Implementation of a High Energy Dissipation Ground Support Scheme

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ABSTRACT

Northern Star Resources (NSR) operates several seismically active mines as part of its Kalgoorlie Operations. In order to successfully continue mining at depth in increasing stress conditions, strategies need to be developed to reduce, control and manage the impact of seismicity causing damage to the rock mass. Consequently, a research partnership was developed with the WA School of Mines (WASM) through Mining3. The main aim of the project was to develop appropriate ground support standards that could withstand the expected dynamic response with minimal to no rehabilitation required for the life of that excavation. The project utilised a design methodology for determining the required energy demand based on detailed geotechnical mapping, probabilistic analysis of wedge formation and an estimate of rock ejection velocity based on uniaxial compressive strength of the intact rock (Villaescusa et al. 2016).

The ground support scheme consists of high tensile chain link mesh, resin encapsulated de-coupled posimix bolts and plain strand cable bolts, in one, or multiple passes together with plain shotcrete. Implementation of the design posed several challenges including how to install the chain link mesh, maintaining the required productivity, ensuring quality control, and understanding the interaction of the several ground support components within the scheme. The implementation of the system within a trial area was successful from development mining to open stope extraction. The most significant field verification of the system occurred with near field M+1.9 seismic occurring in proximity to an operating long-hole drill. Despite large displacements exceeding 0.5m, there was no significant ejection of rock or failure of the ground support system.

Following the successful trial, the ground support design methodology and standards have been implemented across several NSR sites. The system forms the basis for the successful extraction of resources in future high seismic risk areas.