

MINUTES

MINE SAFETY AND HEALTH RESEARCH ADVISORY COMMITTEE (MSHRAC) MEETING JUNE 8, 2015, 9:30 AM – 2:30 PM TELECONFERENCE/WEBINAR

COMMITTEE MEMBERS & ATTENDEES PRESENT

Dr. Cecile Rose, Professor, Department of Medicine, National Jewish Health and University of Colorado, Chair of MSHRAC, called the meeting to order. The following members were present:

Mr. Brent Chamberlain, Consultant, Scorpio Gold Corp.

Mr. Dennis O'Dell, Administrator for Occupational Health and Safety, United Mine Workers of America

Dr. Jeffery Kravitz, Chief, Scientific Development, Mine Emergency Operations, Mine Safety and Health Administration

Mr. Emmett Russell, Director, Department of Safety and Health (Retired), International Union of Operating Engineers

Mr. Kelly F. Bailey, Director, Safety, Health and Environmental Services, Vulcan Materials Co. (signed off of the meeting at 10:45 am and signed back on to the meeting at 1:08 pm)

Dr. Richard J. Fragaszy, Program Director, Division of Civil, Mechanical and Manufacturing Innovation, National Science Foundation

Mr. Michael Wright, Director of Health, Safety, and Environment, United Steelworkers of America

Dr. Anthony Iannacchione, Associate Professor and Director, Mining Engineering Program, University of Pittsburgh

Dr. Hugh Miller, Associate Professor, Department of Mining Engineering, Colorado School of Mines

Dr. Aubrey Miller, Senior Medical Advisor, National Institute of Environmental Health Sciences, National Institutes of Health

Mr. Jeffrey Welsh, NIOSH, Designated Federal Officer

The following attendees were also present:

Mike Parris	Walter Energy
Dale Drysdale	NSSGA
Joe Casper	NSSGA
David Maust	Strata Worldwide
Jessica Jurasko	Jackson Kelly
Willa Perlmutter	Crowell & Moring
Dan Cummings	Barrick Gold
Joseph Hirschi	Illinois Clean Coal Institute
Mark Ellis	IMA-NA
Paul Borchick	Consol Energy
Joseph Riney	Nevada Mining Association
Kenny Murray	Alliance Coal, LLC
Maria Maza	JH Fletcher & Company
Henry Chajet	Jackson Lewis
Jessica Kogel	IMERYS
Allen Dupree	Alpha Natural Resources
Thomas Todd	Murray Energy
Joe Lamonica	URS – Consultant
John Decker	CDC/NIOSH
Gladys Lewellen	CDC Committee Management
Gerry Finfinger	URS – Consultant
Jeff Welsh	CDC/NIOSH – DFO
John Howard	CDC/NIOSH
Lew Wade	URS – Consultant
David Weissman	CDC/NIOSH
Marie Chovanec	CDC/NIOSH
RJ Matetic	CDC/NIOSH

Pam Drake	CDC/NIOSH
Dave Yantek	CDC/NIOSH
Gerrit Goodman	CDC/NIOSH
Drew Potts	CDC/NIOSH
Brad Seymour	CDC/NIOSH
Linda McWilliams	CDC/NIOSH
Maryann D'Alessandro	CDC/NIOSH
Susan Moore	CDC/NIOSH
Bob Randolph	CDC/NIOSH
Art Miller	CDC/NIOSH
Mike Jenkins	URS – Consultant
Dana Willmer	CDC/NIOSH
Jonisha Pollard	CDC/NIOSH
Pete Kovalchik	CDC/NIOSH
Lewis Martin	CDC/NIOSH
Adam Smith	CDC/NIOSH
Lisa Steiner	CDC/NIOSH
Jack Trackemas	CDC/NIOSH
Jim Noll	CDC/NIOSH

Jeff Welsh explained that MSHRAC members participating in the meeting must be free from conflicts of interest. He asked members to declare conflicts of interest prior to the start of both the morning and afternoon sessions of the meeting. There were no conflicts from members reported. He stated that this meeting will be used for informational purposes only since it is a teleconference/webinar.

Dr. Rose read the minutes from the last meeting and Kelly Bailey moved to approve the minutes as written. Hugh Miller seconded the motion, and it was passed unanimously. Dr. Rose thanked the NIOSH staff for arranging the teleconference/webinar and stated that a date would be tentatively selected for the next face-to-face meeting and that committee members will be able to submit agenda items for the next meeting.

DR. JOHN HOWARD, REPORT FROM THE DIRECTOR, NIOSH

Dr. Howard welcomed the committee members and extended his appreciation to the members whose terms expired in December 2014 but who have accepted administrative extensions of 180 days. He apologized for the delay in seating the new MSHRAC members. He stated that he would like to support several phone or face-to-face meetings per year. He reported that the Spokane Mining Research Division (SMRD) is up and running and expressed his thanks to the first interim director, Jeff Whyatt, who retired in April, and the second and current interim director, Pam Drake. SMRD is an integral part of the mining program.

He reported that he has been working diligently to identify a new Associate Director for Mining (ADM). A number of candidates have been interviewed and NIOSH is in the process of preparing to make an offer to a new Associate Director for Mining and a new permanent director for the Spokane Mining Research Division. He thanked RJ Matetic, Jeff Welsh, Lew Wade, and Gerry Finfinger for keeping the mining program in good order. He is hopeful that he will be able to announce the selections for the new ADM and SMRD director by the end of June.

DR. RJ MATETIC, REPORT FROM THE PITTSBURGH MINING RESEARCH DIVISION, NIOSH

Dr. Matetic discussed: 1) the Pittsburgh mining program's priorities due to regulatory agendas; 2) the research portfolio funding levels related to the different mining sectors; 3) the current research program portfolio and 4) current and future research impacts for the coal, metal/nonmetal and stone, sand and gravel sectors.

Several of the priorities due to regulatory agendas were addressed and included:

1. The publishing of reports (2009-2011) related to proper training (setup, use, maintenance and decision making) for using refuge alternatives.
2. The publishing of reports (2014-2015) associated with purging, airlock contamination, temperature and humidity of refuge chambers as well as built-in-place refuge alternatives.

3. The continuous personal dust monitor (CPDM) 3700, which is a real time respirable dust monitor, has been certified by NIOSH and 1800 units have been ordered to aid in reducing respirable dust exposures.
4. The development of control technologies for reducing respirable coal dust exposures. A dry stand-alone scrubber, which can reduce respirable dust concentrations by over 90%, has been constructed, lab tested, and is currently being evaluated in the field. In addition, NIOSH-OMSHR is working with Fletcher, Inc. on a 3rd generation canopy-air-curtain to reduce respirable coal dust to roof bolting machine operators.
5. The development of a hydrophobic rock dust to prevent caking of rock dust when wetted and dried and to ensure rock dust dispersibility in mitigating coal dust explosions. In addition, any potential health effects of the hydrophobic rock dust and the generation of respirable dust during application and re-entrainment from vehicle movement is currently being investigated.

The current and future impacts mentioned in the presentation included:

- Wireless monitoring system to detect proper machine guarding and personnel location.
- ErgoMine App for ergonomic audits.
- EVADE 2.0 software to expand Helmet-CAM to evaluate diesel and noise as well as respirable dust exposures.
- Real-time networking area diesel particulate matter (DPM) monitor to be used as a tool to reduce DPM exposures.
- Bit sleeve to reduce roof bolting machine operator exposures to respirable coal dust.
- Area lighting to reduce roof bolting machine walk-through area hazards.
- Hazard recognition for stone, sand and gravel mines and proper training in the identification of the hazards.
- Characterizing emissions from Tier 4 engines.
- Jumbo drill noise reductions.

Questions and Answers:

Question: What does the real time area networking DPM monitor measure?

Response: The instrument operates from a similar technology (laser absorption) as the Airtec (wearable real time DPM monitor) and measures the concentration of elemental carbon (EC).

Question: The current standard is total carbon (TC). This instrument may be a good tool but will not be useful for compliance?

Response: This instrument is designed to be used as an engineering tool to help reduce DPM exposures. It will have the capability to be setup in different areas of the mine and operate for a month without the need for maintenance. It can also be connected to the mine's communication system to provide real time DPM concentrations to a central station underground or on the surface. This could assist in identifying areas of concern, implementing ventilation, and using administrative controls. Even though this instrument measures elemental carbon, mines can still estimate the total carbon concentration. A mine could use the conversion factor calculated from data from 14 metal/nonmetal mines. In a recent study, NIOSH found a consistent conversion factor (+18% 95% of the time) for the 14 metal/nonmetal underground mines tested (James Noll, Stewart Gilles, Hsin Wei Wu & Elaine Rubinstein "The Relationship Between Elemental Carbon and Diesel Particulate Matter in Underground Metal/Nonmetal Mines in the United States and Coal Mines in Australia" Journal of Occupational and Environmental Hygiene Volume 12, Issue 3, 2015, pp 205-211). A mine could also develop its own conversion factor by collecting EC and TC (NIOSH 5040) samples in areas of the mine away from potential interferences. A conversion factor can be entered into the instrument for automatic calculation of the TC from EC.

Question: Will metal/nonmetal research be able to transfer to coal?

Response: Some of the work for metal/nonmetal could transfer to coal mines (for example, wireless monitoring system and the Tier 4 engine characterization).

Question: Where is NIOSH in the study of the effects of rock dust to the CPDM?

Response: A protocol has been written and is currently being reviewed by the rock dust partnership. We are searching for a field site to complete the study.

Question: What are the sources of injuries for the fatalities for stone, sand and gravel (SS&G)?

Response: Below are the top sources of fatalities for SS&G. A MSHRAC committee member can request the complete list from NIOSH-OMSHR if interested.

Stone, Sand, and Gravel

Top 5 sources of fatalities for 2009-2014

1.	Caught in-under-between a moving and stationary object	12
2.	Struck by falling object	11
3.	Caught in-under-between running or meshing object	8
4.	Drowning	6
5.	Caught in-under-between collapsing material or buildings	6

Top 3 sources of fatalities for 2014 – 18 total

1.	Caught in-under-between a moving and stationary object	4
2.	Struck by falling object	3
3.	Struck against moving object	2

MS. PAMELA DRAKE, REPORT FROM THE SPOKANE MINING RESEARCH DIVISION, NIOSH

Pamela Drake gave an overview about the recent formation of the Spokane Mining Research Division (SMRD). In April 2014, Dr. Howard established the SMRD and in March 2015, the reorganization package was officially approved. The mission of the SMRD is to conduct health and safety research specifically targeting the needs of the Western Mines. The NIOSH organization in Spokane contains more than just the new mining division. The Western States Division was also established during the recent reorganization. With the co-location of these two divisions in Spokane, it presents possible opportunities for collaborations between divisions. The SMRD is moving forward with an aggressive recruitment program to hire additional engineers, scientists, and technicians with a current goal of increasing the research staff to approximately 50 employees. The research program for FY15 includes two ongoing projects – “Ground Control Safety for Deep Vein Mines” and “Coal Mine Safety Applications of Seismic Monitoring”; and two pilot projects – “Smart Ventilation to Control Airborne Pollutants” and “Optimized Ground Support to Improve Safety in Underground Metal Mines”. The “Smart Monitoring and Control of Airborne Pollutants” is currently a pilot project but a full peer-reviewed proposal for FY16 is being developed. The hypothesis of this research is that real-time monitoring and analysis of atmospheric quality can be used to remotely trigger localized engineering controls, in order to treat localized hazards. The goal of this research effort is to build and demonstrate a smart monitoring system that will effectively engage countermeasures to reduce contaminant concentrations. Over the next year, the emphasis of the pilot project “Optimized Ground Support to Improve Safety in Underground Metal Mines”, will be to understand the problems associated with the design, installation, and maintenance of durable ground support systems. The current seismic monitoring project ends in September and a new project “Dynamic Failure of near Seam Features in Coal and Nonmetal Mines” is being developed. The objective of this project is to develop strategies for identifying and managing geologic features that increase the risk of dynamic failures in underground coal and nonmetal mines in bedded deposits. In consultation with mining stakeholders throughout the Western United States, SMRD has been working on a five-year strategic plan that clearly defines the mission of Western mining research activities. The critical next steps for this new Division are to fill key leadership positions from the Division Director to the Team Leaders. We would appreciate any input from MSHRAC they have to offer to guide the future direction of the new Division.

MR. JEFFREY WELSH, REPORT FROM THE DIVISION OF MINING SCIENCE AND TECHNOLOGY, NIOSH

Mr. Welsh presented an update on two activities conducted in the Office of Mine Safety and Health Research (OMSHR), Division of Mining Science & Technology. Under the MINER Act of 2006, OMSHR was provided the authority to: 1) award competitive grants to institutions and private entities to encourage the development and manufacture of new technologies and equipment designed to enhance mine safety and health, and 2) establish

an interagency working group to share technology and technological research and developments that could be utilized to enhance mine safety and accident response.

The OMSHR Technology Contract Program, FY2015 Broad Agency Announcement (BAA) Solicitation, is currently in process. The BAA requests concept papers to conduct research, exploratory development, testing, or evaluations of new technologies to improve mine safety, or to adapt technologies from other industries for application in mining environments. The priority areas for the 2015 solicitation were: 1) Remote detectors for methane gas; 2) Intrinsically safe absolute pressure sensors for mine atmosphere; 3) Economically viable stopping/door systems for built-in-place refuge alternatives; 4) Permissible, non-invasive rock property tools; 5) Compact, high-capacity dust collectors; and 6) Reduced noise fans for use in underground mines. Thirty-eight New Concepts were received. Of those, 12 Full Proposals were requested. The 12 Full Proposals have been reviewed and evaluated, and funding decisions will be made this June. In addition to the Technology Contract Program, OMSHR has Capacity Building Initiatives in the Ventilation Engineering and Ground Control Engineering areas to address important mine ventilation and ground control health and safety issues respectively, and to develop a new cohort of mine ventilation and ground control experts through graduate education. The first Ventilation Engineering Awards were in 2009 (7 awards), and the second round in 2014 (7 awards). The first Ground Control Engineering awards were made in 2011 (8 awards). Each award is for 5 years at \$250K per year. Impact to date: 1) 59 grad students have received support, 2) 12 PhD. Conferred (5 Ventilation and 7 Ground Control), 3) 16 M.S. Conferred (14 Ventilation and 2 Ground Control), 4) 19 Faculty received support at 11 Universities. The Universities receiving contracts are: 1) University of Alaska, 2) South Dakota School of Mines & Technology, 3) University of Arizona, 4) University of Kentucky, 5) University of Nevada, Reno, 6) Virginia Polytechnic Institute & State University, 7) Colorado School of Mines, 8) West Virginia University, 9) University of Utah, 10) Pennsylvania State University, and 11) Missouri University of Science & Technology.

The first meeting of the OMSHR Interagency Working Group was held in Bruceton to discuss technologies being developed by federal agencies unrelated to mining that might have application to mine safety. In attendance were 1) NASA Ames Research Center, 2) DoD Defense Research & Engineering, 3) DARPA Strategic Technology Office, 4) US Army Research Laboratory, 5) US Army Communications & Electronics RD&E Center, 6) Naval Research Laboratory, Navy Center for Safety & Survivability, 7) DoE Sandia National Laboratories, 8) Department of Homeland Security Science & Technology Directorate, and 9) MSHA. As a result of the first meeting, a number of Interagency Agreements were developed and signed for collaborative research in areas such as Emergency Communications & Tracking, Refuge Chambers, Rescue Technology, and Mine Explosions. OMSHR plans to reconvene the Interagency Working Group this fall to discuss activities and results since the first meeting, and to determine what the next steps for the group should be.

(Q) Committee member Cecile Rose asked if we track what students are doing that have graduated under the capacity building initiative. (A) OMSHR does maintain a spreadsheet with information on each capacity building contract. Included is employer of each student following graduation, if available.

MR. DAVID YANTEK, UPDATE ON REFUGE ALTERNATIVES, NIOSH

Mr. Yantek delivered a presentation on OMSHR's refuge alternatives (RA) research including a brief review of prior RA research, an update on heat & humidity research that was performed in 2014, a summary of the RA research planned for the summer of 2015, and an overview of a new RA project that is planned to begin in the fall of 2015. The heat and humidity research from 2014 was aimed at developing a set of occupancy derating tables for mobile RAs. The tasks for this work involve testing a 23-person tent-type RA in OMSHR's Experimental Mine, developing and validating a thermal simulation model of the 23-person tent-type RA, and using the validated thermal simulation model to determine the maximum occupancy such that the conditions inside the RA do not exceed an apparent temperature of 95°F. Mr. Yantek discussed three improvements to OMSHR's heat and humidity test procedures that were used when testing the 23-person RA: (1) the test area used for the 23-person tests was larger than the previously used test area; (2) the moisture generated by OMSHR's simulated miners was increased from an average of 1 liter/simulated miner/day to 1.4 liters/simulated miner/day; and (3) automatic variable AC transformers were used to more accurately control the heat input. Mr. Yantek discussed results for tests conducted with the RA at its 23-person capacity according to MSHA's requirement for 15 ft of unencumbered floor space per miner, and with the RA at its "as sold" 30-person capacity. The test results indicated that the temperature rise per miner was roughly 0.7°F/simulated miner for both cases. Mr. Yantek also presented data showing that the thermal simulation model of the 23-person RA was able to predict the average RA internal temperature to within 1°F. Mr. Yantek also discussed plans to use of the validated model to benchmark the performance of OMSHR-developed simulated miners versus models of real miners. Mr. Yantek

discussed mine air/mine strata temperature measurements at mines across the US and the use of the acquired data to support the occupancy derating efforts. Mr. Yantek discussed OMSHR's plans for RA tests in the summer of 2015 including in-mine heat and humidity tests on a 6-person metal RA in support of a derating study on metal RAs; and preliminary investigations of contamination ingress, purging, air delivery, and heat buildup in OMSHR's recently constructed BIP RA. Finally, Mr. Yantek provided an overview of a new RA project proposal that includes research on RA heat and humidity, RA air delivery, BIP RA stopping/door designs, and integration of communications systems into RAs.

Two questions were asked by MSHRAC members: (1) Emmett Russell asked if industry has provided feedback on RAs that have been used and (2) Hugh Miller asked if the RA heat and humidity research was applicable to deep hard rock mines. At this point in time, RAs in underground coal mines have not been used in response to a disaster. Regarding the applicability of the heat and humidity research on RAs for underground coal mines to RAs for deep hard rock mines, the work is very applicable. The general heat transfer principals are similar for both underground coal and deep hard rock mines. The primary differences would be the construction details of the RAs and the thermal properties of the mine strata. These would be easily accounted for and would have a minor effect. One other possible difference for deep hard rock mines is the possibility of heat transfer to an RA from the mine strata in situations where the mine strata temperatures are much higher than the initial temperature of an RA.

DR. GERRIT GOODMAN, UPDATE ON ROCK DUST, NIOSH

Dr. Goodman discussed NIOSH research activities to improve the effectiveness of rock dust for inerting a propagating coal mine dust explosion. This included increased emphasis on rock dust particles less than 10 microns to provide sufficient surface area for inertization. In fact, a rock dust without these smaller particles was unable to successfully inert when mixed with pulverized Pittsburgh coal (PPC) and tested in the 20-Liter explosion chamber. It was only after these smaller particles were added to the rock dust that inerting became possible. To ensure that a sufficient number of these smaller-sized particles is present in the rock dust, a specific surface area designation can be employed. NIOSH laboratory testing showed that rock dusts with surface areas exceeding 2600 cm²/g successfully inerted coal and rock dust mixtures in the 20-Liter chamber. Dr. Goodman also discussed the addition of an obscuration probe to the existing dust dispersion chamber. This modification permitted comparisons of dust dispersibility for different rock dusts and rock dust treatments, i.e. hydrophobic additives. NIOSH recognizes that application of dry rock dust to mine surfaces can elevate respirable dust levels in the working environment. Wet rock dusting using a mixture of untreated rock dust and water can reduce these levels, although the law stipulates that dry rock dust must be applied after the wet rock dust layer dries so as to provide a dispersible rock dust layer. However, the time needed to dry is unknown and largely dependent upon mine conditions, potentially delaying application of a dry dispersible rock dust layer. Dr. Goodman discussed the development and use of treated rock dust slurries comprised of a treated (dispersible) rock dust, surfactant, water, and air as an alternative to wet dusting. The surfactant is used to arrest the hydrophobicity of the rock dust, allowing it to be mixed with water and aerated. Most importantly, NIOSH testing has shown that a treated rock dust slurry can disperse when dried, with dispersibilities of some slurries similar to those of an untreated rock dust. NIOSH research efforts continue to refine and improve the consistency of slurry formulations. Dr. Goodman discussed a research protocol to quantify respirable dust levels generated by dry applications of treated and untreated rock dusts and by applications of a rock dust slurry. In response to Committee questioning, he detailed recent efforts to arrange such in-mine evaluations of rock dusts and stated that NIOSH remains optimistic about scheduling these needed studies. Finally, questions have been raised regarding potential health implications from exposure to treated and untreated rock dusts. The Health Effects Laboratory Division (HELD) of NIOSH investigated the physical characterization of these rock dusts to identify the preferential residence of silica particles in the respirable size range. A preliminary report has been delivered to the Office of Mine Safety and Health Research and is currently in internal review. HELD is also assessing the toxicological impacts of exposures to these rock dusts by exposing cellular material to treated and untreated products and noting the development of any abnormalities. A report on their findings is scheduled for early summer.

MR. DREW POTTS, UPDATE ON SILICA EXPOSURES, NIOSH

Mr. Potts gave a presentation that summarized OMSHR research in the areas of crystalline silica control and monitoring in the mining industry. Control topics included a comparison between HEPA and MERV16 filtration for enclosed cabs, installation of a prototype filtration/pressurization system for a crusher operator booth and two control interventions for lowering respirable dust exposures during screen changes at a silica sand operation. Both HEPA and MERV16 filters were highly effective at removing respirable sized particulate from the airstream

but the MERV16 filters require fewer changes to maintain acceptable intake airflows. An evaluation of a prototype pressurization/filtration system for a crusher control room found that a system consisting of one pressurized intake filtration device and two recirculation filtration devices provided the best protection factor of 127. Each filtration device produced approximately 100 cfm of air and used MERV16 filters. The two screen changing dust control interventions included vacuuming the screen frame before removing the clips and a redesign of the frame to eliminate the clips. Both controls reduced exposures by 60%. Mr. Potts also discussed how Helmet-CAM technology was being used to assess respirable dust exposures and controls for mobile mine workers. The technology has been expanded to assess diesel, noise and chemical agent exposures. A new version of the supporting software, EVADE 2.0, now allows simultaneous assessments of multiple exposures and multiple workers. Finally, Mr. Potts reported on the progress to develop end-of-shift crystalline silica monitoring methods for coal and metal/nonmetal mines. The analytical technique under investigation is FTIR in transmission mode. A partial least square modelling method is used to improve agreement between estimated silica concentrations and those determined from laboratory analyses. Preliminary results indicate that one calibration strategy may be sufficient for coal mines but that multiple calibration strategies may be needed for other mining industries due to analytical interference from numerous minerals containing silicon. OMSHR is concurrently developing technology to make the estimation process more user-friendly through software development and enhanced sampling equipment.

Questions: After the presentation, three questions were asked by the MSHRAC members. Cecile Rose asked who is using Helmet-CAM for chemical exposures and what chemicals are being assessed. Mr. Potts replied that NIOSH-DART is exploring this technology and that he was uncertain of the specific chemicals that were being assessed. Michael Wright asked if the MERV16 filters, when compared to HEPA filters, may be letting the more dangerous smaller particles escape the filtration process. Jim Noll answered the question by stating that testing has verified protection factors for diesel particulate matter, which is in the submicron size range. Emmett Russell asked if CAT had incorporated NIOSH design criteria for its new equipment or as a retrofit package. Mr. Potts stated that he was only aware of CAT incorporating design criteria in its new equipment but saw no reason why the company could not utilize the information to provide better retrofit kits. Mr. Potts agreed to follow-up with more complete information to the questions in the near future.

Follow-up information for the three questions:

Who is using the Helmet-CAM for chemical exposure assessment and what chemicals are they measuring?

Response from Josh Harney (NIOSH - DSHEFS): I've used it in the lab a little bit looking at isopropyl alcohol (measured at total VOCs) getting familiar with the software, and I've used it in a machine shop evaluating task based exposures to metalworking fluids (measured at thoracic particulate). Had hoped to use it for styrene in a place that makes the big utility size windmill blades, but the company probably won't have us in for a survey until next year. I also talked about EVADE with the principal of a mid-sized IH consulting firm last week, while we were both at the IH conference, who's potentially interested in using it to look at flavorings (diacetyl; 2,5 pentanedione) exposures in a food processing plant.

Response from Kevin Dunn (NIOSH - DART): Using Helmet-CAM to monitor nanoparticle exposures.

Is CAT implementing NIOSH cab criteria for installation in new vehicles as opposed to offering a retrofit kit?

Response from Andy Cecala (OMSHR): CAT is offering the option for the improved "filtration and pressurization" design on some models of their new equipment. Our contact, Dan Spurgeon, who is the director of the HVAC division, greatly appreciated our presentation and visit last fall and would like us to continue to work with them to change Caterpillar's paradigm on how to provide the best air quality in their enclosed cabs. We will discuss retrofit kits with him in the near future.

When doing the HEPA versus MERV16 comparison, did you rely on particle counting and/or gravimetric sampling to determine protection factors? If you used particle counting, what was the size range of the smallest particles measured?

Response from John Organiscak (OMSHR): We primarily used particle counting. The size ranges that we analyze for and report are 0.3 to 1.0 micron. This also covers diesel particulate. However, Andy Cecala

(OMSHR) and Jim Noll (OMSHR) have done some gravimetric sampling for respirable dust and diesel, but their protection factor results are lower because of ingress and egress from the cabs during the shift.

MR. BRAD SEYMOUR, UPDATE ON METAL MINE GROUND CONTROL, NIOSH

Mr. Brad Seymour provided an overview of the current metal mine ground control research that is being conducted at the NIOSH facility in Spokane, WA. Ground falls are the leading cause of fatalities in underground metal mines and an important source of lost-time injuries. Because ground control issues are a critical concern for underground metal mines, this topic has historically been a major area of research emphasis at the Spokane facility. At the present time, we have one research project that is addressing ground control problems in underground metal mines, the Ground Control Safety for Deep Vein Mines project. The research on this project is being conducted in collaboration with the Hecla Mining Company at the Lucky Friday Mine in northern Idaho. Hecla is currently using underhand cut-and-fill mining methods to mine Ag-Pb-Zn ore from narrow, steeply dipping veins in the Gold Hunter deposit at the mine. Because this mining is being conducted at depths of more than a mile beneath the surface, the geology and ground stresses create unique requirements for mining and ground support. As a result, Hecla is undertaking special measures to limit the intensity of mining-induced seismic events and to avoid compromising the static and dynamic capacity of their ground support elements. To assist in these efforts, ground control research is being conducted in cooperation with NIOSH to assess the fault slip mechanisms that initiate these seismic events and to quantify and improve the performance characteristics of the ground support systems that are being used. Mr. Seymour provided a summary of the current research activities on this project including information about geotechnical instrumentation and data acquisition systems; strength property testing of rock, backfill, and shotcrete; large-scale testing of ground support systems; photogrammetry surveys of underground entries and fault locations; monitoring of mining-induced seismic events; and numeric modeling of mining-induced stresses, seismic events, fault slip mechanisms, and ground support systems. In addition, Mr. Seymour also discussed some of the unique technical advancements from this research and provided a list of the current publications and presentations during the past year.

MS. LINDA MCWILLIAMS, UPDATE ON MINING SURVEY, NIOSH

Ms. McWilliams presented an overview of the Mining Industry Surveillance System, a series of ongoing national surveys of mines and mine employees. Surveys will be conducted on a periodic basis with the resulting data being used to update denominator data for demographic and occupational subgroups. This ongoing surveillance system will provide current data that can be employed to guide the research and training activities of the NIOSH mining program.

The National Survey of the Mining Population, a probability-based sample survey of U.S. mining operations and their employees, was conducted by NIOSH in 2008. It was the consensus of MSHRAC that NIOSH should continue to conduct surveys of this type. At this year's MSHRAC meeting the successes and lessons learned from the first national survey were reviewed. Then Ms. McWilliams presented the current status of the Mining Industry Surveillance System. Surveys will be conducted on a rotating basis in the mining sectors aligned with mining associations – Coal, Metal/Nonmetal, and Stone/Sand and Gravel. Beginning in July 2016, each mining sector will be surveyed every three years. The first sector to be surveyed will be Stone/Sand and Gravel. It is anticipated that approximately 398 mines will be selected and will report data for about 1,350 employees. The survey questionnaire contains mine-level questions on work schedules and shift work, independent contractor employees, and safety training. The mine will be asked to provide data on job title, mining experience, primary work location, gender, and year of birth for no more than 10 employees. Ms. McWilliams then noted the project work that had been completed to date – sampling plans, data collection plan and materials, questionnaire, nonresponse questionnaire, non-research determination obtained from the NIOSH Institutional Review Board (IRB). The package to obtain the Paperwork Reduction Act clearance will be submitted to NIOSH by August 2015.

Questions and Answers:

Mike Wright asked about the way that we plan to obtain the sample of 10 employees for mines with more than 10 workers? He also asked if there are plans to validate the number of sampled miners? He asked if the employee level questions are confidential? He asked if personal experience information would be asked with safety questions? He asked what prompted OMSHR to begin the survey with the SSG sector? Mike also mentioned

that the USW is conducting an extensive survey of their mines and he said that it is difficult to get a good response rate.

- We would not be able to validate that the survey respondent chose the correct sample of employees unless we had the mine's list of employees.
- No data, such as names, etc. will be collected that would identify individual employees. Additionally, any data released by OMSHR will be in aggregated form.
- At this time, we are not planning to collect any personal experience information.
- We are beginning with the Stone/Sand and Gravel mining sector because our researchers have requested more information about these mining operations.
- It is very difficult to get a good response rate. We have reduced the burden from the 2008 national survey (fewer questions and fewer employees to sample) in order to try to increase the response rate.

Cecile Rose stated that MSHRAC is supportive of the survey. She asked if employee questions are easily answered if the employee worked in other commodities? She also asked if data collection with other parts of NIOSH (TWH, SMRD) was integrated into the survey? She stated that she is impressed with the breadth and depth of NIOSH epidemiologists.

- At the time each survey is fielded, we would only be able to collect information about employees working in their current mining commodity. Their mining or job title experience might span multiple commodities, but we would not have this information.
- OMSHR has shared the survey with other parts of NIOSH but no formal integrative data collection efforts have been initiated.

DR. MARYANN D'ALESSANDRO, UPDATE FROM THE NATIONAL PERSONAL PROTECTIVE TECHNOLOGY LABORATORY, NIOSH

Dr. Maryann D'Alessandro provided an overview of NIOSH National Personal Protective Technology Laboratory (NPPTL) activities that support mining occupational safety and health. The National Personal Protective Technology Laboratory (NPPTL) was established, by Congress in 2001, by HR 2764, Public Law 110-161 (Included Dept. of Labor, HHS, Education, and related agencies appropriations). It has become one of two major Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) operations in Pittsburgh, PA, and in 2011 operations were expanded to include personnel and laboratories in Morgantown, WV. The program fiscal resources (~\$15.5 million annual base budget) and personnel resources (~85 full time staff) enable NPPTL to make positive contributions to workplace safety and health across all industry sectors.

The NIOSH National Personal Protective Technology Laboratory (NPPTL) conducts respiratory protective device conformity assessment to support mining occupational safety and health. A summary and status update of the activities underway is provided below.

1. Closed Circuit Escape Respirator Rule, 42 CFR 84, Subpart O

In March 2012, the Department of Health and Human Services (HHS) published a final rule (42 CFR 84, Subpart O) establishing a new standard for the NIOSH certification of closed-circuit escape respirators (CCERs). The new standard was originally designed to take effect over a 3-year transition period. HHS determined that extending the concluding date for the transition is necessary to allow sufficient time for respirator manufacturers to meet the demands of the mining, maritime, railroad and other industries. NIOSH is extending the phase-in period until 1 year after the date that the first approval is granted to certain CCER models. The final rule is in clearance at HHS.

2. Respirator Certification Activities under 42 CFR 84, Subpart O

NIOSH has continued to work closely with manufacturers to develop respirators that can be approved under the new Subpart O standard.

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- Two CAP 1 (~ 10 minute unit) non-mining approvals have been issued:
Avon *TC-13G-001 (7/24/2014)* and Ocenco *TC-13G-002 (12/2/2014)*
- NIOSH issued *TC-13G-003* to Avon for a Cap 1 mining unit May 13, 2015.
- Another Cap 1 mining application was received April 30, 2015 and is currently being evaluated.
- One Cap 3 mining application was denied May 6, 2015.

Cecile Rose asked if the manufacturer for the Cap 3 application that was denied would be resubmitting their application. The manufacturer is reassessing and the hope is that they will resubmit.

3. Respirator Correlation Testing under 42 CFR 84, Subpart O

NIOSH offers manufacturers the opportunity to have a product evaluated to the NIOSH requirements prior to submitting an application for approval to assess the product's likelihood to meet the NIOSH requirements. This activity is tracked and managed as Correlation Testing. Since April 2012, we received 21 correlation testing requests and completed 18.

4. Escape Respirator Post Market Evaluation

NIOSH evaluates certified respirators to demonstrate that the products continue to conform to NIOSH requirements. In the mining environment this activity is known as the Long Term Field Evaluation Program (LTFE).

NIOSH is exploring alternative approaches to (1) collecting products for evaluation and (2) disseminating the evaluation findings. NIOSH continues its development of a standardized reporting format for mining users and manufacturers to expedite the approval and dissemination process. The current LTFE respirator collection activity is a labor and time intensive process. One full-time employee travels to mines throughout the country to collect and replace the respirators prior to returning to Pittsburgh to test the units collected. Since MSHA requires mines to assess 1% of their units annually, NIOSH is exploring opportunities to leverage this MSHA requirement to facilitate respirator collection and evaluation for the LTFE. NIOSH is collaborating with MSHA to determine the best path forward for this evaluation.

Additional staff has been added and continues to be trained for the LTFE activity. The LTR1 report and fact sheet remain in the clearance process. LTR2 and LTR3 testing has been finished, but the reports have not been completed.

5. Combination Unit Respirator Standards Development

NIOSH commissioned the National Academies' Institute of Medicine (IOM) to convene a public workshop on April 30, 2015 on the use of combination unit respirators and the development of a performance standard for this type of respirator. This type of respirator has applicability in the mining environment, where there may be a need to switch from one type of device to another (e.g. short duration closed circuit self-contained self rescuer (SCSR) to longer duration open circuit self-contained breathing apparatus (SCBA)). MSHA participated in the workshop and described mining needs for combination unit respirators. The IOM will deliver NIOSH a workshop summary by July 2015 as an input to the NIOSH strategy for updating the regulatory requirements for this type of respirator.

DR. DAVID WEISMAN, UPDATE FROM THE DIVISION OF RESPIRATORY DISEASE STUDIES, NIOSH

Dr. Weissman first presented an update on the Coal Workers' Health Surveillance Program (CWHSP). The program was originally authorized by the Federal Coal Mine Health & Safety Act of 1969. Surveillance is offered to miners at entry into coal mining and then at approximately 5 year intervals thereafter if the miner is still engaged in coal mining. Entitlement to surveillance was previously limited to underground coal miners and focused on providing chest radiography to screen for coal workers' pneumoconiosis (CWP). MSHA's Coal Mine Dust Rule of 2014 extended the opportunity to participate in surveillance to surface coal miners and added respiratory symptoms assessment and spirometry to the surveillance services offered. Since then, a major focus

for NIOSH has been to implement these changes. Regulations were developed to provide a framework for the effort. NIOSH worked with MSHA to communicate information about the program and posted information on the web for mines, miners, and medical facilities. There has been an excellent response and by April 2015 about 60% of surface mines had approved surveillance plans to provide chest radiography to surface miners. Work has also been done to increase capacity. In 2009, there were 31 approved, active medical facilities participating in the surveillance program. In 2015, there were 120 "brick and mortar" and 3 mobile providers. In addition, NIOSH has acquired a new mobile medical unit based in its Spokane, WA facility that can participate in outreach efforts and is recruiting personnel to manage the increased work flow of the program. NIOSH is also working to implement spirometry testing in the program. A new electronic system is being developed that can receive data from providers, be used to evaluate test quality and interpret tests, to report results to miners, and to provide data security to protect confidentiality. Beta testing should start in the next few months and it is anticipated that approval of facilities to provide spirometry services should begin late in 2015 or early in 2016. In view of the addition of surface coal miners to the surveillance program, NIOSH mobile outreach efforts in 2014 focused largely on the Western U.S., as will NIOSH efforts in 2015. Dr. Weissman then provided an update on the project "Characterizing the Burden of Disease and Improving Health Among Metal and Nonmetal (MNM) Miners." The average age of these miners in 2008 was 41 for metal and 42 for nonmetal miners. They face challenges such as physical hazards, long work hours, and remote locations. Yet a recent review of the literature found little documentation of their health status. The project proposes to work with partners to assess the health status of MNM miners, identify risk factors that are potential opportunities for intervention, and to evaluate and improve interventions. It is hoped that the project will help to identify the most important research needs of the MNM mining sector and ultimately help in developing data-driven interventions to improve the health of miners. There was a question about the number of surface coal miners; the slides show that there are about 56,000. There was a question about improving the percentage of surface coal mines that have surveillance plans. It was noted that participation of all mines in surveillance occurs over a 5-year cycle and that, working with MSHA, we expect to enroll additional mines over this initial 5-year cycle, aiming to achieve a percentage of mines with approved surveillance plans paralleling that for underground coal mines (better than 90%). There were several questions/comments about the MNM project. It was noted that the Steelworkers had an Alpha Foundation project to provide health screening and that achieving high participation rates was a challenge. It was asked if the project would provide health assessments to processing workers as well as miners; the answer was that would be possible, depending on arrangements with partners participating in the project. It was asked if comments on a Federal Register Notice posted in relation to the project could be submitted after the deadline later in the month; the answer was that stakeholder input was critical to the project and they would be considered. It was asked if the project would be reviewed by the Institutional Review Board; the answer was yes.

PUBLIC COMMENTS AND QUESTIONS

Mark Ellis from IMA-NA asked: What type of institutional review panel process did the M/NM TWH study go through? Answer: It went through IRB and other routine types of review. Any substantial changes would require additional reviews.

Henry Chajet from Jackson Lewis asked: Have we developed a method to determine the silica content and particle size of results over the PEL obtained with the coal instantaneous sampler? Answer: We have not evaluated methods to determine the silica content or particle size distribution of compliance samples collected with the CPDM. Determining the size distribution of particles on a singular filter substrate is a difficult proposition thus the invention of such devices as multi-stage impactors to accomplish this task. The CPDM has a size-selective cyclone (Dewell Higgins) that limits collected mass to respirable-sized particles. The current filter media for compliance sampling with the CPDM is fiberglass, which would likely interfere with available technologies to determine crystalline silica content. We have experimented with a PVC filter media that would allow you to determine crystalline silica content using the P7 method; however, this filter media is not certified for compliance sampling.

Henry Chajet from Jackson Lewis asked: How does the surveillance system tie into the proposed metal and non-metal health study under consideration? Answer: The two systems are complementary. This surveillance system can be used to establish denominator numbers (for instance, number of miners in each job classification) which can be used to determine rates of illness and injury. The earlier survey results have already been used by the health surveillance researchers to estimate prevalence.

FISCAL YEAR 2014 PROJECT SUMMARIES

The committee had a general discussion about the 2014 OMSHR project summaries. It is NIOSH's hope that after review by individual members, these summaries would be further discussed at the next face to face MSHRAC Meeting.

NIOSH would hope that such discussion would result in feedback to NIOSH such as:

1. High priority project, should be pursued.
2. Low priority project, should be modified or dropped from consideration.
3. The following ideas are important but missing from the projects presented, project proposals should be developed in these areas.
4. Specific projects should be modified as follows.

NIOSH looks forward to MSHRAC's feedback.

GENERAL DISCUSSION AND FINDINGS AND RECOMMENDATIONS BY MSHRAC MEMBERS

There was general discussion of the issues among the members following each of the presentations. Specific discussion, findings, recommendations, comments, and requests include:

There was considerable interest from the MSHRAC Members regarding the status of obtaining a replacement for the Lake Lynn Laboratory (LLL).

While NIOSH will continue to pursue the LLL, we will also be pursuing the following alternatives:

1. Locate another facility that would replace the LLL. We are looking at underground coal mines in addition to underground stone mines.
2. Upgrading the experimental mine facilities on site at Bruceton.
3. Agreements with owners of experimental mines, in all cases universities, that would allow us to do limited, large-scale explosion tests.
4. We also have entered into an agreement with the General Services Administration (GSA) to initiate a search for a replacement for Lake Lynn Lab. This will include an announcement which will meet NIOSH and CDC interests in purchasing a facility that can be designed and constructed to meet the program and research requirements for an underground laboratory. GSA has assembled a team of experts that have initiated the process for finding the right parcel of land. It is estimated to take 2 and ½ to 3 years to complete the search and purchase of the land.

NIOSH will keep MSHRAC informed of our progress.

MSHRAC ACTION ITEMS:

Committee members were asked to review the OMSHR 2014 project summaries and be prepared to prioritize and discuss at the next meeting

The tentative date for the next meeting will be November 12-13, 2015.

Future potential agenda items:

Discuss the use of phone meetings and webinars
Review and prioritize OMSHR mining projects
Site visit to Pittsburgh Mining Research Division
Update on capacity building program to determine if it is performing as intended
NIOSH/MSHA researcher interactions
DRDS Update
NPPTL Update
Hearing conservation effectiveness

The meeting was adjourned at 2:25 pm.

I hereby confirm these Summary Minutes are accurate to the best of my knowledge.

Cecile S. Rose, Chair

Date