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Comment from Celeste Monforton, NA

Submitter Information

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General Comment

See attached file(s)

Attachments

Peters S et al Estimation diesel exhaust Australian mining OEM 2016

Kachuri Workplace exposure diesel_gasoline exhausts and colorectal ca_Env Health 2016

Latifovic_et_al-2015-Cancer_Medicine

Monforton on Diesel MSHA RFI_SUBMITTED Nov 2016

AB86-COMM-13

November 29, 2016

Mine Safety and Health Administration
U.S. Department of Labor

SUBJECT: Request for Information, Exposure of Underground Miners to Diesel Exhaust
RIN: 1219-AB86
Docket No. MSHA-2014-0031

Dear MSHA Staff:

Thank you for the opportunity to respond to your Request for Information (RFI) on mine workers' exposure to diesel exhaust (81 *Federal Register* 36826 (June 8, 2016.)) Before providing answers to a number of the questions posed by MSHA in the RFI, I wish to bring the following to the agency's attention:

- In 2014, the American Public Health Association adopted a policy statement entitled "Preventing Environmental and Occupational Health Effects of Diesel Exhaust." Among seven recommendations, APHA called upon MSHA to "...to review and reconsider its current diesel emission standards in light of recent scientific developments regarding the carcinogenicity of diesel engine exhaust."[1]

In the four years since the results were published of the Diesel Exhaust in Miners Study[2,3] further evidence is emerging on the relationship between exposure to diesel exhaust and cancer. This includes:

- A risk analysis of lung cancer mortality of workers exposed to diesel exhaust in the Australian mining industry. The researchers used more than 8,600 personal air samples for elemental carbon (EC) which were collected during 2003 to 2015 at 124 surface and underground mining operations. Depending on the job task occupation, average full-shift EC exposures ranged from 6 ug/m3 to 59 6 ug/m3. The authors calculated estimates of excess lung cancer deaths based on average EC exposure. Among underground mine workers with average EC levels of 44 ug/m3, for example, the authors estimated 38 excess lung cancer deaths per 1000 male workers. The estimates for excess lung cancer deaths were even more pronounced for certain occupations, such as underground diesel loader operator.[4]

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[1] American Public Health Association. Policy Statement No. 20147 available at: http://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2015/01/28/12/14/preventing-health-effects-of-diesel-exhaust

[2] Silverman DT, Samanic CM, et al. The Diesel Exhaust in Miners study: a nested case-control study of lung cancer and diesel exhaust. J Natl Cancer Inst. 2012 Jun 6;104(11):855-68.

[3] Attfield MD, Schleiff PL, et al. The Diesel Exhaust in Miners study: a cohort mortality study with emphasis on lung cancer. J Natl Cancer Inst. 2012 Jun 6;104(11):869-83.

[4] Peters S, de Klerk N, Reid A, et al. Estimation of quantitative levels of diesel exhaust exposure and the health impact in the contemporary Australian mining industry. Occup Environ Med 2016;0:1–8.

- The Canadian National Enhanced Cancer Surveillance System is also providing new evidence on the association between exposure to diesel emissions and cancer. The authors of one analyses, for example, reported an excess risk of bladder cancer,[5] while another reported an excess risk of rectal cancer.[6]

I have attached the papers mentioned above for your review.

MSHA deserves credit for its actions in the 1990's and its 2001 regulations to address the serious adverse health consequences of exposure to diesel exhaust and Diesel Particulate Matter (DPM). However, a significant risk of cancer remains at current exposure levels. It is appropriate therefore for MSHA to engage in rulemaking to compel the mining industry to further reduce miners' exposure to diesel emissions.

I provide below responses to some of the questions posed in the RFI.

Background

The standards issued by MSHA in 1996 and 2001 on diesel-powered equipment were instrumental in moving the mining industry forward to recognize and address the health hazards of diesel exhaust for underground miners. More than 16 years have passed, however, since these regulations on diesel equipment were put in place. Significant advances have been made in diesel engine and exhaust after-treatment technologies during that time period. MSHA's regulations must be updated to reflect these advances.

MSHA's RFI indicates that 66 percent of diesel engines operating in underground coal mines are classified as light-duty equipment. But MSHA's standards for light-duty equipment are woefully out-of-date. Specifically, under 72.502 MSHA requires light-duty equipment engines, which were introduced in underground coal mines, to meet one of the following:

- 5.0 gr/hr of DPM;
- DPM requirements equivalent to the EPA non road Tier 2 standards; or
- EPA's 1986 DPM standards for highway vehicles.

However, current diesel engine technology can reduce DPM emissions well beyond what these standards require. In fact in the U.S., all non-road diesel engines produced today and installed in new equipment are required to meet EPA Tier 4 standards. Regrettably, the exception are the engines used in underground mining. There's no justification for permitting mine operators to expose miners to polluting diesel engines---and the associated health risks---when cleaner engines are available and in use in all other areas of commerce.

EPA's Tier 4 DPM standards are approximately 90 percent cleaner than those for Tier 2 engines. Moreover, many of MSHA's approved engines under Part 7 have DPM emissions greater than a Tier 2 standard. If MSHA fails to revise Table 72.502-1, mine operators have no incentives to introduce the most modern diesel engines and after-treatment technologies that are available for their light-duty equipment fleet. Since the Part 72 DPM standards were based on technological

[5] Latifovic L, Villeneuve PJ, et al. Bladder cancer and occupational exposure to diesel and gasoline engine emissions among Canadian men. Cancer Med. 2015 Dec;4(12):1948-62.
[6] Kachuri L, Villeneuve PJ, et al. Workplace exposure to diesel and gasoline engine exhausts and the risk of colorectal cancer in Canadian men. Environ Health. 2016 Jan 14;15:4.

feasibility of diesel engines at the time the standards were promulgated, MSHA must update its regulations so that they conform to current feasible engine technology. This technology can reduce DPM exposure by 90 percent.

Moreover, Tier 2 engines are still being produced and are sold in large quantities for use outside of the U.S. Because MSHA's standards 72.502 (a) and (b) refer to EPA Tier 2 engines, mine operators are allowed to purchase these engines and use them. The consequence is that underground miners are exposed to much higher concentrations of air contaminants from diesel engines than what would be allowed in any other workplaces in the U.S. The contribution of DPM emissions from light-duty equipment is not going to be reduced until MSHA requires miner operators to install engines that meet EPA Tier 4 or equivalent standards.

Question A.1 *Is there evidence that non-permissible, light-duty, diesel-powered equipment currently being operated in underground mines emits 2.5 g/ hr of DPM or less? If so, please provide this evidence.*

Response to A.1: MSHA's 2.5 gr/hr DPM standard is not a viable standard for comparison because it does not take into account horsepower. As the horsepower increases, so does the DPM concentrations. As listed in the MSHA diesel list of approved engines, only small engines have DPM concentrations less than 2.5 gr/hr.

Tier 4 engines and most engines approved by MSHA for use in light-duty equipment can meet a 2.5 gr/hr standard if a DPM filter is installed. Mine operators can refer to DPM filter efficiency information to determine how low DPM emissions can be reduced by installing a DPM filter. MSHA has DPM filter efficiency data in its Part 7 engine listings. This information should be made available to the industry (mine operators and miners.)

Question A.2: *What administrative, engineering, and technological challenges would the coal mining industry face in meeting a 2.5 g/ hr DPM emissions level for non-permissible, light-duty, diesel-powered equipment?*

Response to A.2: Adding DPM filters or purchasing Tier 4 engines is feasible for the mining industry. Moreover, all light-duty machines can be equipped with a DPM filter. DPM filters are available in many designs and technologies which make the application feasible for light-duty machines.

Question A.3: *What costs would the coal mining industry incur to lower emissions of DPM to 2.5 g/ hr or less on non-permissible, light-duty diesel-powered equipment? What are the advantages, disadvantages of requiring that light-duty diesel-powered equipment emit no more than 2.5 g/ hr of DPM?*

Response to A.3: There would be a modest cost to mine operators to either add a DPM filter to a light-duty machine or to retrofit a machine with a Tier 4 engine. The benefit of doing either option is a reduction in DPM emissions by as much as 90 percent.

Question A.4: *What percentage of non-permissible, light-duty, diesel-powered equipment operating underground does not meet the current EPA emissions standards?*

Response to A.4: The most current data is already available to MSHA in its national diesel engine inventory data base. MSHA should provide the industry (mine operators and miners) with data on the percentage of non-permissible, light-duty, diesel-powered equipment operating in underground mines that does not meet the current EPA emissions standards.

I urge MSHA to make the data for both standards publicly available and to update it periodically. It will provide worthwhile information on the availability of feasible engine technology. Moreover, it will demonstrate how far behind the mining industry is in installing less-polluting diesel engines. The mining industry is too slow to adopt engine technology standards that are required for the rest of the US diesel equipment sales market.

Question A.5: *What modifications could be applied to non-permissible, light-duty, diesel-powered equipment to meet current EPA emissions standards? What percentage of this equipment could not be modified to meet current EPA emissions standards? If these are specific types of equipment, please list the manufacturers and model numbers.*

Response to A.5: DPM filters are feasible controls that can be installed on all types of light-duty equipment. This includes DPM filters that can be regenerated or disposable type filters that can be installed with proper exhaust cooling systems. This type of DPM filter technology is currently being installed on light-duty equipment in Pennsylvania, Ohio, and West Virginia. By adding a DPM filter to any light-duty machine, DPM concentrations will be reduced to levels equivalent to EPA's Tier 4 DPM standard.

MSHA has a wealth of information in its diesel equipment inventory. It contains the most up-to-date data on the types of DPM filters, by manufacturer and model, which are installed on permissible, heavy duty, and light-duty equipment. The data is especially robust with respect to installations at mines in Pennsylvania, Ohio, and West Virginia.

Question A.6: *What are the advantages, disadvantages, and costs associated with requiring all non-permissible, light-duty, diesel-powered equipment operating in underground coal mines to meet current EPA emissions standards? Please be specific and include the rationale for your response.*

Response to A.6: MSHA is in the best position to obtain this type of cost information directly from equipment manufacturers. There are a number of manufacturers that are selling diesel-powered engines and equipment to mine operators in Pennsylvania, Ohio and West Virginia. MSHA should easily be able to obtain information on the cost of equipping a variety of light-duty equipment with only a DPM filter.

Question A.7: *West Virginia, Pennsylvania, and Ohio limit diesel equipment in the outby areas of underground coal mines based on the air quantity approved on the highest ventilation plate. What are the advantages, disadvantages, and costs of MSHA adopting such an approach?*

Response to A.7: MSHA specifies air quantities in Part 75.325(f) for diesel powered equipment and the current MSHA name plate standards have resulted in reductions in diesel emissions. However, increasing ventilation name plates for machines, especially for DPM control on light-duty equipment operating in outby areas, is problematic. It is not feasible to monitor the air, or even determine over a shift which air course a machine is operating. Moreover, since MSHA cannot measure concentrations of DPM in underground coal mines, increases in ventilation rates on a name plate for individual machines, is not feasible. As a result, miners' exposures to DPM cannot be evaluated to determine if an increase in ventilation is actually reducing DPM exposure.

Question B.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?*

Response B.8: There are several advantages to requiring emission checks on light-duty equipment. Foremost, weekly checks will identify excess DPM emissions in instances of engine faults. Without emission-based maintenance, an engine fault could go unnoticed and expose miners to excessive concentrations of DPM. The same procedure that is already used for permissible and heavy duty equipment (75.1914(g)) would be feasible for light-duty equipment. The procedure may have to be modified slightly, for example, when establishing a repeatable loaded engine operating condition. An engine check procedure is feasible, however, and is already required for light-duty equipment being used in Pennsylvania, Ohio, and West Virginia. Moreover, an emission-based maintenance requirement has been successfully implemented in many underground metal and non-metal mining operations for a variety of diesel equipment. The weekly time frame could be adjusted for light-duty equipment based on operating time or work load.

In addition, I recommend a revision to 75.1914(g)(4). Specifically, remove the sentence "carbon monoxide concentration shall not exceed 2500 Parts per million." This provision relates to testing for engine approval under Part 7 and should not be intended to represent how an engine should operate in an underground mine. As written, 75.1914(g)(4) leads to unacceptable levels of carbon monoxide. The appropriate method is to establish a baseline emissions level for all diesel powered equipment, as required in Pennsylvania, Ohio, and West Virginia.

Question B.9: *Reducing the emissions of nitric oxide (NO) and nitrogen dioxide (NO2) 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 NO2 to determine the effectiveness of emissions controls in underground coal mines? Please provide data and comments that support your response.*

Response to B.9: Exhaust emissions tests on individual pieces of equipment are not needed for NO or NO2. In 70.1900, MSHA already requires on-shift NO2 measurements which determine increases in NO2 from a source. If a Tier 4 engine has a system that uses NO2 to reduce DPM, than the system will be checked during regular maintenance. Tier 4 engine systems also have checks to determine proper performance which includes monitoring of NO and NO2 emissions.

Question B.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? Why or why not?*

Response to B.10: A modern electronic-controlled engine will have a diagnostic system to check performance. MSHA therefore can enforce the performance in the maintenance standards. If a DPM filter is installed on a machine, the filter manufacture will include a back-pressure gauge. MSHA can enforce this through requirements for maintenance checks and log books.

Question C.14: *What exhaust after-treatment technologies are currently used on diesel-powered equipment? What are the costs associated with acquiring and maintaining these after-treatment technologies and by how much did they reduce DPM emissions? How durable and reliable are after-treatment technologies and how often should these technologies be replaced? Please be specific and include examples and the rationale for your response.*

Response to C.14: MSHA's diesel inventory has up-to-date data on the manufacturers and model types of DPM filters. MSHA should make this information available to the industry (mine operators and miners.) As mentioned previously, manufacturers of light-duty equipment use in Pennsylvania, Ohio, and West Virginia can supply MSHA with the cost information for DPM filters.

Question C.15: *What are the advantages, disadvantages, and relative costs of using DPM filters capable of reducing DPM concentrations by at least 75 percent or by an average of 95 percent or to a level that does not exceed an average concentration of 0.12 milligrams per cubic meter (mg/ m 3) of air when diluted by 100 percent of the MSHA Part 7 approved ventilation rate for that diesel engine? How often do the filters need to be replaced?*

Response to C.15: All commercially available DPM filters will reduce DPM with high efficiencies which would meet Tier 4 engine standards. MSHA has the data on its diesel inventory to determine DPM filter efficiency with ventilation rates in order to calculate an exposure. MSHA should provide the most up-to-date data from the inventory to the industry (mine operators and miners.)

Question C.16: *What sensors (e.g. ammonia, nitrogen oxide (NO), nitrogen dioxide (NO2)) are built into the after-treatment devices used on the diesel-powered equipment?*

Response to C.16: Modern Tier 4 engines have the required sensors to make the after-treatment system work properly as installed by the engine manufacturer.

Question C.17: *Are integrated engine and exhaust after-treatment systems used to control DPM and gaseous emissions in the mining industry? If so, please describe the costs associated with acquiring and maintaining integrated systems, and the reduction in DPM emissions produced.*

Response to C.17: MSHA has that data on the diesel inventory and should provide it to the industry (mine operators and miners.)

Question C.18: *What are the advantages, disadvantages, and relative costs of requiring that all light-duty diesel-powered equipment be equipped with high-efficiency DPM filters?*

Response C.18: As stated previously, DPM filters are feasible on all light-duty machines. Cost information is available from manufacturers who are selling equipment in Pennsylvania, Ohio, and West Virginia.

Questions C.19: *In the mining industry, are operators replacing the engines on existing equipment with Tier 4i (interim) or Tier 4 engines? If so, please specify the type of equipment (make and model) and engine size and Tier. Please indicate how much it costs to replace the engine (Parts and labor).*

Response to C.19: MSHA has the data on its diesel inventory and should provide the up-to-date data to the industry (mine operators and miners.)

Questions C.20: *What types of diesel equipment purchased new for use in the mining industry is powered by Tier 4i or Tier 4 engines? What types of diesel-powered equipment, purchased used for use in the mining industry, are powered by Tier 3, Tier 4i or Tier 4 engines?*

Response to C.20: MSHA has the data on its diesel inventory and should provide the up-to-date data to the industry (mine operators and miners.)

Questions C.21: *Are Tier 4i or Tier 4 engines used in underground mines equipped with diesel Particulate filter (DPF) systems (e.g., advanced diesel engines with integrated after-treatment systems)? Please provide specific examples.*

Response to C.21: MSHA has the data on its diesel inventory and should provide the up-to-date data to the industry (mine operators and miners.)

Questions C.22: *How long have Tier 4i or Tier 4 engines been in use in the mining industry and what additional cost is associated with maintaining equipment equipped with these engines?*

Response to C.22: MSHA has the data on its diesel inventory and should provide the up-to-date data to the industry (mine operators and miners.)

Questions C.23: *What percentage of underground coal mines' total diesel equipment inventory is equipped with Tier 4i or Tier 4 engines?*

Response to C.23: MSHA has the data on its diesel inventory and should provide the up-to-date data to the industry (mine operators and miners.)

Question F: *Please provide any other data or information.*

Response to F: MSHA should update Table 57.5067-1 to require that the most up-to-date Tier 4 engines be used in underground metal and non-metal (MNM) mines. As with the standards for underground coal mines, Table 57.5067-1 is outdated. It is feasible for the MNM mining industry to comply with Tier 4 engine DPM standards.

I look for MSHA's leadership in the year ahead to propose a regulation to address these and other deficiencies in the current DPM regulations. I also concur with the comments submitted in response to MSHA's RFI by the American Public Health Association

Sincerely,

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Attachments