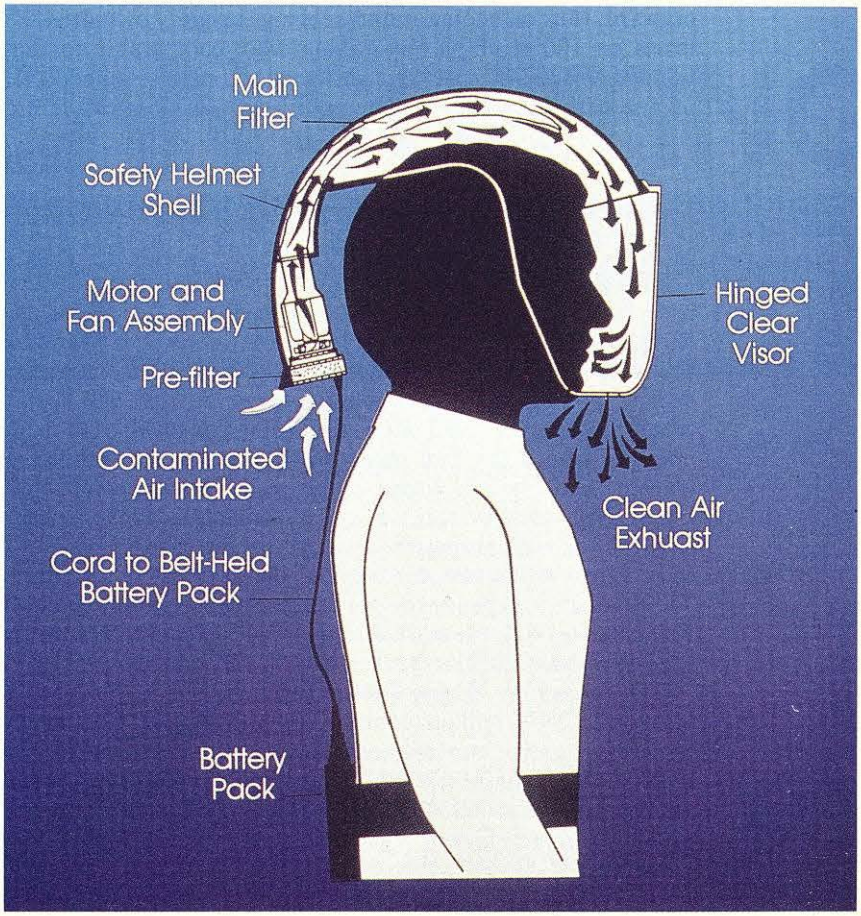
Powered dust-filtering helmet reduces exposure to diesel soot

Most coal mine operators are very conscientious regarding the health of their employees. They often use a combination of engineering controls and work practices to reduce the respirable dust exposures of their workers. Many operators implement a respirator plan even though MSHA does not recognize respirators as a means for compliance.

Powered dust-filtering helmets have become increasingly prevalent in the mining industry for two primary reasons. First, previous underground and laboratory evaluations show that the dust helmet can dramatically reduce the respirable dust exposure of its wearer.[1,2] Second, employee acceptance of the helmet tends to be much higher than that of other respirators. The helmet allows some verbal communication and does not restrict breathing. This feature also permits facial hair growth without decreasing performance. A full-face shield also provides some facial protection against solid and chemical projectiles.

Many longwall operations use dust helmets to reduce the respirable dust exposures of miners required to work downwind of crusher, roof support and shearer operations. While continuous mining sections are usually less dusty, use of diesel equipment may represent a new potential health problem. Diesel particulates consist primarily of insoluble carbonaceous agglomerates and soluble organic compounds with some small concentrations of sulfates and trace metals.[3] Some of the soluble organic compounds that are present in diesel soot have been shown to be carcinogenic in laboratory animals. In order to address these concerns, the Bureau of Mines recently conducted a study to determine the efficiency of a dust helmet on diesel particulates.

Two underground evaluations were conducted on continuous mining sections using diesel haulage vehicles. Model No. AH21 Racal airstream helmets equipped with AS22-3 prefilters, AS23-3 main filters and AS60476 Tyvek full-face seals were tested. Helmets were placed on mannequin heads and mounted in the hauler cabs. This was done to test a previous bureau study that found



Powered dust-filtering helmets, increasingly commonplace in today's coal mines, also have been found to protect miners against diesel particulates.

Author information
J. Drew Potts and Edward F. Divers are engineers in Dust Control and Ventilation, Pittsburgh Research Center, U.S. Bureau of Mines, Pittsburgh, Pa.

normal breathing in the range of 30 to 60 liters per min had no significant effect on the efficiency of the dust helmet.[1]

Cascade impactors were used to sample air inside and outside of the helmet. Impactor data were analyzed to determine submicron particle concentrations. Typically, very little coal and mineral dust is observed in this size range. Conversely, diesel engines generate particles with aerodynamic diameters predominately in the range of 0.075 to 0.75 micron.[3] Therefore, the collected submicron mass was assumed to be diesel exhaust particulate.[4]

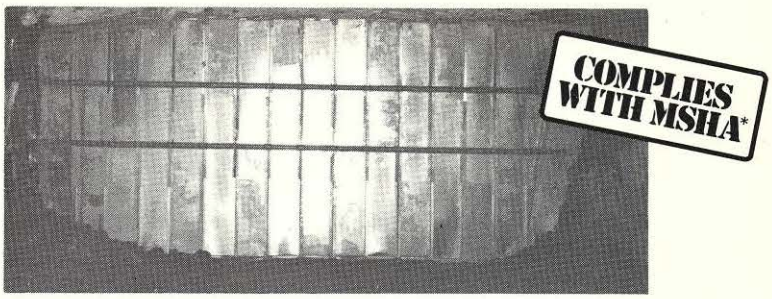
Data collected during this study showed the helmet to be 94% efficient on submicron particles. Based on the findings of this study and previous research, proper use of the dust helmet can provide significant protection against diesel soot on continuous mining sections using diesel haulage vehicles.

Implemetation of a respirator plan is commendable and should be encouraged. The effectiveness of any personal protection device, however, is highly dependent on proper maintenance and use of the equipment. Therefore, any respirator plan should include employee training in these areas. Training should also be used to ensure that proper attitudes toward engineering controls and work practices are not relaxed due to enhanced personal protection. It will probably be necessary to assign at least one person to manage the maintenance of a dust helmet plan and to oversee its successful implementation. □

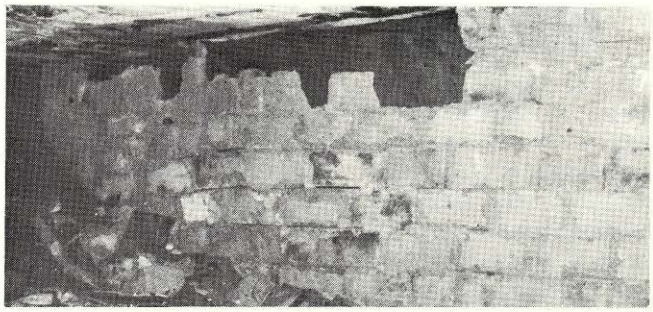
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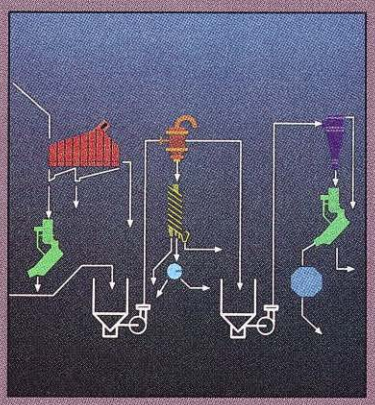
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COAL

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Cover Story



COAL PREPARATION

To satisfy tough market demands, coal producers strive to offer a wider range of higher quality products. Coal preparation is the means to that end. New process control schemes and on-line coal analysis now drive many of the improvements in preparation, as two articles in this issue describe. Also, the editors report on cyclones—critical machines in nearly every preparation plant flowsheet.

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