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Utilisation of video real time monitoring to manage dust in hard rock quarries

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Objectives

Mineral dusts, some containing respirable crystalline silica, are generated throughout the hard rock quarrying process and if not properly controlled, can pose a serious risk to a worker's health. Results from traditional gravimetric dust monitoring methods can often take up to 2-3 weeks and only provide workers with time-weighted average dust concentrations, giving no indication of how their exposure levels vary throughout the shift, and limited information on specific dust sources. This makes it difficult to determine what activities result in elevated exposures and which dust controls are ineffective. Video real time monitoring for dust has emerged as a promising solution to address these issues in coal and metalliferous mining. This project's purpose was to study the feasibility of using the same technology to effectively manage respirable dust and respirable crystalline silica in quarries.

Methods

Video real time monitoring was conducted at 3 quarries across Australia to create dust profiles, evaluate different cleaning procedures and assess process changes with respect to dust generation, based on personal exposure levels. While carrying out tasks, workers were fitted with a body camera (GoPro HERO7 White) and real time dust monitor (Nanozen DustCount 9000-ZI) that sampled from their breathing zone. Respirable dust was measured to the ISO 7708 standard, which also allowed for the estimation of respirable crystalline silica. Dust sources were identified through the review of video footage alongside the recorded respirable dust concentrations, or in real time as higher levels were detected on the dust monitor screen.

Results

A site dust map was generated for Quarry A, which established different zones based on measured dust levels. At Quarry B, workers in an enclosed bobcat had no exceedances of dust exposure levels and showed considerably lower levels in comparison to high pressure hosing or a vacuum truck. Following a review of the footage, dust control recommendations for identified dust sources were made to improve management strategies where possible. Finally, dust generated from the running of a new raw material through the crushing plant at Quarry C was found to be below exposure levels.

Conclusions

The use of video real time monitoring for measuring respirable dust provides a more accurate understanding of how ambient dust is released throughout the quarrying process and the ways in which workers can better control their dust exposures. This technology offers valuable insights to both the management team and workers, enabling sites to quickly assess working conditions and make focused and rapid decisions regarding dust control improvements. Video real time monitoring technology is proving to be an extremely useful tool to assist with dust management and reduce worker exposure, which is of considerable focus within the hard rock quarrying industry.

Keywords

quarry, video real time dust monitoring, dust control, respirable dust, dust exposure, respirable crystalline silica