From: Bob Kearfott [mailto:bkearfott@smcelectrical.com]
Sent: Tuesday, March 30, 2010 5:24 PM
To: zzMSHA-Standards - Comments to Fed Reg Group
Subject: RIN-1219-AB65

Please find the attached response letter for RIN-1219-AB65

Best regards

Bob Kearfott
Product Integration Manager

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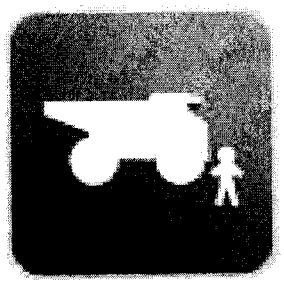
AB65-Comm-4

becker SMC



Response Letter

for

Proximity Detection Systems for Underground RIN-1219-AB65

to

U.S. Department of Labor
MSHA
Mine Safety & Health Administration

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INTRODUCTION RFI RESPONSE TO RIN 1219-AB65

Becker/SMC is pleased to submit our response to MSHA's Request for Information relating to Proximity Detection in underground mines RIN 1219-AB65. We understand that a single technology cannot encompass the coverage, protection and reliability needed for this environment. Becker/SMC is aware of the problems with current proximity detection systems and therefore realized and developed the use for multiple technologies working together to establish the necessary "zones of protection" that will provide the margin of safety required.

Becker/SMC has a solution that integrates three technologies that meet the requirements stated within the request. Becker's Collision Avoidance solution has been in use in underground mines in South Africa for years and Becker/SMC is ready to introduce this technology into the States. As you will see within the enclosed response letter, we have addressed all the questions/concerns stated in the RFI.

Becker/SMC is in the process of submitting the data package to MSHA for approval and is making arrangements to have this solution installed on a continuous miner in a mine for field evaluation.

Becker/SMC is available to give a presentation on this triple technology solution upon your request.

Please contact:
Bob Kearfott
Becker/SMC
Product Integration Manager
304-840-3921

bkearfott@smcelectrical.com

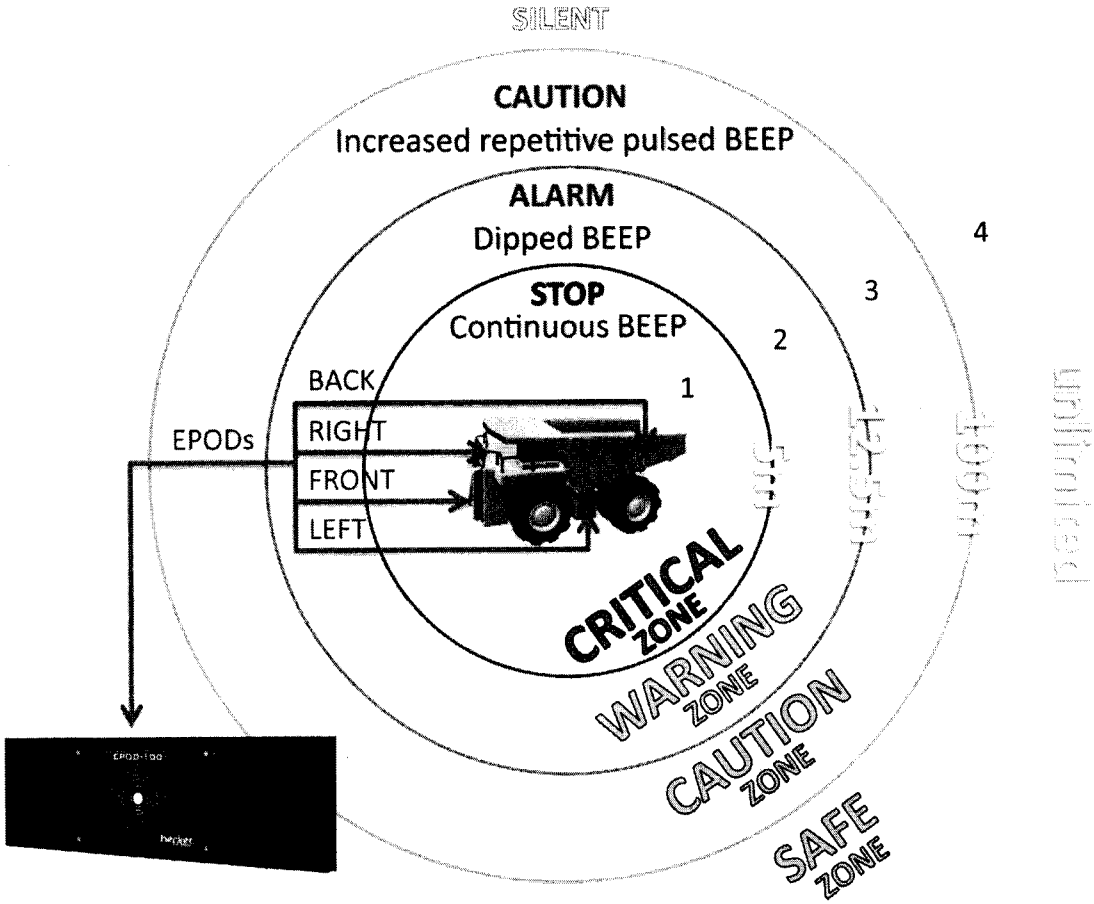
QUESTION 1

"Please provide information on the most effective protection to miners that you believe proximity detection systems could provide, e.g., warning, stopping the equipment, or other protection. Include your rationale."

RESPONSE

4 PROXIMITY warning zones are envisaged. The absolute distances constituting the zone transition thresholds are variable, but as default general values for SLOW moving vehicles (less than 10km/hr) are as follows:

0 to 5m	:	(1) CRITICAL zone – Force vehicle to stop.
5 to 12.5m	:	(2) WARNING zone – Intensely warn vehicle operators and miners
12.5 to 100m	:	(3) CAUTION zone – Gently warn vehicle operators and miners.
100m +	:	(4) SAFE zone – No warning necessary.



It is important to note that in order to do this effectively the system must be able to know from which direction the possible danger is coming from.

QUESTION 2

"Other than electromagnetic field based systems, please address other methods for effectively achieving MSHA's goal for reducing pinning, crushing, and striking hazards in underground mines."

RESPONSE

No	TECHNOLOGY	MERITS	DE-MERITS
1	UHF RFID - Electric Field	Long Range, Reliable, UG & Surface Suitable, Inexpensive	Lack of Range Accuracy, Susceptible to metallic / dielectric blind spots
2	EM RFID - Electromagnetic Field	Tight Distance Suitable, Impervious to Large Metallic Obstruction	Relatively Short Range, Larger Equipment, Challenging Hazardous Area deployment
3	SHF RFID - Radar Ranging (TOF)	Medium Range, High Distance Accuracy, UG & Surface Suitable	Susceptible to multi-path interference, Relatively Expensive
4	Global Positioning System - GPS	Un-tagged hazard warning functionality, complementary to other technologies	Only surface suitable, Expensive to implement per miner for Vehicle to Personnel CAS
5	DTIS - Decline Traffic Information System	Productivity Enhancement + Safety Enhancement, Pre-emptive event prevention	Generally only for Vehicle to Vehicle CAS
6	Video Imaging - Peripheral Vision Systems (PVS)	Well received by machine operators, Complementary to other technologies	Requires maintenance & cleaning, Driver / Machine Operator Incumbent, Susceptible to environmental dust & humidity
7	RADAR - Passive RADAR Ranging	Reliable, UG & Surface Suitable, Accurate	Relatively Short Range, Susceptible to metallic / dielectric blind spots (ie: No around corner functionality)
8	IR CAS - Infrared Detection	Inexpensive, Can integrate with other technologies	Susceptible to environmental conditions (dust & humidity)
9	LRS - Laser Ranging Systems	Accurate Distance Measurement, Programmable vehicular contouring possible	Expensive, Susceptible to environmental conditions (dust & humidity), Requires regular preventative maintenance
10	US CAS - Ultrasonic Detection	Extremely Accurate Ranging, Medium Range, Inexpensive	Susceptible to environmental conditions (acoustic noise), Requires regular preventative maintenance

The technology methods described in the table above recognizes that no single detection technology is currently capable of providing all of the required information to predict "dangerous proximity" in a reliable and optimal manner however a combination of technologies utilising a modular design will be able to concurrently and optionally as appropriate facilitate:

a. System Reliability: by combination of detector redundancy and better systemic decision making based on more information.
b. System Repeatability: by ensuring best distance measurement accuracies possible under given environmental and installation conditions.
c. System Comfort: by ensuring that the proximity information is conveyed to the vehicle/machine operator and the person/miner in such a manner as to minimize the annoyance factor.

QUESTION 3

"In general, reliability is defined as the ability of a system to perform when needed. Please provide information on how to determine the reliability of a proximity detection system. The Agency would appreciate information that describes reliability testing, how reliability is measured, and supporting data."

RESPONSE

1. Repeatability of stopping or alarming distance.
2. User acceptance and willingness to utilize system.
3. Event recording to provide data for improvements in false alarm reduction settings.
4. Multiple technologies with overlapping cross check decision making.
5. Self testing devices in strategic locations to give vehicle operator and mining personnel "system OK" confidence.
6. Environmentally appropriate product packaging and installation techniques.
7. Tagging & Tracking and Collision Avoidance tags must be the same devices to help enforce preventative maintenance.

QUESTION 4 & 5

"Manufacturers should design their systems to be failsafe. Please provide information on how miners would know when a proximity detection system is not working properly. Include suggestions for what works best, including your experience, if applicable."

"Please describe procedures that might be appropriate for testing and evaluating whether a proximity detection system is functioning properly. Include details such as the frequency of tests and the qualifications of persons performing tests; include specific rationale for your suggestions."

RESPONSE

The reliability and absence of annoyance alarms are crucial factors in the successful deployment of a long term Collision Avoidance System (CAS) project. Special "Control Active RFID ID Tags" are therefore provisioned in order to improve these desirable characteristics within the CAS system.

These are self contained and powered by their internal Lithium batteries. They are factory configured to transmit specific commands to CAS controllers mounted on vehicles as well as to individual miners tag devices. They may be installed in any appropriate / strategic location and provide for the following systemic features:

a. "Self Test" vehicular CAS receiver system. Place a Self Test Tag at mine entrance to force a vehicular CAS controller to perform a self test sequence recognisable by the vehicle operator.
b. "Disable Alarms whilst in this area". Typically installed in an underground workshop, where multiple vehicles or personnel come and go.
c. "Learn All". Instructs a vehicle CAS controller to learn all tags within current proximity and ignore them until they are removed and then re-appear.
d. "Learn Vehicles" Instructs miners tag to learn all vehicles in proximity and ignore them until they are removed and then re-appear.
e. "Disable Audio Alarms" and "Enable Audio Alarms". Used to temporarily disable and then re-enable audio alarms which may be distracting to the vehicle operator.
f. "Hazard Notification". Used to notify vehicle operator that they are within close proximity to a hazardous area, such as an unsupported underground roof.

Various additional "Control Active RFID Tags" are provisioned for against practical customer expectations. In general, these tags are used to modify the behaviour of the CAS system in or beyond a specific physical location.

QUESTION 6

"Some proximity detection systems provide a warning before the equipment shuts down. An excessive number of warnings can cause miners to become complacent and routinely ignore them as nuisance alarms. Please describe any experience you have had with nuisance alarms and how you addressed these alarms to assure an appropriate level of safety for miners. In addition, please provide suggestions for minimizing nuisance alarms."

RESPONSE

A combination of multiple technologies all combined into a modular product design for the provision of bi-directional notification and alert messaging between the following targets:

a. A surface or underground mining vehicle/machine or vehicles/machines operator/s
b. A surface or underground mining person or persons.

Such...

a. that the persons may be warned of possible stationary or moving vehicles in close proximity and
b. that the vehicle operators may be warned of possible persons in close proximity and
c. that vehicle operators may be warned of other stationary or moving vehicles in close proximity.

It is our opinion that voice annunciation of warnings with volume adjustment pending proximity would be more suitable than the current industry standard of "beeps".

QUESTION 7 & 8

"How should the size and shape of the area around equipment that a proximity detection system monitors be determined? What specific criteria should be used to identify this area, e.g., width of entry, seam height, section type, size of equipment, procedures for moving equipment, speed of equipment, and related information? Please provide any additional criteria that you believe would be useful in identifying the area to be protected."

"Proximity detection systems can be programmed and installed to provide different zones of protection depending on equipment function. For example, a proximity detection system could monitor a larger area around the RCCM when it is being moved and a smaller area when the machine operator is performing a specific task, such as cutting and loading material. How should a proximity detection system be programmed and installed for each equipment function?"

RESPONSE

A distinctive feature of the system must be the ability to dynamically adjust between the zones transition distances in accordance with the following input measured variables:

a. Motion Status of Vehicle A and Vehicle B (discrete: moving or not moving)
b. Motion Status of Person or Miner (discrete: moving or not moving)
c. Speed of Vehicle A and Vehicle B
d. Collision Vector "distance-to-collision" for GPS based GPOD measurements (Surface only)
e. Vehicle Type (Maximum Speed, length and width of vehicle)
f. Vehicle engine & power train status, based on CAN bus information.
g. Control Tags to adjust thresholds on the move dynamically in response to tunnel topography.

This ability to dynamically adjust thresholds based on these measurements and inputs contributes considerably to minimizing false alarms and alerts.

QUESTION 9

"Since 1983, six fatalities occurred while miners performed maintenance on RCCMs. The fatalities involved three miners crushed in the machine and three miners pinned between the machine and mine wall or roof. Please provide specific information, including experience, on how a proximity detection system might be used to protect miners during maintenance activities and why the system would be effective in each situation."

RESPONSE

There is two ways this can be achieved;

1. Setting up of "exclusion zones" around the RCCM. If the maintenance worker moves out of these designated zone(s) the machine will STOP.
2. Issuing every maintenance worker with a personal "kill switch" to STOP the machine.

QUESTION 10

"Some proximity detection systems include an override function that allows the system to be temporarily deactivated. Please provide information on whether an override function is appropriate and, if so, please provide information on the circumstances under which such a function should be used. Please provide information on the types of procedures or safety precautions that could be used to prevent unauthorized deactivation of a proximity detection system."

RESPONSE

We believe that no proximity detection system should be able to be disabled as this defeats the objective of saving lives. The correct way to address this issue would be the functionality of having a "learn key" that will change certain functionalities of the system to cater for the event of maintenance personnel coming within the normal critical zones around a vehicle.

QUESTION 11

"MSHA found, in its field testing experience, that the use of some new technology for controlling motor speed, like variable frequency drives, could result in nuisance or false alarms (shutdowns) from the proximity detection system. Please provide information on other sources of interference, if any, that might affect the successful performance of proximity detection systems in underground mines. In addition, please provide information on whether a proximity detection system might adversely affect other electronic devices, such as atmospheric monitoring systems, used in underground mines. Please provide specific circumstances including: (1) types of equipment; (2) adverse effect; and (3) how the adverse effect could be minimized."

RESPONSE

Making use of multiple technologies combined into one modular designed product will give the user redundancy between the technologies by cross referencing each other in order to assist with the prevention of nuisance alarms that may be caused by outside interferences.

QUESTION 12 & 13

"Commenters who have experience with RCCMs, please describe: (1) any experience with pinning, crushing, and striking hazards, including accidents and near misses; and (2) any unique experience with an RCCM with auxiliary equipment attached."

"How should the area that a proximity detection system monitors be determined on an RCCM interconnected with auxiliary equipment?"

RESPONSE

As with the RCCM and many other underground vehicles it is very difficult due to factors like different sizes, heights, width, composites, mining environment, mining techniques and many more. No single technology system will be able to cater for all the different scenarios that might exist. However we feel that the use of multiple technologies combined with a modular product design can and will cater for all unique instances.

QUESTION 14

"Describe whether there are safety benefits from applying proximity detection systems to underground equipment other than RCCMs. Describe your experience with pinning, crushing, or striking accidents and nearmisses involving other underground equipment. Please provide examples identifying the specific types of equipment involved and how proximity detection systems may help provide an additional margin of safety to miners. Also describe any experience you have with respect to obtaining MSHA or other agency approval for systems designed for underground equipment other than RCCMS."

RESPONSE

Proximity Detection has proven useful in a full range of vehicle types. Specific reference is made to Pedestrian/Vehicles, Small Vehicles/Large Vehicles and large Vehicle/Large Vehicles. Our experience has also proven that Proximity Detection is also useful on Locos where Loco/Loco collisions are experienced, as well as Loco/Pedestrian collisions. LHD's front and back visibility is mostly restricted.

The Becker Tags for Collision Avoidance and Tagging and Tracking are identical which ensures ease of maintenance of the tags. This improves system reliability.

QUESTION 15

"How might a proximity detection system for remote controlled equipment be different than one for nonremote controlled equipment?"

RESPONSE

The Collision Avoidance System on a remote controlled piece of equipment would require the use of a Learn All Tag which enables the operator to have the system learn his presence in the case of a non remote controlled circumstance, and "unlearn" his presence in the case of a remote circumstance.

In a remote circumstance he would require a remote human machine interface and un-tethered radio that communicates to a system installed into the piece of equipment.

QUESTION 16

"Manufacturers are evaluating the use of proximity detection systems on multiple pieces of equipment that operate near each other, such as RCCMs and shuttle cars. In your experience, what are the safety considerations of coordinating proximity detection systems between various types of underground equipment?"

RESPONSE

Because of the modular nature of the Becker Collision Avoidance System, the system is able to co-locate multiple targets. This enables the system to locate and identify different types of equipment and personnel whilst these devised are co-located in the same physical space.

QUESTION 17

"Describe your experience with the state-of-the-art of proximity warning technology. Include any experience related to whether the current technology is able to accurately locate and protect workers from all recognized hazards."

RESPONSE

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We believe that only a combination of technologies will be able to cater for all scenarios in mining. The challenge is to provide these combinations in a cost effective manner.

QUESTION 18

"What knowledge or skills would be necessary for miners to safely operate equipment that uses a proximity detection system? What knowledge or skills would other miners working near the equipment need?"

RESPONSE

No specific knowledge or skill should be required for operator to safely operate equipment only proper training with daily checklist before any work can start which falls in place with what mines are currently doing on many instances regarding working with machines. In the case of other workers working around a vehicle normal awareness training with each individual must be done in conjunction in with normal induction procedures that the mine might have for all person going to unsafe areas.

QUESTION 19

"Please provide suggestions on how to effectively train miners on the use and dangers of equipment that uses a proximity detection system. Please include information on the type of training (e.g., task training) that could be used and on any evaluations conducted on the effectiveness of outreach and/or training in the area of proximity detection (e.g., red zone warning materials). How often should miners receive such training?"

RESPONSE

We offer different level of training for different scenarios;

1. Operator Training
2. Maintenance Personnel Training
3. Management Training (Very important as they must buy into the system / Awareness starts from the top)
4. Administrators Training
5. General System Awareness Training

We believe that training is ongoing and should fall in place with all critical working procedures currently being adhere to in the mine. To give a specific guide is difficult as every installation, vehicle and mine is unique and will be custom designed accordingly.

QUESTION 20

"Please provide information on the benefits of using proximity detection systems with RCCMs. Please be specific in your response and, if appropriate, include the benefits of using proximity detection systems with other types of underground equipment. Include information on your experience related to whether proximity detection systems cause a change in the behavior of an RCCM operator. For example, would the operator need to operate the machine from a different location, such as one that might introduce additional hazards, to remain outside of a predefined danger zone? Please explain your answer in detail and provide examples as appropriate."

RESPONSE

The primary benefit of using Proximity Detection on a RCCM would be first and foremost to eradicate the potential of loss of life. The second benefit would be to avoid collisions, and the associated costs of maintaining mining equipment.

Due to the "Learn" ability of the Becker Collision Avoidance System, the operators may us the RCCM as usual and therefore not find the system to be a hindrance to their normal day to day operations.

QUESTION 21

"Please provide information on the costs for installing, maintaining, and calibrating proximity detection systems on underground equipment. What are the feasibility issues, if any, related to retrofitting certain types of equipment with proximity detection systems?"

RESPONSE

We offer a range of Collision Avoidance options from "simple – single technology" to "advance – combination of technologies in one" systems depending on variables like mining environment, vehicle size, average speed, mounting restrictions and many more. It is not possible to provide any costs at this stage as more system information is required about the mine and foreseen layout. All our Collision Avoidance equipment are modular in design and can be custom fit for any vehicle and / or environment. Our multiple technology systems is self calibrating so no additional calibration costs are incurred.

QUESTION 22

"What is the expected useful life of a proximity detection system? Please provide suggested criteria for servicing or replacing proximity detection systems, including rationale for your suggestions."

RESPONSE

We have had systems running for over 12 years in instances. However the useful life depends on the requirements and maintenance budget of the user. Some systems are very simple and will only require one single technology based system where others will require multiple technologies in order to ensure a safe working system. If a system is designed on a modular bases with backward compatibility to older designs it will insure that the customers initial capital layout be protected.

QUESTION 23

"Some proximity detection systems automatically record (data logging) information about the system and the equipment. Are there safety benefits to having a proximity detection system automatically record certain information? If so, please provide specific details on: (1) safety benefits to be derived; (2) information that should be recorded; and (3) how information should be kept."

RESPONSE

It is cardinal to collect information in order to put preventative measures in place to ensure that all work around vehicles happen safe and effectively and that procedures are strictly adhered to. It will also help with any accident investigation that might involve vehicle to vehicle or vehicle to personnel collisions. We suggest that this information be collected and stored on board "akin to an aeroplanes black box" and also remotely downloadable via an UHF Leaky Feeder System or any Wi-Fi "hotspot". Data logging will also play a huge role in the maintenance of the systems and can give remote system statuses to control room / maintenance personnel.

QUESTION 24

"Please provide information on whether small mines or mines with special mining conditions, such as low seam or mine entry height, have particular needs related to the use of proximity detection systems. Please be specific and include information on possible alternatives."

RESPONSE

Any machine whether operated remotely or not, is a threat to human life where harsh mining environments such as limited vision, space or simply lack of sight due to limited light can cause an accident. It is clear that all mining vehicle have the potential to seriously or even terminally hurt a human and that the only way is to equip all underground or surface mining vehicles with proximity detection systems. The only way to do this effectively is to have one base system that caters for all the different mining scenarios to achieve this is to have a system that offers more than one technology combined to insure redundancy, scalability and that is cross referenceable. It must have a modular design to cater for all the types of underground or surface vehicles and scenarios.

QUESTION 25

"What factors (e.g., cost, nuisance alarms) have impeded the mining industry from voluntarily installing proximity detection systems on mining equipment?"

RESPONSE

We believe that one of the most common instances is the fact that up until now there has not been one single technology that could cater for the many different mining vehicles and diverse mining methods effectively and has created reluctance towards the use of proximity detection systems. However a multiple technology system that has a modular design to cater for the different underground vehicles and situations will ensure that the past reluctance towards proximity detection systems is forgotten by virtue of being able to be fitted to any vehicle and any mining environment effectively.

We trust you will find this response to be sufficiently informative as to Becker's vision for Collision Avoidance. Should you have any further questions or require any additional clarification, please do not hesitate to contact us.

BECKER/SMC