

Explosive Dust Management system for underground coal mines, digitally integrating stone dust application, sampling plans, and results to help mitigate explosion risk

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ABSTRACT

A coal dust explosion is one of the most significant risks in the harsh and complex environment of an Underground Coal Mine (UCM). Reviewing literature, regulations, and existing systems surrounding explosive dust management shows that there have been few advancements in managing this risk over the past 90 years. Legislation has remained relatively stagnant, and minimal systems are implemented in the real world that can simplify, standardise, and improve the effectiveness of UCM explosive dust management.

To help bridge this gap, Corehesion, in collaboration with an UCM has designed, developed, and implemented an Explosive Dust Risk Mitigation System (EDRMS) utilising components of Business Intelligence (BI) that is capable of real-world use in industry. To do this the existing explosive dust management process at the associated research mine was evaluated to form high-level and detailed design requirements, focusing on digitally simplifying the procedure, not replicating it. The system was then iteratively and incrementally developed and implemented at the research mine to commence real-world use. The developed BI platform is compared with the existing process to highlight the advancements in performance transparency, efficiency, and optimisation of UCM explosion mitigation.

This comparison and evaluation of the real-world system implementation at the research mine demonstrate its success in automating procedure steps, providing a readily accessible source of data, and enabling a proactive approach to planning and managing explosion risk mitigation. In addition to improvements just for the research mine, this EDRMS created directly address many Queensland regulatory audit findings. By finalising the total system and making the highlighted changes for standardisation, this BI system will have the adaptable capabilities for implementation across the UCM industry. As accurate data availability improves at UCMs, further work can be done to improve the systems' optimisation techniques, and integration of other risks.