



JOY MINING MACHINERY
A Joy Global Inc. Company

2011 NOV 28 A 9:37

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November 25, 2011

Mine Safety and Health Administration
1100 Wilson, Boulevard
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Comments on RIN 1219 - AB65 – Proximity Detection Systems for Underground Mines

To whom it may concern:

Joy Mining Machinery (“Joy”) is submitting the following comments in response to the Request for Information for the above proposed Rule, 30 CFR § 75.1732 involving Proximity Detection Systems (“PDS”). In addition to the comments set forth below, we are attaching and incorporating a copy of Joy’s previous comments on RIN 1219-AB65, which we submitted on March 29, 2010 in response to MSHA’s prior Request for Information in the Federal Register (volume 75, No. 20) dated February 1, 2010.

As indicated in our March 29, 2010 comments, Joy is in a unique position to provide comments on this subject, as we have been involved with the concept of proximity detection in underground coal mines since the initial research project was conducted in 2002 (as documented in the Background information of MSHA’s February 1, 2010 Information Request). In addition, Joy has been involved to some degree with each PDS manufacturer because of the interface with our continuous miners. Throughout the installation of the various generations of systems, Joy has worked with both PDS manufacturers and coal mine operators in an attempt to develop a reliable system that is able to survive the rigors of the mining environment. In addition, Joy has reviewed each manufacturer’s system over the past nine (9) years to determine if their PDS warranted Joy’s involvement to develop the system into a viable product for use as a training tool.

Despite the mining industry’s efforts, as of the date of this letter, no PDS has proven to be reliable and effective enough in an underground coal mine to be a safety device – the technology is not “fail safe” (as described in the “Supplementary Information” to the proposed rule). Instead, as stated in Joy’s March 29, 2010 comments, our experience has shown that the potential benefit of the system is as a training tool to be used in conjunction with an ongoing training program in each mine.

In this regard, Joy has made significant progress since our 2010 comments. We have now entered into the partnership agreement with Matrix Design Group that was contemplated at that time, and have developed a PDS for JOY Continuous Miners -- the product is offered as an option, on both original equipment and rebuilt miners. (A copy of our current brochure is attached.)

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As noted in the brochure, an important feature of the Joy/Matrix system is that data is stored and can be used for training; for example, to show an operator his tendencies and try to eliminate potentially dangerous behavior.

In addition to the proper use of the system, the other thing that Joy has learned from our extensive experience is that in order to be successful, the system needs to be fully integrated into the continuous miner, and not just added on. This would seem to be in accord with MSHA's comment on p. 44 of the Supplementary Information Section, which states that "proper functioning of a proximity detection system is directly related to the quality of the installation ... of the system." Based on this, the system should either be installed at the time of the manufacture of a new continuous miner, or when the miner is rebuilt.

With this in mind, Joy's two primary comments to the proposed rule are as follows:

- A. Due to the inability of the existing technology to perform at an acceptable level of consistency and reliability in underground applications, the PDS should be used as a training tool, rather than a safety system. In conjunction with this, each mine should develop a training program that incorporates the system, including providing feedback to the operator on the data recorded in the system. Therefore, since it is recommended that the PDS be used as a training aid, the regulation should be incorporated in Part 48 instead of Part 75. This approach helps reinforce the safe operating methods mines should adopt, as well as encouraging miners to use safe judgment, instead of relying on a device that cannot be made "fail safe" with existing technology.
- B. The proposed 18 month period for retrofitting the existing fleet is not sufficient. An explanation as to why, and Joy's suggested alternative, is set forth in our detailed comments in Item 1 below.

With that premise, please find the following responses to each of the seven (7) Requests that MSHA has specifically asked for comment:

1. As stated in the proposed rule, MSHA proposes to phase in the use of proximity detection systems over an 18-month period. Continuous mining machines manufactured after the date of publication of a final rule would be required to be equipped with a proximity detection system three months after the date of publication of a final rule. Continuous mining machines manufactured on or before the date of publication of a final rule would be required to be equipped with a proximity detection system 18 months after the date of publication of a final rule. The Agency requests comments on the proposed compliance dates, considering the availability of systems, the time necessary to process approvals for proximity detection systems, and projected time needed to install systems.

Comment:

The proposed 18 month period for retrofitting the existing fleet is too short given that the only suitable way to install a proximity detection system on an existing continuous

miner is during rebuild, and the rebuild capacity in the industry is not sufficient to accomplish this in 18 months.

In particular, as noted in the commentary for the proposed rule, the proper functioning of a PDS is directly related to the quality of the installation. Contrary to the assertion of one system supplier to the effect that installation can be done in one shift underground, Joy's experience is that installation requires multiple shifts of cutting and welding. In turn, the safest and most effective way to perform these operations is in an above ground workshop rather than in the cramped underground environment. In addition, since the system should be fully integrated in to the machine rather than being just mounted, the best and most effective way to install the system is during rebuild.

Given this, there is simply not enough capacity the industry to accomplish this in 18 months. The following facts illustrate the reasons why:

1150	Current US operating fleet
18	Months to comply
64	Machine installations per month required Joy, which has the most capacity, typically rebuilds 11 machines per month.
1,500,000	Typical tons mined between machine rebuild
40,000	Typical tons mined per machine per month
38	Average months between rebuilds

Therefore, based on the need to install the systems during the rebuild process, the industry capacity, and an average of 38 months between rebuild, Joy suggests that a 36-40 month period is more reasonable. In conjunction with this, as an interim measure, MSHA could do a program re-emphasizing the importance of training, which has been effective in the past (as noted in the Supplementary Information Section).

2. MSHA proposes to require the use of proximity detection systems that cause a machine to stop no closer than 3 foot from a miner. The continuous mining machine operator would be allowed to be closer than 3 foot only when the machine is cutting coal or rock. However, the proximity detection system would be required to prevent contact with the machine

operator. MSHA considered proposing other specific stopping distances and considered proposing a performance-oriented requirement that would not have included a specific distance. MSHA requests comments on this proposed provision, including whether a greater distance or a performance-based approach would be effective alternatives to the proposed 3-foot stopping distance requirement.

Comment:

In Joy's experience with the ten (10) continuous miners that Joy has equipped with PDS, it is impossible to assure a set distance at which a continuous miner would stop in relation to a person. The variability of electromagnetic technology is such that the system will not recognize a wearable device in time to disable the machine functionality for the machine to consistently stop within any set distance.

Attempts to move the Red Zone out further to maintain a stopping distance of approximately 3 feet under most circumstances results in a larger Red Zone, which in turn may force the miner operator into a shuttle car's path or other unsafe operating location.

In addition, the current technology does not have the ability to allow the continuous miner operator to be closer to the machine when cutting coal or rock for the following reasons:

- (1) Not all continuous miners can determine if coal or rock is actually being cut; rather, the only information available is that the cutter motors are engaged.
- (2) A continuous miner does not have room for conveyor boom position sensors, making it impossible to prevent contact between the operator and the conveyor boom unless the operator is not permitted to operate the machine within the sweep area of the conveyor boom. This is not practical, as the operator **MUST** stand in this area to be able to see the face while cutting coal and to prevent him from going into the path of a shuttle car.
- (3) The common practice of frequent changes of an operator throughout a shift makes it difficult for a PDS to determine who the current operator is.

Query: Would the regulation under section (e) New Technology allow for closer distances if the control system would prevent movement of the machine toward an individual that would be closer than three feet ? Examples – Machine moving forward but individual closer than three feet behind machine. Machine tramming straight and individual beside the machine but closer than three feet.

3. Some proximity detection systems on continuous mining machines are installed to stop machine tram movement and the conveyor swing function when the system is activated while permitting other machine movement, such as rotation of the cutter head and movement of the gathering arms. MSHA requests comments on whether all movement should be stopped or

under what, if any, circumstances it would be acceptable for continuous mining machines to continue moving.

Comment:

Joy's PDS currently disables machine movements that could cause the machine to approach an operator (tram and conveyor swing). The operator must use good judgment at any time when approaching a piece of equipment. Proximity detection cannot be used as a substitute for that.

It would be impractical to disable all machine functionality when an individual is too close to a piece of equipment. There would be additional wear resulting in increasing costs and downtime, without a significant benefit to the miner operator. For example, if all motion were to stop (which could mean to shutdown the pump motor on some machines), the amount of time and the number of actions that must be taken to restart the machine is significant (i.e. greater than 30 seconds). This would cause operator frustration, which would increase willingness to find ways to defeat the system. In fact, early trials of the Joy proximity detection system involved disabling the pump when a person became too close to a machine. The interruptions in work flow frustrated continuous miner operators such that they would find ways to not use the system.

The rule must permit the selective disabling of functions to allow for the development of advanced systems that can pin-point operator location and disable functionality accordingly.

4. The proposed rule does not cover full-face continuous mining machines. A full-face continuous mining machine includes integral roof bolting equipment and develops the full width of the mine entry in a single cut, generally without having to change locations. The Agency is interested in whether full-face continuous mining machines should be equipped with a proximity detection system and, if so, why. And, again, please be specific.

Comment:

Full face miners move significantly slower than place changing miners and do not pivot during normal operations. In addition, they cut the full width of the entry, eliminating the need to back up and set over, proposing a minimal risk while mining. Several individuals are required to operate within close proximity to a full-face mining machine (less than 3 feet).

There has not been any experience to date with a PDS on a full-face continuous miner. At this time Joy recommends that MSHA permit proximity detection technology to be further developed and enhanced by implementation on place-changing continuous miners. With the existing technology, the mining sequence for full-face miners would be dramatically impacted and slowed by the use of proximity detection systems as described in the proposed ruling without any tangible safety benefit in return.

5. Each of the three proximity detection systems approved for underground coalmines in the United States require use of a miner-wearable component. These systems cannot detect a miner who is not wearing the component. MSHA solicits comments on which miners working around continuous mining machines should be required to have a miner-wearable component.

Comment:

Some technologies have limited ability to function properly when more than two (2) wearable devices are within range of the system. At this time, only miners who interact closely with the continuous miner on a daily basis should be required to use the miner wearable component. According to MSHA's data, the only individuals who have been involved in fatal pinning/crushing incidents with place-changing continuous miners are the miner operator (or person who was operating the miner at the time), helper/cable handler, and maintenance personnel who were working on an energized continuous miner.

At this point, it would be premature to require additional users until adequate testing under a wide variety of conditions for an extended time period determines the systems will successfully operate.

6. Most proximity detection systems alert miners who get within a certain distance of a machine before causing machine movement to stop. This provides an added margin of safety and is consistent with most standard safety practices. The Agency recognizes that the use of a proximity detection system that causes frequent machine stops can result in: Frustration to miners; miners ignoring warnings; and can possibly lead to unsafe work practices. MSHA believes that an appropriate warning signal is necessary to optimize the safety of miners when a proximity detection system is used. MSHA requests comments on this provision, including whether a greater distance or a performance-based approach would be effective alternatives to the proposed 5-foot stopping distance requirement for the warning signals.

Comment:

Prescribing a 5-foot warning signal has similar implications to prescribing a 3-ft stopping distance. The technologies that exist today are not capable of repeating this warning signal at exactly 5 feet from the machine every single time an operator reaches this area.

In addition, 5 feet is not practical for all mining conditions (or machine configurations), particularly in low-seam mines in which proximity detection systems have not been extensively tested and visibility is limited (the operator must be closer to the machine than normal).

By prescribing a 5-ft warning signal, this signal would preclude circumstances in which a stopping distance or 'Red Zone' of greater than 5 feet is intended to be used.

Joy recognizes that appropriate warning signals are critical to the implementation of a proximity detection system. However, the distances at which these warning signals are given should be set as agreed upon between equipment manufacturers and mining companies based on the machine configuration and mining conditions.

7. MSHA's estimates of the benefits and costs of the proposal are given in detail in the Preliminary Regulatory Economic Analysis and summarized in the preamble. MSHA requests comments on the proposed estimated benefits and costs.

Comment:

The cost of a PDS, if installed at the time of manufacture or rebuild of a continuous miner, is not significant in relationship to the overall cost of the continuous miner. Provided that the PDS is used as a training tool in conjunction with an ongoing training program (instead of being regarded as a safety device, Joy believes that the current PDS technology has a potential beneficial impact.

The above information and responses indicate Joy's ongoing commitment to the safety of mining personnel who utilize our equipment. We will continue to strive to meet our core principle of "Zero Harm Mentality" by investing in ideas, concepts and designs that will improve the working environment of all underground mines.

Thank you for giving us this opportunity to address the subject of Proximity Detection. If further information is needed or clarification of the information presented in this correspondence, please contact me at mcrow@joy.com or telephone at (814) 432-1573.

Best Regards,

A handwritten signature in black ink that reads "Matt Crow". The signature is written in a cursive, flowing style.

Matt Crow
Global Certification Engineer