DEPARTMENT OF MINING ENGINEERING RESEARCH

A limit equilibrium fracture zone model to investigate seismicity in coal mines

This research explores possible synergies between techniques used to minimise seismicity in deep South African gold mines and their applicability to control coal bumps. The paper gives a summary of the techniques used in deep gold mines and a critical appraisal if these are useful in coal mines. The techniques typically include control of mining rate, preconditioning, optimisation of extraction sequences and centralised blasting. Of particular interest to the coal bump problem is an experimental limit equilibrium fracture zone model implemented in a displacement discontinuity code. This was recently developed for the gold mines to enable the interactive analysis of complex tabular mine layout extraction sequences. The model specifically accommodates energy dissipation computations in the developing fracture zone near the edges of these excavations. This allows the released energy to be used as a surrogate measure of ongoing seismic activity and addresses a number of the weaknesses in the traditional use of this quantity as a criterion for the design of seismically active layouts. This paper investigates the application of the model to a hypothetical coal longwall layout and the specific problem of coal bumps.

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