Evaluation of Underground Haulage Capability for the Carrapateena Mine using Simulation

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# ABSTRACT

The true capability of an underground truck haulage operation can be difficult to determine with a high level of accuracy and reliability. Truck haulage for underground mining typically operates on single width roadways. Limited opportunities for passing and holding trucks on the underground haulage network often leads to a requirement for active negotiations between empty and loaded trucks to manage interactions. The effects of these interactions and the magnitude of associated delays can be challenging to estimate and have the potential to inflate cycle times significantly, reducing haulage system throughput. Convoying of trucks on declines, a common practice used to reduce the number of interactions, can also require complex manoeuvres involving multiple trucks to execute passes.

Simulation is necessary for quantifying the effects of haulage system interactions on throughput for future haulage operations. However, an accurate model requires representation of the complex manoeuvres often employed by underground haulage operations. This involves extension of the haulage movement logic beyond the typical capabilities of most simulation models to manage complex manoeuvres with occupation of sections of the haulage network by multiple trucks, directionality and turnouts that can hold one or more trucks.

This case study describes simulation of the truck haulage operations at the Carrapateena underground sub-level cave mine in South Australia to evaluate the future capability of the haulage system. The representation of haulage operations includes detailed truck manoeuvres to manage convoying and passing of multiple trucks. Management of ore and development waste stockpiles is also represented by the simulation model to feed the downstream materials handling system and allow the upstream mine production and development to continue operating. The model is used to assess ability of the system to meet haulage targets over time as the depth of the production levels and throughput requirements increase over time.