Shift adjustment of the guideline limit for diesel particulate matter

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The International Agency for Research on Cancer (IARC) has declared diesel exhaust to be carcinogenic to humans. DNRM's Mines Inspectorate have now made recommendations to adjust guideline exposure limits to account for extended or non-routine work shifts.

Where is the risk?

The IARC declared diesel engine exhaust to be carcinogenic to humans (a Group 1 carcinogen) in June 2012. The IARC Working Group found sufficient evidence linking exposure to diesel exhaust to increased risk of lung cancer.

Exposure standards and monitoring methods for DPM

Diesel exhaust contains both a gaseous and particulate fraction. The particulate fraction contains elemental carbon (EC) which can be accurately measured to determine the amount of diesel particulate matter (DPM) present. This in turn can be used to provide a reliable indication of the amount of diesel exhaust present in the working environment.

Current Queensland mining legislation does not specify an occupational exposure limit for DPM. However, the Queensland Mines Inspectorate (QMI) recommends adopting the limit used in New South Wales Machine Design Guideline MDG 29, as a guideline limit.

The DPM limit specified in MDG 29 is 0.1 mg/m^3 (measured as sub-micron EC). This limit is based on preventing irritant health effects, not protecting against the risk of lung cancer. IARC's declaration linking diesel exhaust exposure to lung cancer is likely to result in this limit being reviewed.

Not withstanding this, the Mines Inspectorate believes that in line with best practice **all exposures** should be reduced to as low as reasonably achievable.

Further information on exposure monitoring for DPM can be found at: Australian Institute of Occupational Hygienists (AIOH), Diesel Particulate Matter and Occupational Health Issues - Position Paper on Diesel Particulate.

Shift adjustment

Previously there was no recommendation on applying shift adjustment for extended shifts or non-routine rosters relating to DPM. MDG 29 states that 'Until such time as data linking health outcomes to workplace exposures over extended shifts becomes available, it is recommended that no alteration be made to the exposure standard for diesel particulate for extended working hours.'

With the reclassification of diesel exhaust's carcinogenic status the QMI now considers the current guideline limit should be adjusted to account for extended shift lengths or non standard rosters. This practice is currently a regulatory requirement for exposure to other hazardous substances including respirable coal dust, respirable crystalline silica and carbon monoxide.

The QMI does not specify which method to use, but the method selected should consider factors such as toxicity of the agent, the target organ and time for action (whether acute or chronic).

Several recognised methods are currently used for shift adjustment of occupational exposure limits. Safe Work Australia provides advice in its Guidance on the Interpretation of Workplace Exposure Standards for Airborne Contaminants.

Adjustment models must be selected by someone appropriately qualified, such as an occupational hygienist, who has a sound understanding of the toxicology and pharmacokinetics of the substance as well as the rationale for setting the exposure standard.

Information on adjustment models

Information on some specific adjustment models that may be applied in the mining industry can be found at the following links:

- Guide for the adjustment of permissible exposure values (PEVs) for unusual work schedules - Quebec model
- Western Australia Department of Minerals and Energy, Adjustment of Exposure Standards for Extended Workshifts - Guideline
- Simtars' Adjustment of occupational exposure limits for unusual work schedules Brief and Scala average weekly hours adjustment equation
- Australian Institute of Occupation Hygienists (AIOH), Adjustment of Workplace Exposure Standards for Extended Work Shifts - Position Paper.

Recommendations

The recommendations for site senior executives of underground coal and metalliferous mines are to:

- adopt 0.1 mg/m³ as the exposure limit for DPM, measured as sub-micron elemental carbon (EC).
- adjust the exposure limit for DPM to account for extended shift lengths or non-standard rosters, using an appropriate adjustment model selected by a suitably qualified person.

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