thus developed were used to investigate the effect of parameters like coal type, powered support type, modulus, friction angle and thickness of overlying rock and depth of working on longwall face stability. Statistical relations are developed based on the data generated from finite element models for the evaluation of face stability factors. An index called face stability index is developed for easy estimation of front leg pressure, roof to floor convergence and peak abutment ratio for any longwall panel. Validation of the statistical models is carried out with the field monitored data and found that the combination of finite element results and statistical models are sufficient to forecast face stability at longwall face.

Finally, a window based mouse driven program is developed on statistical model results. This program can be used for the selection as well as for ascertaining the longwall face stability measures in a wide range of geomining conditions.