

a machine-mounted continuous respirable dust monitor (MMCRDM). In-mine testing of the prototype MMCRDM in the late 1990s demonstrated the capability of the TEOM system to produce dust measurements in a mining environment. However, because instrument accuracy could not be determined by in-mine testing and questions about the comparability of fixed-site versus personal sampling, NIOSH decided to discontinue final development of the MMCRDM.

In 1999, at the urging of labor and industry, NIOSH, in conjunction with MSHA, funded the development of a personal dust monitor (PDM) based on the TEOM technology used in the MMCRDM. The ability to miniaturize the TEOM dust sensor without compromising its performance made it possible in 2000 to develop the first PDM capable of directly measuring in real-time and displaying the concentration of respirable coal mine dust. The PDM-2, as it was called, was a two-piece unit consisting of a belt-mounted dust monitor battery/pump pack with a display and the TEOM dust sensor that was attached to the lapel like the standard sampling device in use today. Although laboratory and in-mine tests showed the PDM-2 to be dependable and capable of accurately measuring the amount of dust that accumulated on the filter, concern was expressed by miners about the size of the instrument. Specifically, miners believed that since they were already required to carry a cap-lamp battery and a self-contained self rescuer on their belt, there was no room for a separate dust monitor battery/pump pack. They also indicated that the TEOM dust sensor was too bulky, heavy and interfered with work activity. As a result of these concerns, further efforts to refine the PDM-2 were suspended by NIOSH.

In 2001, NIOSH contracted the development of a one-piece version of the PDM that would be less cumbersome to mine workers. Efforts to date have produced a belt-worn instrument (PDM-1) that contains the dust monitor and the miner's cap lamp battery in a single package. To improve wearer convenience and to simplify the monitor, the sample inlet for the instrument was moved from the traditional lapel location to the cap lamp of the hard hat. A pump mounted in the instrument transports the dust-laden air that enters the inlet to the instrument through a conductive silicone rubber tube that runs parallel to the lamp cord. Unlike the PDM-2 which employed a 10-mm Dorr-Oliver nylon cyclone used in the approved sampling

device, the PDM-1 uses a Higgins-Dewell cyclone to separate the non-respirable dust. The redesigned cap-lamp battery pack contains all the components, including two separate batteries, to enable the instrument and cap lamp to be operated independently. To accommodate monitoring over an extended shift, the PDM-1 was designed to operate continuously for 12 hours.

The PDM-1 is designed to continuously measure dust levels on real-time basis and provide information on (1) the cumulative average dust exposure during the shift; (2) the current exposure level based on entire shift duration (projected end-of-shift exposure); and (3) the time-weighted average concentration (total mass of dust collect divided by the length of time the unit was operated) within 15 minutes after the end-of-shift. The unit is capable of being used either in a shift mode in which the instrument is programmed to operate for a specific shift length (e.g., 8, 10, 12 hours) or in an engineering mode. When operated in the engineering mode, the miner could program periods during the shift to record dust levels during specific mining cycles or at specific dust-generation sources in the mine. The display on the instrument has various screens that show the (1) current time of day, (2) elapsed time since beginning of the shift, (3) total amount of dust accumulated on the filter since the start of sampling which is stored in an internal memory for analysis, (4) dust concentrations, and (5) a bar graph that shows the average dust concentration of the last 30 minutes. The PDM-1 is also capable of showing whether the instrument was bumped significantly or tipped beyond 90 degrees. This information will be stored along with information on the amount of dust that has accumulated on the filter and the concentration data which can be accessed with a personal computer at the end of the shift and analyzed. While the performance of the PDM-1 to accurately and precisely measure respirable coal mine dust in the mine environment and its durability under in-mine conditions has yet to be extensively evaluated, preliminary indications from the limited testing performed to date are that the PDM-1 has the potential to provide timely information on dust levels and miner exposure. Although MSHA has confidence in this technology, a final determination of the applicability and suitability of PDMs under the conditions of use being proposed is not expected until after completion of the scheduled laboratory and in-mine

testing and evaluation at the end of 2003. Both NIOSH and MSHA recognize that to be accepted by the mining community, the PDM must reliably monitor respirable dust concentrations in the mine environment with sufficient accuracy to permit exposures to be effectively controlled on each shift.

Accordingly, as recommended by the Dust Advisory Committee and urged by the mining community, MSHA is encouraging deployment of personal continuous dust monitoring technology once verified as reliable under in-mine conditions by proposing a new standard for the use of such monitors as part of a comprehensive dust control program. As discussed under proposed § 70.220, operators would be permitted to use PDMs capable of continuously measuring and displaying dust levels during the shift in conjunction with engineering and administrative controls. Each miner would be required to wear such a device on each shift, unless the operator successfully demonstrated during verification sampling that the exposure of each miner working on the same shift is represented by sampling the DO and/or another occupation under administrative control. For additional specific details regarding the proposed application of PDM under this proposed rule refer to the discussion of § 70.220 in section IV of the preamble.

#### **IV. Section-by-Section Discussion of Proposed Rule**

##### *A. Part 70*

The following explains, section-by-section, each provision of the proposed rule. The text of the proposed rule is included at the end of the document.

##### **Section 70.1 Scope**

Under the proposed rule, the existing scope will remain the same. It sets forth mandatory health standards for each underground coal mine subject to the Federal Mine Safety and Health Act of 1977.

##### **Section 70.2 Definitions**

The technical terms that were developed for use in this part are defined in the proposed rule. These include "citation threshold value," "dust control parameters," and "engineering or environmental controls." Some existing definitions of terms such as "certified person" and "respirable dust" have been modified to more clearly convey the intended meaning under the proposed rule. These and other modifications discussed below reflect changes resulting from the removal of existing paragraphs, the transfer of other paragraphs, and the