

Site Specific Longwall Cavity Formation- A Quantitative Study of from an Atypical Dataset

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ABSTRACT

Metallurgical (coking) coal is an essential part of the steel manufacturing process. As a result, high quality coking coals are in great demand by global steel producers to provide high grade coke for use in blast furnaces. Although the world has vast reserves of coking coal, not all of these reserves are to be found in seams with favourable mining conditions. Global economic growth and the lack of an economically viable alternative to metallurgical coal has resulted in new mines being brought on stream to meet demand, often in geological conditions not previously encountered.

In an underground mining scenario, majority of geological hazard indicators are limited to regional scale folding/faulting, mine scale geological features, gross physical and intrinsic rock mass properties of target seam roof and floor. Hazard estimation for longwall mining gets further compounded by deeper, transitional coal seams with gradational lithologies, limited datasets and less than adequate point of observations.

The primary intent of the authors during this research was to develop a spatial overview map to identify likelihood zones of a potential cavity formation. This case study is from an underground longwall mine in the Northern Bowen Basin, Queensland, which extracts a deep, thick coal seam. Field observations and corresponding lithological attributes of geophysical logs have been analysed to determine the lead indicators behind a cavity formation. The authors have used largely underutilised field data, geomechanical, petrophysical data and seam level geometric features along with their conventional geological indicators in a quasi-empirical hazard analysis. The research has enabled a much-improved understanding of hazard indicators at the mine, enabling potential geological and geotechnical hazards to be anticipated prior to their intersection. This ability is vital for safety and sustainability in a highly productive, longwall coal mine.