 Proceedings of ICCES'08, pp.601-602

Numerical Simulation of Coal Bump or Rock Burst Associated with Coal Mining Under Strong Roofs

XIE Yao-she[1,2], DOU Lin-ming[1,2], LU Cai-Ping[1,2]

Summary

Coal is currently a major energy source in China as well as throughout the world, and will be continue to be so for many years. With the mining depth increase, more and more problems appear. One of the most serious problems is the coal bump or rock burst. Coal bumps, or rock burst, the violent, sudden failure of coal pillars and rock around the mine opening, are a common problem in deep underground coal mines with strong roof and floor rock. Although many factors, such as the abnormal geological conditions, improper mine design, the physical and mechanical properties of the roof strata, and the like, may act together or separately to trigger coal bump or rock burst events, the presence of the strong, massive roofs immediately overlying the mined-out area has long been recognized to be a substantial factor in contributing to the coal bumps, or rock bursts associated with pressure and shock bumps. Typical strong roof strata in coal mines are sandstone, limestone, or sandy shale. Most of reserves in these areas are deep and have thick, strong, and massive sandstone or sandy shale roofs in close proximity to the coal seam. There were more than 2,000 bumps with Richter magnitudes between 2.5 and 3.8 occurred in China coal mines since 1949 which were associated with mining extractions taking place under strong sandstone, limestone roofs, with compressive strengths between 100 MPa and 220 MPa. Bump events caused by mining under strong roofs were also reported in other coal-producing countries, such as Poland, Russia, Australia, England, Canada, and Japan.

The PFC2D software was used to simulate the coal bump associated with the coal mining under different strong roof. The numerical model was based on a real prototype – a sandstone rock core. Then a complex lithology specimen consisted of two materials of different bond strength was generated. Contact bonds in the top and bottom parts of the sample were left unchanged, whereas the middle section was assigned weaker value (based on another real prototype - a coal core). There are 9 different models with different coal height were established. The experimental and numerical results show that with the increase of the coal percentage. the elastic modulus and the peak strength of the complex lithology specimen decreases. The index of burst energy of the complex lithology specimen increases with the increase of height ratio of roof to coal. The elastic energy index of the complex lithology

[1]School of Mining Engineering, China University of Mining & Technology, Xuzhou, Jiangsu, China, 221008

[2]State Key Laboratory of Coal Resource and Mine Safety (CUMT)

specimen increases with the coal percentage. Meanwhile the thicker the coal in the combined sample is, the greater the elastic energy index is.