STRESS DISTRIBUTION AND DISPLACEMENT ANALYSIS IN A STOPE IN PONGKOR UNDERGROUND GOLD MINE

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ABSTRACT

Pongkor is one of the underground gold mines in Indonesia which applies the cut-and-fill mining method. During the mining, the stability of mine opening is one of the factors deciding the continuity of underground mining process. Due to the mining activity, stresses around the mining area will be redistributed, and in some condition they may lead to a failure on the stope. To avoid such failure, it is important to monitor the deformation and understand the stress redistribution effects on surrounding rock mass as the mining activity proceeded. A borehole extensometer was installed in the ore body to monitor the rock mass displacement, and a 3D model of the mining sequence was made to understand the stress redistribution in the surrounding rock mass.

INTRODUCTION

Pongkor underground gold mine carries out a cut–and-fill mining method to excavate the vein ore body. The stope mining activity is carried out in slice which is 100m in length, 3m in height and the width follows the potential ore body. In some occasion, failures happen around the stope opening, mostly in the stope roof, which may affect the mining activity. To avoid such condition, analysis is carried out to understand the influence stress distribution due to stope mining activity of the surrounding rock mass through a monitoring station located above the stope.

The aim of this study is to analyze the stress redistribution and rock deformation in the roof due to stoping activity. Deformation analysis was carried out by drilling a set of borehole in a crosscut located above the stope and the stress redistribution in surrounding rock mass is analyzed by using a 3D model regarding the mining location and mining sequence. This research is a continuation of the previous study carried out by Dwinagara, et.al., 2006.

NUMERICAL MODELLING

Numerical modeling was carried out to understand the stress redistribution due to mining activities located below the monitoring station. The model was also used to verify the direct measurement (horizontal extensometer). FLAC3D program was used to analyze the stress redistribution by assuming the rock mass as continuous material. The model represented the location of monitoring station in crosscut 6A in Level 500 of Block II Central Ciurug, at an elevation of 568 m, around 300 m from the surface (Dwinagara, et.al., 2006). The stope was located below monitoring station, and the vertical distance between the floor of crosscut 6A and the stope roof was about 3 m. As can be seen in Figure 1, the stoping was started from the stope 1 (located at bottom part) and move upward to