

Request for Information  
Exposure of Underground Miners to Diesel Exhaust  
(81 FR 36826)  
Comment Summary

## **B. Maintenance of Diesel-Powered Equipment in Underground Coal Mines and Recordkeeping Requirements**

General comments on maintenance and recordkeeping:

- a) One commenter recommended that MSHA should:

“Adopt an emission-based maintenance program that includes all types of diesel-powered equipment.... All light-duty equipment used in underground coal mines should be covered by the requirements of 75.1914(g) to ensure they are ‘in tune.’” [[Comment](#)].

- b) A second commenter described corporate requirements for emission-based maintenance. Gas and particulate testing are performed monthly using a Bosch BEA 850 analyzer and MAHA MP-4 DPM analyzer. Baseline data is used to establish in-house emissions standards for each piece of equipment ranging from 20 to 26 mg/m<sup>3</sup> at the manifold (before exhaust treatment), as compared to a non-U.S. regulatory limit of 40 mg/m<sup>3</sup>. Any vehicle going underground, whether company or contractor owned, must be tested, meet these limits, and be fitted with an exhaust filter (exhaust filter effectiveness has also been tested). Key maintenance requirements that affect emissions have been identified for each vehicle and engine type, such as attention to the fuel pump and injectors, and engine oil condition. Vehicles are also fitted with over speed protection (but not idle limiters) and tested monthly to ensure the maximum allowable revs are within original equipment manufacturer (OEM) specifications. Monthly preventative maintenance items specific to controlling DPM exposure include: DPM emissions testing; servicing of lubrication system, injectors, air filters, oil filters and fuel lines; and inspection and servicing of cabin windows, doors, seals and pressurizing systems, including replacement of air conditioner return and cabin pressure filters.

### **8. What would be the advantages, disadvantages, safety and health benefits, and costs of testing non-permissible, light-duty, underground diesel-powered equipment on a weekly basis for carbon monoxide as required for permissible diesel-powered equipment and non-permissible, heavy-duty, diesel-powered equipment?**

- a) Four commenters recommended weekly emissions testing of light-duty equipment, as is already required for heavy-duty and permissible equipment. One of these commenters stated that maintaining in-use engine emissions at certification levels and using effective after-treatment technologies, with emissions-based engine and exhaust after-treatment maintenance, are very important tools in reducing the exposure of underground miners to diesel aerosols and gases. Another suggested that the weekly time-frame could be

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adjusted based on operating time or workload, and included a small data table. [[Comment](#)].

- b) One commenter stated that this testing would add only 5 to 7 minutes to weekly safety checks already required on each piece of light-duty equipment, using exhaust gas analyzers and trained technicians already in place for testing heavy-duty and permissible equipment. A second commenter stated that an engine check procedure is already required for light-duty equipment being used in Pennsylvania, Ohio, and West Virginia, and that emissions-based maintenance has been successfully implemented in many underground metal and nonmetal mines.
- c) Two commenters recommended eliminating the language in 30 CFR 75.1914(g)(4) which states that carbon monoxide must not exceed 2500 ppm – this requirement for engine approval testing should not be applied to field testing. One commenter stated that most approved engines working in the field today will have CO concentrations of about 80 to 300 ppm of CO, and that, as CO concentration increases in an engine the DPM concentration also increases. The other suggested that the appropriate method is to establish a baseline emissions level for all diesel-powered equipment, as required in Pennsylvania, Ohio, and West Virginia. [[Comment](#)], [[Comment](#)].

**9. Reducing the emissions of nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>) is one way that engine manufacturers can control particulate production indirectly. What are the advantages, disadvantages, and costs of expanding exhaust emissions tests to include NO and NO<sub>2</sub> to determine the effectiveness of emissions controls in underground coal mines?**

- a) Two commenters stated that NO and NO<sub>2</sub> emissions testing were unnecessary. The first stated that, once an engine is approved, NO<sub>x</sub> production cannot be adjusted to curtail field emissions of DPM.
- b) The second commenter stated that MSHA already requires on-shift NO<sub>2</sub> measurements, which determine NO<sub>2</sub> increases from a source. This commenter also stated that those Tier 4 engines with a system that uses NO<sub>2</sub> to reduce DPM would be checked during regular maintenance, which includes monitoring NO and NO<sub>2</sub> emissions.
- c) A third commenter stated that reducing NO and NO<sub>2</sub> emissions is not an effective method of controlling DPM production in a traditional diesel engine, because DPM and NO<sub>x</sub> production are inversely related, and cited supporting studies. [[Comment](#)].

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- d) The third commenter stated that NO and NO<sub>2</sub> measurements were useful to assess engine performance and exhaust after-treatment systems, particularly the performance of catalyzed exhaust after-treatment devices such as DOCs converters, catalyzed DPF systems and SCR systems (continuous NO<sub>x</sub> testing over the duty cycle is critical for SCR systems).

**10. Should MSHA require that diagnostics system tests include engine speed (testing the engine at full throttle against the brakes with loaded hydraulics), operating hour meter, total intake restriction, total exhaust back pressure, cooled exhaust gas temperature, coolant temperature, engine oil pressure, and engine oil temperature, as required by some states?**

- a) Two commenters listed engine speed, operating hour meter, total intake restriction, total exhaust back pressure, cooled exhaust gas temperature, coolant temperature, engine oil pressure, and engine oil temperature as items that MSHA should require as part of emissions testing. [[Comment](#)].
- b) A third commenter also listed engine make, model, operating temperature, CO concentration, and either CO<sub>2</sub> or O<sub>2</sub> concentration as required elements for a “repeatable loaded engine operational test.” This third commenter explained that the intake restriction and back pressure must be within the OEM approval specification, the engine operating temperature must be within the normal range, and that the loaded factor can be measured by either O<sub>2</sub> or CO<sub>2</sub> concentration – while the CO concentration indicates whether the engine is operating properly, the CO concentration depends on the engine load, as indicated by the CO<sub>2</sub> or O<sub>2</sub> concentration.
- c) A fourth commenter stated that modern engines have diagnostic systems and backpressure gauges on exhaust filters, and that MSHA can enforce the performance of these through maintenance standards and log books.
- d) One commenter stated that these tests would give an early indication of problems, allowing for adjustments that would ultimately save money on down time and maintenance costs, in addition to reducing DPM emissions.

**11. What would be the advantages, disadvantages, and costs associated with requiring additional records to document the testing and maintenance of diesel-powered equipment in underground coal mines, such as the testing described above?**

- a) Two commenters stated that recordkeeping is necessary to identify changes in individual engines over time and take early intervention. One stated that this requires quantitative performance tests, and acceptable control ranges, while the

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other stated that savings on maintenance costs would outweigh the recordkeeping costs.

**12. If your mine is in West Virginia, Pennsylvania, or Ohio, what is your experience with the resources expended to keep testing records? How have these records been used, e.g., have you analyzed the records for trends?**

- a) One commenter stated that these emissions test records are kept in a record book, similar to other maintenance records, and that the additional resources simply involve getting an additional book for diesel maintenance.
- b) A second commenter stated that MSHA should assess the contribution of DPM by light-duty equipment using the equipment records (based on operating hours) maintained under State law in PA, WV, and OH.

**13. Please provide information related to additional training requirements for persons who operate and maintain diesel equipment.**

- a) One commenter stated that operators are trained and authorized to operate machines within OEM specifications, and receive training to minimize emissions that includes simple requirements such as not leaving equipment idling. This commenter also described awareness training for all mine personnel to help them avoid higher exposure situations. A second commenter stated that eight-hour training, including classroom fundamentals and equipment specific on the job hands-on training should be required to operate diesel-powered equipment. This commenter also stated that 8-hour operator refresher training separate from 30 CFR Part 48 should be required annually, which covers: engine fundamentals, diesel regulations, diesel emissions, factors that affect diesel emissions, emission control devices, diagnostic techniques, preoperational inspection, ventilation, fire suppression systems, operating rules, emergency procedures, and record keeping procedures. [[Comment](#)].
- b) One commenter described training for mechanics by the OEM to perform required maintenance, and diagnose and correct causes when emissions exceed specified limits. They are trained to perform maintenance aimed at reducing emissions, change exhaust filters, and are competent to operate the gas and particulate measurement equipment. A second [commenter](#) stated that maintenance mechanics should receive a minimum of 16 hours of training regarding the general function, operation, maintenance and testing of emissions control and conditioning components. Eight-hour annual refresher (separate from that required by 30 CFR part 48) should be required that addresses:
  - Federal and state requirements
  - Company policies related to diesel equipment
  - Emissions control system design and component technical training

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- On-board engine performance and maintenance diagnostics system design and component technical training
- Service and maintenance procedures and requirements for the emissions and control systems
- Emissions testing procedures and evaluation and interpretation of test results
- Troubleshooting procedures for the emissions control systems
- Fire protection systems test and maintenance
- Fire and ignition sources and their control and elimination
- Fuel system maintenance and safe fueling procedures
- Intake air system design and components technical training and maintenance procedures
- Engine shutdown device tests and maintenance
- Special instructions regarding components, such as the fuel injection system, that shall only be repaired and adjusted by a qualified mechanic who has received special training and is authorized to make such repairs or adjustments by the component manufacturer
- Instruction on record keeping requirements for maintenance procedures and emissions testing