# PUBLIC SUBMISSION

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Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines.

**Comment On:** MSHA-2018-0016-0001
Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines.

**Document:** MSHA-2018-0016-0101
Comment from Thomas Harman, National Mining Association

## Submitter Information

**Name:** Thomas Harman
**Organization:** National Mining Association

## General Comment

See attached file(s)

## Attachments

RFI RIN 1219-AB91

AB91-COMM-9

December 21, 2018

Ms. Sheila A. McConnell, Director
Office of Standards, Regulations, and Variances
Mine Safety and Health Administration
201 12th Street South
Arlington, VA 22202

Re: RIN 1219-AB91, Comments on Request for Information from the Mine Safety and Health Administration on Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines

Dear Ms. McConnell:

The National Mining Association (NMA) offers the following comments to the Mine Safety and Health Administration (MSHA) concerning MSHA's request for information (RFI) on "Safety Improvement Technologies for Mobile Equipment at Surface Mines, and for Belt Conveyors at Surface and Underground Mines", 83 Fed. Reg. 29716 (June 26, 2018). This letter details our comments.

Introduction

The National Mining Association is the national trade association whose members produce most of America's coal, metals and minerals. NMA's membership also includes the manufacturers of mining machinery and equipment as well as the independent contractors who supply goods and services to the mining industry. NMA's members have a long history of developing and implementing technology that increase miners' safety and health protections.

NMA agrees with MSHA that, "Mining safety could be substantially improved by preventing accidents that involve mobile equipment at surface coal mines and metal and nonmetal mines and belt conveyors at surface and underground mines." However, to comprehensively address solutions, we need to acknowledge certain factors that can limit operators' ability to introduce new safety technology effectively, such as mistrust in technology by the workforce, inadequate testing of technology before full implementation, and challenges in communicating to miners why technological improvements in equipment operation create a safer work environment.

The Role of Human Behavior in Accepting the Use of Safety Improvement Technology

Any discussion about the use of technology on mobile equipment to increase safety protections for miners must include the role that individual behavior plays in whether to use devices, such as seat belts, designed to prevent injury or death. As stated in the Federal Mine Safety and Health Act of 1977 (the Mine Act), mine operators, with the assistance of miners, have the primary responsibility of preventing *[unsafe]* conditions and practices at mines. Although a mine operator may have a robust training and education system with a formal, established policy that equipment operators wear seat belts, and the operator diligently and consistently enforces the policy, safe work requires the *assistance* of the miner to comply with the policy.

Mistrust in technology by the workforce will cause mine operators to move cautiously and deliberately in introducing technological advances in equipment safety to the mine working environment.[1] As an example, mine operators are very interested in the use of automatic systems to ensure the safest work environment but will not embrace these systems until they are proven to operate properly which will not occur until the end of this decade.[2] Additionally, the rapid introduction of safety automation can result in the workforce experiencing cognitive overload especially if introduced without communicating the need for the automation and careful explanation to employees how the automation creates a safer work environment.[3]

General Comments and the Results from NMA Member Survey

NMA conducted a survey[4] to determine members' use of technology designed to ensure that drivers of mobile equipment engage seat belts when driving, or to alert drivers of production equipment when vehicles are nearby in a defined zone. The survey specified surface material haulage trucks, end loading machines, bulldozers, or other earth moving equipment. Survey results revealed a wide range in the percentage of mobile production equipment with seat belt or collision awareness safety technologies in operation at mine sites.

Seat belt technology is well-established and includes varying levels of devices to warn the driver, either visually or audibly (or a combination of the two), if the seat belt is not fastened. Similarly, interlocking mechanisms can prohibit engine startup if the seat belt is not buckled. Both types of safety controls may be bypassed.

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[1] Remarks by Dr. Kray Luxbacher, MSHRAC Metal Mine Automation Workgroup Report, Centers for Disease Control and Prevention, Mine Safety and Health Research Advisory Committee (MSHRAC) semi-annual meeting, November 29, 2018, University of Arizona, Tuscon, Arizona. The minutes for this MSHRAC meeting will be presented for a vote of approval to members in spring 2019.

[2] Remarks by Dr. Kray Luxbacher, November 29, 2018

[3] Remarks by Dr. Kray Luxbacher, November 29, 2018

[4] See Table I

Respondents[5] to the survey addressing seat belts indicated that all surface material haulage trucks are equipped with seat belts, and the range of trucks equipped with a visual indicator to show a fastened seat belt is 0 – 23 percent. Visual indicators were retrofitted. For earth moving equipment such as bulldozers, less than 1 percent are equipped with an interlocking device that prevents operation unless the seat belt is engaged; the equipment came from the factory with the device already installed. Responses indicate that end loading machines are not equipped with either visual indicators to show a seat belt is fastened, or an interlocking device to prevent operation if seat belt is not engaged.

Collision awareness in mines relies on a variety of monitoring systems designed to alert the operator when people or equipment are in the area. While collisions are a significant hazard to miners' safety, proximity monitoring can lower the risks considerably. Some systems rely on the use of detection devices installed on heavy equipment and set to surveil areas around the machinery; others combine the detection devices with signals placed on equipment or vehicles that will operate in the area. The basis for these devices is an effective tracking system that places tags on workers and machinery and equipment which communicates the location of people or equipment to the operator.[6] Alarms sound or alerts display when the two tags come near one another, triggering defensive driving techniques by the equipment operator.

Operator visibility plays a key role in detecting people and equipment nearby and therefore in avoiding collisions. Even though equipment may have proximity tracking devices, operators must be attentive to nearby people or equipment and avoid workplace distractions. Tracking devices combined with visual clues work together to form a technology/human interaction that is necessary to avoid "struck by" and "strike against" incidents. Reporting reliable information to the operator on the proximity of the closest objects to equipment reduces the likelihood that an accident will occur.[7]

Satellite tracking and technology removes the need for people and machinery to be tagged to avoid collisions. If operators have access to this level of sophistication, technological upgrades can incorporate several system monitoring levels into a single operation.[8]

Responses to the portion of the NMA survey addressing installation of collision awareness devices showed that material haulage trucks range from 10 percent - 100 percent installation, all of which were retrofitted. Similarly, earth moving equipment such as bull dozers with proximity devices ranged from 0 percent - 100 percent installation. Those reporting collision device installation for earth movers indicated all were retrofitted. For end loading machines handling material, the range for collision awareness system installation was 15

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[5] The number of respondents to the survey is not inclusive of all members of NMA.

[6] Casey, J. P., *Mining Technology,* Mining guide: Collision avoidance in mines, November 28, 2018, online article with no referenced page number

[7] Ibid, online article with no referenced page number

[8] Ibid, online article with no referenced page number

percent - 100 percent. Again, all devices were retrofitted onto the equipment. In addition to material haulage trucks, bull dozers and end loaders, respondents also reported that they have installed collision awareness systems on road graders, light duty vehicles, buses and all equipment that operates on mine access roads. Several respondents also reported that they are preparing operations to begin trials and pilot testing for proximity solutions on surface haulage equipment in 2019.

Unless enough testing is conducted in real mining applications, the potential increases for miners to place themselves in dangerous conditions. Although the technology exists to stop surface haulage trucks from colliding with vehicles in the drive path, an inherent problem with collision avoidance systems is that sensors may prematurely react to road and weather conditions that include slope, speed, uneven surfaces, and others. Equipment manufacturers are able to install sensors to navigate all road conditions on the mine site and account for people and equipment nearby. The problem lies in determining how many sensors the equipment needs to operate safely and not place the driver or others in an unsafe position, leading to serious injury or death. An additional challenge at mine sites is the radio frequency capacity needed to operate a proximity detection system that manages hundreds of pieces of surface equipment. Upgrades in operating capacity for radio frequencies are likely to be necessary. The solution to these challenges is for operators to conduct extensive equipment trials and pilot tests cautiously and deliberately in actual mining conditions before deploying the systems throughout the operation.

NMA stated in comments to a proposed rule in 2015, "Proximity Detection Systems for Underground Mobile Machines in Underground Mines", (RIN 1219-AB78, Fed. Reg. 53070, September 2, 2015), that the lack of research and performance verification by our nation's preeminent mine safety and health research agency, the National Institute of Occupational Safety and Health (NIOSH) can impose unrealistic deadlines for operators to install and implement technology that has not been thoroughly tested.[9] Matching unique mine environments with mine equipment and its safety technology requires thorough testing to reach the level of accuracy and reliability miners deserve; NMA believes that mine operators, working in cooperation with their employees as well as equipment manufacturers, provide the best environment to facilitate research and development into safety systems that work.

Additional Use of Technology in Mines Today to Improve Miner Safety

As noted, rapid introduction of unproven technology can pose unforeseen safety risks, thereby increasing reluctance of mine operators to bring new systems online. However, mine operators are committed to continuously evaluate methods to improve safety and therefore, often are creative innovators spurring new technologies or new approaches. For example, mine operators are testing the use of drones to learn new ways to better protect miner safety,

[9] Comments from Bruce Watzman, National Mining Association, December 15, 2015, https://www.regulations.gov/docketBrowser?rpp=50&so=DESC&sb=postedDate&po=0&dct=PS&D=MSHA-2014-0019

discovering during the testing process new ways to introduce changes in the mining process. For example, drone usage allowed an operator to see an overhead view of a blast site during the explosion, and during observation, the operator discovered a vertical fault along the highwall. The discovery was possible only because of an aerial view of the shot. Knowing the vertical fault existed allowed the operator to prepare for future mining in the area. Likewise, overhead drone mapping led an operator to construct a "roundabout" in a troublesome intersection with poor visibility for drivers as they approached. Neither of these safety advances would have been possible without the use of drones. In addition to increased usage of drones, there are instances of operator pilot testing of lighting systems that illuminate the swing radius of shovels.

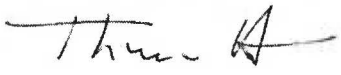
Mine operators also use dash-mounted cameras to detect eye movements of truck drivers as they work to detect when fatigue may be a factor in safe driving. Monitoring drivers' eye movements allows managers to determine times during the shift when drivers may be at risk for falling asleep or otherwise inattentive to road hazards and the mine environment. Being aware of the times when drivers are tired gives important information and provides opportunities for educating employees about when they need to exercise extra caution.

Conclusion

Reliability and safety are first-order factors in adopting safety technology into the mining environment. While equipment manufacturers can introduce innovative solutions to control collisions and ensure use of seat belts, miners remain skeptical about the use of technology to improve safety. NMA's members have found that rather than regulation-driven use of unproven technologies, the best outcomes occur when mine operators and their employees partner with others, including NIOSH and equipment manufacturers to introduce innovative solutions into the workplace to improve miner safety with the use of technology.

In closing, NMA reiterates its agreement with MSHA that mining safety could be significantly improved by reducing powered haulage accidents. However, thorough testing before full implementation is the best way to eliminate fatalities in powered haulage in mining. NMA looks forward to working with MSHA to achieve this common objective without unnecessarily burdening operators or miners in the process.

Sincerely,



Thomas Harman

Seat Belt System – Please check column(s) to note type of mechanism that is used by your company, whether it was installed at factory or retrofitted, and the approximate percentage that is present in the fleet.

| Type of Equipment | Visual indicator such as strobe light to indicate that seat belt is engaged | Interlocking mechanism to prevent operation unless seat belt is engaged | Factory installed | Retrofitted | Approximate percentage in total fleet |
|---|---|---|---|---|---|
| Material haulage truck | | | | | |
| Bulldozer or other earth mover<br><br>(Please list type other than bulldozer) | | | | | |
| End loader or other equipment<br><br>(Please list type other than end loader) | | | | | |

Collision Awareness/Avoidance System – Please check column(s) to note type of mechanism that is used by your company, whether it was installed at factory or retrofitted, and the approximate percentage that is present in the fleet.

| Type of Equipment | Collision awareness system to alert driver when other equipment/vehicles are too close | Factory installed | Retrofitted | Approximate percentage in total fleet |
|---|---|---|---|---|
| Material haulage truck | | | | |
| Bulldozer or other earth mover<br><br>(Please list type other than bulldozer) | | | | |
| End loader or other equipment<br><br>(Please list type other than end loader) | | | | |