

Geotechnical Design of Highwall Mining System in Angren Open Pit Coal mine

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Introduction

The Angren coal mine is located in the Republic of Uzbekistan and produces 4.45 million tons of brown coal per year for the needs of the national economy and the generation of electricity. In the case of the Angren coal mine, it has been started up as an open pit and work is still ongoing. However, case of study shows that, it is becoming time for making balance between coal mine and city. As a result of the gradual development of coal deposits, the mining area expanded annually. Consequently, the mining area has become very close to the city. Block No. 3 is located in the north of the Angren open pit mine, (Fig.1) which is currently in the final stage of coal production due to a large amount of overburden because further development by the previous method is economically unprofitable. Under this situation, highwall mining system can be a candidate to extract the coal remained in the final highwall. The purpose of this study is to discuss the application of highwall mining system with safety and efficiently by using the numerical software RS2.

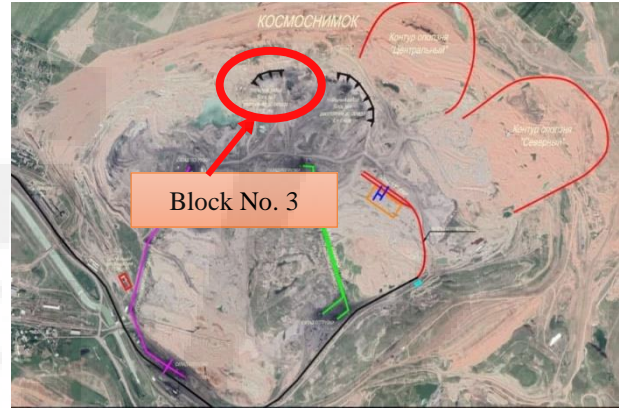


Fig.1 Location of block No. 3 in the Angren coal mine.

Analysis Model

In this study, the multi-pass auger mining system is selected as a highwall mining system due to the thick coal seam which the thickness is 7.0 m. The diameter of the drilling hole is 2.5 m and the pillar width is changed from 1.0~2.0 m. The overburden height is changed from 54 m~151 m based on the field condition. Besides, two different types of layout are adopted: square pattern and staggered pattern as shown in Fig.2.

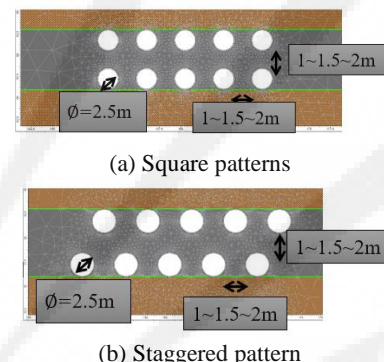


Fig.2 The two most stable methods

Result and Discussions

Figs.3 (a), (b) shows the results of strength factor around the pillar when the overburden depth is 151 m. The warmer color indicates the higher risk of failure. Additionally, it is indicated the failure if the strength factor is less than 1.0. According to the results, there are pillar failure for the case of 1.0 m pillar width with square pattern. On the other hands, the pillar stability can be improved drastically by changing the 1.5 m pillar width with staggered pattern because there is no failure in the pillar. These results suggest that the multi-pass auger highwall mining system can be adopted by selecting the appropriate pillar width and layout of drilling holes. Table 1 summarizes the evaluation of the pillar stability under the staggered pattern. This result is useful to determine the design of pillar width in highwall mining system in Angren coal mine.

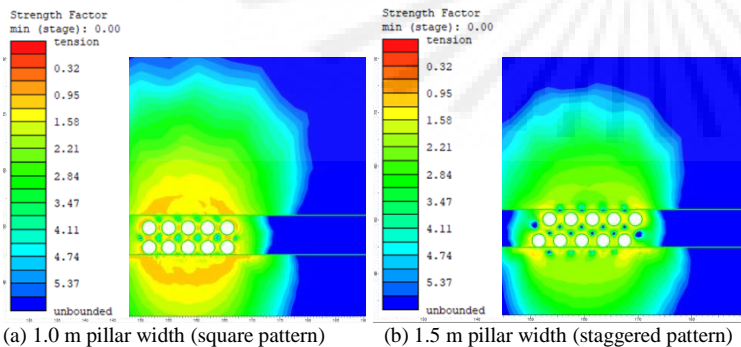


Fig.3 Stability of pillar when the overburden is 151 m.

Table1 Guideline for the application of highwall mining system.

Pillar width (m)	Overburden =54 m	Overburden =104 m	Overburden = 151 m
1	Stable	Collapse risk	Dangerous
1.5	Stable	Stable	Stable
2	Stable	Stable	Stable