

Study on Application of Multi-slice Longwall Mining System for Extra-Thick Coal Seams under Weak Geological Condition in Thailand

NAY ZAR LIN

Laboratory of Rock Engineering and Mining Machineries,
Department of Earth Resources Engineering, Faculty of Engineering, Kyushu University

ABSTRACT

The EGAT Mae Moh Lignite Mine in Thailand produces about 16 million tons of lignite annually from open-cut mining. The coal is used to generate 2,400 MW of electricity. In the near future, however, the coal must be extracted from underground from a 400-600 m depth. The problems are the thickness of the coal seams and weak geological conditions. The thickness of coal seam is about 25 m thick. This study discusses the applicability of multi-slice longwall mining system for this 20-30 m extra thick coal seams under weak conditions in Mae Moh Lignite Mine by means of numerical analysis performed by using three dimensional differential code "FLAC3D". The ground behavior and failure characteristics as well as stability of face and around the panel in each slice were evaluated based on the results of a series of numerical analyses.

According to the results obtained from the numerical simulation, although the mine roof was found in stable condition, excessive failures were occurred at the floor of panel during the extraction of top slice. Therefore, a large thickness of coal barren have to be left in order to extract the next slice safely, and thus coal recovery will be decreased significantly. In addition, the operational difficulties especially the roof control problem in extraction of lower slices can be expected. Therefore, it was considered that the rapid roof support by using crib in the gob behind the first slice longwall face in order to control the roof sagging and caving in the gob. After supporting, the hydraulic stowing operation in the gob area will be started. After stowing gob is consolidated, next slicing starts. It was also found that the application of stowing right after the coal extraction was effective not only to reduce ground displacement but also to control the propagation of failure zones around the longwall panel as shown in figure 1. The results of numerical analysis showed that the extra-thick seams under weak geological conditions in Mae Moh lignite mine can be extracted safely by using multi-slice longwall mining system with stowing in the gob area (see Figure 2). However, the stowing system and the cost-effectiveness associated with stowing system must be studied before introducing this system.

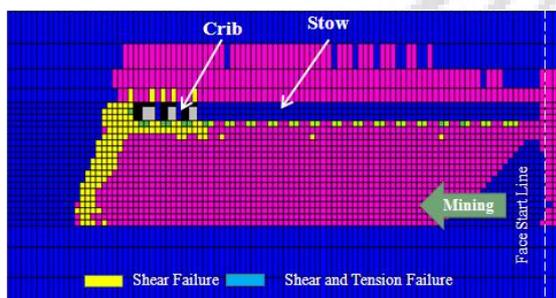


Figure 1. Distribution of failure zones around the longwall panel in top slice with stowing in the gob area.

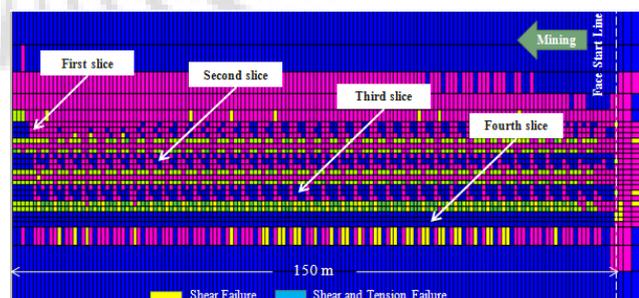


Figure 2. Distribution of failure zones around the longwall panels by using multi-slice longwall mining system with stowing in the gob area.