PUBLIC SUBMISSION

As of: 12/2/16 8:11 AM
Received: November NOV 29 2016
Status: Posted
Posted: December 02, 2016 NOV 29 2016
Tracking No. 1k0-8tb6-5hl9
Comments Due: November 30, 2016
Submission Type: Web

Docket: MSHA-2014-0031
Exposure of Underground Miners to Diesel Exhaust

Comment On: MSHA-2014-0031-0047
Exposure of Underground Miners to Diesel Exhaust , Extension of Comment Period

Document: MSHA-2014-0031-0063
Comment from Hunter Prillaman, National Lime Association

Submitter Information

Name: Hunter Prillaman
Address:
National Lime Association
200 North Glebe Road
Arlington, VA, 22203
Email: hprillaman@lime.org
Phone: 703-908-0748
Organization: National Lime Association

General Comment

Please accept for filing the comments of the National Lime Association on "Exposure of Underground Miners to Diesel Exhaust: Request for Information (RIN 1219-AB86)"

Attachments

NLA Comments on MSHA DPM RFI Final

AB86-COMM-16

LIME

NATIONAL LIME ASSOCIATION

November 29, 2016

Mine Safety and Health Administration
Office of Standards, Regulations, and Variances
201 12th Street South
Suite 4E401
Arlington, Virginia 22202-5452

(Submitted electronically at http://www.regulations.gov)

RE: Exposure of Underground Miners to Diesel Exhaust: Request for Information (RIN 1219-AB86)

The National Lime Association (NLA) appreciates the opportunity to provide comments on MSHA's notice referenced above. The notice asks for input on MSHA's approach to the regulation of diesel particulate matter (DPM) in underground mines.

NLA is the trade association for manufacturers of high calcium quicklime, dolomitic quicklime, and hydrated lime, collectively referred to as "lime." Lime is a vitally important chemical, providing cost-effective solutions to many of society's environmental problems, as well as serving key industrial, construction, and agricultural applications. Lime is produced by calcining limestone, and thus most lime manufacturers also quarry limestone, with mining operations under the jurisdiction of MSHA.

The limestone used to produce lime is obtained from both surface and underground mines. There are eight underground mines in the lime industry, located in seven different states, and operated by six different companies. These mines differ significantly in size, geology, and equipment used.

These comments will address several general points, and additionally provide responses to the relevant questions posed in MSHA's notice.

General Comments

1. NLA Supports MSHA's Decision to Engage in a Diesel Exhaust Health Effects Partnership

At the public hearing on the notice held in Arlington, Virginia, on July 26, stakeholders urged MSHA to engage in a cooperative effort with industry and labor experts to study the need for a new DPM standard for metal/non-metal mines, and what form such a standard should take. NLA provided testimony supporting that approach.

It is NLA's understanding that MSHA has agreed to engage in a Diesel Health Effects Partnership, and that the first meeting of the partnership will be held on December 8. NLA strongly supports this decision.

As detailed in live testimony on July 26, the issues involved in a potential further rulemaking on DPM in metal/non-metal mines are complex. They involve understanding the health risks posed by DPM exposure at different levels, as well as the development of scientifically supportable methods for measuring DPM in the workplace. In addition, there are many practical considerations with respect to reducing DPM in metal/non-metal mines, several of which will be discussed below.

2. Metal/Non-Metal Mines Differ from Coal Mines—and from Each Other

NLA notes that technological approaches that may be appropriate in coal mines may not be appropriate in metal/non-metal mines, because of significant differences in the configuration and equipment use in those mines. Indeed, underground metal/non-metal mines can differ significantly from mine to mine, even among those mining the same commodity (such as limestone). There can be major differences in access, vault height, availability of ventilation, risks from other airborne materials, and size of equipment that is used in the mine.

These differences mean that MSHA must proceed thoughtfully in considering new DPM standards for metal/non-metal underground mines, and must take into account the experience of operator and labor stakeholders. Once again, NLA believes that the planned partnership is the best way to achieve this level of communication.

3. Availability of Upgraded Equipment Is a Key Element of an Appropriate Approach to Any Revised DPM Standard

One of the primary methods operators have used to reduce DPM exposure in underground mines is to place into service upgraded equipment (including new equipment and retrofit control devices, as well as monitoring devices). Obviously, operators can only deploy equipment that is available and appropriate for use in the mine environment.

Thus, in developing a future standard, MSHA must take into account the crucial role of the original equipment manufacturers (OEM). The OEMs must design and produce the monitoring and mining equipment needed to meet a more stringent DPM standard. This can be very challenging. For example, NLA members have noted that the Tier 4 engine technology has not yet fully matured, and there are numerous other, related issues that still need to be overcome.

Even when enhanced engines and monitoring equipment become more readily available, mines will need adequate time to fully deploy these devices. Most of the equipment in question will be capital expenditures for the regulated entities. As such, these will need to be planned well in advance of any future compliance date for a lower DPM standard. In addition, evaluations of the equipment under normal operating conditions will be necessary. Changes to standard maintenance schedules and procurement of service contracts, which will present challenges to certain mines due to geographic location, also will require time to implement. It is vital for MSHA to consider these practical challenges working in partnership with stakeholders in the context of the inter-agency approach.

Responses to MSHA Questions

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 rationale for your response.

NLA members have had varying experiences with after-treatment technologies.

Companies using catalytic diesel particulate filters have reported that these devices achieve around 60% removal efficiency, and that the filters last approximately 5,000 hours and show 70-80% durability during that time. Replacement of the filters costs between $12,000-15,000 per unit. In addition, equipment can be out of service for lengthy periods of time while a new filter is obtained and installed (one member reported a delay of over a month for these repairs).

Capturable filters have better removal efficiency (one user reports 95% removal, while others have not had the equipment in service long enough to make an evaluation), but the cost is $30,000 per unit, with replacement of just internal parts running $14,000 and cleaning costing $2,000. One member reported that an effort to install a DPM filter on a 65-ton haul truck was not successful, because the filter (which cost $40,000) failed to regenerate properly and had to be removed.

Members have identified several other problems with Tier 4 filter systems. For example, the engine must continue to run if a re-gen is in process (about 15-20 minutes), and if there is a short circuit the motor will not run and the equipment is stuck in place. Members have also experienced increased maintenance costs with this equipment. It has also been reported that equipment that requires significant idling time may not regenerate filters adequately, resulting in premature failures and systems shutdowns. Finally, the methods and timing for filter regeneration can be complex, leading to an increased risk of human error and the need for technician assistance.

(See also the response to question 18 below with respect to light-duty vehicles.)

15. What are the advantages, disadvantages, and relative costs of using DPM filters capable of reducing DPM concentrations by at least 75% or by an average of 95% or to a level that does not exceed 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 engine? How often do the filters need to be replaced?

Most filters available to lime operations have either 60% or 95% removal efficiency. Observed disadvantages of the 95% DPF include a much higher associated cost, coatings that produce increased NO_2 emissions resulting in the need for additional controls, and availability only on engines at Tier 3 status or higher. Additionally, retrofitting existing equipment with more efficient filters can create visibility issues as these filters have to be very large to capture the exhaust of older engines. The 95% DPF in use at lime operations is relatively new, so the typical timing of replacement is not yet known. For 60% filters, operators have experienced duty cycle replacement at around 5,000 hours (approximately every 3 years), although some members have reported greater difficulties with Tier III equipment, resulting in replacement at around 2000 hours.

Some members have experienced more serious problems with filters, including filters that required daily replacement on a powder truck. These filters were discontinued because they were both cumbersome and expensive, and were not cost-effective.

16. *What sensors (e.g. ammonia, nitrogen oxide (NO), nitrogen dioxide (NO_2)) are built into the after-treatment devices used on diesel-powered equipment?*

Equipment in use at lime operations has back pressure and temperature sensors built into the equipment. Some members also perform separate testing on equipment exhaust for specific contaminants. Some engines with urea injection have a NOx sensor.

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

Integrated systems are in use at some lime operations. They are more complex, require additional maintenance expertise, and possess more operational steps than older equipment, and thus impose higher costs, including labor costs. Companies seeking to deploy such systems have also experienced significant delays in delivery.

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

At some lime operations, light-duty equipment is not a significant source of DPM compared to large mobile equipment. There have also been difficulties with diesel particulate filters on light-duty equipment, such as those that are standard on model year 2007 and newer pickup trucks. These vehicles have been observed to produce more smoke than the older trucks when the filter cleaning cycle begins or during engine malfunctions. Another drawback to the newer generation engines is the requirement to take them to the dealer for regeneration of the filters due to operating conditions in the mine. The truck filters are typically designed to clean themselves at highway speeds. Many of these trucks in mine use never reach highway speeds (because of low speed limits in the mine, and because some of them are not licensed for highway use) and therefore do not clean reliably. Taking them to the dealer (or manually regenerating the filters, which is possible for some equipment) is costly and imposes delay on availability of the equipment for use in the mine. For light duty vehicles that do not have filters as standard equipment, retrofitting can be difficult because of the size of the filters required.

19. *In the mining industry are operators replacing engines on existing equipment with Tier 4i 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).*

Engine replacement is generally not feasible due to configuration differences and high costs. In addition, several OEMs have indicated that they are not interested in performing the engineering work that would be required to replace engines. Thus, typically lime operations switch to Tier 4 engines only when the entire piece of equipment is replaced. There can be a significant lead time to obtain Tier 4 equipment, and in some cases operators have found it necessary to accept new Tier 3 equipment as replacements. Furthermore, the cost of Tier 4 equipment is significantly higher.

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?*

Much of the equipment in lime industry underground mines is gradually being replaced with Tier 4 equipment, although as noted above this is costly and can take an extended period of time. Equipment affected includes trucks, loaders, excavators, drills, bolters, and powder trucks, as well as smaller equipment such as gators, welders, and generators. Only a small portion of the relevant equipment in underground mines in the lime industry has been replaced with Tier 4 equipment to date.

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)? Provide specific examples.*

Many Tier 4 engines in use in the lime industry have integrated systems, but some meet emission requirements in other ways. For example, some Cat Tier 4i engines use engine fueling and control technology along with an oxidation catalyst muffler.

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?*

Tier 4 engines on heavy equipment began to be used widely in the lime industry only in the last few years, so long-term service and maintenance costs are not yet clear. However, the systems are complex and require highly-trained technicians for service, so servicing costs are already significant. Some members have observed that service calls on equipment with the Tier 4i/Tier 4 engines are usually longer than on equipment with older engine types, and plants need to special order parts more frequently for these engines.

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

Although this question appears to address coal mines, a minority of underground diesel equipment at lime operations is equipped with Tier 4i or Tier 4 engines.

24. *MSHA requests information on alternative surrogates, other than TC, to estimate a miner's DPM exposure. What is the surrogate's limit of detection and what are potential interferences in a mine environment?*

Lime companies have noted that TC cannot be measured in real time, which delays the response time to correct any elevated concentrations. MSHA should consider other surrogates, including carbon monoxide (CO). This consideration should include a careful analysis of how other activities in the mine could affect levels of potential surrogates.

25. *What are the advantages, disadvantages, and relative costs for using the alternative surrogate to determine a MNM miner's exposure to DPM? Please be specific and include the rationale for your response.*

MSHA should consider other surrogates, including CO, focusing on the technical challenges and benefits of each method.

26. *MSHA requests information on advances in sampling and analytical technology and other methods for measuring a MNM miner's DPM exposure that may allow for a reduced exposure limit.*

NLA is concerned about the reliability of continuous monitoring systems for incomplete combustion gases, especially when used in the mine environment. An evaluation of real-time monitoring systems published in the *Journal of Occupational and Environmental Hygiene* found the monitored results could deviate up to 20% from the NIOSH Method 5040 results[1]. MSHA should carefully evaluate sampling methods before using them to support a modified exposure limit.

27. *What existing controls were most effective in reducing exposures since 2006? Are these controls available and applicable to all MNM mines?*

NLA members have found that a combination of approaches has been most effective in reducing DPM exposures, including the use of fuel additives or alternate fuels, new engine technologies, completion of semiannual testing on engines to ensure proper function and early identification of any issues, reduction in the amount of hand scaling being performed, increased mine ventilation, and administrative work practices (i.e. spreading equipment out in the mine, rather than being focused in one area).

28. *Based on MSHA's data, MNM miner's average exposures are well below the existing standard of 160_{TC} $\mu g/m^3$. What are the technological challenges and relative costs for reducing the DPM exposure limit?*

First, it is important for MSHA to understand the range of current exposures, and not just the average. There may be mines for which reductions would be much more difficult than for other mines.

Much of the challenge lies with the difficulty of obtaining replacement equipment with lower emissions. Tier 4 engines are simply not available for all the equipment utilized in underground mining. In addition, it will take time to adapt after the equipment is available because mines would not typically replace all their equipment at once, because of the enormous capital expense of doing so. Furthermore, it will be difficult to model the potential reductions from new engines until more of them are in place and their performance can be studied.

Several challenges to compliance with the current standard could be even more difficult with a more stringent standard. For example, the current standard does not allow for personnel change out or shift rotation as acceptable administrative controls to meet the DPM limit, even though

---

[1] Yu, C. H., Patton, A. P., Zhang A., Fan Z., Weisel, C. P., & Lioy, P. J. (2015). Evaluation of Diesel Exhaust Continuous Monitors in Controlled Environmental Conditions. *Journal of Occupational and Environmental Hygiene, 12*(9), 577-587.

underground miners may have shifts lasting greater than or less than 8 hours. A more restrictive limit without the option of applying administrative controls would create an even greater challenge.

Similarly, the current compliance monitoring method provides only a snapshot in time. It does not allow for standard deviation with the set of actual DPM values, nor does it provide the median or average DPM value over time. As such, the method provides only a partial picture of the true DPM exposure for miners at any given mine. These challenges would be even more acute with a more stringent DPM standard.

Finally, many changes (such as to ventilation and work practices) have already been made at underground mines, making it difficult to find additional sources of reductions, at least until Tier 4 equipment can be deployed more widely.

NLA appreciates the opportunity to comment on these important issues, and looks forward to working with MSHA on them in the future.

Very truly yours,

Hunter L. Prillaman

Director of Government Affairs and General Counsel
National Lime Association
200 N. Glebe Road
Arlington, VA 22203
703-908-0748
hprillaman@lime.org