



Contribution ID: 41

Type: **Oral Presenter**

Numerical modeling of main/tail gate of a long wall mining operation

Monday 2 April 2018 15:20 (20 minutes)

Coal mines opting for longwall mining or one of its variations rely on the main and tail gates for production of coal from a panel. Therefore stability of these entries or crosscuts is crucial in coal mining operations. Failure of roof/strata may be fatal and may lead to a loss of property, and delayed coal production. Failure of the gates may be a function of many factors including the mining method, width of pillar, mining depth, caving speed, weak roof etcetera. In Pakistan the coal is mined through a variation of longwall mining method with almost no mechanization while using timber as a support system. Timber support as choke is very useful in coal mines specially when it comes to supporting an overhanging face. Similarly gate entries are supported through choke supports throughout the entire length. In this paper the stability of the longwall gate is assessed for a typical mine in Pakistan using finite element code. It is shown that the elasto-plastic analysis is essential for assessing the stability of a gate entry. A model parametric study is performed for some of the factors. It is demonstrated that the default practice of mines is not suitable and there is a need to review the mining approach.

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Session Classification: Mining Engineering

Track Classification: Mining Engineering