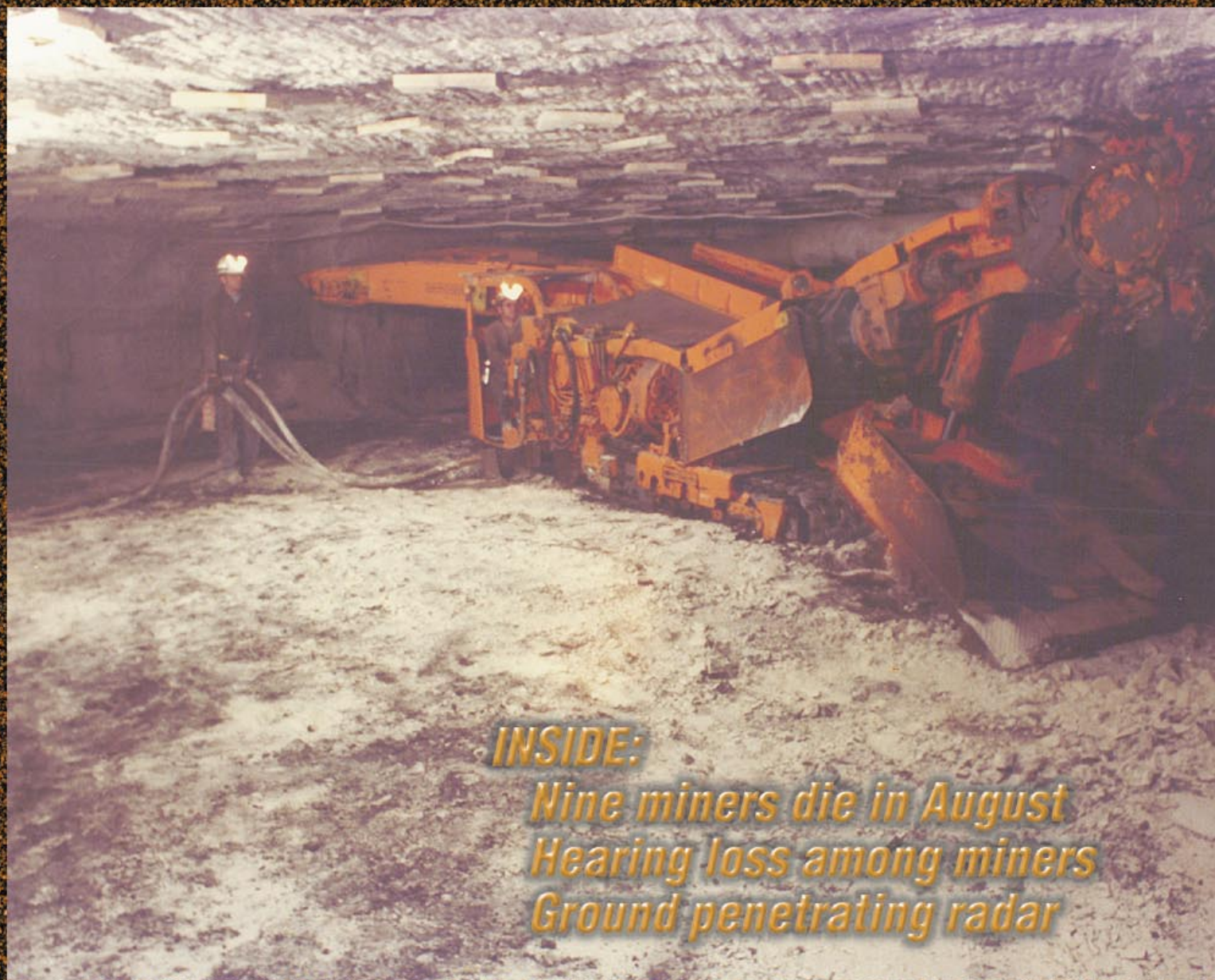


*The Holmes Safety Association*

# **BULLETIN**

*October 1998*



## **INSIDE:**

*Nine miners die in August  
Hearing loss among miners  
Ground penetrating radar*



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The **Holmes Safety Association Bulletin** contains safety articles on a variety of subjects: fatal accident abstracts, studies, posters, and other health- and safety-related topics. This information is provided free of charge and is designed to assist in presentations to groups of mine and plant workers during on-the-job safety meetings. For more information visit the *MSHA Home Page* at [www.msha.gov](http://www.msha.gov)

**PLEASE NOTE:** The views and conclusions expressed in Bulletin articles are those of the authors and should not be interpreted as representing official policy or, in the case of a product, represent endorsement by the Mine Safety and Health Administration.

**COVER:** This month's cover is also from the editor's collection of "old and older" photos, vintage 1970-1984, and indicates why we continually ask for submissions from our readers. If you have a potential cover photo, please send an 8" x 10" print to the editor, Fred Bigio, MSHA, 4015 Wilson Blvd., Arlington, VA 22203-1984

**KEEP US IN CIRCULATION  
PASS US ALONG**

# Hearing loss among miners and measures to protect hearing

By Mark R. Stephenson, Ph.D. and Carol J. Merry, Ph.D., National Institute for Occupational Safety and Health (NIOSH)/Centers for Disease Control and Prevention. Drs. Merry and Stephenson are centered in Cincinnati, Ohio, at NIOSH's Physical Agents Effects Branch, Division of Biomedical and Behavioral Science.

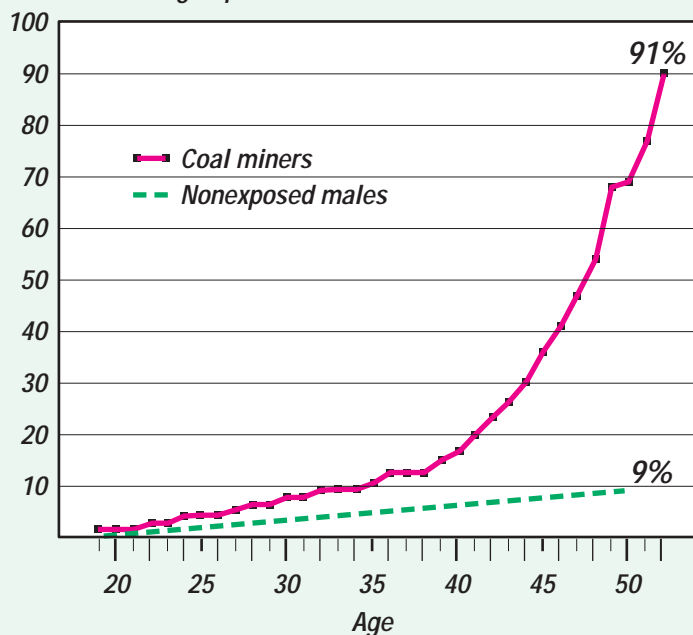
Everyone knows that mining is a noisy job, but did you know that you are nine times more likely to lose your hearing than someone who works in a quieter job? If unprotected from noise on the job, by age 50, you will probably need hearing aids. Obviously, the best solution is to engineer out the noise, but that isn't always immediately possible. Until mines are quieter, one way you can help save your vital sense of hearing is to use hearing protectors whenever the noise around you is hazardous. Even if you already have some hearing loss, you can use hearing protectors to prevent your hearing from getting worse. **When loud noise is present, proper use of hearing protectors will help miners prevent most or all noise-induced hearing loss.**

The tools and machines that miners use are noisy enough to cause most miners to lose some or much of their hearing. NIOSH analyzed hearing tests from a large sample of coal miners. This chart shows that by age 30, coal miners have about as much permanent hearing loss as a healthy, non-noise exposed male worker will have at age 50. This chart also shows that coal miners' hearing loss continues to get worse. If current trends continue, by the time the average coal miner retires, 9 out of 10 will have a serious hearing handicap. Other types of mining (surface, metal/nonmetal, etc.) require noisy tasks that are equally hazardous to hearing.

Both employers and miners, working together, can take steps to reduce the risk of permanent hearing loss.

**Figure 1.—Percent of males with hearing impairment: male coal miners vs. general population of non-noise exposed males**

Percent with hearing impairment



**Engineering controls should be the number one priority in the battle to eliminate hazardous noise.**

When replacing or upgrading equipment, mine owners and operators should “buy quiet” whenever possible. In many situations, sound barriers, sound dampening material, enclosed cabs, or other noise controls can reduce miners' exposure to noise. But, if engineering controls have not eliminated the noise hazard, then employers should provide hearing protectors that meet the special needs of miners for: (1) comfort, (2) convenience, and (3) usability in a mining environment. Employers should provide training to miners on how to select and wear a variety of hearing protectors, and miners

should make a conscientious effort to use the devices effectively.

Miners need to know that hearing protectors can safely be worn in a mine along with other safety equipment. In fact, sometimes hearing protectors can actually help miners hear warning signals, alarms, and speech by muffling the level of continuous background noise. Miners should also be assured that properly worn earplugs will not damage their ear canals or eardrums. If the job requires miners to talk with one another, hearing protectors with built-in communication circuits are available. New protectors with active circuits that muffle background noise while amplifying nearby speech are available. These may be especially useful in a mining environment where the

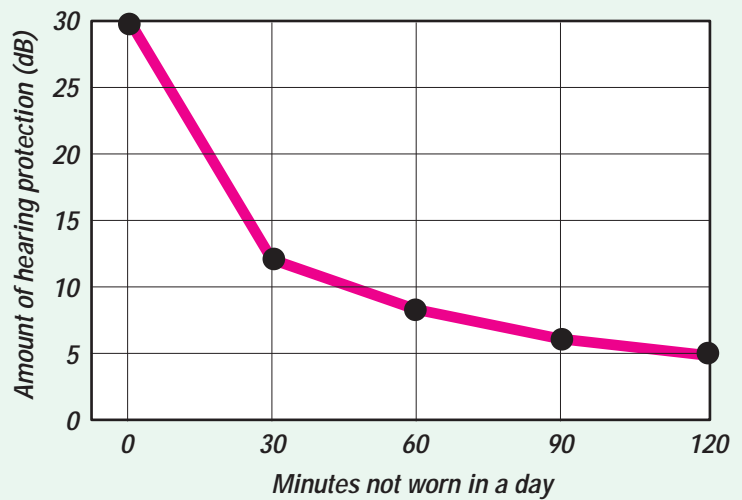
## 4

noise is intermittent. Some of these electronic devices may not yet be approved for underground mining, but are already in use for above ground mining and heavy construction.

Picking a hearing protector is like trying on shoes: no single device will suit everyone. NIOSH has published a booklet that lists over 50 manufacturers and nearly 250 different hearing protectors including many types of earplugs, earmuffs, and banded canal inserts. Employers can help by making a variety of these devices available. Miners need to keep trying hearing protectors until they find one that they are willing to wear. The single leading cause of hearing loss among miners exposed to hazardous noise is failure to wear hearing protection **every time** and **all of the time** that they are working in hazardous noise.

Figure 1 shows the surprising drop in the amount of *effective* protection you will get from your hearing protector if you don't wear it 100% of the time you are in hazardous noise. For this example, let's assume you work in hazardous noise for an entire 8 hour shift. Let's say you take your hearing protector off a few minutes here, and a few minutes there so that you actually wear your hearing protector 7 hours out of the noisy 8-hour day. Because of

Figure 2.—Effect of **NOT** wearing your hearing protector in noise



the way your ear interacts with noise, this would result in a loss of **almost 75%** of the hearing protector's *effective* protection! In this example, a person who was exposed to a time-weighted average noise level of 95 decibels might think that an earplug with a Noise Reduction Rating (NRR) of 30 would provide plenty of protection. But, because the earplug was not worn 100% of the time the worker was in hazardous noise, its *effective* NRR was only about 8 decibels. As a result, this person's noise exposure will be much worse than they thought: 87 decibels,

instead of 65 decibels. Exposure to 87 decibels doesn't sound like a lot, but research has shown that over time, even this much noise exposure can cause permanent hearing loss in many people. Remember—you might think that by wearing an earplug *most* of the time, you will be fully protected from hazardous noise. But as Figure 2 shows, you need to wear hearing protection consistently **whenever** the noise is hazardous. This is actually not very different from the need to wear welders' goggles whenever welding, and not just "most of the time".

### What about hearing roof noises?

Many underground miners share a concern about being able to hear noises that indicate a roof fall may be about to occur. Miners may assume that if they are wearing hearing protectors, they will not be able to hear these roof noises. Because of the importance of this issue, it has been carefully studied both in the United States as well as in Australia. We now know that:

(1) The machinery used in mining operations is loud enough to cover up the sounds made by the roof working ... "roof-talk".

(2) Wearing hearing protectors while noisy machinery is in use does **NOT** affect whether or not a miner hears roof noises.

In other words, miners can't hear roof noises during mining operations because the machinery "drowns out" the roof noises, not because hearing protectors "block out" roof noises. When loud noise is not present, naturally, there is no need to wear hearing protection.

If miners want to be able to hear the roof working, it is very important for them to wear their hearing protectors every time they are in hazardous noise. This will prevent

miners from developing both temporary and permanent hearing loss. Either of these types of hearing losses will interfere with miners ability to hear **ALL** kinds of sounds—including roof noises.

Miners who have not protected their hearing may have enough temporary or permanent hearing loss to interfere with their ability to hear roof noises—even in quiet. Miners who **have protected their hearing** will have the advantage! They will be most able to hear roof noises and take appropriate [evasive] action

**How can you tell when noise is loud enough to hurt you?**

There are two rules of thumb:

#1. If you have to shout to be heard from three feet away, and



#2. If your ears are ringing or feel stuffed up after you leave a noisy area,



Then, the noise is hazardous and hearing protectors should be worn.

**REMEMBER:**  
Almost all miners would keep almost all their hearing...

**IF**  
they wore almost **ANY** hearing protector **EVERY** time they were in hazardous noise.

*How can you learn more about noise control, hearing protectors, and preventing occupational hearing loss?*

*There are many sources of information from government agencies (particularly MSHA and NIOSH), universities that study mining issues,*

*and private industry. Two NIOSH documents may be particularly useful:*

*NIOSH has published a booklet, **The NIOSH Compendium of Hearing Protection Devices** (DHHS, NIOSH publication No. 95-105) that lists nearly every manufacturer and type of hearing protector sold in the United States. Information is provided about 78 earmuffs, 30 hard-hat-mounted earmuffs, 86 earplugs and 17 semi-aural devices (sometimes referred to as ear canal caps or semi-inserts).*

*NIOSH has also developed a general guide for workers and employers that describes how to start an effective hearing loss prevention program, **Preventing Occupational Hearing Loss—A Practical Guide**, (DHHS, NIOSH publication No. 96-110). This guide also includes information about training materials and sources of further information.*

*For a free copy of either of these documents, or to talk to someone about protecting hearing please call toll free: **1-800-35-NIOSH***

*When free copies are exhausted, additional copies of these documents can be purchased by contacting the **National Technical Information Service (NTIS)**, 5285 Port Royal Road, Springfield, VA 22161 phone: (703) 487-4650*

*The authors wish to acknowledge Dr. John Franks for the figure comparing hearing impairment between coal miners and non-noise exposed males, and Dr. Fredrik Lindgren for providing the data for the figure used to describe the effect of not wearing your hearing protector.*

**FIND A PROTECTOR YOU LIKE AND WEAR IT!**

**Miners memorial to be dedicated at Twin Falls**

A memorial honoring coal miners was dedicated at the Twin Falls Resort State Park Lodge.

Coal miners who have been killed in mining accidents and those who have died from work related diseases or as a result of work-related activities will be honored.

The memorial is a joint effort of the United Mine Workers of America, Wyoming County Commission, and the state of West Virginia.

Guests included UMW President Cecil Roberts, Rep. Nick Rahall, UMW District 17 President Robert Phalen, state Sens. Billy Wayne Bailey Jr. and

Bill Wooton, and Dels. Joe Sparks and Rick Staton, according to spokesman Harold Hayden.

Twin Falls is located on state Route 97 between Pineville and Mullens.

*Reprinted from the August 13, 1998 edition of the Beckley, WV **Register-Herald**.*

# 6

## Ground penetrating radar for highwall guidance

### OBJECTIVE

To provide a safe, practical, cost-effective method for measuring coal rib thickness during highwall mining.

### Background

U.S. highwall operators have been seeking a method to maintain an optimum coal rib thickness throughout the entire depth of the entry, particularly in mines where the depth of penetration can be up to 400 m. In Appalachian coal mines, the typical coal rib thickness is 1 to 2 m, depending on the mechanical properties of the particular coal seam being mined. If the rib becomes too thin, the hazard of ground fall increases and with it the resulting risk of burying the mining equipment. Freeing a buried machine is an expensive process, places workers at risk, and produces no coal. Conversely, if the rib becomes too thick, the excess coal left behind is permanently unrecoverable and makes the rib thin for the next hole. Although the current typical alignment procedures utilize precision surveys, geological and mechanical forces during mining produce uncertainties in position nearly as large as the rib thickness itself at depths of 300 to 400 m despite the accuracy of the initial alignment.

### Approach

The National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Research Center, is evaluating a new method wherein a ground penetrating radar (GPR) is mounted on the mining machine to measure the rib thickness to the adjacent hole as cutting progresses. The advantage of GPR is that it uses electromagnetic pulses to measure the coal rib thickness directly. The GPR works best in clean coal seams; coal seams with significant partings or dirt bands tend to disrupt the radar signal so that the radar echo from the coal-air boundary is too weak or indistinct to be usable.

The success of a GPR system at a given location primarily depends on the electrical conductivity and dielectric constant of the geological formations. The electrical conductivity of coal is generally quite low (e.g.,  $10^{-5}$  S/m), which allows the radar signals to readily propagate through the coal. The dielectric constant of coal is typically 4-5; in contrast, air has a dielectric constant of 1. Consequently, there is a very distinct interface at coal/air (or air/coal) boundaries. The side of a highwall rib is fairly planar, is perpendicular to the direction of the radar, and thereby becomes a relatively easy target for the GPR. It should be noted that coal is an anisotropic (nonuniform) material, which requires that the GPR antenna be optimally oriented in such a way for maximum transmit and receive signals. This is best done by slowly rotating the antenna through a 90° arc about the transmitting direction and noting the angle that maximizes the radar signal.

### How it works

The basic system consists of a radar control unit and an antenna, a PC to process the data, a Mine Safety and Health Administration-approved barrier box for intrinsic safety, and a remotecontrolled hydraulic- or electrical-powered arm attached to a highwall miner (figure 1). The antenna needs to be housed in a metal box for protection during mining operations. The remote controlled arm will keep the antenna retracted until coal rib thickness measurements are needed, at which time the operator would activate the arm to press the antenna "gently" against the coal rib to reduce the air gap between the antenna and the coal. The ability of the GPR to penetrate coal depends on the frequency of the radar, which must be selected accordingly.

For highwall applications requiring a rib thickness on the order of 1 to 3 m, a 400- or 500MHz antenna would probably be the most suitable. A 900-MHz antenna would be recommended for thinner coal ribs between 0.5 and 1.5 m. Figure 2 is a schematic of a typical highwall mining scenario using this radar system to measure coal rib thickness.

Project personnel have developed in-house software that runs on a laptop PC, which simplifies the normally cumbersome interpretation of the radar data. The PC reads and analyzes the received signals in real time, then provides the machine operator with a number corresponding to the rib thickness, as well as a tri-color display (green = "OK", amber = "caution", red = "danger") of the computed rib thickness.

### Results

This GPR system was taken to a highwall mining site in Kentucky to evaluate the feasibility of using GPR to measure coal rib thickness and to obtain information regarding the depth of penetration and the effect of airgap on the GPR response. A 500-MHz antenna was used and found to be capable of measuring coal rib thickness from 0.9 m to more than 3 m. The best results were obtained with the antenna being no more than 5 cm from the coal surface. The antenna was positioned near the top of the coal seam because the cleanest coal was located there.

The operator prepared two highwall entries, each approximately 15 m long, 3.5 m wide, and 1 m high. The first entry was driven straight into the highwall. The second entry was driven in about 3 m from the first and was deliberately angled in such a way to come to within 0.9 m of the end of the first entry. Several tests were then run by moving

the antenna continuously from the entrance to the end of the entry and then back to the entrance, with each test having a different airgap (0 cm, 2 cm, and 4 cm). In all cases, the radar was capable of “seeing through” the coal rib at thicknesses ranging from 0.9 m to more than 3 m; however, the best response was when the antenna was physically touching the rib (0 cm - no airgap).

**Patent status**

A patent of this total system has been granted (U.S. patent No. 5,500,649, “Method and Apparatus for Monitoring the Thickness of a Coal Rib During Rib Formation”); it is available for field testing and/or licensing.

**For more information**

To obtain a free copy of a technical paper on this topic or for additional information, contact Gary L. Mowrey, Ph.D., National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Research Center, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070, phone (412) 892-6594, fax (412) 892-6764, e-mail: gdm6@cdc.gov

Mention of any company name or product does not constitute endorsement by the National Institute for Occupational Safety and Health.

To receive additional information about mining issues or other occupational safety and health problems, call 1-80035-NIOSH (1-800-356-4674), or visit the NIOSH Home Page on the World Wide Web at <http://www.cdc.gov/niosh/homepage.html>

As of October 1996, the safety and health research functions of the former U.S. Bureau of Mines are located in the National Institute for Occupational Safety and Health (NIOSH).

*Reprinted from the July 1997 issue of Technology News—No. 462. U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health*

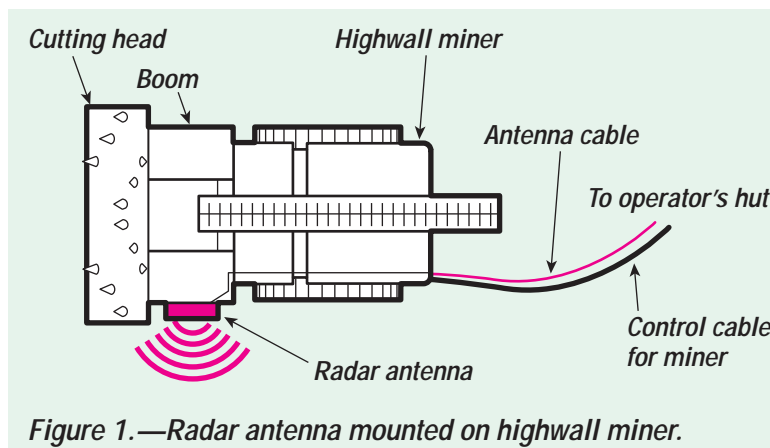


Figure 1.—Radar antenna mounted on highwall miner.

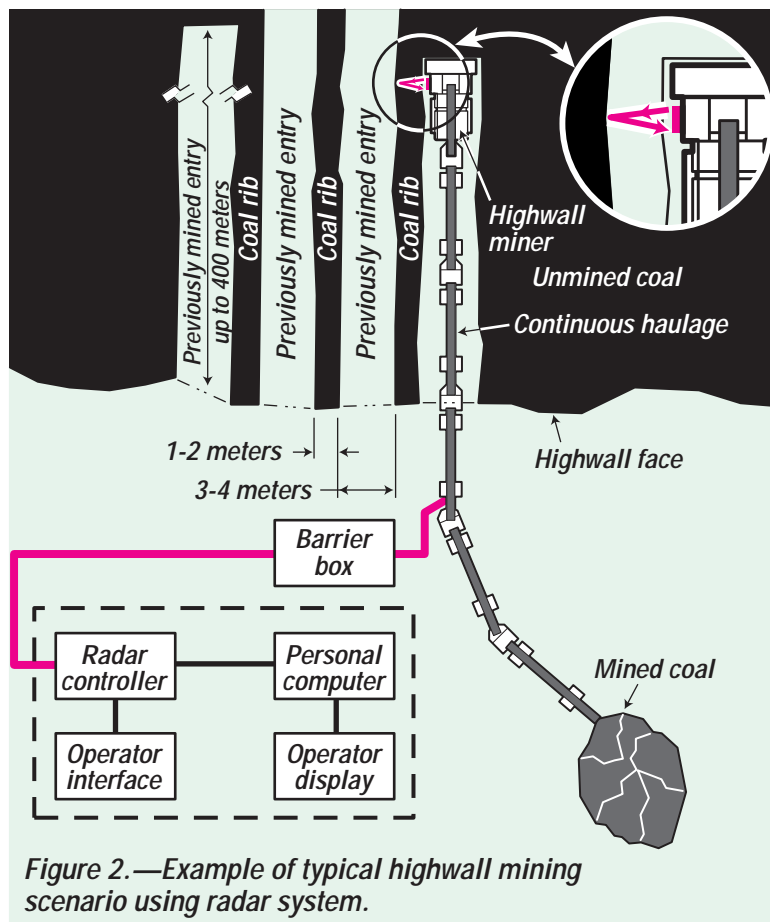


Figure 2.—Example of typical highwall mining scenario using radar system.

**CORRECTION—**

Four short articles in the September Bulletin were erroneously attributed to the Mine Regulation Reporter when in fact the original source was the Mine Safety and Health News. We regret the error.  
—The Editor.

# 8

## Roof fall fatality rate alarms MSHA

The Labor Department's Mine Safety and Health Administration (MSHA) has alerted its staff, coal mine operators, and coal mine safety personnel of "the alarming number of fatal roof/rib fall accidents that have occurred thus far in 1998."

MSHA said that as of late May, five coal miners have lost their lives in roof and rib fall accidents, which "indicates an obvious need for the industry to increase miners' awareness of the hazards of roof and ribs and to renew efforts to prevent hazards that expose miners to these deadly occurrences."

According to MSHA statistics, in each of the four preceding years, only one or two miners had died in roof fall accidents by late May. The agency said that the recent roof fall accidents had happened in various circumstances, including large and small mines, mines of varying seam heights, in both advancing and retreating sections, and in both inby and outby supported roof.

MSHA Assistant Secretary for Mine Safety and Health, J. Davitt McAteer, said in a letter to mine executives: "I am asking every underground mine operator to closely evaluate your roof

and rib conditions and to discuss the roof control plan with every miner, emphasizing safe mining practices. I also ask that you discuss with each foreman the need to exercise extreme caution when making examinations or evaluating mining conditions."

Of the 10 coal mining fatalities that had occurred as of early June, eight were in underground mines, with five caused by roof falls.

*Reprinted from the July 1998 issue of Coal Age.*

## Record production levels expected through 2000

U.S. coal production is expected to hit record levels in each of the next three years, rising to 1.14 billion tons in 2000, according to a report published by the CIT Group.

The *Fourth Annual Coal Mining Outlook* attributes these gains to on-going outages at a few large nuclear plants in the Northeast as well as early closings of some older plants around the country. Because coal and nuclear power plants are base loading units, any reduction in nuclear generation is positive for coal mining.

While coal's share of utility generation hit a record 57.2% in 1997, coal's share of overall generation is expected to remain flat for the next several years as natural gas increases its share. According to the Department of Energy, 1,600 megawatts (mw) of new generating capacity came online in 1997. Natural gas ac-

counted for 1,410 mw; coal accounted for 23 mw.

"There are a couple of reasons for this, said Charles T. Lee, a vice president for CIT's Equipment Financing company. "Most of the new capacity units are peak load units, which coal isn't suited for. Also non-utility generators prefer gas because the generating units are easier to operate while baseloading gas plants are about 40% less expensive to build."

According to the report, coal exports are not expected to contribute significantly to forecasted production levels. While steam coal has increased over the last few years, metallurgical coal exports have stagnated. New technologies have reduced the need for coking coal and the demand for steel has decreased.

Regionally, production levels of low-sulfur Western and Appalachian coal are expected to rise through 2000. Midwestern coal production, though, will fall about 10% to 155 million tons in 2000, the report said. Large Midwestern production declines will not transpire until much later in the next decade.

"There has been massive overcompliance with the Clean Air Act Amendments to the tune of 10 million tons of SO<sub>2</sub> currently and possibly 12 million tons in 2000," said Michael Paslawskyj, vice president for economic development at the CIT Group. "This will ease the pain for Midwestern producers."

*Reprinted from the July 1998 edition of Coal Age.*



## Nine miners killed in August; six are metal/nonmetal miners

Nine miners—six in the metal/non-metal industry and three in the coal industry—were killed in mining accidents in August.

The fatalities mean 57 miners have lost their lives in accidents this year, 37 in metal/nonmetal and 20 in coal. The number of miners who had died at this time last year was 69.

This past August saw three deaths due to powered haulage accidents, two from roof falls, and two slip and fall accidents. One miner died as an air bladder exploded and another died from a combination of swallowing slurry material and heart problems.

- A 38-year-old contract truck driver working at a strip mine in Harlan County, Ky., was killed in a surface haulage accident on Aug. 19.

The accident occurred on the coal haulage road leading from the strip mine. The victim was killed when the 1971 Mack DM 800 truck overturned.

- A fall of rock killed a 37-year-old section foreman on Aug. 13 in Pike County, Ky.

The victim was operating a battery-powered scoop, cleaning up rock where a boom hole had been shot, when a large rock fell and crushed him. The rock measured 3' by 8' by 6'. Investigators said the victim was reportedly in by permanent roof support. The scoop did not have a canopy in the 34-inch coal seam.

- A 40-year-old utility man died in a roof fall at a coal mine near Oceana, W.Va., on Aug. 8.

The victim, who had 20 years of experience in the mining industry, had installed 8 of the 12 roof bolts in the first three rows of permanent roof supports and was drilling the first roof bolt hole in the fourth row when a section of mine roof fell on

him. The piece of roof was 12' long, 8' wide, and up to a foot thick.

The section electrician found the victim unconscious and he was pronounced dead on arrival at the hospital.

- A 44-year-old shift manager, with 22 years of experience, died on Aug. 23 when an air bladder exploded under pressure at a taconite plant in Mountain Iron, Minn.

As workers installed a new water pipeline, the victim checked a 30" discharge water line lying in an excavated area. He noticed bubbles around the area where a rubber bladder had been placed in the line.

The bladder burst when the victim put compressed air into it. In the blast he was thrown from the excavated area. The blast injured four other workers.

- On Aug. 21, a 41-year-old contract laborer, with 15 years of experience, suffocated as he cleaned material from a rail car at a plant in Summit, Ga.

The victim was using a rake to clean material from the sides of an enclosed bottom-dump rail hopper car. The hopper car was being unloaded, but it still contained a large amount of finely ground dry clay. The victim reportedly was tied off with a safety belt and was working from a ladder when he apparently fell into the material and was asphyxiated.

- A 69-year-old security guard, with 20 years experience working at the mine, died in a powered haulage accident at a granite quarry in Charlotte, N.C., on Aug. 15.

The victim got out of his truck, leaving the engine of his truck running and the automatic transmission in reverse gear. Apparently when he went to the back of the truck, the truck began to move and he was dragged beneath it. The truck ran

over him and trapped him beneath the right front tire.

- A 22-year-old driller, with two years of experience, apparently died in a fall at a boron operations facility in Kern County, Calif., on Aug. 18.

The victim, a contract employee was found floating in 3' of water at the bottom of a pit that measured 15' long, 13' wide, and 6' deep. The pit was located about 4' from the cab door of the drill rig he had been operating.

The pit was used to collect waste water and sediment which accumulated during drilling. A foaming agent filled the pit and extended onto the roadway.

- A 55-year-old service man, with 28 years of experience, died in an accident at a copper mine in Morenci, Ariz., on Aug. 9.

The victim went to close a tailing valve at the No. 4 pipeline. When the foreman arrived at the valve, he found the victim sitting under the discharge end of the pipe. CPR was administered without success. Preliminary autopsy results indicate asphyxia from slurry material in the victim's windpipe contributed to his death, along with hypertensive heart disease.

- A 61-year-old contract employee, with 14 years of experience as a field service mechanic, died in an accident involving a front-end loader at an alumina milling plant in San Patricio County, Texas.

The victim was repairing a hydraulic system on a Caterpillar 990 front-end loader when a sudden release of hydraulic pressure caused the bucket support arm to fall and pin the victim against the loader frame.

*Reprinted from the September 7, 1998 edition of the **Mine Regulation Reporter** by Pasha Publications.*

# 10

## MSHA sets up dust fraud hotline

The Labor Department's Mine Safety and Health Administration has set up a toll-free hotline which coal miners may call to report any problem related to coal dust sampling which may affect the accuracy of the samples or may not reflect normal mine conditions.

Fraud includes hanging dust sampling pumps in wrong locations, turning off the dust sample pumps, or tampering with the filters.

The number to call for reporting coal mine dust sampling frauds is 1-888-249-8223.

"This is another step in our comprehensive efforts to eliminate black lung disease from the nation's coal mines," said Davitt McAteer, assistant secretary of labor for mine safety and health. "This hotline gives miners another tool for alerting this agency concerning dust sampling problems, allowing us to respond quickly and direct our resources toward the problem of respirable dust at that location."

Callers to the hotline will be asked to give the mine location and the specific area of the mine in

which the violation was witnessed. Although callers are not required to leave their name and phone number, they are asked to do so to aid in the follow-up investigation by the agency. Any identifying information would be kept confidential.

All complaints called in will be thoroughly checked by MSHA inspectors.

*Reprinted from the Tuesday, August 11, 1998 edition of the Norton, Virginia Coalfield Progress.*

## MSHA sets deadline on breathing devices for underground coal miners

The Labor Department's Mine Safety and Health Administration (MSHA), along with the National Institutes of Occupational Safety and Health (NIOSH), have determined that certain Ocenco, Inc., breathing devices produced between June 1, 1997 and March 31, 1998 are no longer considered approved breathing devices in that these devices may not function as designed and approved. Accordingly, MSHA is requiring that the devices be refurbished or replaced by Dec. 31, 1998.

MSHA requires that each underground miner be equipped with an approved one-hour breathing device which could be used during a mine emergency.

"We have found that wearers of some Ocenco self-contained self-rescuers may encounter elevated breathing resistance," said J. Davitt McAteer, assistant secretary of labor for mine safety and health. "Some users, particularly those with breathing problems, may be at higher risk in attempting to use the device properly

and effectively in an underground emergency situation. Therefore, these devices are no longer considered approved by MSHA and NIOSH."

MSHA previously notified the mining community about the potential problem and informed them that MSHA and NIOSH were working with the manufacturer to determine what actions were necessary to correct the problem. It was determined that the devices should be refurbished or replaced. The agency is now setting a deadline for that to be accomplished.

The problem with the elevated breathing resistance should not significantly impact most users. Miners have been instructed to use the device, should an emergency arise, until mine operators refurbish or replace them with other available, MSHA/NIOSH-approved breathing devices.

The resistance problem was discovered during a routine product audit. Two Ocenco EBA 6.5 self-contained self-rescue devices were tested and exhibited elevated levels of

breathing resistance. Subsequent testing conducted determined that an exhalation valve diaphragm was the source of the increased exhalation breathing resistance. Ocenco has taken corrective action to assure that the exhalation valve diaphragm installed in units produced or factory-serviced after April 1, 1998 conform to approval requirements.

MSHA is notifying operators of underground mines to make prompt arrangements to have the affected breathing devices replaced. Devices produced during the period June 1, 1997 through March 31, 1998 may be identified by the serial number, the first four digits of which indicate the year and month of manufacture. For example, a serial number that appears as "9706XXXX" would have been produced in June 1997.

Operators of underground mines must have these Ocenco devices refurbished or replaced by Dec. 31, 1998 to avoid enforcement actions by MSHA.

# Biodiesel use in underground metal and non-metal mines

Steve Howell and J. Alan Weber, MARC-IV, LLC, Consulting

## Introduction

Biodiesel is not a new fuel to North America. In fact, activities date back to the late 70s and early 80s. As a result of the OPEC crisis, a significant amount of research on biodiesel and other domestically produced fuel was conducted by various universities and government agencies. The general conclusion at that time was that biodiesel was a technically acceptable substitute, replacement, or blending stock for conventional petroleum diesel, but that its costs were prohibitive compared to petroleum based diesel fuel. Concern over the health impacts of diesel fuel exhaust and proposed regulations has spurred the recent activities to commercialize biodiesel in North America and opened doors for its use in confined areas such as underground mines.

## What is biodiesel?

Biodiesel is defined as the mono alkyl esters of long chain fatty acids derived from renewable lipid sources. Biodiesel is typically produced through the reaction of a vegetable oil or animal fat with methanol in the presence of a catalyst to yield glycerin and biodiesel (chemically called methyl esters). Biodiesel has been registered with the US Environmental Protection Agency as a pure fuel or as a fuel additive and is a legal fuel for commerce.

Biodiesel is an alternative fuel which can be used in neat form, or blended with petroleum diesel for use in compression ignition (diesel) engines. Its physical and chemical properties as it relates to operation of diesel engines are similar to petroleum based diesel fuel. The specification for pure (100%) biodiesel is described in Table 1 and is in the process of being approved by ASTM.

Table 1. Biodiesel specifications (as of July, 1996)<sup>†</sup>

| Property                            | ASTM method              | Value             | Unit     |
|-------------------------------------|--------------------------|-------------------|----------|
| Flash point .....                   | D93 .....                | 100.0 min. ....   | °C       |
| Water & sediment .....              | D1796 .....              | 0.050 max. ....   | vol. %   |
| Carbon residue (100 % sample) ..... | D4530 <sup>‡</sup> ..... | 0.050 max. ....   | wt %     |
| Sulfated ash .....                  | D874 .....               | 0.020 max. ....   | wt %     |
| Viscosity @ 40°C .....              | D445 .....               | 1.9 - 6.0 .....   | Cst      |
| Sulfur .....                        | D2622 .....              | 0.05 max. ....    | wt %     |
| Cetane number .....                 | D613 .....               | 40 min. ....      |          |
| Cloud point .....                   | D2500 .....              | by customer ..... | °C       |
| Copper strip corrosion .....        | D130 .....               | No. 3b max. ....  |          |
| Acid number .....                   | D664 .....               | 0.80 max. ....    | mg KOH/g |
| Free glycerin .....                 | G.C.§ .....              | 0.020 max. ....   | wt %     |
| Total glycerin .....                | G.C.§ .....              | 0.240 max. ....   | wt %     |

<sup>†</sup> This specification is in the process of being evaluated by ASTM. A considerable amount of experience exists in the US with a 20% blend of biodiesel with 80% petroleum based diesel. Although biodiesel can be used in the pure form, use of blends of over 20% biodiesel should be evaluated on a case by case basis until further experience is available.

<sup>‡</sup> Or equivalent ASTM testing method.

<sup>§</sup> Austrian (Christina Planc) update of USDA test method.

## Biodiesel attributes

### Emissions reductions

The use of biodiesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter. Emissions of nitrogen oxides are either slightly reduced or slightly increased depending on the duty cycle and testing methods. Particulate emissions from conventional diesel engines can be divided into three components. Each component is present in varying degrees depending on fuel properties, engine design and operating parameters.

The first component, and the one most closely related to the visible smoke often associated with diesel exhaust, is the carbonaceous material. This material is in the form of sub-micron sized carbon particles which are formed during the diesel combustion process and is especially prevalent un-

der conditions when the fuel-air ratio is overly rich. This can occur as a result of insufficient combustion air, over-fueling or poor in-cylinder fuel-air mixing. The second component is hydrocarbon or PAH material which is absorbed on the carbon particles. A portion of this material is the result of incomplete combustion of the fuel, and the remainder is derived from the engine lube oil. Finally, the third particulate component is comprised of sulfates and bound water. The amount of this material is directly related to the fuel sulfur content.

The use of biodiesel decreases the solid carbon fraction of particulate matter, eliminates the sulfate fraction (as there is no sulfur in the fuel), while the soluble, or hydrocarbon, fraction stays the same or is increased. Therefore, biodiesel works well with new technologies such as catalysts (which reduces the soluble fraction of diesel particulate), particulate traps, and exhaust gas

recirculation (potentially longer engine life due to less carbon).

Biodiesel's particulate reduction has been verified in both lab and field testing completed by the former US Bureau of Mines (USBOM). Lab testing was conducted with a power pack from a Jeffrey 4110 RamCar powered by a Deutz/MWM 6.3 liter naturally aspirated IDI engine with a water scrubber. The test was performed both with and without a prototype diesel oxidation catalyst. Particulate matter reductions of 50% were obtained when using neat biodiesel compared to diesel fuel. The addition of the catalyst reduced the biodiesel SOF by an additional 48%. In this test, the addition of a catalyst to the diesel fueled engine increased DPM due to sulfate aerosol formation.

The USBOM conducted field tests at Homestake Mines in South Dakota and measured both energy specific DPM using ambient air samplers as well as time weighted DPM on samplers attached to the equipment itself. These results demonstrated an energy specific DPM reduction of 75% and a time weighted DPM reduction of 55%. These reductions were greater than that of the laboratory, most likely due to the heavier duty cycle used in the mine compared to that used in the lab testing. Equipment operators also commented on the distinct absence of black smoke upon acceleration when using biodiesel.

**Operating performance**

One of the major advantages of biodiesel is the fact that it can be used in existing engines and fuel injection equipment without negative impacts to operating performance. Biodiesel has a higher cetane number than conventional diesel fuel and its demonstrated use at the Homestake mine in South Dakota resulted in similar fuel consumption, horsepower, torque, and haulage rates compared to conventional diesel fuel.

**Health effects**

Evidence does exist which indicates that diesel particulate matter is a potential carcinogen. In 1988, the National Institute for Occupational Safety and Health (NIOSH) recommended that whole diesel exhaust be regarded as "a potential occupational carcinogen," as defined in the Cancer Policy of the Occupational Safety and Health Administration. The use of biodiesel does result in decreases in most regulated emissions. Relative to health effects, research results indicate that particulate matter, specifically the carbon or insoluble fraction, is significantly reduced. In addition to reducing the overall levels of pollutants and carbon, the compounds that are prevalent in biodiesel and diesel fuel exhaust are different. Preliminary research on the speciation of diesel and biodiesel particulate indicates that biodiesel exhaust has less harmful impacts on human health than petrodiesel.

The USBOM has also completed Ames mutagenicity testing of the DPM and exhaust gases from engines fueled with biodiesel to better understand how the use of biodiesel may impact the health of miners. Samples were taken from the exhaust of a Caterpillar 3304 PCNA equipped with an exhaust catalyst. Test results documented that the use of biodiesel reduced the Ames mutagenicity of DPM by 50% over conventional diesel fuel. In addition, the gas phase mutagenicity of biodiesel was negligible. USBOM researchers believed the strong reduction in mutagenicity may be due to the lack of aromatics or polycyclic aromatic hydrocarbons (PAHs) in the biodiesel fuel and, subsequently, in the exhaust gases. Tests from Europe confirm the reduction in DPM PAH using biodiesel blends as outlined in Table 2.

**Lubricity**

With the lubricity of conventional diesel fuel being scrutinized due to processing changes required to reduce the sulfur and aromatic content of diesel fuel, biodiesel use can be demonstrated to be a benefit. Lubricity tests utilizing both the High Frequency Reciprocating Rig

**Table 2. Gaseous PAH levels of diesel fuel and a 50% biodiesel blend.**

|                          | Diesel        | 50% Biodiesel |
|--------------------------|---------------|---------------|
|                          | micro-g/cycle |               |
| Naphthalene .....        | 331 654 ...   | 384           |
| Methyl-2 Naphthalene ... | 10 289 ....   | 329           |
| Fluorene .....           | 1 864 .....   | 368           |
| Anthracne .....          | 4 301 .....   | 873           |

(HFRR) and the Ball On Cylinder Lubricity Evaluator (BOCLE) have demonstrated the lubricity advantage of biodiesel. Test results are detailed in Table 3.

Tests have also been conducted on Jet A-1 fuel. These test results from Southwest Research Institute concluded that biodiesel shows significant lubricity improvement compared to diesel fuel. Results are detailed in Table 4.

**Flash point and sulfur content**

The flash point of a fuel is defined as the temperature to which the fuel must be heated to produce a vapor-air mixture above the surface of the fuel that will ignite when exposed to an ignition source such as a spark or flame. Due to the operating environment of underground mines, flash point is an important parameter. Provincial agencies in Canada and federal agencies in the US regulate the flash point of fuels allowable in underground mines. The flash point of biodiesel has been tested and reported by various sources. Specific testing at Southwest Research Institute concluded that the flash point of biodiesel blends increases as the percentage of biodiesel increases. Therefore pure biodiesel or blends of biodiesel with petroleum diesel is safer to store, handle, and use than conventional diesel fuel. In addition, the sulfur content of fuels utilized in underground mines is also regulated. Pure biodiesel is essentially sulfur free and results in a total reduction of SO<sub>2</sub> emissions as well as sulfate aerosols in particulate matter. These reductions should assist in

**Table 3. Exxon lubricity results using the HFRR\* test at 60° C**

| Fuel type   | Scar      | Friction   | Film% |
|---|-----------|------------|-------|
| #2 ISD (reference fuel) .....                             | 492 ..... | 0.24 ..... | 32    |
| B20 with reference fuel .....                             | 193 ..... | 0.13 ..... | 93    |
| 1000 ppm Exxon lubricity additive with reference fuel.... | 192 ..... | 0.13 ..... | 82    |

\* Results Courtesy of Midwest Biofuels

**Table 4. Effects of biodiesel on Jet A-1 lubricity as determined by the HFRR test\***

| Fuel                             | HFRR, mm |
|----------------------------------|----------|
| Biodiesel.....                   | 0.27     |
| Jet A-1 .....                    | 0.66     |
| Jet A-1 + 8 vol% biodiesel ..... | 0.28     |
| Jet A-1 + 4 vol% biodiesel ..... | 0.28     |
| Jet A-1 + 2 vol% biodiesel ..... | 0.20     |
| Jet A-1 + 1 vol% biodiesel ..... | 0.34     |

\* Tests performed by Southwest Research Institute (SwRI) are not an endorsement of biodiesel by SwRI. Tests funded jointly by the USDA and the USDOD.

increasing both vehicle and catalyst life over time.

### Biodegradability

Biodiesel also has desirable degradation attributes. Studies at the University of Idaho have been conducted to determine the biodegradation of biodiesel in an aqueous solution. Biodiesel was compared to diesel fuel and dextrose. Biodiesel samples degraded more rapidly than the dextrose control and were 95 percent degraded at the end of 28 days. The diesel fuel was approximately 40 percent degraded after 28 days.

Another study conducted at the University of Idaho tested the "Biodegradability of Biodiesel in the Aquatic Environment" by the CO<sub>2</sub> evolution method and gas chromatography (GC), comparing the results with regular diesel. According to the University of Idaho's report, under aerobic conditions and nutrient supply (N, P), microorganisms will metabolize a substance to two final products, CO<sub>2</sub> and water. Therefore, CO<sub>2</sub> is presumed to be the prevalent indicator of organic substance breakdown. If the substrate is the only carbon source, the amount of CO<sub>2</sub> evolved will be proportional to the carbons

consumed by microorganisms from the test substrate. Thus, the percentage of CO<sub>2</sub> evolution is proportional to the percentage of substrate degradation.

The maximum percent CO<sub>2</sub> evolution from several samples of biodiesel produced were between 85.54-88.49 percent in 28 days, the same as that of dextrose, indicating there is no difference in their biodegradability. Yet, the CO<sub>2</sub> evolution from the diesel flasks was only 26.24 percent. It should also be noted that biodiesel blends accelerate the biodegradability of No. 2 diesel. For example a 20% biodiesel blend degrades twice as fast as No. 2 diesel. This illustrates that biodiesel use has demonstrated biodegradability benefits at levels lower than 100%.

### Toxicity

Impacts on human health represent a significant criteria as to the suitability of a fuel for commercial applications. Health effects can be measured in terms of fuel toxicity to the human body as well as health impacts due to exhaust emissions. Tests conducted by Wil Research Laboratories, Inc. investigated the acute oral toxicity of pure biodiesel fuel as well as B20 in a single-dose study on rats. The LD<sub>50</sub> of pure biodiesel, as well as B20, was found to be greater than 5000 mg/kg, although hair loss was noted on one sample in the B20 group. The acute dermal toxicity of neat biodiesel was evaluated in a single dose study involving rabbits. The LD<sub>50</sub> of biodiesel was found to be greater than 2000 mg/kg and the 2000 mg/kg dose level was found to be a No Observable Effect Level (NOEL) for systemic toxicity.

Acute aquatic toxicity tests with *Daphnia Magna* have also been conducted. Table salt (NaCl), diesel, and biodiesel were compared to each other.

The LC<sub>50</sub> count (the concentration where 50 percent of the *Daphnia Magna* have died and 50 percent were still alive) for table salt was 3.7 parts per million (ppm). Fifty percent of the *Daphnia Magna* were dead at 1.43 ppm for diesel fuel. The LC<sub>50</sub> number varied for biodiesel from 23 ppm to 332 ppm. Therefore, biodiesel is less toxic than diesel fuel.

### Considerations for biodiesel use Infrastructure

In general, the standard storage and handling procedures used for petroleum diesel should be used for biodiesel. The fuel should be stored in a clean, dry, dark environment. Temperature extremes should be avoided. Acceptable storage tank materials include mild steel, stainless steel, fluorinated polyethylene, and fluorinated polypropylene. Biodiesel has a solvent effect which releases the deposits accumulated on tank walls and pipes, which previously have been used for diesel. These deposits can be expected to clog filters initially and precautions should be taken to allow for this.

### Materials compatibility

Biodiesel over time will soften and degrade certain types of elastomers and natural rubber compounds. Precautions are needed when using high percent blends to ensure that the existing fueling system, primarily fuel hoses and fuel pump seals, does not contain elastomer compounds incompatible with biodiesel. Manufacturers recommend that natural or butyl rubbers not be allowed to come in contact with neat biodiesel. Biodiesel will lead to degradation of these materials. If a vehicle's fuel system does contain these materials, replacement with biodiesel compatible elastomers such as Viton B is recommended. The recent switch to low sulfur diesel fuel has caused most OEMs to switch to components suitable for use with biodiesel, but users should contact their OEM for specific information.

### Cold flow properties

As with any diesel fuel, cold flow properties are important. A 20% blend of biodiesel will increase the cold flow properties (cold filter plugging point, cloud point, pour point) of petrodiesel approximately 1 to 3 degrees Celsius. Thus far, no precautions have been needed for fueling with 20% blends. Operation of neat (100%) biodiesel in cold weather, however, will experience gelling faster than petrodiesel. The solutions for this potential issue are much the same as that with low-sulfur #2 diesel (i.e., blending with No. 1 diesel, utilization of fuel heaters and storage of the vehicle in or near a building). Biodiesel appears to be unaffected by conventional pour point depressants.

### Fuel availability

The following companies have applied or are in the process of application to be listed as a biodiesel fuel supplier with the National Biodiesel Board. Any of these companies can be contacted for quotes on current price, supply, and distribution of biodiesel.

*Ag Environmental Products (AEP)*  
9804 Pflumm  
Lenexa, KS 66215  
(800) 599-2121  
Contact: Bill Ayres or Doug Pickering

*Twin Rivers Technology, Inc. (TRT)*  
780 Washington Street  
Quincy, MA 02169  
(617) 472-9200  
Contact: Biodiesel Sales

*NOPEC Corporation*  
P.O. Drawer 2868  
Lakeland, FL 33806-2868  
(888) 296-6732  
Contact: Biodiesel Sales

*Columbus Foods*  
800 North Albany  
Chicago, IL 60622  
(312) 265-6500  
Contact: Mike Gagliardo

*Pacific Biodiesel, Inc.*  
285 Hukilike, B-103  
Kahului, HI 96732  
(808) 871-6624  
Contact: Bob King

### Economics

There has been increasing interest in using diesel equipment in mines for reasons such as cost considerations. Diesel-powered equipment is potentially less expensive to operate compared to other transportation systems and can increase productivity. Safety is also an issue. Some mine operators are interested in replacing electric trolleys used to transport miners with diesel-powered equipment because workers have expressed concern of electrocution by power lines and mine explosions caused by electrical sparks. For these and other reasons, the number of diesel units being used in mines has been gradually increasing.

Concurrently, regulatory entities are considering the passage of stricter regulations for diesel powered equipment in underground mines. These regulations are geared toward reducing the levels of exhaust emissions in mines. Several industry sources do not believe that promulgating a strict particulate emission rule will have the desired effect of forcing development of low emission underground diesel engines as the potential market is too low. These sources believe that the market for mine engines is too small to drive technology development itself. The speed with which these technologies can be made available is dependent upon the length of the equipment development cycles. Because many equipment types are highly specialized and relatively low volume, and because equipment manufacturers and their suppliers need to recover their investment costs before re-designing their products, development cycles are typically quite long.

Biodiesel offers the opportunity to utilize existing diesel engine technology and meet emissions reductions goals or enhance existing exhaust aftertreatment devices. Because biodiesel has a higher flash point than diesel and since it lowers emissions of particulate matter, carbon monoxide, oxides of sulfur, and potentially other air toxics, it could lower emissions levels in underground mines, reduce the cost of providing adequate ventilation in mines, and im-

prove the performance of dry emissions systems by increasing the interval between servicing.

### Summary

The use of biodiesel in underground mines is an easily implemented control strategy which has been demonstrated to reduce diesel particulate matter as well as other diesel emissions. The use of biodiesel substantially reduces the Ames mutagenicity of diesel particulates. Biodiesel compliments existing diesel and aftertreatment technologies (EGR, catalysts, filters, etc.) and can be used as a stand alone strategy or in combination with these future technologies. In addition, biodiesel is compatible with existing diesel fuel and provides the added benefit of improving lubricity and reducing sulfur and aromatics. Finally, biodiesel use provides other benefits to society such as reduction of CO<sub>2</sub>, reducing dependence on foreign petroleum, and creation of domestic manufacturing jobs which make it an attractive option to help meet governmental and worker related goals.

*Reprinted from the 15 March 1998 issue of the DEEP Newsletter.*

*URL: www.dieselnet.com [Accessed 10 June 1998].*

### Selected references:

*Henderson, Paul. 1994. Diesel Fuel Update. Presented at the 1994 Association of Diesel Specialists International Convention in August.*

*Howell, Steve. 1995. Lubricity, the Biodiesel Advantage. Presented at the 1995 ASAE Annual International Meeting, June 18-23, 1995.*

*National Biodiesel Board. 1996. 1996-1998 Biodiesel Marketing Plan. Completed by Weber Consulting for the National Biodiesel Board. March, 1996.*

*Power Systems Research. 1995. Biodiesel for Underground Mines. June, 1995.*

*Walwijk, M. 1995. Biodiesel Particulate emissions and fuel storage. On behalf of the IEA Automotive Fuels Information Service. October.*

*Weber, J. Alan and Kenlon Johannes. 1996. Biodiesel Market Opportunities and Potential Barriers. Proceedings of the Third Liquid Fuels Conference. September 15-17, 1996 in Nashville, TN.*

## Warning issued to roof bolters, helpers on rotating drill steels

Miners who operate roof bolting equipment need to make sure that the drill steel has stopped rotating before completely withdrawing the steel from the drill hole.

In tests on drill steels, MSHA has found drill steels will bend when allowed to rotate freely at high RPM, standing in a drill head twist-lock chuck, outside of the drill hole.

As part of a recent accident investigation, testing was conducted to deter-

mine what effect high speed rotation would have on drill steel.

Four different 4-foot sections of 1-1/2-inch diameter steel were tested: two remanufactured steels, an unused new steel, and a used steel. The tests showed that as the RPM was increased, the centrifugal force induced by the rotation caused the drill steel to bend. As the RPM was increased, the drill steel tip would move in an ever increasing rotational arc to approximately 740 RPM. At 740 RPM the steel would per-

manently deform (bend) near the chuck to an angle of about 30 degrees. The deformation was nearly identical in all four drill steels tested.

MSHA would like to operators to tell all roof bolting machine operators and helpers of this hazard. The only way to avoid a problem is to make sure that the drill steel has stopped rotating before completely withdrawing the steel from the drill hole.

*Reprinted from the Sept. 4, 1998 issue of Mine Safety and Health News by Legal Publication Services.*

## Warning issued about Moog remote controller

MSHA has issued a warning about accidental activation of the tram function of mining machinery remotely controlled by the Moog Inc. Model 129 Series Send Unit.

The unit has a special sleeve that the machine operator must lift to activate a tram function. This design prevents accidental activation through inadvertent contact.

MSHA has found, however, that excessive wear or dust build-up in the tram control lever's mechanical interlock assembly can cause an accidental activation.

The agency has also found cases where the control lever lift sleeve was taped in the "up" position which bypasses the interlock feature, and contact with the tram control lever could cause the activation of the tram function.

Because it is a protective feature, maintaining the mechanical interlock in a safe operating condition is particularly important. In order to ensure proper action of the tram control lever mechanical interlock safety feature, MSHA recommends that the following

regularly-scheduled maintenance be performed on the Moog Inc. Model 129 Series Send Unit:

1. Using a brush or low pressure compressed air (5 psi maximum), clean any dirt or dust from the control lever detent area to allow proper seating of the lift sleeve. Appropriate eye and respiratory protection should be worn.

2. Check to be sure the lift sleeve is not taped up, moves freely on the control lever shaft, and the return spring fully seats the lift sleeve upon release. If the lift sleeve exhibits any sluggishness or binding, the Send Unit should be removed from service and returned to the manufacturer for repair. Disassembly in the field is not recommended and lubricants should not be applied in this situation since it is likely to make the problem worse.

3. Test the control levers with the actual machine controlled by the Send Unit to determine if excessive wear has developed. From a safe location, with the remote controlled machine energized, and without lifting the tram control lever lift sleeve, move each tram

control lever forward, backward, and side to side while in the detent position. Any activation of the tram function during this test indicates excessive wear of the detent components, and the Send Unit should be removed from service and returned to the manufacturer for repair.

MSHA inspectors have been told to look for excessive wear and dust build-up on the tram lever controls or the taping up of the lift sleeves which bypasses the interlock feature. These conditions constitute a failure to maintain the unit in a safe operating condition, and operators will be cited if these conditions are found.

Questions can be directed to: Gerald D. Dransite, Technical Support, Approval and Certification Center, 304-547-2022.

Robert L. Phillips, Coal Safety Division, 703-235-1915.

Milburn B. Rinehart, Metal and Nonmetal safety Division, 703-235-8647.

*Reprinted from the Sept. 4, 1998 issue of Mine Safety and Health News by Legal Publication Services.*

# 16

## Three girls die in clay pit

To 11-year-old Mitchell Bass and his friends, the unfenced clay pit the size of a city block near his home was a cool place to ride their bikes, climb and hunt for treasure amid the trash.

To adults in the neighborhood, it was a tragedy waiting to happen.

The yawning hole became a deathtrap Aug. 13, when a 20-foot-high ledge collapsed during a rainstorm, burying Mitchell and three friends who had taken cover. Only Mitchell survived.

Funeral services were held in nearby Milton, Fla., for 11-year-old Mallory Bush and her sisters, 10-year-old twins Jessica and Jillian,

who died after being trapped beneath dirt and boulders for about 45 minutes.

The pit serves as a source of red clay for roads and other construction projects.

Their deaths have prompted a renewed effort to have the pit filled or fenced in, and the county commission voted to have its staff research options for a possible law mandating fences.

"I assure you this board will do what it can within its powers," said Milton Commission Chairman Byrd Mapoles. But he added, "Keep in mind if this board starts taking away

your private property rights, the next thing we can be at your house making you fence up your yard." The county has a tradition of property rights activism.

"We can't understand why the clay pit wasn't fenced in," said Wayne Whitsett, the girls' maternal grandfather, had said earlier. "I have no anger at this point. I'm just numb to the whole thing. I can't accept the fact that my little grandbabies are gone."

*Reprinted from the September 4, 1998 issue Mine Safety and Health News - September 4, 1998 by Legal Publication Services*

## Free, confidential chest X-rays offered to Kentucky coal miners

In its continuing efforts to eliminate black lung disease and silicosis, the Mine Safety and Health Administration (MSHA) is offering free, confidential chest x-rays to surface and underground coal miners employed at Kentucky coal mines. Over the past three years, MSHA has offered similar screenings in Pennsylvania, Oklahoma, West Virginia, and Wyoming.

During the month of September, any miner currently or previously employed (within the last 12 months) by a Kentucky coal mine is eligible for the examination. The identity of miners taking part in the screening, and the results, will be kept confidential.

"To combat black lung effectively, we need to know more about the extent of the problem in all the nation's coalfields," said Davitt McAteer, assistant secretary of labor for mine safety and health. "We urge coal miners to take advantage of this program. It

will provide valuable, confidential information for the miners who participate, and it will help in the effort to eliminate black lung."

Before being selected for the screening, miners must contact one of three designated MSHA field offices in Kentucky. Miners will be asked a series of questions regarding work history to determine their eligibility. A total of 500 appointments are available on a first-come, first-served basis, so miners are encouraged to call MSHA as soon as possible.

Physicians at the West Virginia University Medical Center in Morgantown will interpret the x-ray screenings, and the university will provide individual findings confidentially to each miner by the end of the year. The National Institute for Occupational Safety and Health will compile the cumulative results of the tests

to determine if there continues to be a problem with lung disease.

To sign up for a free screening, Kentucky coal miners need to call one of the following MSHA offices using the toll-free numbers below:

Eastern Kentucky (Pikeville office): (800) 294-4033

Southeastern Kentucky (Barbourville office): (877) 215-5100

Western Kentucky (Madisonville office): (800) 294-4035.

Black lung and silicosis are disabling, irreversible, and often fatal lung diseases. Black lung is caused by overexposure to respirable coal mine dust, while silicosis results from overexposure to crystalline silica. More than 2,000 miners have previously participated in these screenings.

*Reprinted from an MSHA news release dated: Monday, August 17, 1998. For further information contact Amy Louviere at 703-235-1452.*



## New Internet site covers natural resource news

Six federal agencies have announced the introduction of a new Internet service to cover breaking natural resource news in California.

Launched in June, the California FedPage provides current information on issues affecting the state's natural resources from the latest endangered species to breakthroughs in earthquake technology and water manage-

ment to the best vacation bets in national parks and forests and Bureau of Land Management public lands.

Sources supplying information are: BLM, Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, and National Park Service.

The Internet site highlights major news releases, decision documents

such as environmental impact statements and records of decisions, upcoming public meetings, and ongoing public comment periods for each agency.

Once online, the new service can be reached through <http://fedpage.doi.gov>.

*Reprinted from the September 1998 issue of California Mining*

## Refurbished methane detectors wanted for Ukrainian mines

More than 264 miners have lost their lives in the Ukraine so far this year, with the majority of the deaths caused by methane gas explosions.

According to newspaper reports, Ukraine mining officials say that the methane detonations could have been prevented had the mines been equipped with basic methane detection equipment. But, even before the devaluation of the ruble, the mines couldn't afford the machines.

So, a group called Partners in Economic Reform Inc. (PER) is asking U.S. coal companies to donate old methane detectors so they can be shipped to miners in the Ukraine.

James G. Randolph, executive director of PER said his organization has already sent some new methane detectors to what he called "a couple of their most gassy mines." And, MSHA has supported the program by donating 128 old methane detectors. They were refurbished by Industrial Scientific and sent overseas.

Many American mining operations are upgrading from the single methane detectors to multi-gas detector machines, Randolph told the National Mining Association's *Mining Week*. Because of the ongoing upgrades, he believes U.S. mining companies have old machines to donate to the Ukraine coal industry. PER is seeking

funding from the U.S. Agency for International Development to finance the rehab work on the old methane machines.

*Mine Safety and Health News* (MSHN) tried to get more information on how U.S. companies could participate but Randolph did not return several MSHN phone calls seeking further information on the program.

Companies who would like to participate may try to call Randolph at 202-466-3840.

*Reprinted from the Sept. 4, 1998 issue of Mine Safety and Health News by Legal Publication Services.*

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## WINTER ALERT REMINDER—

- Always maintain adequate mine ventilation and make frequent checks for methane and proper airflow.
  - Know your mine's ventilation plan and escapeways. Properly maintain methane detection devices. Communicate changing mine conditions to one another during each shift and to the oncoming shift.
  - Control coal dust with applications of rock dust.
  - Make frequent visual and sound checks of mine roof during each shift. NEVER travel under unsupported roof!
-

# 18

## Mining operations recognized for outstanding safety records

Eight mining operations are being honored for their outstanding 1997 safety records in the annual Sentinels of Safety awards program co-sponsored by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) and the National Mining Association (NMA).

Mining companies in various operational categories were recognized for achieving the greatest number of employee work-hrs. in 1997 without an injury that resulted in lost workdays. To qualify for the program, a mining operation must compile at least 30,000 employee work-hrs. during the year without a lost-time injury or fatality.

"Safety and production go hand in hand," said J. Davitt McAteer, assistant labor secretary for mine safety and health. "While all companies strive to meet production goals, it's the safe mine that, in the long run, will excel in production by not cutting corners. And when you have a strong team of workers, that's the biggest payoff."

The sentinels award is the oldest established award for occupational safety. The first Sentinels of Safety award was announced by former President

Herbert Hoover, a mining engineer, when he was secretary of commerce in 1925. The annual safety competition has

continued uninterrupted to the present day.

First place winners and their number of consecutive employee-hrs. free of fatalities or lost-time injuries recorded in each of the mining categories are:

### UNDERGROUND COAL GROUP

Roaring Fork No. 2 Mine, Clinchfield Coal Co., Dante, VA, 154,337 hrs.

### SURFACE COAL GROUP

Colowyo Mine, Colowyo Coal Co., L.P., Meeker, CO, 666,850 hrs.

### UNDERGROUND METAL GROUP

Greens Creek Mine, Kennecott Greens Creek Mining, Juneau, AK, 434,236 hrs.

### UNDERGROUND NON-METAL GROUP

Big Island Mine & Refinery, OCI Wyoming, L.P., Green River, WY, 326,090 hrs.

### OPEN PIT GROUP

Cyprus Sierrita Corp., Cyprus Amax Minerals Co., Green Valley, AZ, 556,736 hrs.

### QUARRY GROUP

Pennsoco Quarry, Tarmac America, Inc., Medley, FL, 232,232 hrs.

### BANK OR PIT GROUP

Lilesville Mine, W.R. Bonsal Co., Lilesville, NC, 164,262 hrs. (Second consecutive year)

### DREDGE GROUP

Briggs Plant, The Fordyce Co., Victoria, TX, 207,838 hrs.

*Other mining operations with exceptional safety records during 1997*

*include the following:*

### UNDERGROUND COAL GROUP

Brushy Eagle Mine, Marfork Coal Co., Inc., Pettus, WV, 144,836 hrs.  
Black Knight II, Elk Run Coal Co., Inc., Sylvester, WV, 134,035 hrs.  
Laurel Alma Mine, Elk Run Coal Co., Inc., Sylvester, WV, 111,899 hrs.  
Bishop Branch Mine No. 1, McCoy Elkhorn Coal Corp., Pikeville, KY, 103,400 hrs.

### SURFACE COAL GROUP

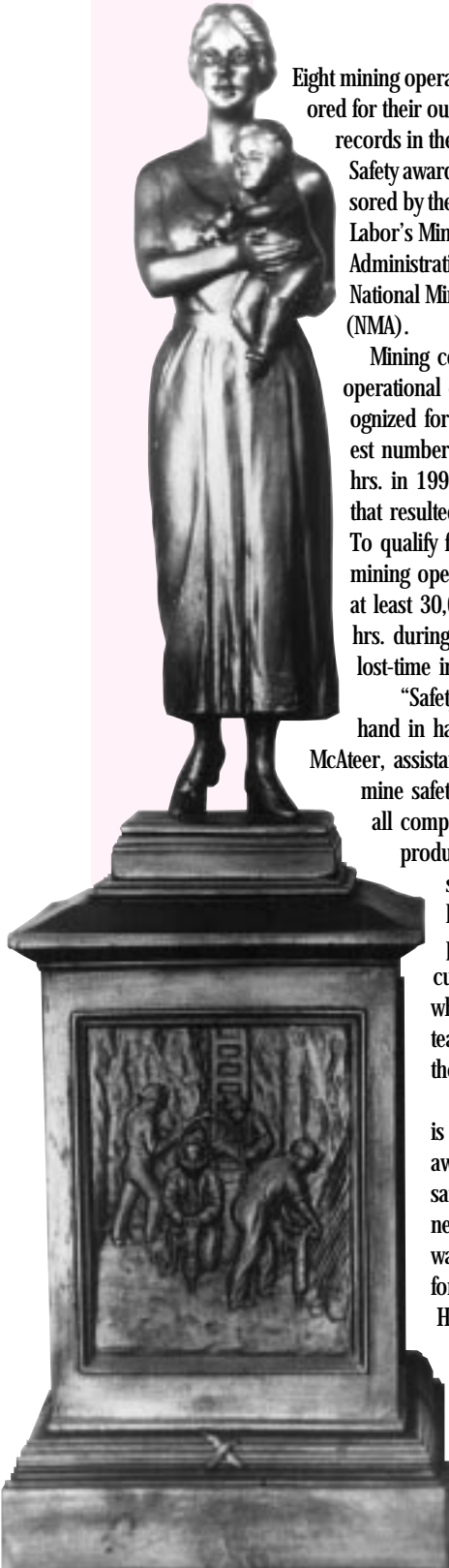
Cordero Mine, Cordero Mining Co., Gillette, WY, 560,041 hrs.  
Kemmerer Mine, Pittsburg & Midway Coal Mining, Kemmerer, WY, 528,916 hrs.  
North Antelope Mine, Powder River Coal Co., Gillette, WY, 482,222 hrs.  
Winfield North Strip, Texas Utilities Mining Co., Mt. Pleasant, TX, 476,600 hrs.

### UNDERGROUND METAL GROUP

Fletcher Mine & Mill, The Doe Run Co., Viburnum, MO, 175,846 hrs.  
West Fork Mine, ASARCO, Inc., Bunker, MO, 142,981 hrs.  
Lamefoot Mine Site, Echo Bay Minerals, Inc., Republic, WA, 142,258 hrs.  
Viburnum No. 29 Mine, The Doe Run Co., Viburnum, MO, 72,520 hrs.

### UNDERGROUND NONMETAL GROUP

Locust Cove Mine, United States Gypsum Co., Saltville, VA, 149,936 hrs.  
Randolph Mine, Hunt Midwest Mining, Inc., Kansas City, MO, 93,309 hrs.  
Greer Limestone Mine & Mill, Greer Industries, Inc., Morgantown, WV, 88,497 hrs.  
Central (underground) Quarry, Vulcan Materials Co., Knoxville, TN, 77,034 hrs.



**OPEN PIT GROUP**

Denton-Rawhide Mine, Kennecott Rawhide Mining Co., Fallon, NV, 272,334 hrs.  
 Fort Knox Mine, Fairbanks Gold Mining, Inc., Fairbanks, AK, 258,989 hrs.  
 Ridgeway Mine, Kennecott Ridgeway Mining Co., Ridgeway, SC, 222,118 hrs.  
 Cyprus Tohono Mine, Cyprus Tohono Corp., Casa Grande, AZ, 205,102 hrs.

**QUARRY GROUP**

Three Rivers Plant and Quarry, Martin Marietta Aggregates, Smithland, KY, 162,286 hrs.

Longview Lime Quarry, Dravo Lime Co., Saginaw, AL, 115,762 hrs.  
 Miami Quarry, Florida Rock Industries, Inc., Miami, FL, 106,242 hrs.  
 Morgan Pit, A.J. Brauer Stone Co., Jarrell, TX, 97,620 hrs.

**BANK OR PIT GROUP**

Curl's Neck and Plant 18, Tarmac America, Inc., Richmond, VA, 112,530 hrs.  
 Pit No. 10, Harper Sand & Gravel, Inc., Kearns, UT, 110,339 hrs.  
 Bradshaw Pit and Mill, Granite Construction Co., Sacramento, CA, 99,967 hrs.

Puddledock Sand & Gravel, Tarmac America, Inc., Petersburg, VA, 99,264 hrs.

**DREDGE GROUP**

Rockport Plant, Mulzer Crushed Stone, Inc., Tell City, IN, 115,484 hrs.  
 Porter Plant & Pit, Hallett Materials, Porter, TX, 90,681 hrs.  
 Evansville Mill, Mulzer Crushed Stone, Inc., Tell City, IN, 85,381 hrs.  
 Seitz Pit, Gifford-Hill Concrete Co., Thackerville, OK, 63,103 hrs.

*For release: Monday, August 24, 1998*

## **FMC Corp. takes first place in national mine rescue contest**

FMC Corporation's FMC Red Team of Green River, Wyo., won first place yesterday in the 1998 National Metal and Nonmetal Mine Rescue Contest, which was held July 8 and 9 at the Las Vegas Convention Center in Las Vegas, Nev.

General Chemical Soda Ash Partners' General Chemical Black Team, also of Green River, Wyo., and Morton International, Inc.'s Grand Saline Team from Grand Saline, Texas, were the second- and third-place winners in the competition, which is sponsored by the Department of Labor's Mine Safety and Health Administration.

Mine rescue contests are designed to sharpen skills and test the knowledge of miners who may one day be called upon to respond to a real mine emergency. The contest requires six-member teams to solve a hypothetical rescue problem while being timed and observed by judges according to precise rules. The simulated problem involved trapped miners who had to be located and rescued.

State and federal mine safety experts evaluated each team as they worked through their rescue problem in a simulated mine environment. Teams were rated on adherence to safety procedures and how quickly they completed their task.

"Mine rescue contests are invaluable training exercises that enable both new and veteran teams to solve an elaborate problem when miners' lives are not on the line," said J. Davitt McAteer, assistant labor secretary for mine safety and health. "These men and women are truly a special breed of people, often practicing on their own time, and always ready to respond at a moment's notice to save the lives of people they may not even know."

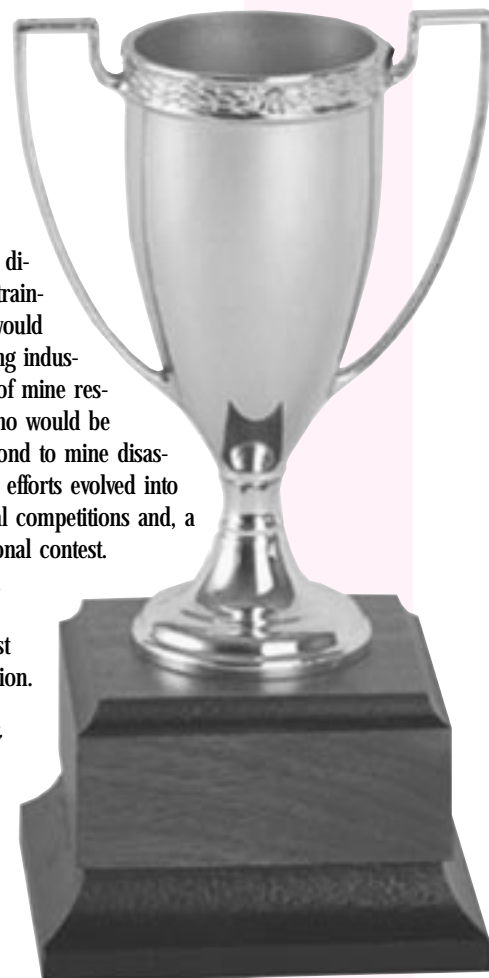
Joe Baca of Westinghouse Electric Corporation's Waste Isolation Pilot Plant, Carlsbad, N.M., took first place in the bench competition. Benchmen are charged with maintaining the rescue equipment. In the bench competition, participants must thoroughly inspect breathing devices that have been purposely tampered with, and they must correct those defects as quickly as possible.

Second and third place winners in the bench competition were Jeff Jetmore of Solvay Minerals, Inc., Green River, Wyo., and Melvin Lovato of TG Soda Ash's Wyoming Soda Ash Operations, Granger, Wyo.

The National Metal and Nonmetal Mine Rescue Contest is held in even-numbered years.

Mine rescue training began in the United States in 1910, the year the U.S. Bureau of Mines was created. Joseph A. Holmes, the bureau's first director, sought a training vehicle that would provide the mining industry with a cadre of mine rescue specialists who would be prepared to respond to mine disasters. The training efforts evolved into local and regional competitions and, a year later, a national contest. President William Howard Taft was present at the first national competition.

*For complete scores, standings and photographs of the 41 participating teams, visit MSHA's home page at [www.msha.gov](http://www.msha.gov). Contact: Amy Louviere or Rodney Brown  
 Phone: (703) 235-1452  
 Friday, July 10, 1998*



# 20

## A LOOK BACK... In the depths of a coal mine

By Stephen Crane McClure's Magazine: Vol. III, August, 1894. No. 3.

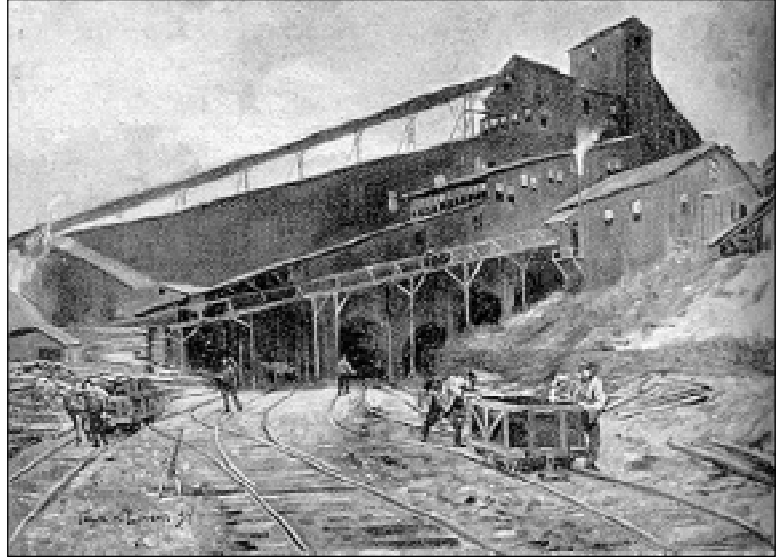
[This is the same Stephen Crane who wrote the "Red Badge of Courage"—The Editor]

The "breakers" squatted upon the hill-sides and in the valley like enormous preying monsters, eating of the sunshine, the grass, the green leaves. The smoke from their nostrils had ravaged the air of coolness and fragrance. All that remained of vegetation looked dark, miserable, half-strangled. Along the summit line of the mountain a few unhappy trees were etched upon the clouds. Overhead stretched a sky of imperial blue, incredibly far away from the sombre land.

The  
"Breaker."

We approached the colliery over paths of coal dust that wound among the switches. A "breaker" loomed above us, a huge and towering frame of blackened wood. It ended in a little curious peak, and upon its sides there was a profusion of windows appearing at strange and unexpected points. Through occasional doors one could see the flash of whirring machinery. Men with wondrously blackened faces and garments came forth from it. The sole glitter upon their persons was at their hats, where the little tin lamps were carried. They went stolidly along, some swinging lunch-pails carelessly; but the marks upon them of their forbidding and mystic calling fascinated our new eyes until they passed from sight. They were symbols of a grim, strange war that was being waged in the sunless depths of the earth.

Around a huge central building clustered other and lower ones, sheds, engine-houses, machine-shops, offices. Railroad tracks extended in web-like ways. Upon them stood files of begrimed coal cars. Other huge structures similar to the one near us, upreared their uncouth heads upon the hills of the surrounding country.



From each a mighty hill of culm extended. Upon these tremendous heaps of waste from the mines, mules and cars appeared like toys. Down in the valley, upon the railroads, long trains crawled painfully southward, where a low-hanging gray cloud, with a few projecting spires and chimneys, indicated a town.

Car after car came from a shed beneath which lay hidden the mouth of the shaft. They were dragged, creaking, up an inclined cable road to the top of the "breaker."

At the top of the "breaker," laborers were dumping the coal into chutes. The huge lumps slid slowly on their journey down through the building, from which they were to emerge in classified fragments. Great teeth on revolving cylinders caught them and chewed them. At places there were grates that bid each size go into its proper chute. The dust lay inches deep on every motionless thing, and clouds of it made the air dark as from a violent tempest. A mighty gnashing sound filled the ears. With terrible appetite this huge and

hideous monster sat imperturbably munching coal, grinding its mammoth jaws with unearthly and monotonous uproar.

In a large room sat the little slate-pickers. The floor slanted at an angle of forty-five degrees, and the coal, having been masticated by the great teeth, was streaming sluggishly in long iron troughs. The boys sat straddling these troughs, and as the mass mover slowly, they grabbed deftly at the pieces of slate therein. There were five or six of them, one above another, over each trough. The coal is expected to be fairly pure after it passes the final boy. The howling machinery was above them. High up, dim figures moved about in the dust clouds.

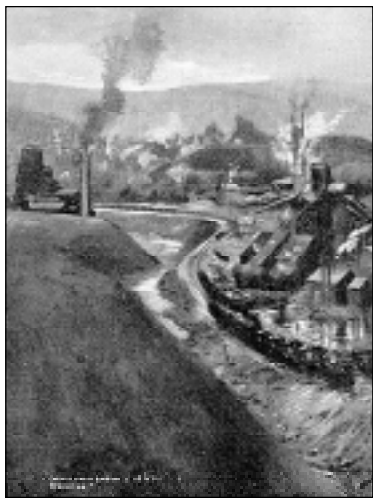
These little men were a terrifically dirty band. They resembled the New York gamins\* in some ways, but they laughed more, and when they

\* The New York gamins the author refers to were well organized gangs of toughs who robbed unwary citizens, guarded houses of prostitution, and engaged in a variety of unsavory activities—they varied in age from 10-16.

laughed their faces were a wonder and a terror. They had an air of supreme independence, and seemed proud of their kind of villainy. They swore long oaths with skill.

Through their ragged shirts we could get occasional glimpses of shoulders black as stoves. They looked precisely like imps as they scrambled to get a view of us. Work ceased while they tried to ascertain if we were willing to give away any tobacco. The man who perhaps believes that he controls them came and harangued the crowd. He talked to the air.

The slate-pickers all through this region are yet at the spanking period. One continually wonders about their mothers, and if there are any school-houses. But as for them, they are not concerned. When they get time off, they go out on the culm heap and play baseball, or fight with boys from other "breakers" or among themselves, according to the opportunities. And before them always is the hope of one day getting to be door-boys down in the mines; and, later, mule-



boys; and yet later, laborers and helpers. Finally, when they have grown to be great big men, they may become miners, real miners, and go down and get "squeezed," or perhaps escape to a shattered old man's es-

tate with a mere "miner's asthma." They are very ambitious.

Meanwhile they live in a place of infernal dins. The crash and thunder of the machinery is like the roar of an immense cataract. The room shrieks and blares and bellows. Clouds of dust blur the air until the windows shine pallidly afar off. All the structure is a tremble from the heavy sweep and circle of the ponderous mechanism. Down in the midst of it sit these tiny urchins, where they earn fifty-five cents a day each. They breathe this atmosphere until their lungs grow heavy and sick with it. They have this clamor in their ears until it is wonderful that they have any hoodlum valor remaining. But they are uncowed; they continue to swagger. And at the top of the "breaker" laborers can always be seen dumping the roaring coal down the wide, voracious maw of the creature.

Over in front of a little tool-house a man smoking a pipe sat on a bench. "Yes," he said, "I'll take yeh down if yeh like." He led us by little cinder paths to the shed over the shaft of the mine. A gigantic fan-wheel near by was twirling swiftly. It created cool air for the miners, who on the lowest vein of this mine were some eleven hundred and fifty feet below the surface. As we stood silently waiting for the elevator we had opportunity to gaze at the mouth of the shaft. The walls were of granite blocks, slimy, moss-grown, dripping with water. Below was a curtain of ink-like blackness. It was like the opening of an old well, sinister from tales of crimes.

We stood staring at them and wondering. Then of a sudden the elevator appeared and stopped with a crash. It was a plain wooden platform. Upon two sides iron bars ran up to support a stout metal roof. The men upon it, as it came into view, were like apparitions from the center of the earth.



[An uncaptioned drawing of one of the breaker boys.]

A moment later we marched aboard, armed with little lights, feeble and gasping in the daylight. There was an instant's creak of machinery, and then the landscape, that had been framed for us by the door-posts of the shed, disappeared in a flash. We were dropping with extraordinary swiftness straight into the earth. It was a plunge, a fall. The flames of the little lamps fluttered and flew and struggled like tied birds to release themselves from the wicks. "Hang on," bawled our guide above the tumult.

The dead black walls slid swiftly by. They were a swirling dark chaos on which the mind tried vainly to locate some coherent thing, some intelligible spot. One could only hold fast to the iron bars and listen to the roar of this implacable descent. When the faculty of balance is lost, the mind becomes a confusion. The will fought a great battle to comprehend something during this fall, but one might as well have been tumbling among the stars. The only thing was to await revelation.

Far left: "A few projecting spikes and chimneys indicated a town."

# 22

*Near right:  
"The dead  
black walls  
slipped swiftly  
by."*

*Far right:  
"Two men  
crouching  
where the roof  
of the passage  
came near to  
meeting the  
floor."*

It was a journey that held a threat of endlessness.

Then suddenly the dropping platform slackened its speed. It began to descend slowly and with caution. At last, with a crash and a jar, it stopped. Before us stretched an inscrutable darkness, a soundless place of tangible loneliness. Into the nostrils came a subtly strong odor of powder-smoke, oil, wet earth. The alarmed lungs began to lengthen their respirations.

Our guide strode abruptly into the gloom. His lamp flared shades of yellow and orange upon the walls of a tunnel that led away from the foot of the shaft. Little points of coal caught the light and shone like diamonds. Before us there was always the curtain of an impenetrable night. We walked on with no sound save the crunch of our feet upon the coal-dust of the floor. The sense of an abiding danger in the roof was always upon our foreheads. It expressed to us all the unmeasured, deadly tons above us, as if the roof were a superlative might that regarded with the supreme calmness of almighty power the little men at its mercy. Sometimes we were obliged to bend low to avoid it. Always our hands rebelled vaguely from touching it, refusing to affront this gigantic mass.

All at once, far ahead, shone a little flame, blurred and difficult of location. It was a tiny, indefinite twig, like a wisp-light. We seemed to be looking at it through a great fog. Presently there were two of them. They began to move to and fro and dance before us.

After a time we came upon two men crouching where the roof of the passage came near to meeting the floor. If the picture could have been brought to where it would leave had the opposition arid the contrast of the glorious summer-time earth, it would have been a grim and ghastly thing. The garments of the men were no more



sable than their faces, and when they turned their heads to regard our tramping party, their eyeballs and teeth shone white as bleached bones. It was like the grinning of two skulls there in the shadows. The tiny lamps in their hats made a trembling light that left weirdly shrouded the movements of their limbs and bodies. We might have been confronting terrible specters.

But they said, "Hello, Jim," to our conductor. Their mouths expanded in smiles—wide and startling smiles.

In a moment they turned again to their work. When the lights of our party reinforced their two lamps, we could see that one was busily drilling into the coal with a long thin bar. The low roof ominously pressed his shoulders as he bent at his toil. The other knelt behind him on the loose lumps of coal.

He who worked at the drill engaged in conversation with our guide. He looked back over his shoulder, continuing to poke away. "When are yeh goin' t' measure this up, Jim?" he demanded. "Do yeh wanta git me killed?"

"Well, I'd measure it up t'day, only I ain't got me tape," replied the other.



"Well, when will yeh? Yeh wanta hurry up," said the miner. "I don't wanta git killed."

"Oh, I'll be down on Monday."

"Humph!"

They engaged in a sort of altercation in which they made jests.

"You'll be carried out o' there feet first before long."

"Will I?"

Yet one had to look closely to understand that they were not about to spring at each other's throats. The vague illumination created all the effect of the snarling of two wolves.

We came upon other little low-roofed chambers, each containing two men, a "miner," who makes the blasts, and his "laborer," who loads the coal upon the cars and assists the miner generally. And at each place there was this same effect of strangely satanic smiles and eyeballs wild and glittering in the pale glow of the lamps.

Sometimes the scenes in their weird strength were absolutely infernal. Once, when we were traversing a silent tunnel in another mine, we came suddenly upon a wide place where some miners were lying down in a group. As they appeared to gaze at us, it resembled a resurrection. They slowly arose with ghoul-like movements, mysterious figures robed in enormous shadows. The swift flashes of the steel-gleaming eyes were upon our faces.

At another time, when my companion, struggling against difficulties, was trying to get a sketch of the mule, "Molly Maguire," a large



group of miners gathered about us intent upon the pencil of the artist. "Molly," indifferent to the demands of art, changed her position after a moment and calmly settled into a new one. The men all laughed, and this laugh created the most astonishing and supernatural effect. In an instant the gloom was filled with luminous smiles. Shining forth all about us were eyes glittering as with cold blue flame. "Whoa, Molly," the men began to shout. Five or six of them clutched "Molly" by her tail, her head, her legs. They were going to hold her motionless until the portrait was finished. "He's a good feller," they had said of the artist, and it would be a small thing to hold a mule for him. Upon the roof were vague dancing reflections of red and yellow.

From this tunnel of our first mine we went with our guide to the foot of the main shaft. Here we were in the most important passage of a mine, the main gangway. The wonder of these avenues is the noise—the crash and clatter of machinery as the elevator speeds upward with the loaded cars and drops thunderingly with the empty ones. The place resounds with the shouts of mule-boys, and there can always be heard the noise of approaching coal-cars, beginning in mild rumbles and then swelling down upon one in a tempest of sound. In the air is the slow painful throb of the pumps working at the water which collects in the depths. There is booming and banging and crashing, until one wonders why the tremendous walls are not

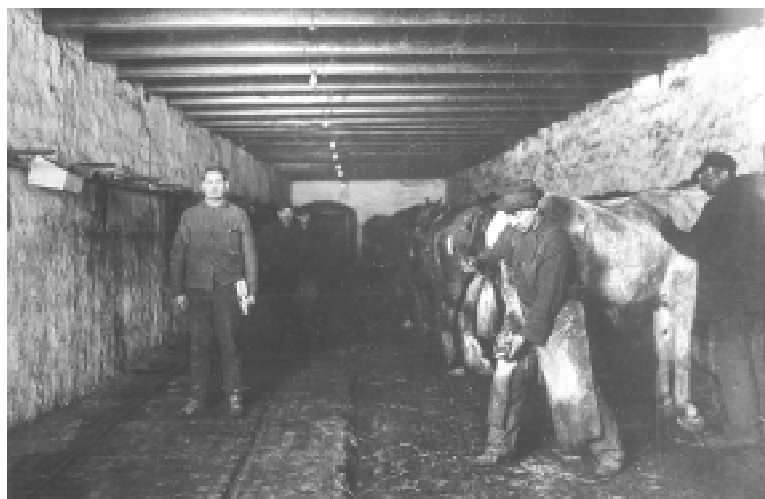


wrenched by the force of this uproar. And up and down the tunnel there is a riot of lights, little orange points flickering and flashing. Miners stride in swift and sombre procession. But the meaning of it all is in the deep bass rattle of a blast in some hidden part of the mine. It is war. It is the most savage part of all in the endless battle between man and nature. These miners are grimly in the van. They have carried the war into places where nature has the strength of a million giants. Sometimes their enemy becomes exasperated and snuffs out ten, twenty, thirty lives. Usually she remains calm, and takes one at a time with method and precision. She need not hurry. She possesses eternity. After a blast,

the smoke, faintly luminous, silvery, floats silently through the adjacent tunnels.

In our first mine we speedily lost all ideas of time, direction, distance. The whole thing was an extraordinary, black puzzle. We were impelled to admire the guide because he knew all the tangled passages. He led us through little tunnels three and four feet wide and with roofs that sometimes made us crawl. At other times we were in avenues twenty feet wide, where double rows of tracks extended. There were stretches of great darkness, majestic silences. The three hundred miners were distributed into all sorts of crevices and corners of the labyrinth, toiling in this city of endless night. At different points one could hear the roar of traffic about the foot of the main shaft, to which flowed all the commerce of the place.

We were made aware of distances later by our guide, who would occasionally stop to tell us our position by naming a point of the familiar geography of the surface. "Do you remember that rolling-mill yeh passed coming up? Well, you're right under it." "You're under th' depot now." The length of these distances struck us with amazement when we reached the surface. Near Scranton one can



*Far left: "He who worked at the drill engaged in conversation with our guide."*

*Near left: "Whoa, Molly."*

*[The photo below is from the Editor's collection and is included because of the relationship to the article.]*

really proceed for miles, in the black streets of the mines.

Over in a wide and lightless room we found the mule stables. There we discovered a number of these animals standing with an air of calmness and self-possession that was somehow amazing to find in a mine. A little dark urchin came and belabored his mule "China" until he stood broadside to us that we might admire his innumerable fine qualities. The stable was like a dungeon. The mules were arranged in solemn rows. They turned their heads toward our lamps. The glare made their eyes shine wondrously like lenses. They resembled enormous rats.

About the room stood bales of hay and straw. The commonplace air worn by the long-eared slaves made it all infinitely usual. One had to wait to see the tragedy of it. It was not until we had grown familiar with the life and the traditions of the mines that we were capable of understanding the story told by these beasts—standing in calm array with spread legs.

It is a common affair for mules to be imprisoned for years in the limitless night of the mines. Our acquaintance, "China," had been [working underground for the past] four years. Upon the surface there had been the march of the seasons; the white splendor of snows had changed again-and-again to the glories of green springs. In our times the earth had been ablaze with the decorations of brilliant autumns. But "China" and his friends had remained in these dungeons from which daylight, if one could get a view up a shaft, would appear [as] a tiny circle—a silver star aglow in a sable sky.

Usually when brought to the surface, the mules tremble at the earth radiant in the sunshine. Later, they go almost mad with fantastic joy. The frill splendor of the heavens, the grass, the trees, the



Far right, upper: Mule stables—putting in a team.

[Mid-right: The drawing of the "old timer" was untitled. The photos are from the Editor's collection and are included merely because of the scenes depicted—none of which bore a caption.]

breezes, breaks upon them suddenly. They caper and career with extravagant mulish glee. A miner told me of a mule that had spent some delirious months upon the surface after years of labor in the mines. Finally the time came when he was to be taken back. But the memory of a black existence was upon him; he knew that gaping mouth that threatened to swallow him. No cudgellings could induce him. The men held conventions and discussed plans to budge that mule. The celebrated quality of obstinacy in him won him liberty to gambol clumsily about on the surface [for the remainder of his days].

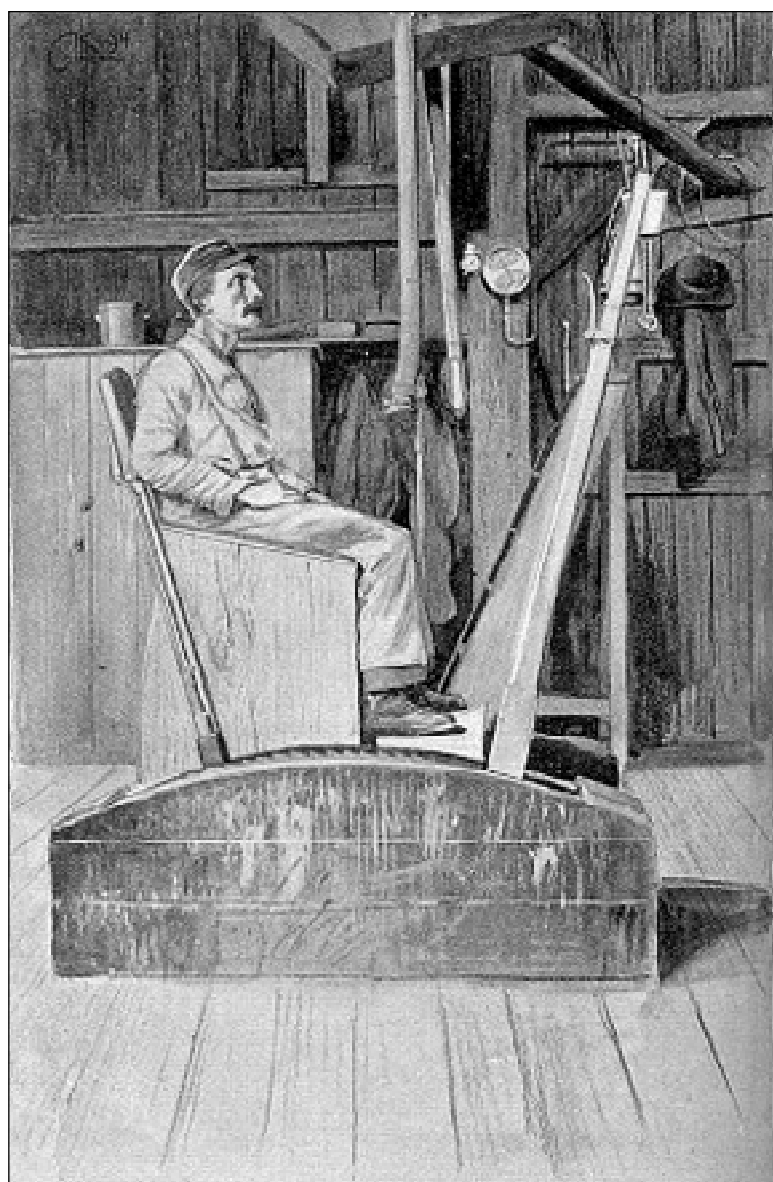
After being long in the mines, the mules are apt to duck and dodge at the close glare of lamps, but some of them have been known to have piteous fears of being left in the dead darkness. We met a boy who said that sometimes the only way he could get his team to move was to run ahead of them with the light. Afraid of the darkness, they would follow. To those who have known the sunlight there may come the fragrant dream of a lost paradise. Perhaps this is what they brood over as they stand solemnly flapping their ears. Perhaps they despair and thirst for this bloomland that lies in an unknown

direction and at impossible distances.

In wet mines, gruesome fungi grow upon the wooden props that support the uncertain looking ceiling. The walls are dripping and dank. Upon them, too, frequently grows a mosslike fungus, white as a druid's beard, that thrives in these deep dens, but shrivels and dies at contact with the sunlight.

Great and mystically dreadful is the earth from a mine's depth. Man is in the implacable grasp of nature. It has only to tighten slightly, and he is crushed like a bug. His loudest shriek of agony would be as impotent as his final moan to bring help from that fair land that lies, like Heaven, over his head. There is an insidious, silent enemy in the gas. If the huge fanwheel on the top of the earth should stop for a brief period, there is certain death. If a man escape[s] the gas,





beams. The high sun was afloat in a splendor of spotless blue. The distant hills were arrayed in purple and stood like monarchs. A glory of gold was upon the nearby earth. The cool fresh air was wine.

Of that sinister struggle far below there came no sound, no suggestion save the loaded cars that emerged one after another in eternal procession and went creaking up the incline that their contents might be fed into the mouth of the "breaker," imperturbably cruel and insatiate, black emblem of greed, and of the gods of this labor.

*Far left: The Engineer. [this is the only caption for what one would presume to be the hoist operator]*



*Near left: Last sight of the "breakers" from the town.*

the floods, the "squeezes" of falling rock, the cars shooting through little tunnels, the precarious elevators, the hundred perils, there usually comes to him an attack of "miner's asthma" that slowly racks and shakes him into the grave. Meanwhile he gets three dollars per day, and his laborer one dollar and a quarter.

In the chamber at the foot of the shaft, as we were departing, a group of the men were resting. They lay about in careless poses. When we climbed aboard the elevator, we had a moment in which to

turn and regard them. Then suddenly the study in black faces and crimson and orange lights vanished. We were on our swift way to the surface. Far above us in the engine-room, the engineer sat with his hand on a lever and his eye on the little model of the shaft wherein a miniature elevator was making the ascent even as our elevator was making it. Down one of those tremendous holes, one thinks naturally of the engineer.

Of a sudden the fleeting walls became flecked with light. It increased to a downpour of sun-

*The photos contained in the article are from The Editor's collection and have been dated about 1910-1915. Although 25 years later little had changed with the exception that carbide cap lamps had supplanted the coal oil/kerosene cap lamps in some mines.*

*The author and an artist, identified only by the initials "CK", traveled together from New York to collectively gather information for this article.*

*Reprinted from McClure's Magazine, Vol. III. August, 1894. No. 3.*

*URL: <http://www.history.ohio-state.edu/projects/coal/CraneDepths/CraneDepths.htm> [Accessed 29 May 1998].*

## THE LAST WORD...

**“Tomorrow is often the busiest day of the week.”**—Spanish proverb

**“Success is not the result of spontaneous combustion. You must first set yourself on fire.”**—Fred Shero

**“To see what is in front of one’s nose requires a constant struggle.”**—George Orwell

**“A friend is a lot of things, but a critic he isn’t.”**—Bern Williams

**“The brain is a wonderful organ. It starts the moment you get up and doesn’t stop until you get into the office.”**—Robert Frost

**“You cannot hold back a good laugh any more than you can the tide. Both are forces of nature.”**—William Rotsler

**“Nothing is so embarrassing as watching someone do something that you said couldn’t be done.”**—Sam Ewing

**“The future has a way of arriving unannounced.”**—George F. Will

**“Success is getting what you want. Happiness is liking what you get.”**—H. Jackson Brown

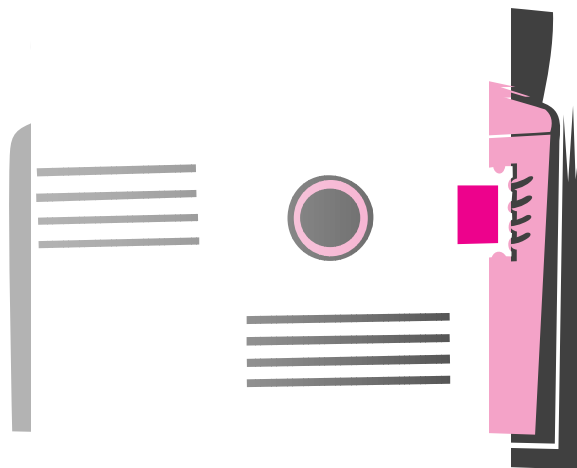
**NOTICE:** We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at [www.msha.gov](http://www.msha.gov). We **DESPERATELY** need color photographs suitable for use on the front cover of the *Bulletin*. We cannot guarantee that they will be published, but if they are, we will list the contributor(s). Please let us know what you would like to see more of, or less of, in the Bulletin.

**REMINDER:** The District Council Safety Competition for 1998 is underway—please remember that if you are participating this year, you need to mail your quarterly report to:

**Mine Safety & Health Administration  
Educational Policy and Development  
Holmes Safety Association Bulletin  
P.O. Box 4187  
Falls Church, Virginia 22044-0187**

Please address any comments to the editor, Fred Bigio, at the above address or at: MSHA—US DOL, 5th floor—EPD #535A, 4015 Wilson Blvd., Arlington, VA 22203-1984.

Please phone us at (703-235-1400).



# Holmes Safety Association Officers and Executive Committee 1998-1999

| <i>Officer</i>                     | <i>Name</i>                  | <i>Representing</i>   | <i>State</i> |
|------------------------------------|------------------------------|-----------------------|--------------|
| <b>President</b> .....             | <b>Gary Moore</b> .....      | <b>Mgmt.</b> .....    | <b>NM</b>    |
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| <i>Name</i>            | <i>Representing</i> | <i>State</i> | <i>Name</i>              | <i>Representing</i> | <i>State</i> | <i>Name</i>            | <i>Representing</i> | <i>State</i> |
|------------------------|---------------------|--------------|--------------------------|---------------------|--------------|------------------------|---------------------|--------------|
| Jesse Cole .....       | Federal             | WV           | Richard Burns .....      | Mgmt.               | WY           | Ron Cunningham .....   | State               | OK           |
| John Collins .....     | Federal             | OH           | Robert Coker .....       | Mgmt.               | TX           | Steve Dunn .....       | State               | MO           |
| Don Conrad .....       | Federal             | PA           | Gary Cook .....          | Mgmt.               | NM           | John Franklin .....    | State               | KY           |
| Dave Couillard .....   | Federal             | MN           | Jim Dean .....           | Mgmt.               | WV           | Larry Frisbie .....    | State               | WA           |
| Robert Crumrine .....  | Federal             | OH           | Vern Demich, Jr. ....    | Mgmt.               | PA           | William Garay .....    | State               | PA           |
| Gerald Davis .....     | Federal             | PA           | Matt Hindman .....       | Mgmt.               | PA           | Lee Graham .....       | State               | KS           |
| Ron Deaton .....       | Federal             | KY           | Bill Holder .....        | Mgmt.               | NM           | Tom Gregorich .....    | State               | MN           |
| Bruce Dial .....       | Federal             | WV           | Glen Hood .....          | Mgmt.               | TX           | Tony Grbac .....       | State               | WV           |
| Bob Glatter .....      | Federal             | VA           | Robert Johnson .....     | Mgmt.               | CO           | Ben Hart .....         | State               | FL           |
| Jim Hackworth .....    | Federal             | VA           | Joe Kinnikin .....       | Mgmt.               | NM           | Paul Hummel .....      | State               | PA           |
| Whitey Jacobson .....  | Federal             | TX           | George Krug .....        | Mgmt.               | FL           | Phillip Johnson .....  | State               | KY           |
| Jerry Johnson .....    | Federal             | WV           | Pete Kuhn .....          | Mgmt.               | WY           | Debbie Kendrick .....  | State               | AK           |
| Jack A. Kuzar .....    | Federal             | CO           | Joseph Lamonica .....    | Mgmt.               | DC           | Douglas Martin .....   | State               | AZ           |
| Rexford Music .....    | Federal             | KY           | Kevin LeGrand .....      | Mgmt.               | IA           | Gilbert Meira .....    | State               | NM           |
| Joseph Pavlovich ..... | Federal             | KY           | Ernest Marcum .....      | Mgmt.               | WV           | Jim Myer .....         | State               | OH           |
| Leland Payne .....     | Federal             | KY           | Jon Merrifield .....     | Mgmt.               | OH           | Bob Novello .....      | State               | TX           |
| James Petrie .....     | Federal             | PA           | Bill Moser .....         | Mgmt.               | WV           | Glen Rasco .....       | State               | GA           |
| John Radomsky .....    | Federal             | MN           | Kevin Myers .....        | Mgmt.               | KY           | Ed Sinner .....        | State               | OR           |
| Bob Randolph .....     | Federal             | PA           | Myron Nehrebecki .....   | Mgmt.               | PA           | Richard Stickler ..... | State               | PA           |
| Mel Remington .....    | Federal             | PA           | Greg Oster .....         | Mgmt.               | MN           | Bonita Stocks .....    | State               | AR           |
| Martin Rosta .....     | Federal             | AL           | Richie Phillips .....    | Mgmt.               | KY           | Ron Umshied .....      | State               | MT           |
| James Salois .....     | Federal             | MN           | Richard Radakovich ..... | Mgmt.               | PA           | Sam Vancil .....       | State               | IL           |
| Donna Schorr .....     | Federal             | PA           | David Rebuck .....       | Mgmt.               | PA           | Michael Weaver .....   | State               | ID           |
| John Shutack .....     | Federal             | VA           | Ray Rucker .....         | Mgmt.               | TX           | Alan Cook .....        | Supplier            | AZ           |
| Judy Tate .....        | Federal             | TX           | Subash Sethi .....       | Mgmt.               | NM           | Chuck Edwards .....    | Supplier            | PA           |
| Timothy Thompson ..... | Federal             | WV           | Nancy Staley .....       | Mgmt.               | MI           | Shea Kirkpatrick ..... | Supplier            | CA           |
| Glenn Tinney .....     | Federal             | PA           | Cheryl Suzio .....       | Mgmt.               | CT           | Steve Walker .....     | Supplier            | WV           |
| Roger Carlson .....    | Labor               | MN           | Steve Taylor .....       | Mgmt.               | TX           | Vern Demich .....      | Emeritus            | PA           |
| Joe Main .....         | Labor               | DC           | Penny Traver .....       | Mgmt.               | MI           | William Hoover .....   | Emeritus            | AZ           |
| Lloyd Armstrong .....  | Mgmt.               | MN           | William Vance .....      | Mgmt.               | NM           | Al Simonson .....      | Emeritus            | MN           |
| H.L. Boling .....      | Mgmt.               | AZ           | Doug Conaway .....       | State               | WV           | Harry Thompson .....   | Emeritus            | PA           |

*We are short of articles on metal/quarry safety and welcome **any** materials that you submit to the Holmes Safety Association Bulletin. We **DESPERATELY NEED** color photographs (8" x 10" glossy prints are preferred however, color negatives are acceptable—we will make the enlargements) for our covers. We **ALSO NEED** color or black and white photographs of general mining operations—underground or surface. We cannot guarantee that they will be published. If they are, we will credit the contributor(s) within the magazine. All submissions will be returned unless indicated.*

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## ***Upcoming events:***

- ***Oct. 11-14, NMA's Mining Convention '98, Pointe Hilton Resort, Phoenix, AZ***
- ***Oct. 13-15, TRAM Conference and National Mine Instructor's Seminar, National Mine Academy, Beckley, WV***
- ***Oct. 13-16, 20th Ann. Conference on Occupational Health & Environment, Hershey Resort & Conf. Center, Hershey, PA***
- ***Nov. 30-Dec. 4, NWMA 104th Annual Meeting & Expo., Doubletree Hotel, Spokane, WA***
- ***Feb. 9-10, South Central Conference, San Antonio, TX***

