Combining Gnss Measurement Technologies with Terrestrial to Improve Slope Stability Monitoring Accuracies.

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SUMMARY

Slope stability monitoring activity and slope movement analysis in an open pit mine are important in evaluating the operational areas with high degree of failure possibility. Mining deformations such as geological conditions, hydrology, geomechanics conditions and geometry of the slope and the knowledge of the kinematic analyses are crucial in managing and reducing these possible risks. PT. Adaro mining concession lies in Warukin formation with coal deposits punctuated by mudstone and sandstone. Central Tutupan pit is located at the nose folds with the rock layers which undergo significant changes in the bedding dip of 65 ° at the low wall and 20 ° - 30 ° at the high wall. The low wall also contains layer of bedding shear form carbonaceous mudstone contained in the low wall and high wall. Green sandstone at low wall has a power lower than the sandstone. Drastic decrease of green sandstone with strength comparable to uncemented sand if exposed to air force. Since 2004 PT Adaro Indonesia has been developing an advanced slope monitoring system to monitor slope stability of its open pit mines. As one of the world's largest, with a mining area of nearly 45,000 hectares, PT Adaro's single open-pit mine boasts of 13 Robotic Total Stations (RTS) supported by 800 active monitoring prisms scattered throughout the mine area. From the results of the automatic slope monitoring system performed by RTS and GNSS, the information is taken as the value of the movement that occurs in each respective area or disposal. If the movement of a slope exceeds a predetermined trigger level, then it can be taken in the form of changes in mine design controlling evacuation or any type of work (including the mining activity) done in the affected area to avoid the risk of equipment damage caused by a catastrophe, such as landslide. For long-term purposes, data from the RTS and GNSS can be used as supporting data for further Geotechnical analysis to get an overview of the characteristics of a slope in a particular area. Geodetic monitoring, through the RTS system, measures 3D positions at specific instances in time and compares them with previous positions to derive changed in deformation over time. These positions are derived from what is an assumed to be FIXED and STABLE reference position, which is not always so, specifically in the world of open pit mining. GNSS equipment can position 3D coordinates over longer distances, where a FIXED and STABLE reference position is better controlled. This paper cites an example in Indonesia where 16 Robotic Total Stations are combined with 8 GNSS devices to provide better overall absolute accuracies.