

the face, roof, ribs and floor, as well as from pieces of broken coal that have been crushed by the mining machine. A five to 15 per cent level of methane in the air is capable of igniting, which in turn can result in a fire or an explosion. Frictional methane ignitions in mining can occur when sparks or hot metal fragments from the drill bits on mining equipment or roof bolting machines contact the liberated methane. Ventilation, as provided by an approved ventilation plan, dilutes and removes the liberated methane.

Over the years, the coal mining industry has expanded its use of a number of mining methods that increase production. One such method is deep cut mining, also called extended cut mining, where a continuous mining machine makes cuts greater than 20 feet into the coal seam. Formerly, when most continuous mining machines were operated by an on-board miner positioned in the cab at the rear of the machine, the cut was limited to the distance between the cutting head and the cab, or about 20 feet, to protect the miner in the cab from hazards associated with unsupported roof. Today, most continuous mining machines are manufactured to operate with remote control devices, which allow the machines to cut well beyond 20 feet into the coal seam while the miner stands under supported roof and in an area of reduced coal dust.

Most of the mining operations today use continuous mining machines that make deep cuts. These longer distances to the face make monitoring and removing methane more difficult. The devices used to test for methane often consist of a methane detector attached to either a pole which may be held by the miner or an extension device which the miner slides forward to the face. In mining sections with deep cuts, the longer probe arrangements can telescope 40 feet or more. The comments and testimony from the 1996 rulemaking include suggestions that back injuries could result from holding the longer probes, although some miners testified that the arrangements are practicable without causing injuries. MSHA is not aware of any empirical testing concerning injuries from the use of these probe arrangements; however, we are mindful of the importance of seeking compliance alternatives that will ensure safe working practices.

Generally, miners begin a deep cut operation by directing the ventilation to the face, usually by positioning tubes or curtains. A qualified person then makes a methane test, and the continuous mining machine is moved into the area. The continuous mining machine

generally cuts from 20 to 40 feet into the coal seam. When the coal is mined from the cut, the continuous mining machine is backed out, and the ventilation may be adjusted to redirect more air to the next face area.

The roof bolting machine then moves into the working place. Virtually every roof bolting machine in operation today is equipped with an automated temporary roof support (ATRS) system. When the ATRS is deployed, steel hydraulic jacks position a support against the roof. This configuration provides the protection of temporary roof support for the miners who are positioned at the drill head control to install the roof bolts. Once the ATRS is fully deployed, the miner begins the installation process. Generally four or more roof bolts are installed across the width of the cut. When the row of roof bolts is installed, the roof bolting machine advances approximately four feet, depending on the roof bolting plan and machine design, and the process is repeated until the entire roof is supported up to the face.

During this entire process, a qualified person, as defined in § 75.151, makes a methane test at the face before electrically powered equipment is energized, taken into or operated in the workplace, and at intervals not exceeding 20 minutes during the operation of this equipment.

In 1997 MSHA tested an arrangement for making methane tests at the face by magnetically attaching a portable methane detector to the head of the continuous mining machine, which would be trammed forward by remote control to the face for the test. However, similar arrangements for making methane tests from roof bolting machines are not practicable because roof bolting machines do not operate by remote control.

The National Institute for Occupational Safety and Health (NIOSH) conducted a study ("Comparison of Methane Concentrations at a Simulated Coal Mine Face During Bolting") which examined issues related to methane in working places during roof bolting. In 1999, NIOSH presented the study at the 8th U.S. Mine Ventilation Symposium, sponsored by the Society of Mining Engineers' Underground Ventilation Committee. The testing consisted of gallery simulations using a model roof bolting machine fitted with instrumentation to record methane levels at various locations in the simulated working place under different methane release conditions. A part of this study examined MSHA's 38 accident investigation reports from 1981

to 1994 which involved methane ignitions at roof bolting machines. The ignition source was at the roof bolting machine in 37 of these accidents, and no ignition source was identified in the one remaining accident. The report shows that a combination of continuous monitoring near the drill head together with methane tests in by the roof bolting machine would be effective in identifying methane hazards when the primary source of methane liberation is at the drill hole.

During the period 1994 through 2001, MSHA investigated 16 accidents which involved methane ignitions at roof bolting machines. Twelve of these accidents directly involved roof drilling or bolt installation. Consistent with the ignitions studied by NIOSH, the accidents involving roof drilling or bolt installation occurred when a hot drill bit being pulled out of the drill hole ignited a flammable methane-air mixture, or when the miner inadvertently drilled through metal roof straps or encountered harder than normal rock strata in the mine roof.

In November, 1998, the United Mine Workers of America (UMWA) and the Bituminous Coal Operators Association (BCOA) jointly recommended that MSHA amend the current rule to allow the option of making methane tests by sweeping a probe 16 feet in by the last area of supported roof, provided that a number of mandatory precautions are taken, such as providing the roof bolting machine with both an integral ATRS and a permanently-mounted continuous methane monitor. The joint recommendation cited the draft NIOSH study, and UMWA and BCOA further stated that the suggested compliance option would promote greater safety. MSHA believes that this optional method for methane testing does not diminish safety provided in the existing rule, and is therefore publishing this final rule, which is largely based on the NIOSH research and the joint recommendation of labor and industry. The rule is designed to protect the miner and to be easily integrated into the mining cycle.

I. Discussion of the Rule

A. Paragraph 75.362(d)(2)

This final rule adds a new subparagraph after the existing § 75.362(d)(2) to allow an optional method for making methane tests during roof bolting activities in room and pillar mining operations using continuous mining machines. Thus the phrase "Except as provided in subparagraph 75.362(d)(3)" is added to the beginning