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Personal Dust Monitor: Empowering the worker

ICN INTERNATIONAL COAL NEWS

A POWERFUL alliance between government, union, operators and government has supported the development of the Personal Dust Monitor (PDM), now at the stage of 25 new monitors being manufactured for extensive underground testing beginning in spring 2004. Here NIOSH health branch chief Edward Thimons looks at the partnership players, history and development of the PDM.

A miner wears the Personal Dust Monitor.

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The Pittsburgh Research Laboratory of the National Institute for Occupational Safety and Health (NIOSH), working in partnership with the United Mine Workers of America (UMWA), the Bituminous Coal Operators Association (BCOA), and the National Mining Association (NMA) has been working to develop a Personal Dust Monitor (PDM) that will provide real-time dust exposure data to miners. This partnership effort has also had assistance from the Mine Safety and Health Administration (MSHA). The

actual development work has been accomplished via a research contract with Rupprecht and Patashnick Co., Inc., (R&P), whose commitment to this effort has been a key component of its success.

The concept is to develop a person-wearable dust monitor that provides both real-time and end of shift dust exposure data; empowering both miners and management to take action to prevent overexposures to respirable dust.

The evolution of this new dust monitoring technology is a true product of this partnership effort among labor, industry, and government. From day one there was mutual agreement among all partnership members as to the conceptual design of the PDM and its intended fundamental capabilities.

There has also been a mutual commitment on the part of all partnership members to work toward the development of a technology that will really make in difference in improving the health of America's coal miners. Each member of the partnership has contributed to advancing the development of the PDM to its current status. The BCOA and NMA have made mines available to NIOSH for testing of prototype PDM units. The UMWA has provided the support of their mining membership in cooperating in the conduct of underground testing and providing miner feedback on daily use of the PDM units. NIOSH has committed significant financial and personnel efforts to the design, development, and testing of the PDM concept. MSHA has provided assistance in facilitating intrinsic safety testing and approval and has participated in underground testing.

All partners in this effort have taken an active role in the review of laboratory and in-mine test protocols, review of PDM performance results, and numerous meetings to discuss design improvements to the PDM to make it more mine worthy and user-friendly. The rapid advance in PDM technology is a perfect example of how labor, industry, and government working together in partnership can improve safety and health in the mining industry.

The PDM technology represents the first major advance in coal mine dust sampling technology in more than 30 years. Currently, personal exposure dust samples are collected on filters worn by the miners during a sampling shift. These are sent away for analysis and sampling results are usually not

known for one or more weeks. This precludes taking action to correct overexposures as they happen. The ability of the PDM to provide real-time dust exposure data to both the miner and management allows corrective actions to be taken before overexposures occur.

The PDM is built right into the miner's cap lamp system. When he puts on his cap lamp, he is also putting on the dust monitoring system. Dust enters the sampling system next to the cap lamp on the miner's helmet; moves through a tube running along the cap lamp electrical cord to the battery case worn on the miner's belt. The battery case contains two high-capacity compact batteries; one to operate the cap lamp and the second to operate the sampling pump and dust monitoring instrumentation, which is also located in the cap lamp battery case. The dust entering the battery case is analyzed and the dust exposure data is clearly displayed on top of the battery case and stored for download later. At any time during the shift, a miner can look at the display on the battery pack and see his exposure to that point in the shift and a projection of his end of shift exposure if conditions remain the same. When the PDM is placed on the battery charging rack at the end of the shift, the shift dust data is downloaded to a file for record keeping and later analysis.

The PDM cap lamp system is ergonomically designed, easy to wear, and provides a minimum of 12 hours of light (equivalent to or better than current mine cap lamps). The cap lamp battery case is also equipped with a quick connect/disconnect power take-off connection for operation of the radio remote controls for continuous miners. The entire cap lamp/dust monitor unit weighs only 8 ounces more that current stand alone cap lamp systems. It is 1.5 pounds lighter than the combination of current cap lamp systems and conventional dust sampling units.

In addition to the benefit of providing real time exposure data to avoid overexposures to respirable dust, the PDM provides a number of other benefits. Information provided by the PDMs will tell management how actions on the part of the miner impact exposure. This could result in administrative controls which reduce exposure. The PDM real-time readout can be used to recognize when dust control technologies employed at the face are not correctly functioning. A rapid increase in dust exposure would be seen and corrective action taken. Miners can use the PDM to learn how

to reduce their dust exposures by minimizing certain activities, better positioning themselves during given activities, and the quicker recognition of the failure of engineering controls.

Recently, six PDM prototype units were successfully tested in the laboratory and in four underground coal mines. Results showed that the units provide accurate readings of a miner's dust exposure and are rugged enough to survive the underground mine environment. Twenty-five new PDMs, incorporating design changes agreed to by all members of the partnership, are being designed and built by the contractor, R&P, and will undergo extensive underground testing beginning in spring 2004. NIOSH, its labor and industry partners, MSHA, and the contractor, are all committed to making the PDM a tool that will empower miners and the underground coal mining industry to do something positive to reduce the incidence of coal worker pneumoconiosis.