NATIONAL STONE, SAND & GRAVEL ASSOCIATION

Natural building blocks for quality of life

April 5, 2004

Marvin W. Nichols, Jr.
Director, Office of Standards, Regulations and Variances
Mine Safety and Health Administration
1100 Wilson Boulevard, Room 2349
Arlington, VA 22209-3939

Via Email: comments@msha.gov

Diesel Particulate Matter Docket; RIN 1219-AB29
(Federal Register Vol. 69, No.34, February 20, 2004)

Dear Mr. Nichols:

The National Stone, Sand & Gravel Association (NSSGA) is pleased to submit the following comments to the Mine Safety and Health Administration (MSHA) concerning the reopening of the comment period for the proposed rulemaking on Diesel Particulate Matter (DPM) Exposure to Underground Metal and Nonmetal Miners, 30 CFR Part 57 (Federal Register 68, Vol. 157, August 14, 2003).

The majority of the underground mines covered by the proposed rule produce lime and limestone products, and many are owned and operated by NSSGA member companies. NSSGA represents approximately 800 member companies and more than 120,000 working men and women in the aggregates industry. Our members are engaged in the extraction and production of stone, sand and gravel, industrial and specialty minerals, and include companies that manufacture equipment and provide service to the aggregates industry. Our members account for 90% of the crushed stone and 70% of the sand and gravel produced annually in the United States. More than three billion tons of aggregate were produced in the U.S. in 2002 at a value of approximately $14.6 billion.

Summary & Conclusions

On February 20, 2004, MSHA announced in a *Federal Register* notice[1] the record for the proposed DPM rulemaking would be reopened for written comments on the following documents:

1) Dr. Gerald Chase's report on the National Institute for Occupational Safety and Health (NIOSH)/ National Cancer Institute (NCI) data release of the health study of miners[2]
2) NIOSH/Stillwater Mining Company DPM control test report (hereafter referred to as the Phase I report)[3]
3) BLS Survey of Respirator Use in Mining[4]

NSSGA considers a fourth document also relevant due to its reference in the NIOSH/Stillwater Phase I study: the NIOSH/Stillwater evaluation of diesel particulate filters (DPF) and catalytic converters under actual production circumstances (hereafter, the Phase II study)[5], and thus will comment on it in these remarks. NSSGA wishes to enter this document, attached, into the record.

The most directly relevant of the aforementioned documents are the NIOSH/Stillwater Mining Co. report of control technologies in an isozone study, the Phase II study, and the preliminary evaluation by Dr. Chase of the NIOSH/ NCI health effects data.

In the Phase I study, four of the six DPFs evaluated were determined to be impractical or infeasible by the Stillwater Mining Co., the mine operator. Based on study findings, the remaining two DPFs showed promise. However, study results must be viewed with caution because of limitations, which included (1) a lack of evaluation of DPF durability and reliability, (2) use of only large vehicles with duty cycles compatible with passive filters, and (3) the use of a non-production study setting.

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[1] Mine Safety and Health Administration, *Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners: Proposed Rule; Limited Reopening of Comment Period*, Federal Register, Vol. 69, No. 34, pg. 7881, Friday, February 20, 2003.

[2] Chase, Gerald, *Characterizations of Lung Cancer in Cohort Studies and a NIOSH Study on Health Effects of Diesel Exhaust in Miners,* (undated).

[3] Bugarski, Aleksandar; Schnakenberg, George; Noll, Jim; Mischler, Steve; Patts, Larry; Hummer, Jon; Vanderslice, Shawn; Crum, Mike; Anderson, Rick. *The Effectiveness of Selected Technologies in Controlling Diesel Emissions in an Underground Mine-Isolated Zone Study at Stillwater Mining Company's Nye Mine*, Jan. 5, 2004.

[4] U.S Department of Labor, Bureau of Labor Statistics, and National Institute for Occupational Safety and Health (BLS/NIOSH), *Respirator Usage in Private Sector Firms, 2001,* September 2003.

[5] Bugarski, Aleksandar; Mischler, Steven; Noll, James; Schnakenberg, George; Crum, Mike; Anderson, Rick, *An Evaluation of the Effects of Diesel Particulate Filter Systems on Air Quality and Personal Exposure of Miners at Stillwater Mine Case Study: Production Zone,* NIOSH/Stillwater Mining Co., March 26, 2004.

Freed from the artificiality of the relatively controlled research environment seen in the Phase I study, the Phase II investigation - which attempted to evaluate DPFs and Diesel Oxidation Catalysts (DOC) control efficiencies in an actual production setting - was so beset by problems as to cause one to wonder if study objectives were compromised. Nevertheless, the Phase II study experience underscores two important points: that such vast differences exist between isozone ("laboratory") conditions and a real time production environment as to severely limit the conclusions that can be drawn from laboratory studies, even when they are conducted in a working underground mine.

Second, besides the fact that fundamental questions still remain about DPF durability and reliability, DPFs coated with platinum- based catalysts are not ready for the underground diesel market. This is because, in helping alleviate one health problem, DPM, they create another problem, elevated exposure to nitrogen dioxide (NO_2). This finding reinforces statements expressing concern about DPFs made by NSSGA in previous oral[6] and written testimony[7]. In light of this problem alone, MSHA's support of DPFs as the DPM control measure of choice is both troubling and mystifying. NSSGA cannot support DPFs until the NO_2 issue is resolved and other concerns, including but not limited to their durability and reliability are determined.

We also note that DPFs are a technology currently quite limited in the scope of their application. The mobile equipment selected for testing at the Stillwater mine was carefully selected, in part, to support passive regeneration, the only regeneration mode considered feasible by NSSGA and, apparently, by Stillwater, too. Many more pieces of DPM-emitting diesel equipment are in use there for which DPFs are unsuitable. Unless technology improves to the point of feasibly addressing DPM on these vehicles, DPM levels in operations with this equipment are likely to remain difficult to control, especially in underground stone mines with ventilation levels lower than those seen in metal mines, such as Nye.

Dr. Gerald Chase's evaluation of the NIOSH/NCI preliminary DPM health effects data from the eight-mine study suggests lung cancer is not a problem in this worker population. If this conclusion stands up after the final report of this highly scrutinized, well-controlled study is in, it will cast a long shadow of suspicion over the credibility of that part of MSHA's quantitative risk assessment dealing with lung cancer that the Agency relied upon in its DPM rulemaking, especially in setting the permissible exposure limits (PELs). Industry stakeholders, including NSSGA, have previously raised serious questions about this risk assessment. Further, since MSHA banned worker rotation as an administrative control because of what the Agency determined

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[6]National Stone, Sand & Gravel Association, *Oral Testimony to MSHA on its Proposed Rule for Diesel Particulate Matter Exposure of Underground Miners,* October 7, 2003.

[7] National Stone, Sand & Gravel Association, *Testimony to the Mine Safety and Health Administration on its Proposed Rule for Diesel Particulate Matter Exposure of Underground Metal/Nonmetal Miners,* Oct. 13, 2003.

was a link between DPM and lung cancer, this decision would be undermined, and, as a result, we would expect the ban on worker rotation to be rescinded.

NSSGA's conclusion from reviewing the respirator protection study is that the mining industry's high level of compliance with regulatory provisions for respirator use demonstrates the industry's sophistication as a user of respirators. As such, from the perspective of operator compliance with rules governing respirator use, respirators represent a viable control option for DPM in underground stone mines.

In summary, NSSGA urges MSHA to establish 308 ug/m^3 EC as the final PEL, and to combine this rulemaking with a rulemaking that would eliminate the final existing PEL of 160 ug/m^3 total carbon or its EC equivalent. We also urge the Agency to allow sufficient time for operators to come into compliance with the 308 ug/m^3 EC PEL without resorting to enforcement action, and allow worker rotation as a viable means to comply with the final PEL. NSSGA also endorses the comments submitted by the MARG Coalition during this record reopening period. A brief description of each document follows.

Comments on the Documents

The Effectiveness of Selected Technologies in Controlling Diesel Emissions in an Underground Mine - Isolated Zone Study at Stillwater Mining Company's Nye Mine, January 5, 2004 {Phase I study]

The purpose of the NIOSH/Stillwater study was to determine the effectiveness of selected technologies in controlling diesel emissions in an underground mine operated by the Stillwater Mining Co. The study, conducted in May 2003, evaluated diesel particulate filter (DPF) systems, effects of biodiesel blends, differences in #1 and #2 diesel fuels, and a selection of diesel oxidation catalysts (DOC).

The following six DPFs were evaluated: Engelhard DPX 9308, Clean Air Systems FPA 158W, DCL Blue Sky 3211-SA-6CG1-21, Mac's Mining Repair/Donaldson P604516, ECS CT 28 Cattrap, and the DCL MineX 5C57 11.

Elemental carbon (EC) analyses of the samples collected in the torque converter stall (TCS) mode indicated effective removal efficiencies of diesel particulates using DPFs. However, the results were not achieved without serious complications. First, four of the six DPFs systems tested were determined by the mine operator, Stillwater, to be impractical or infeasible for their operations.

Cost rendered two of the DPF systems infeasible. The Clean Air Systems FPA 158W, which uses a fuel borne catalyst (FBC), was estimated to cost $15, 000/month to provide to

the entire Stillwater fleet. Stillwater also found economically infeasible the initial and replacement costs of the ECS CT 28 Cattrap ($8,300 plus $6,000 for a replacement filter).

Major modification/retrofitting problems and equipment failure were cited as fatal deficiencies of three DPF systems. The DCL Blue Sky 3211-SA-6CG1-21 had to be removed from the Stillwater equipment due to failure of an on-board heating element. Another major problem with this DPF, an active regeneration system, was that a source of electric power was not available at the majority of the mine's production zones. Further complicating the logistics of regenerating the DCL Blue Sky DPF was the mine's procedure of not returning its mobile equipment to a central station after a work shift. Mac's Mining Repair/Donaldson P604516 filter system and the ECS CT Cattrap were determined to have major obstacles associated with their implementation due to their size and/or relatively short (100-hour) life span.

Second, certain DPF and DOC systems tested exhibited increased ambient concentrations of NO_2; that is, between a 180-270% increase associated with DPFs and a 26% increase for DOC. In some airborne exposure results, the normalized peak concentration of NO_2 exceeded MSHA's 5 parts per million (ppm) Short Term Exposure Limit (STEL) for NO_2.

The source of the elevated NO_2 concentrations were attributed to the platinum-based catalyst wash-coated on some of the filters to lower the combustion temperature of the soot in the filter and thus enhance passive regeneration. Unfortunately, the DPF systems otherwise deemed feasible for use on certain equipment at the mine used either the Engelhard DPX 9308 filter or the DCL Mine X 5C57 11, both of which contain platinum-based catalysts. Both are passive regeneration systems. The Clean Air System unit also contained the platinum-based catalyst.

Regarding differences in DPM emissions between #1 and #2 diesel fuels, while #1 burns cleaner than #2, #1 fuel oil is significantly more expensive than #2 and thus may not be considered economically feasible at some mines, even though it is used at the Nye operation. As for biodiesel blend fuels, while they were shown to achieve a 26-48% reduction in ambient DPM emissions from #2 diesel fuel, both purchase price and the cost of storage and blending are likely to render this fuel alternative cost-prohibitive.

In summary, the work conducted by NIOSH/Stillwater at the Stillwater Nye Mine is a useful contribution to the small database of research directed at finding "practical mine-worthy" DPM control technologies. But the results, however promising, do not demonstrate that DPFs have reached the point where they can be considered a reliable, long-term control of DPM emissions.

An Evaluation of the Effects of Diesel Particulate Filter Systems on Air Quality and Personal Exposure of Miners at Stillwater Mine Case Study: Production Zone, March 26, 2004. [Phase II study]

The NIOSH/Stillwater Phase II study evaluated the effects of DPF and DOC/muffler systems on air quality and personal exposure to DPM at the Stillwater mine. The objective of this study was to quantify the effects of selected DPF and DOC/muffler systems on the ambient concentrations of elemental carbon and selected gasses in an actual mine setting during actual production conditions.

As was the case in the Phase I study, the researchers found that DPF systems are effective in achieving significant reductions in DPM emissions. However, this study was beset by problems that might limit the conclusions that can be drawn from it. As expected, NO_2 levels soared, since both DPF systems tested contained platinum-based catalysts. In fact, after levels twice exceeded 5 ppm, personnel in the study area had to be evacuated, and specific test results on two days were invalidated. The original study plan to conduct six tests, three with DPFs and three with DOCs and mufflers, had to be scrapped because of the NO_2 problem and technical problems with one of the test vehicles. A mine engineer, who conducted his own ventilation test on two days with a vane anemometer, took issue with the results of ventilation test readings obtained by the researchers using different instrumentation. The issue was never resolved. Ventilation test results were compromised on the first day of testing when monitoring equipment was found to be located inappropriately; the same haul trucks were not available throughout the course of the week-long study and substitutions had to be made; a personal sampling test result for carbon on the LHD operator could not be obtained because a sampling pump failed; no results for carbon monoxide, nitrogen oxide and NO_2 were available for test #3 due to a failure to initiate the logging session.

Although DPF systems performed well in reducing DPM emissions, ambient EC concentrations at downstream locations exceeded the 308 $\mu g/m^3$ EC, the proposed PEL, in both cases when three test vehicles were equipped with DPF systems. Additionally, a personal sample result was well above the final DPM PEL (corrected for EC) of 123 $\mu g/m^3$ EC.

The authors' own conclusions [8] point out the limitations of the Phase II evaluation:

> These studies also demonstrated that considerable effort is needed to select and optimize DPF systems for individual mining applications, [and] Due to the nature of the study, Phase II did not address other and no less important matters related to the implementation of DPM control technologies in underground mines. These matters include

[8] Bugarski, Aleksandar, et al., Phase II study, pg. 4.

selection of DPM regeneration strategies, economic, logistical, and technical feasibility of implementation of various DPF systems of mining vehicles, and the reliability and durability of the systems in mine settings. Addressing those matters would require a different and more comprehensive type of feasibility study yet to be performed.

Characterizations of Lung Cancer in Cohort Studies and a NIOSH *Study on Health Effects of Diesel Exhaust in Miners*

On November 5, 2003, NIOSH/NCI unveiled preliminary results of their "Study on Health Effects of Diesel Exhaust in Miners". In his evaluation of the preliminary data, Dr. Gerald Chase, a statistician and epidemiologist, concluded that, based on the number and pattern of lung cancer deaths reported in the study, there appears to be no risk of increased lung cancer deaths when compared to reference populations of the same demographics. Dr. Chase said his conclusions were the same regardless of whether reference mortality data were from the entire U.S. or the states and counties where the eight study mines were located. Similar mortality studies of miners conducted from various countries, including the U.S., all indicate no significant excess of lung cancer due to diesel exhaust exposure, he added. If the assumptions used by NIOSH/NCI in their preliminary data are correct, the number of lung cancers reported are notably less than would have been predicted, Dr. Chase said.

U.S Department of Labor, Bureau of Labor Statistics, and National Institute for Occupational Safety and Health, *Respirator Usage in Private Sector Firms, 2001*

Although the *Respirator Usage in Private Sector Firms (2001)* seems to lack direct relevance regarding exposure to DPM, it is informative with respect to respirator usage as a whole within the mining industry. According to the Bureau of Labor Statistics (BLS), 82% of firms in the mining industry reported both the highest rate (82%) of worker respirator training, and the highest rate (50%) for determining which respirators are appropriate for substances faced by employees through air sampling[9]. Respirator use in mining is the lowest among the industry sectors studied (8,396), being dwarfed by the top two industries, construction (153,857) and manufacturing (100,942)[10].

The BLS data support the conclusion that the mining industry is a sophisticated, albeit small, user of respiratory protection. Clearly then, respirators are a viable control option in mining in general and in the control of DPM exposure in particular.

[9] BLS/NIOSH, Text Table 6, pg. 7.
[10] BLS/NIOSH, Table 1, pgs. 10-11.

NSSGA wishes to thank MSHA for the opportunity to comment on the issues at hand.

Respectfully submitted,

James Sharpe, M.Ed., M.S., CIH
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Attachment

Cc: Mike Neason, Chair, NSSGA Diesel Task Force
Ed Elliott, Vice Chair, NSSGA Diesel Task Force