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Real-time DPM Ambient Monitoring in Undeground Mines

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Abstract A real-time Diesel Particulate Matter (DPM) monitor has been developed on the basis of the Personal Dust Monitor (PDM) unit designed by National Institute of Occupational Health and Safety (NIOSH). The objectives of a recently completed Australian Coal Association Research Program (ACARP) study was to modify the PDM to measure the submicrometre fraction of the aerosol in a real-time monitoring underground instrument. Mine testing focused on use of the monitor in engineering evaluations of Longwall (LW) moves demonstrated how DPM concentrations from vehicles fluctuate under varying ventilation and operational conditions. The strong influence of mine ventilation systems is reviewed. Correlation between the current SKC DPM measurement system and real-time DPM monitors was conducted and results from eight mines show a correlation between elemental carbon (EC) and the new monitor DPM mass ranging from 0.45 to 0.82 with R2 >0.86 in all but two cases. These differences are suspected to be due to variations from mine to mine in aspects such as mine atmospheric contamination, vehicle fleet variations, fuel type, engine maintenance, engine combustion efficiency, engine behavior or interference from other submicrometre aerosol. Real-time monitoring clearly reflects the movement of individual diesel vehicles and allows pin-pointing of high exposure zones such as those encountered where various vehicles engage in intense work in areas of constrained or difficult ventilation. DPM shift average monitoring approaches do not readily allow successful engineering evaluation exercises to determine acceptability of pollution levels. Identification of high DPM concentration zones allows efficient modification of mine ventilation, operator positioning and other work practices to reduce miners' exposures without waiting for laboratory analysis results.

Keywords longwall; realtime diesel particulate matter; total carbon; elemental carbon

Ⅳ. DPM, SMOKE AND DUST

Ⅴ. GAS DRAINAGE AND OUTBURST