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Development of an exposure control plan for diesel particulate matter: A case study in an underground metalliferous mine

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Abstract

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Development of an exposure control plan for diesel particulate matter: A case study in an underground metalliferous mine

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Olympic Dam is a copper, uranium, gold and silver underground mine located 550 km north of Adelaide, South Australia, operated by BHP Billiton. Plastic fibre reinforced shotcrete is used at Olympic Dam for ground support and gamma radiation shielding. The shotcrete operators have historically been grouped with the shotcrete agitator truck drivers in the same similar exposure group (SEG). In response to concerns raised following the reclassification of diesel particulate matter (DPM) as carcinogenic to humans (Group 1) by the International Agency for Research on Cancer (IARC), the exposure of shotcrete operators to DPM was assessed by reviewing the available historical exposure data and conducting a quantitative risk assessment.

A total of 26 personal exposure samples were collected over a two-week period in accordance with NIOSH method 5040. Statistical analysis of the data yielded similar outcomes to the review of the historical exposure data. The exposure of shotcrete operators was determined to have exceeded the workplace exposure standard (WES) for DPM (Land's 95% UCL = 201 - 221 $\mu g/m^3$) while the WES, which is set at 100 $\mu g/m^3$, was not exceeded (Land's 95% UCL = 49 - 51 $\mu g/m^3$) in the case of agitator truck drivers. In addition to personal monitoring, fixed area monitoring and engine exhaust testing was carried out. The area monitoring demonstrated the impact a well-ventilated underground heading can have on DPM exposures. The results from the engine exhaust testing have shown that the shotcrete rigs emit more DPM than agitator trucks. There were significant variations in DPM emissions within the fleet of shotcrete rigs and agitator trucks, which were attributed to the age of the respective engines.

Following the exposure assessment, a range of controls were considered and later implemented as part of an exposure control plan (ECP). This paper examines the development of the ECP and the implementation of practical engineering controls.