Electromagnetic interference from personal dust monitors and other electronic devices with proximity detection systems

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Abstract ■ In April 2016, the U.S. Mine Safety and Health Administration (MSHA) began requiring the use of continuous personal dust monitors to monitor and measure respirable mine dust exposures to underground coal miners. Mines are currently using the PDM3700 personal dust monitor to comply with this regulation. After the PDM3700's implementation, mine operators discovered that it interfered with proximity detection systems, thus exposing miners to potential striking and pinning hazards from continuous mining machines. Besides the PDM3700, other electronic devices were also previously reported to interfere with proximity detection systems. MSHA sought the aid of the U.S. National Institute for Occupational Safety and Health (NIOSH) and mining industry stakeholders to determine how the PDM3700 and some other electronic devices and proximity detection systems interact with each other. Accordingly, NIOSH investigated existing standards, developed test protocols, designed experiments and conducted laboratory evaluations. Some interferences were observed to be caused by electromagnetic interference from some electronic devices, including the PDM3700. Results showed that there was no significant interference when the PDM3700, as well as other electronic devices, and the miner-wearable component of the proximity detection system were separated by distances of 15 cm (6 in.) or greater. In the present study, it was found that the PDM3700 and the personal alarm device needed to be at least 15 cm (6 in.) apart in order for them to be used simultaneously and reduce potential interference.

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Introduction

Underground coal miners are exposed on a daily basis to a variety of hazards, such as coal dust exposures, high noise levels, roof and rib falls, potential for fires and explosions, and operating and working with heavy machinery. One of the hazardous jobs is that of operating or working near a continuous mining machine. According to U.S. Mine Safety and Health Administration (MSHA) statistics, 44 miners had been fatally struck or pinned by a continuous mining machine since 1984. In an effort to prevent future striking and pinning fatalities from occurring, proximity detection systems have been developed and are required on all operating continuous mining machines in underground coal mines, with the exception of full-face continuous mining machines, by 2018 (MSHA, 2015a).

Proximity detection systems are designed to sound an alarm to warn miners and stop machine motion in order to protect miners from being struck, pinned or crushed by continuous mining machines (Jobes, Carr and DuCarme, 2012). Currently, MSHA-approved proximity detection systems, installed on continuous mining machines, are based on the principle of magnetic flux density, or B-field (Li, Carr and Jobes, 2012; Li, Jobes and Carr, 2011). The system generates a magnetic field around a continuous mining machine

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