A story of Impact

A Real-Time Monitor to Prevent Coal Dust Explosion Hazards in the Mining Industry

Mine explosions remain a threat to underground coal miners, requiring constant vigilance to prevent accumulations of combustible gasses and dusts and to limit sources of ignition. Accumulations of combustible dust in coal mines create the risk of large-scale explosions that can result in multiple deaths and traumatic injuries. The explosion hazard can be effectively controlled through the application of rock dust, such as limestone dust, to render inert the combustible coal dust generated during the mining and transport of coal *(see publication 2011-196 at www.cdc.gov/niosh/docs/impact)*. Traditionally, determining when additional rock dust should be applied or evaluating the effectiveness of existing rock dust application has been limited to a subjective visual evaluation or to the collection and laboratory analysis of dust samples—a process that requires days or weeks to identify a hazard.

For decades, miners have been able to monitor the concentrations of methane and other combustible gasses using handheld, direct reading gas detectors. These detectors have allowed miners to take

▲ The Coal Dust Explosibility Meter (CDEM)—a small, portable device designed by NIOSH researchers to evaluate coal mine dust samples in real-time.

Relevant Information

From 1986 to 2010, there were 7 multiple fatality explosions in underground coal mines. Inadequate rock dusting or poor rock dusting practices was a contributing factor in these explosions.

The CDEM immediately detects excessive coal dust accumulations, is an easy-to-use hand held device, and will provide information necessary to eliminate explosion hazards.

The CDEM received MSHA IS (intrinsically safe) approval in 2011 and is commercially available.

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immediate action to dilute gasses and prevent explosions. With this same purpose in mind, researchers at the National Institute for Occupational Safety and Health (NIOSH) developed a real-time dust explosibility measuring instrument to provide instant feedback to miners on the relative hazard of dust accumulations in the mine and the effectiveness of their rock dusting practices. This instrument, the Coal Dust Explosibility Meter (CDEM), is a simple-to-use handheld device that provides a pass/fail assessment of coal mine dust samples. With this device, miners, mine operators and regulators will have the information necessary to take immediate action to eliminate an explosion hazard.

Impact

Development of the CDEM required significant research[1] by NIOSH's mine safety and health research program and its predecessor program in the U.S. Bureau of Mines—in collaboration with the Mine Safety and Health Administration (MSHA)—to identify a technology that could provide real-time results comparable to the existing laboratory test. Researchers then transferred the technology from a laboratory setting to a rugged hand held device—which received the R&D 100 Award in 2006 for Innovation in Technology—and refined the device to pass the rigorous MSHA evaluation for intrinsic electrical safety. Attempts to commercialize the instrument over the past 10 years were unsuccessful due to a lack of market interest; however, recent events have renewed interest from key stakeholders in bringing the CDEM to market.

In late 2010, NIOSH upgraded the device software to include ambient methane in the hazard determination and revised the calibration procedures to address issues identified in an earlier MSHA field study. In April of 2011, MSHA approved the CDEM for use in underground coal mines. It is being manufactured in the U.S. and is expected to be available for purchase in August of 2011. Miners, mine operators and regulators will now be able to make real-time determinations of excessive coal dust accumulations and take immediate actions to prevent fatal mine explosions. Excessive coal dust accumulation is one of the most commonly cited violations of mine safety regulations. Before the CDEM, mines were not aware they were in violation for weeks after the hazard was discovered. The CDEM will now allow these excessive accumulations to be immediately evaluated and abated, resulting in safer work environments for miners.

For more information on the CDEM go to www.cdc.gov/niosh/mining.

For a complete list of references, see www.cdc.gov/niosh/docs/2011-205

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