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Assessing the implementation of a Low-Profile Roof-bolter in a platinum mining section based on a systems approach

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Abstract

The drive towards mechanisation is currently in transition in many South African mines, and although it is being met with mixed reviews due to the high risks it involves and the rate of failure in implementation, it is regarded as an eminent solution around the current state of the industry. From the Original Equipment Manufacturers (OEM) to the mines, the establishment of requirements and specifications for underground trackless mechanised mining equipment is far from being an efficient process, leading to a solution prone to errors and a potentially unsuccessful implementation a piece of equipment.

The discipline of systems engineering has proven to provide integrated solutions to multidisciplinary industries in the past, and in many instances, has worked in different settings from manufacturing to aerospace and automotive to name but a few. Applying systems thinking to a set of requirements, can lead to the delivery of a holistic model that would allow the generation of specifications which would provide an adaptable solution to meet the initial requirements.

The introduction and implementation of trackless mechanised mining equipment within an existing traditional drill and blast underground mining operation would be more prone to success if implemented with a systems engineering mind-set.

A fleet of low profile equipment which generally includes face drill rigs, roof-bolters, LHDs and dozers, need to be implemented in-stope as part of a whole mechanised system. Each piece of equipment can be regarded as its own independent subsystem whose implementation can individually be optimised. Stabilizing the rock mass within the vicinity of the excavation after blasting the rock is critical in order to reduce potential hazards associated with rockfalls and rockbursts and increase safety. Falls of ground (FOG) remain the main contributor of fatalities in narrow reef stopes and an adequate implementation strategy for mechanised support needs to be addressed.

The research presented investigates a systems approach to develop a framework for implementing a low profile roof-bolter in a section of a narrow reef platinum mining operation for in-stope support. A number of specifications are generated based on initial requirements and the proposed framework is measured as a case study at a platinum mining operation. This framework is developed by means of systems engineering tools and is mainly based on assumptions.