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SUBJECT: Re-Issue of P02-04 - Potential Health Hazard Caused by Platinum-
Based Catalyzed Diesel Particulate Matter Exhaust Filters

Scope

This Program Information Bulletin (PIB) affects underground coal and metal and nonmetal mine operators using diesel-powered equipment, manufacturers of diesel-powered underground mining equipment, including exhaust after-treatment devices and systems, 'miners' representative' and Mine Safety and Health Administration (MSHA) enforcement personnel.

Purpose

The purpose of this bulletin is to inform mine operators of a potential health hazard caused by currently available platinum-based catalyzed diesel particulate matter (DPM) exhaust filters for diesel-powered equipment. Use of these type filters may result in increased production of nitrogen dioxide (NO₂) gas, as compared to NO₂ emissions produced by engines operating without these type filters, causing miners to be exposed to increased concentrations of NO₂. Symptoms of overexposure to NO₂ include irritation to the eyes, nose and throat, cough, decreased pulmonary function, chronic bronchitis, breathing difficulty, chest pain, pulmonary edema, and rapid heartbeat.

Background

The MSHA standard at Title 30, Code of Federal Regulations, Section 72.501 (30 C.F.R. § 72.501) establishes a schedule requiring that coal mine operators meet certain emission specifications for nonpermissible heavy-duty diesel-powered equipment in underground coal mines. At 30 C.F.R. § 57.5060, MSHA requires operators of metal and nonmetal underground mines to limit DPM concentration where miners normally work or travel. Mine operators most likely have to use DPM filters to meet these MSHA requirements.

A common type of DPM filter is the ceramic (Cordierite® or silicon carbide) wall-flow monolith. These filters are either catalyzed (containing precious or base metal) or non-catalyzed. Catalyzed filters offer the advantage of low-temperature on-board regeneration (removal of trapped soot from the filter) accomplished through the utilization of exhaust gas heat. Non-catalyzed or base metal catalyzed filters may require removal from the machine for cleaning, but may, in some cases, be regenerated on board.

In addition to DPM standards, the concentration of NO₂ in underground mining environments may not exceed a ceiling value of 5 parts per million (ppm) as established in MSHA standards at 30 C.F.R. § 57.5001 (Metal/Nonmetal) and 30 C.F.R. § 75.322 (Coal).

‘This program information bulletin is updated with current contact persons’ information.’

Information

Thus far, MSHA has tested six precious metal (platinum) catalyzed filters at its diesel laboratory and has determined that each of them increases the amount of NO₂ emitted by one MSHA-approved diesel engine, as compared to the same engine operating under identical test conditions, but without the catalyzed filter. The increase is attributed to the oxidation of nitric oxide (NO) due to the presence of the platinum catalyst. The concentrations of NO₂ obtained through the installed platinum catalyzed filters reached levels that could not be diluted to or below 5 ppm using the engine’s approved gaseous name plate air quantity. The gaseous name plate air quantity is the amount of ventilation air necessary to reduce the engine emission gaseous concentrations to or below these specified levels: NO to 25 ppm, NO₂ to 5 ppm, CO (carbon monoxide) to 50 ppm and CO₂ (carbon dioxide) to 5000 ppm based on a laboratory test cycle. This air quantity is listed on the engine’s approval plate which is attached to the engine.

MSHA will continue to test additional filters and release the results to the mining community. Manufacturers are developing catalyst formulations which may overcome the NO₂ problem, possibly by lowering the platinum content of the traps or by using other catalytic formulations. MSHA maintains a list of manufacturers who can supply filters on its Internet web site at:

<http://www.msha.gov/01-995/Coal/DPM-FilterEfflist.pdf>

Note that MSHA has included a cautionary statement on this list concerning the potential health hazard associated with the available catalyzed DPM filters. The listed manufacturers can assist the mine operators in selecting a filter system to meet MSHA requirements. Please contact MSHA Technical Support for additional information on DPM filters.

Recommended Action

To determine whether the catalyzed filter is causing an increase in NO₂ that might adversely affect the mine's air quality, the machine should be operated in an entry that provides the engine's name plate air requirement, or the minimum quantity of air that the machine can work in. The machine should be operated under its normal working cycle and NO₂ levels should be monitored downstream from the machine. The NO₂ concentration should not exceed 5 ppm when tested. MSHA representatives are available to assist mine operators with this test.

Platinum-based catalyzed DPM filters that cause a MSHA-approved engine or a non-approved engine to produce NO₂ emission levels that cannot be diluted to or below 5 ppm, utilizing either the:

- MSHA name plate air quantity established for the engine, or
- Minimum quantity supplied where that engine operates should be removed and replaced with a DPM control device that does not increase NO₂ levels. MSHA intends to issue enforcement policy in the near future allowing affected mine operators a reasonable amount of time to comply with applicable MSHA standards.

Authority

Federal Mine Safety and Health Act of 1977; 30 C.F.R. Parts 7, 36, 57, 72 and 75.

Issuing Offices and Contact Persons

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Internet Availability

This information bulletin may be viewed on the Internet by accessing MSHA's home page at <http://www.msha.gov> and choosing "Compliance Info" and "Program Information Bulletins."

Distribution

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