ENHANCHING DRAGLINE SAFETY: A MULTI-LAYERED PROXIMITY DETECTION SYSTEM

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Keywords: Safety, Proximity, Detection, Standards, Interaction, Layering, AI, Alerts, Technologies, Mining, Dragline

ABSTRACT

Seeking to reduce the likelihood of uncontrolled personnel entry into the operating footprint of a dragline, Coronado Global Resources initiated a review of proximity detection systems currently available and equipment interactions in and around dragline operational areas. At the time of the assessment, there were no established personnel proximity detection systems in compliance with functional safety standards for large machinery in Australia. Our primary objective was to guarantee a functionally safe outcome, particularly by implementing a performance-level-rated system in accordance with AS4024 (Safety of Machinery series of Australian Standards)."

Applying appropriate detection technologies, the goal was to reduce the residual operating risk for machine-to-machine and machine-to-personnel interactions. A comprehensive analysis of available or in-development technologies was conducted, and a layered approach was adopted to achieve the desired risk reduction by segregating the sensing zones into distinct areas using diverse and disparate technologies consisting of Radar (Short); LIDAR (Medium); and Optical (Long). To address the potential limitations of each technology, overlapping layered sensing zones were designed. With LIDAR and Optical using two distinct Artificial Intelligence (AI) systems to classify detections, these were specifically trained to handle the unique environments of a mining operation.

Criticality and urgency increases as the proximity to the dragline decreases. The Optical sensors provide notifications enabling operators to track personnel/vehicles around the dragline; the LIDAR alerts the operator and proportionally reduces the swing reference depending on the distance of the detection from the dragline; and the Radar removes the Swing function entirely, further alerting the operator and locking out the Swing functionality with reset procedures.

The combined solution effectively reduces the risk of personnel/equipment interactions with draglines through reliable detection and failure mode design. The versatility of this scalable approach makes it applicable to other machinery within the mining industry where similar risks exist.