BULLETIN

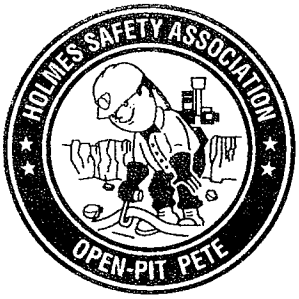
HOLMES SAFETY ASSOCIATION

E PLURIBUS UNUM

SAFETY EFFICIENCY

MINERAL INDUSTRIES

December 1993



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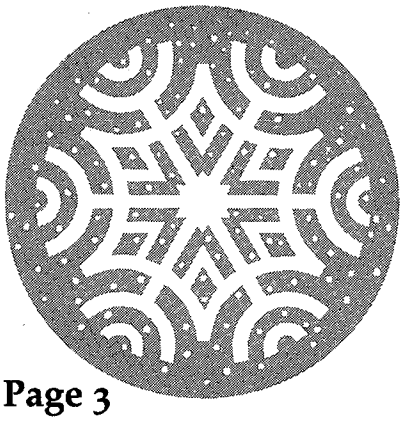

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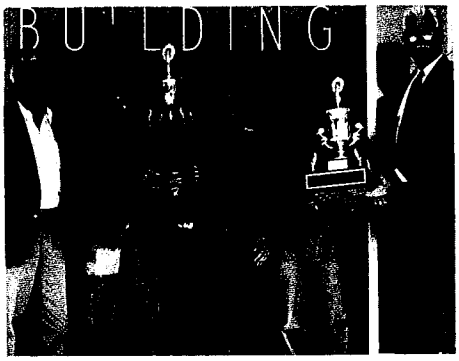

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Please note: The views and conclusions expressed in HSA Bulletin articles are those of the authors and should not be interpreted as representing official policy of the Mine Safety and Health Administration.

KEEP US IN CIRCULATION

The Holmes Safety Association Bulletin contains safety articles on a variety of subjects: fatal accident abstracts, studies, posters and other 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.

Welcome new members

NAME	CHAPTER NO.	LOCATION
M & M Rock	10619	Conway, AR
Edwards Brothers	10620	Melbourne, AR
Foothill Electric Company	10621	Santa Paula, CA
C & J Gravel Products, Inc.	10622	Durango, CO
Georgia Marble Company	10623	Marble Hill, GA
Gary Jacobs Drilling & Excavation	10624	Fairchance, PA
Imco	10625	Sacramento, CA
Poe Asphalt Paving, Inc.	10626	Clarkston, WA
Munn & Perkins	10627	Modesto, CA
Northern Slate Co., Inc.	10628	Fair Haven, VT
Burns Concrete, Inc.	10629	Idaho Falls, ID
West Crystal Mining	10630	Mt. Ida, AR
Crystal Mining	10631	Mt. Ida, AR
Panther Preparation Plant	10632	Owensboro, KY
Hill County Road Department	10633	Haupe, MT
Pacific Concrete	10634	Bellingham, WA
Longview Mine	10635	Friedens, PA
Mine #37	10636	Friedens, PA
Diamond T-c	10637	Friedens, PA
Diamond T-b	10638	Friedens, PA
Chemstar Lime Company	10639	Stockton, CA
Red Oak Mining Company	10640	Westoer, PA
Loon Creek District	10641	Clayton, ID
Waukesha-Pearce	10642	Ft. Smith, AR
Premier Elkhorn Coal Co.	10643	Myra, KY
Premier Elkhorn Coal	10644	Myra, KY
Randall Sand & Gravel	10645	Carterville; CA
Woodman Three Mining, Inc.	10646	Steele, KY
IHP Industrial	10647	Sherwood, AR
Marathon Technical Services	10648	Summersville, WV
Polar Mining	10649	Fairbanks, AK
Diamond Construction	10650	Las Vegas, NV
Rheoforce Mining Corporation	10651	Bellmore, NY
Owl Crane	10652	Fontana, CA
Santa Cruz Aggregates	10653	Felton, CA
House Brothers Construction, Inc.	10654	McCleary, WA
Granite Const. Company	10655	Santa Cruz, CA
Rowe Sand & Gravel	10656	Pittsford, VT
McDuff Electric	10657	Pittsford, VT
Granite Creek Rock Quarry	10658	Sitka, AK
Olive Springs Quarry, Inc.	10659	Soquel, CA
Hurst	10660	Hurst, TX
Pondera County	10661	Conrad, MT
Department Of Transportation	10662	Great Falls, MT
Lavelle Powder Co., Inc.	10663	Butte, MT
Black Pine Mine	10664	Snowville, UT
Al Shankle Construction	10665	Chino, CA
B & T Scale Co.	10666	Ontario, CA
Western Aggregates, Inc.	10667	Marysville, CA
Robinson Construction Co., Inc.	10668	Oroville, CA

Winter alert 1993

Fall and Winter are a time for thankful reflections for the less demanding seasons that had just passed.

During the cold season, working families and friends prepare to gather for holidays and celebrations whose traditions were established and handed down through generations.

Also, during the months between October and March, there is a greater potential for a gathering of components in the mine workplace that can trigger a fatal event.

There is an increase in methane gas liberation from the coal seam and the worked-out areas that is caused by the lower atmospheric air pressure inherent during the cold season.

The ability for the methane gas to concentrate in high places and migrate more readily to all working places is due to the lower barometric pressure traditionally accompanying winter months and marginal ventilation controls that will become less effective during such a period.

In addition, any coal dust accumulation will dry out much faster, because of the drier weather conditions, and any float coal dust becomes harder to control. Therefore rockdusting should be done in a thorough manner.

The effects of alternate freezing (during colder night conditions) and thawing (during warmer daylight conditions), especially in the proximity of the mine entrances, can result in roof deterioration and roof falls. These areas should be inspected more frequently and supported where it is needed.

Icy conditions can cause hazardous travel situations for all miners. Maintenance on equipment can also become an added problem.

Miners must recognize the need to become more alert and safety conscious during this time of the year. All miners must learn to recognize and help avoid the mix of these ingredients.

It must be recognized by all miners and the mining community to stay more alert, be more safety conscious, and recognize the dangers while performing all work in a safe manner.

Enjoy a happy holiday season and be alert not to add to the tragic history of mining's past.

Submissions sought for 1994 safety slogan

The Holmes Safety Association requests your support in submitting a slogan for our 1994 safety campaign. Our 1993 slogan was "Stay Injury Free in '93" and was submitted by Diane Covell of Blue Circle Cement Co., Ravena, NY. The slogan must be very brief and end with the words "in '94." The Executive Committee approved an award of a $100 U.S. Savings Bond to the person submitting the winning slogan.

Please submit all entries to the following address:

Holmes Safety Association
P.O. Box 4187
Falls Church, Virginia 22044-0187

All entries must be received before January 14, 1994. The winning slogan will appear in the March 1994 *Bulletin.*

Robert Glatter, HSA Secretary

Holmes Safety Association Monthly safety topic

Fatal machinery accident

GENERAL INFORMATION: A 20-year-old repairman, with 3 years of mining experience, was killed when he accidentally engaged the boom lift lever and was pinned against the roof. The mine produces coal two shifts a day, five days a week, with 39 underground employees and 3 surface employees.

DESCRIPTION OF ACCIDENT: At about 7:00 a.m., the maintenance shift, including the victim, entered the mine and proceeded to the MMU 004-0 section. This was the victim's fourth day back at work after suffering a non-work injury that incapacitated him for two months. The victim's usual job was as a repairman but due to the absence of the regular roof bolter operator he was performing this task. This shift routinely performed needed maintenance work on the mining equipment.

At about 8:00 a.m., the victim arrived from the MMU 002-0 section. He normally traveled underground with the MMU 002-0 section production crew and remained on this section until coal production began. He then traveled to the MMU 004-0 section to perform repair work.

Upon arrival on the MMU 004-0 section, he met with the section foreman and they proceeded to perform repair work on the continuous mining machine cable. They then traveled to the No. 3 entry where the section foreman began installing roof bolts. The victim informed the foreman that he was going to the No. 4 entry to change a ruptured hydraulic hose on the roof bolter.

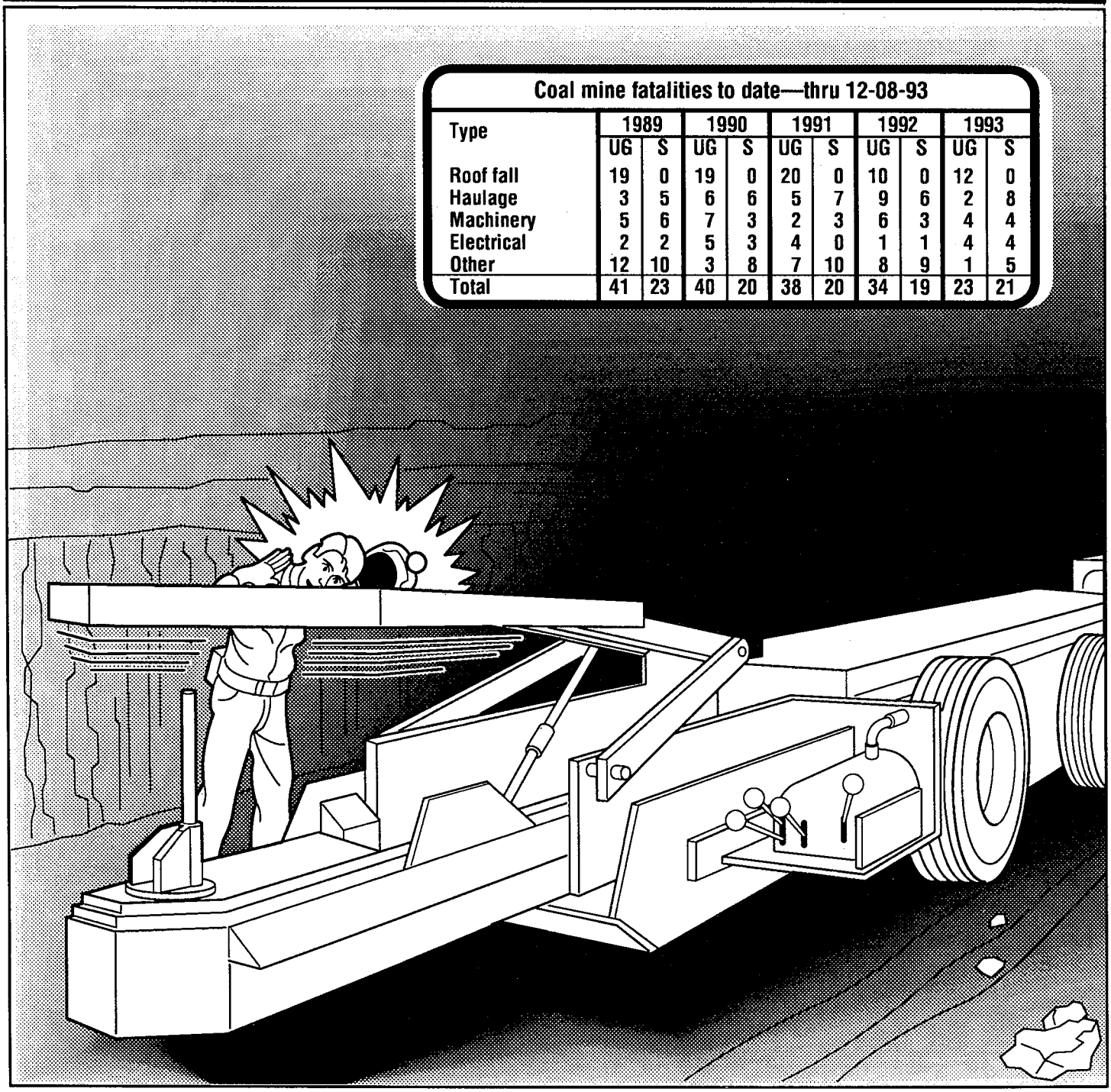
At about 9:40 a.m., 20 minutes after the foreman last talked with the victim, while checking the working faces he observed the victim trapped between the boom of the bolter and the mine roof. The foreman released the pressure on the boom and removed the victim from machine. He checked the victim's vital signs but found none. He then summoned help from other crew members on the section.

Cardiopulmonary resuscitation was administered. The victim was then loaded onto the battery-powered mantrip and transported to the surface to an awaiting ambulance. He was transported to the hospital where he was pronounced dead by the county coroner, at approximately 11:00 a.m. The cause of death was massive internal injuries.

CONCLUSION: The accident occurred due to management's failure to assure that equipment was deenergized when repairs were being made on the roof bolter. The victim positioned his body across the boom of the roof bolting machine as he attempted to reconnect the suction hose to the cou-

Coal mine fatalities to date—thru 12-08-93

Type	1989		1990		1991		1992		1993	
	UG	S	UG	S	UG	S	UG	S	UG	S
Roof fall	19	0	19	0	20	0	10	0	12	0
Haulage	3	5	6	6	5	7	9	6	2	8
Machinery	5	6	7	3	2	3	6	3	4	4
Electrical	2	2	5	3	4	0	1	1	4	4
Other	12	10	3	8	7	10	8	9	1	5
Total	41	23	40	20	38	20	34	19	23	21



pling near the boom jack (it appears that this suction hose had broken loose from the same coupling several times in the past). He accidently engaged the boom lift lever (which had been altered from a vertical to a horizontal position), pinning himself against the mine roof and resulting in fatal crushing injuries. Evidence indicated that the victim was apparently installing roof bolts in the No. 4 entry. According to observers one roof bolt had been installed and a bolt hole had been started.

Breakthrough in roof-bolt drilling technology

Provides 200 to 400 times greater bit life

Problem

Roof bolting is a slow, expensive, and absolutely necessary mining activity. Roof-bolting activities also account for the largest percentage of lost-time injuries in underground coal mines. Dull bits result in the application of excessive force, which bends drill steel; and changing starter and finisher steel was the most significant source of injuries associated with roof bolting. The tungsten carbide (WC) roof-bolt drill bits currently used in American, Canadian, and Australian coal mines are capable of drilling only one or two 4-foot holes and then they are resharpened once or twice to drill another one or two holes. Often, in medium-hard rock formations (sandstone), as many as 20 to 30 bits may be required to drill a single 4-foot hole.

Objective

To compare the performance, longevity, and cost of newly developed polycrystalline diamond compact (PDC) roof-bolt drill bits against WC bits.

Research and background

Diamonds for industrial use have been scarce throughout history and continuous attempts have been made to produce synthetic diamonds. The first synthetic diamonds were manufactured in 1953. Economically produced synthetic diamonds are 1 to 10, μm in size. In this size range, they are totally unsuitable for industrial applications. In 1972, General Electric Co. developed a process to sinter the artificially developed, minuscule diamond particles into usable products. In this process, several layers of diamond particles and cobalt mixture are overlaid on WC substrates and sintered at 2,350° F and 1,000,000 psi. The final product is known as PDC. Today, PDCs are available in many shapes, but their size is limited to 3/4-inch, or less, in length or diameter, because pressures greater than 1,000,000 psi are required to manufacture larger PDCs. At present, diamond and PDC are the hardest and strongest commercial materials available for wear surfaces. The PDC used in this study had a hardness 3.61 times greater than that of WC.

Development

Since 1979, the U.S. Bureau of Mines' Twin Cities Research Center has engaged in research to put PDCs to use in the mining industry. In 1983, Hanson demonstrated that diamond-coated bits reduce the risk of methane ignition in coal mines. In 1987, Pliss showed that PDCs can enhance the life of coal-cutting tools by a factor of 3.5. In 1988, Sundae demonstrated that it is possible for a conical PDC bit to cut more than 10,000 feet of very abrasive rock and show no sign of wear on the bit tip, while a similar WC bit wears off completely after cutting 2,500 feet. A similar test with a spherical PDC bit gave similar results.

Field testing

During the fall of 1991, a midwestern coal company asked the Bureau for technical assistance to help them minimize roof-bolting costs. The Bureau, in cooperation with a PDC manufacturer and a drill bit manufacturer, who had recently designed and fabricated a PDC-coated roof-bolt bit, which was ready for field testing, conducted a field test to demonstrate the feasibility of using PDC roof-bolt drill bits.

Discussion of results

Past research by the Bureau and the manufacturer's literature suggest that the PDC inserts are brittle and highly susceptible to fracture because of thermal and mechanical stresses and impact loading. Therefore, a decision was made to test the PDC-coated roof-bolt bits with normal 80 psi water pressure and half the rotational speed and thrust required by WC bits. During the first field trial, a single PDC bit drilled 401 holes and showed no sign of wear, abrasion, oxidation streaks, or fracture. Because of these preliminary test results, a decision was made to conduct additional tests, with the remaining bits in other nearby mines in the southeastern Utah coal fields. All four of the test mines contain similar roof-rock formations, i.e., shale, mudstone, and sandstone.

During field testing, mine No. 2 was not able to maintain 80 psi water pressure with an in-line pump and a new, 150-hp pump was installed, which boosted water pressure to 200 psi. This change in water pressure doubled the bit life, but caused the bits to plug with clay around the tips. To avoid this problem, cutting speed was increased from 300 to 450 rpm.

Quartz-size analysis of mine No. 2 roof rock shows that quartz grains were cut through at 300 rpm, but full grains of quartz were removed at 450 rpm. The latter enhanced the penetration rate significantly and increased bit life. This mine was previously able to drill only 10 feet with a WC bit; with a PDC bit, a bit life of 4,500 feet was achieved. With further refinements in drilling techniques, this mine is currently drilling up to 6,000 feet per PDC bit.

After completion of initial trials in the Utah mines, tests were conducted in four eastern mines with massive sandstone roofs, designated No. 6 through 9. The compressive strength of sandstone in these mines varied from 27,000 to 28,000 psi and the quartz content from 70 to 85 pct. Two of the test mines, No. 6 and 7, are located in West Virginia coal fields and the other two, No. 8 and 9, are located in Pennsylvania coal fields.

The first two sandstone roof mines usually experienced WC bit life of 2 to 10 feet. The test results show that with the use of PDC bits, mine No. 6 was able to drill 1,400 feet, and test mine No. 7 was able to drill 500-1,080 feet during the first trials. Mines No. 8 and 9 were able to drill 6 to 8 inches in the sandstone with a single WC bit, but with the PDC bits, they were able to drill 98 and 72 feet.

An increase in bit life of a magnitude of 400 will drastically reduce the injuries associated with roof bolting by reducing the time a driller is exposed when changing drill bits, and performing other activities associated with roof bolting. Despite the much higher costs of PDC bits,

each mine operator was able to reduce bit cost by as much as 50 percent and to realize additional savings in labor and other material costs, such as drill steels.

Why it works

At present, very little is known about the fatigue behavior of PDC under prolonged cyclic loading; therefore, it is difficult to explain why the PDC bits have a life expectancy 400 to 500 times greater than that of WC bits, when their hardness is only 3.6 times greater. The PDC bit has a larger surface area for heat dissipation and the grain size of synthetic diamond appears to be somewhat smaller than that of WC, but none of the differences in physical properties can adequately explain the phenomenal longevity of PDC bits.

Special instructions for use of pdc bits

With proper application, this technology is capable of even greater bit life. The test results show that three of eight mines were able to achieve optimum life for PDC bits. To achieve this in general use, mine operators are urged to motivate their miners to follow the special instructions outlined below. The roof-bolt drillers should be clearly warned that these bits are very brittle, and to avoid premature bit fracturing, it is absolutely necessary to take the following precautions:

1. Maintain cutting speed between 450 and 480 rpm, thrust between 2,000 and 3,200 lbs., and water pressure between 200 and 300 psi. Any increase in cutting speed above 500 rpm or drop in water pressure below 180 psi will cause the PDC to fracture because of frictional heating, i.e., uneven expansion of WC and cobalt in the transitional layers of the PDC bit tip. Any increase in thrust above 3,200 lbs. will cause the bit to shatter. Many times, the PDC bits were lost because miners failed to turn the water on, or because of a sudden drop, below 180 psi, in water pressure. Miners are urged to continuously monitor cutting speed, thrust, water pressure, and penetration rate, and not put the drill into reverse gear.

2. To obtain higher penetration rates and avoid bit failure, all holes should be collared or started with WC bits.

3. It is absolutely necessary to firmly secure the bit to its steel rod with two roll pins. The roll pins should be inspected after drilling five or six holes and be replaced promptly when needed.

4. Caution should be exercised when using PDC bits in roof rock that contains voids, clay pockets, fissures, large cracks, or other openings.

For more information

A Bureau report on the use of PDC bits is being prepared. To obtain additional information contact:

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U.S. Bureau of Mines
Twin Cities Research Center
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Minneapolis, MN 55417-3099
Phone (612) 725-4783.

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Fire protection for mobile mining equipment

PART III - Fire suppression systems for large, enclosed surface mining machinery

by William H. Pomroy, U.S. Bureau of Mines
Twin Cities Research Center, Minneapolis, MN

This article is the third in a three-part series which covers mobile equipment fire protection at mining operations. Part I provided an introduction and background to the mobile equipment fire problem. Part II covered manually operated and automatic fire suppression systems for electric or diesel-powered rubber-tired and tracked vehicles such as haulage trucks and dozers in surface mines and load-haul-dumps and scoops in underground mines. This final installment covers fire suppression systems for large electrically-powered enclosed surface mining machines such as shovels and draglines.

Standard dry chemical fire suppression systems are not suitable for large, enclosed, electrically-powered machines such as blasthole drills, power shovels, and draglines. The large size of this equipment makes total flooding or local application with dry chemical impractical, and the electrical motors, controls, switch gear, and other electrical equipment could be severely damaged by the residual deposits remaining after a dry chemical discharge.

Dry chemical is chemically hygroscopic, meaning it draws moisture out of the air. (If dry chemical containers are not tightly sealed, the dry chemical contents can be contaminated by moisture, causing the dry chemical to "cake" and become totally unusable.) If dry chemical is not promptly cleaned up after a discharge, it forms a crusty deposit which can be highly corrosive. On the exterior of a diesel engine, this is not particularly damaging and clean up is quite simple. But on exposed electrical equipment such as motor windings, contact points, switch gear, or collect rings, the corrosive effects can be devastating. And as might be expected, clean-up of such deposits is practically impossible.

Beginning in the mid-1970s, the Bureau of Mines initiated research to develop a suitable alternative to dry chemical suppression systems for large, enclosed, electrically powered mining equipment. The resulting designs incorporated both a gaseous fire suppressant agent and dry chemical. A noncorrosive, gaseous fire suppressant was used to totally flood the machinery spaces containing electrical equipment, and dry chemical was used in other areas where residual deposits of dry chemical would not cause a problem or where they could be easily cleaned up.

Halon 1301 was selected for this application because it is an extremely effective fire suppressant, its high vapor pressure results in good total flood performance, and when properly used, it does

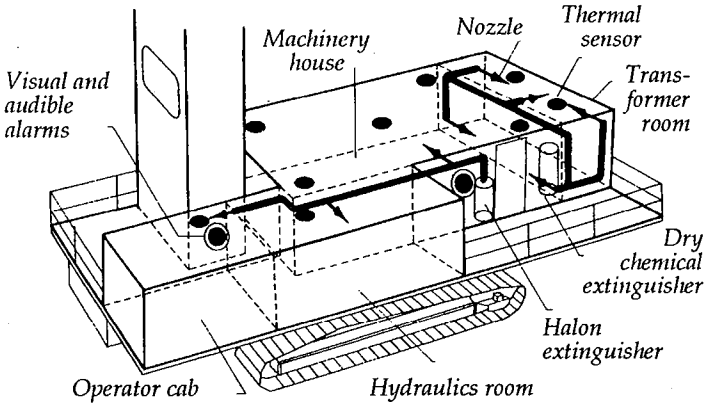

Figure 1.—Automatic fire suppression system for blast hole drill.

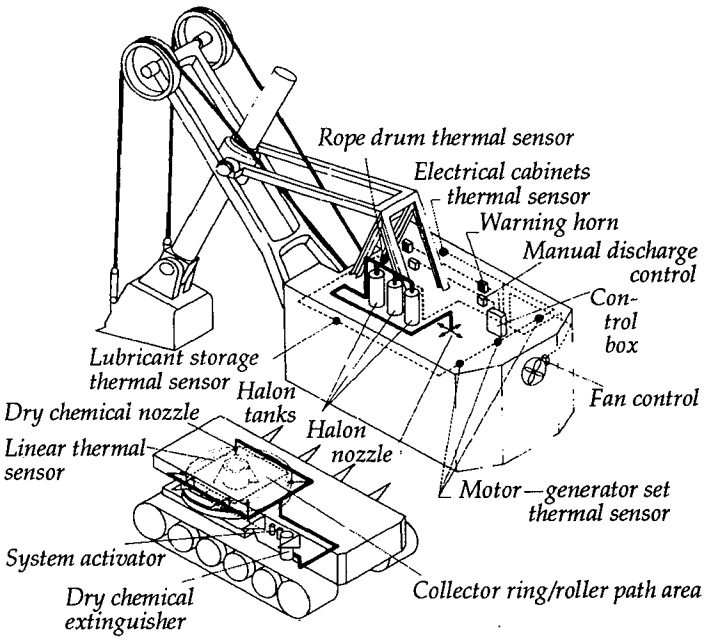

Figure 2.—Automatic fire suppression system for power shovel.

not present a life safety hazard. Prototype systems were designed, fabricated, and successfully tested on two blasthole drills, one loading shovel, and one walking dragline (figures 1-3).

Systems based on this conceptual design were subsequently marketed by several fire protection equipment manufacturers. By the early 1980s, a high percentage of new drills, shovels, and draglines were equipped with automatic fire suppression upon delivery, and many older machines were retrofitted with suppression systems. Other system designs were also introduced, including automatic sprinkler systems containing a water/glycol antifreeze solution and CO_2 systems for enclosed and unoccupied areas.

In view of the high level of acceptance of halon fire extinguishing systems in the surface mining industry, it is ironic that, at roughly the same time halon systems were being developed, events were unfolding that would eventually cause them to be removed from the marketplace. In the early to mid 1970s, environmental researchers concluded that complex chemical reactions in the upper atmosphere involving fire fighting halons and other chlorofluorocarbon compounds (CFCs) were damaging the earth's protective ozone layer. The research continued during the 1980s, and concern over ozone depletion finally created enough international pressure that a plan to phase out ozone-depleting chemicals worldwide over a 10- to 15-year period was adopted. It was thought that suitable substitute compounds could be developed by then for the multitude of applications for CFCs (refrigerants, inerting agents, fire suppressants, cleaning agents, etc.).

However, by the late 1980s, prompted by the appearance of "holes" in the ozone layer over the Antarctic, the timetable for halon phase-out was substantially accelerated. Progressively increasing taxes were imposed on the sale of these compounds to discourage their purchase, and

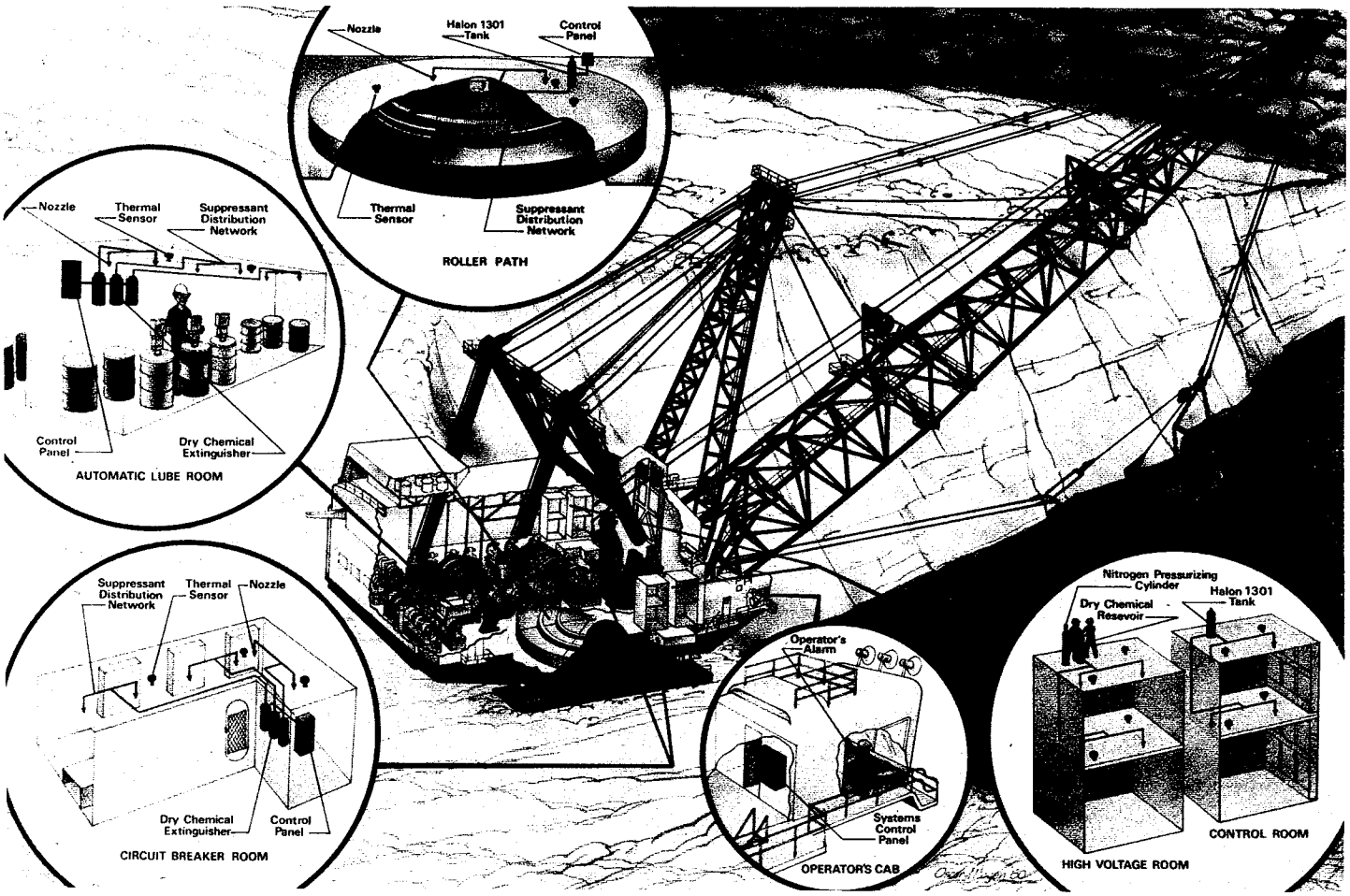

Figure 3.—Automatic fire suppression system for walking dragline.

an outright ban on manufacturing halon agents by January 1, 1994, was established.

Unfortunately, this accelerated halon phase-out timetable has left a serious gap in fire protection, as no halon substitutes have yet been approved by a nationally-recognized independent testing laboratory. Although the international agreements regarding the phase-out of halon do not require existing halon systems to be removed from service, new systems, or the recharging of an existing system would be very expensive, if allowed at all. In addition, new laws will very likely mandate environmentally-safe recycling of halon from existing systems, with the costs of recycling being the responsibility of the system owner.

Several chemical manufacturers have developed halon substitutes having very low or no ozone depletion potential. Most are non-chlorinated halogenated compounds which have similar physical properties to halon 1301. Several have been accepted by the U.S. Environmental Protection Agency's (EPA) Stratospheric Protection Division, however there is still some concern about their global warming potential and their long atmospheric life. One proposed substitute, which has been accepted by EPA, is a proprietary

mixture of carbon dioxide, nitrogen, and argon. All are satisfactory fire suppression agents, but not as efficient on a weight basis as halon 1301. Substitute agents will become commercially available as soon as fire suppression effectiveness, safety, and health effects testing is completed and formal listings or approvals are received.

Summary and conclusions

Fire protection for mobile mining equipment is essential to protect operators as well as to prevent costly downtime and production losses. Good maintenance and housekeeping practice, proper training, and improved mobile equipment designs have contributed to reducing the incidence of fires. However, fuels and ignition sources cannot be eliminated entirely, so use of a proper fire suppression system is also important. Current fire suppression systems are the product of nearly 40 years of evolutionary improvements, and they offer effective and reliable fire protection performance.

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How to choose an air-purifying respirator

Eight steps to compliance

An effective workplace respiratory program depends on the right respirator for the job. Choosing the right respirator, however, can be difficult.

Answering the eight critical questions in this article will assist you in making the right respiratory choice.

1. What is the contaminant?

First, determine what chemical the worker needs to be protected from. If you don't know, check the Material Safety Data Sheet (MSDS) for all the chemicals used in your work processes. Look under the section titled, "Hazardous Ingredients."

In the MSDS, the manufacturer will list the hazardous chemicals, including other relevant data. Some manufacturers may list the hazardous chemicals, including other relevant data. Some manufacturers may list trade names or proprietary ingredients and need to be contacted for further information. If the MSDS is not available, contact the manufacturer.

2. What is the physical form of the contaminant?

You'll need to know if the contaminant is a gas, vapor, dust, mist, fume or a combination of any of these. Each form will have to be handled differently.

If an element is a *gas*, it is gaseous at standard temperature and pressure, such as chlorine. A *vapor* is the gas phase of a substance that is liquid or solid at standard temperature and pressure. For example, lacquer thinners release vapors.

A *mist* is liquid droplets caused from condensation or a mechanical means—spray painting creates paint mists. *A dust is* made up of mechanically formed solid particles—sanding wood creates saw dust. A *fume*, which is often confused with the term vapor, is actually a solid condensation of a metal—welding creates metal fumes.

A combination of any of these is also possible—such as a paint-spray operation where vapors are present from the solvents and mists are created from the spraying of the paint. If you need help determining the type of contaminant, consider having your workplace evaluated by a professional industrial hygienist.

3. What is the estimated or actual concentration of the contaminants in the location where the respirator will be worn?

To learn what concentration of contaminant is present, you'll have to monitor the air in the work area.

You can use detector tubes, personal badges, electronic or other types of equipment to determine the in-air concentration of the contaminant. (If no one in the facility has the experience to perform air monitoring, you can hire an outside consultant.)

Compare your in-air concentration with OSHA's exposure limit, called Permissible Exposure Limit or PEL. If the concentration is below the PEL, no action is required. If the concentration in your workplace is above the PEL, control measures need to be implemented.

Remember, OSHA specifies that respirators are an option only if engineering and administrative control measures prove ineffective in reducing the contaminant level.

4. Is the in-air concentration above the Immediately Dangerous to Life or Health (IDLH) level?

If a person enters an IDLH atmosphere with the wrong respiratory protection, it could mean severe injury or even death. Air-purifying respirators cannot be used in IDLH situations for two reasons:

First, they do not supply oxygen—which is imperative if it is a low-oxygen situation.

And second, chemical cartridges have a limited adsorption capacity and can only handle a certain level of con-

For IDLH situations, your only options for protection are a self-contained breathing apparatus (SCBA) or a pressure-demand airline with a 5- to 10-minute escape bottle.

5. What is the worker's exposure?

Exposure is how long the worker will be in the contaminated area.

If he/she will only be working in the contaminated area 30 minutes a day for five days a week, it might be permissible for the worker to be exposed to a higher concentration and use a respirator with a lower protection factor.

If he/she will be working a forty-hour week in the contaminated area, a respirator with a higher protection factor may be needed.

6. What are the particulars of the work process?

Are chemicals being mixed together or heated? If the answer is yes, there is a very good chance that the by-products of the mixture or heating process could be more harmful than the initial ingredients. If either situation occurs, there may be hidden hazards that should also be thoroughly monitored.

7. What is the condition of the surrounding area?

Airflow can bring contaminants into your work area from another part of the plant or warehouse. Those contaminants should also be taken into consideration. You may have to perform additional air monitoring to make sure contaminants from other work areas are not present in high levels.

8. What are the characteristics of the work area and the work being performed?

Before issuing respirators, you must determine if any administrative controls can be implemented to lower concentration levels. New or improved ventilation systems could help minimize the hazard.

If the area is a confined space, high levels of contaminants may be present and the area may be oxygen deficient. The combination of those two factors could create an IDLH situation.

If temperature or humidity is high, the cartridge life could be shortened and special procedures may need to be followed.

If the worker is in a hot or cold environment, or performing strenuous tasks, an air-purifying respirator may be very difficult for him/her to use. If so, it may be better to supply the worker with a powered air-purifying respirator (PAPR) or supplied-air respirator to reduce the strain of breathing.

Once these questions have been answered, you should have the information you need to begin looking at different respirator brands.

If you still have questions about respirator selection, consult a respirator manufacturer or distributor for more information.

Article submitted by Lab Safety Supply, Inc., Janesville, WI.

Contractors in construction industry must develop unique safety programs

Commitment to safety starts with management, but even temporary employees must participate

By Charles Darnell

As a result of catastrophic explosions at several chemical plants during the past four years, the Occupational Safety & Health Administration has issued regulations (OSHA 1910.119: Process Safety Management) to address safety and health issues. The process safety management (PSM) standard is one of the most far-reaching of OSHA's regulations.

For construction industry contractors with comprehensive safety and health programs already in place, the standard may have minimal effect. Others must move toward developing an all-inclusive program which could include training, awareness programs and a fall prevention program. The all-inclusive program includes preventive measures beyond just OSHA compliance.

Management commitment. The responsibility lies with the construction contractor to implement mechanisms to ensure the safety and health of the workforce. This means each contractor should be responsible for the safety of their employees regardless of their status (temporary contract workers or permanent employees). That commitment must be realized at the chief executive officer's level and continued throughout each level of the organization.

Safety is everyone's responsibility. But management has to be committed to providing the best training, high quality tools and equipment and a safe, healthful environment.

The commitment must permeate the organization and be embraced by all employees. A quality improvement process helps to promote team work and empower employees to analyze their work processes and identify better and safer ways of performing.

Programs that work. A comprehensive, well-executed safety program is the result of a methodical approach to managing the hazards inherent in the construction and engineering industry. Some of these hazards include heights/elevation, lead in construction and excavations/trenching. Some hazards may be eliminated in the design process. Others may be reduced in severity by applying engineering controls, and ones that cannot be removed must be managed.

Eliminating hazards during the design process happens when engineering and construction collaborate at the front-end of a project. For example, engineers can design structures to minimize climbing, so more work is accomplished on the ground. When you consider that 30 to 35 percent of construction injuries are due to falls, the importance of fall prevention

becomes very clear.

While climbing may be minimized during the design phase, some climbing still occurs. In that case, a fall prevention plan can help to reduce the severity of a fall. Brown & Root developed a 100 percent fall prevention plan that requires wearing a full-body harness. The full-body harness fits under the groin and over the shoulders to evenly distribute the shock transmitted when a fall is arrested.

The fall prevention program also includes building lifelines and anchorage points at high-hazard locations, plus using complete work platforms such as aerial lifts, scaffolds and handrails to reduce fall exposure.

Also, Brown & Root uses remotely operated pin extractors to help protect workers against falls. Operated by employees on the ground, these devices enable loads to be cut loose from the rigging without sending personnel aloft. As a result, the need for personnel baskets and other means of lifting personnel to cut loads loose from the crane is greatly reduced.

Another procedure that helps to create safety awareness is the company's Total Safety Task Instruction plan. This plan requires supervisors to analyze each work assignment for potential safety hazards and give full safety instructions as part of each work assignment.

No construction industry safety program would be complete without a drug and alcohol policy and testing program. Removing hazards due to drug and alcohol abuse can considerably reduce personal injury and equipment accidents. Employees using drugs or alcohol are less attentive to process safety management warnings or other general industry guidelines and endanger themselves and other workers. Statistics show that accidents decrease when firms implement drug and alcohol testing procedures.

The contractor's responsibility does not stop with preventing accidents. Eliminating work-related health hazards is equally important. Finding a substitute for hazardous chemicals helps eliminate the dangers. For example, many have replaced silica previously used in sandblasting with non toxic granular matter to protect workers, and some lead paint removal can be accomplished with a liquid substance instead of scraping.

Industrial hygienists should be employed to constantly review the ever-increasing pool of occupational health literature for the latest health-hazard information.

Health hazards should be eliminated where possible or minimized with exposure controls. Sometimes the only way to control a hazardous chemical is to remove it from the job site and use a less toxic substance.

In situations where hazard elimination or substitution is not possible, engineering controls should be used to remove contaminants from the work area. For example, Brown & Root used a ventilation system to remove smoke from a Canadian fabrication shop where welding and burning occurred.

In addition, building components on the ground in a modular fashion is preferred to construction at high elevations. This restricts high-elevation work to installation only. When controls cannot be achieved by other means, personal pro-

tective equipment such as respirators and hearing and skin protection should be used.

Conclusion. Providing a safe and healthful workplace for employees is the contractor's responsibility, but it should be done in partnership with the client. For the program to truly work, it must have the commitment of the chief executive officer, the employees, and the client. It must combine both proactive and reactive activities. All of this is needed for continuous improvement in the safety and health process.

Charles Darnell is the corporate safety manager for Brown & Root, Inc. He is based in the company's Houston office.

Reprinted from the September 1993 issue of ***Occupational Health & Safety.***

Safety program initiates change

Tommy Sanders, left, road maintenance supervisor from the mine and Kenny Hill, truck shop supervisor from the Mechanical & Electrical Division of PDMI.

Coochie Gomez, at left, shift supervisor from the Concentrator Division and John Lakey, assistant leach supervisor from the Hydrometallurgical Division, PDMI.

Most success stories don't happen overnight but are rather a culmination of factors that evolve and change with time. Such is the case for PDMI and their ongoing, award winning, safety program for its 2,200 employees.

Morenci's safety program has provided a safer environment and initiated positive change for the employees and Phelps Dodge Corporation.

Tommy Sanders, road maintenance supervisor in the mine division, said one positive change was the increased role of communication, which has become more focused and plays a more important role at all levels within the mine. "Communication from me to the employees and from the employees back to me and from the employees to employees is very important," Sanders said.

He believes that improved communication among employees has provided a framework where the exchange of information helps employees perform a safer job. Sanders said employees also are offering helpful ideas for doing a safer job

and the division has developed more specific procedures for accomplishing tasks.

Matching the best qualified employee with a specific type of job has also been very beneficial, Sanders said. "You put people in places where you know they can do the best job, plus the safest job," he said.

In addition to the five-minute, daily safety meetings before each shift begins work, Sanders said PDMI's safety policies have resulted in "bigger, better, and safer equipment" for the employees.

Another employee, Kenny Hill, truck shop supervisor from the mechanical and electrical division, said "the communication is a lot better—both visual and spoken communications. Everybody is working toward that same common goal."

Hill said the monthly safety meeting and daily tailgate safety meetings before each shift begins work have also been very beneficial. "Anybody who has a good idea or workable idea, we follow through with it," he added.

One example of an employee suggestion that was implemented is the jigs that are now being used, Hill said. "A jig is a tool that you put on a forklift that will hold a big component, so you can put it on or off the truck. And, these have all been designed in-house by mechanics or supervisors," he added.

"We couldn't do the things we are doing today without the money being put back into the operations and that reflects all the way down the line, both in terms of safety and job security," Hill said.

"With good safety, we can actually improve production." That's how John Lakey, assistant leach supervisor in the hydrometallurgical division, views the role of safety within the operations.

"If you have a good safety program and the employees know you care about them, that improves morale," and greater productivity results, Lakey said. "People who think that safety and production don't go hand-in-hand, they're wrong. It does."

Another change that is attributed to PDMI's safety program is the peer pressure that is demonstrated among the employees within the division, Lakey said. "Each one of our people feels like a safety inspector," and share the responsibility for keeping their fellow employees safe, he added.

Daily tailgate safety meetings, monthly safety meetings and increased employee awareness of safety are positive changes that have resulted from Morenci's safety program, said Coochie Gomez, concentrator division shift supervisor. "The crews treat each other like family members and watch out for each other. It's more of a team effort now," he said.

In addition, safety chains in appropriate areas, more visible signs, and drug and alcohol testing are also changes that have helped to achieve employee safety, Gomez said.

The careful tagging of inoperable equipment by electricians that safeguards equipment from startingwhile repair crews are at work is another positive change, Gomez said. "It takes a little bit longer, but it's safer. And in a long run, it's going to save somebody's life."

Reprinted from Phelps Dodge Morenci, Inc. October 1993 issue of ***Copper Today.***

WINTER ALERT

Check your:

Ventilation, rock dusting, and workplace OFTEN!

Effective operation of conveyor belt cleaning systems

Objective

Reduce the number of conveyor-related accidents in the mining industry by providing recommendations for effective operation of conveyor belt cleaning systems.

The problem

Troughed belt conveyors provide effective and efficient materials transport and their use has increased throughout the mining industry. Carryback, the spillage that accumulates under the belt, is a problem even with belt cleaning systems installed. Mining personnel are exposed to safety and health hazards as they attempt to clean up this spillage.

Approach

To investigate the influence of metal-segmented-blade belt cleaners on the amount of carryback spillage, the Bureau identified and tested the following parameters: (1) amount of pressure applied to the cleaner blades, (2) friction between the blades and conveyor belt, and (3) wear rates of different metal blades.

The test parameters were quantified by recording the amount of carryback material passing the metal cleaner blades and the weight loss of the blades. The data collected were used to identify the following critical operational parameters of a segmented-blade conveyor cleaner system: (1) the existence of an optimal operating pressure for the conveyor and cleaning systems and (2) elimination of recessed patterns on the working side of the conveyor belt.

Test facility

A full-sized conveyor test facility was constructed to gather the data. It consists of two 30-foot-long conveyors with 24-inch-wide belts and 24-inch-diameter pulleys. A special test fixture bracket was designed to hold test blades perpendicular to the rubber belt with air-actuated cylinders. The recycling conveyor was fitted with a large storage hopper to provide a constant sand-lime slurry mixture to the test runs.

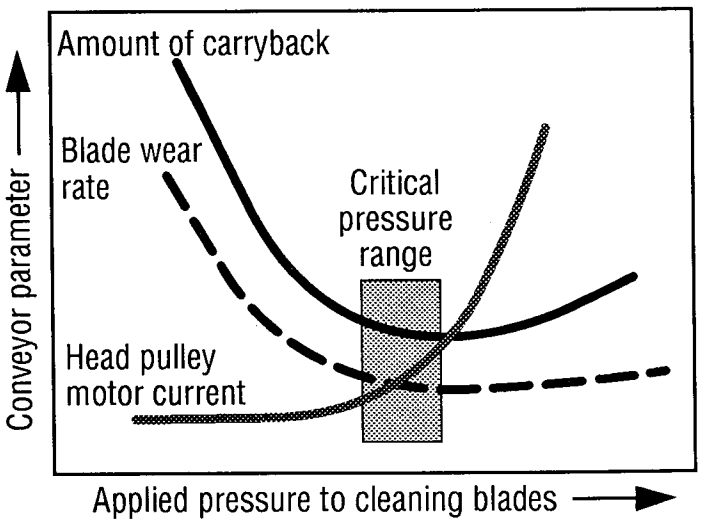


Figure 1.—Critical (optimum) pressure applied to cleaning blades as defined by carryback, blade wear rate, and motor current of conveyor.

Investigation results

Carryback rate and blade wear rate versus pressure curves indicate the existence of a critical pressure range. The critical pressure range for the test con-

veyor system was 11 to 14 psi applied to each cleaner blade. Above 14 psi no significant decrease in carryback was observed during the 8- to 24-hour test runs. Blade wear rate did not increase above this pressure but the conveyor belt-blade friction increased. The conveyor head pulley drive motor current increased 26 percent when the pressure applied to the blades was increased from 14 to 20 psi.

Nonuniform wear patterns were observed in the edge of all the cleaning blades during the 8- to 24-hour test runs. The channels or grooves worn into the blade edges were from abrasion and erosion caused by the sand particles and the slurry mass. Once the grooves were worn into the blades, increasing the blade-to-belt contact pressure did not eliminate the carryback. Metal blades (1/4- by 6- by 2-inches) made from mild stainless, alloy, and tool steel were tested. The Rockwell C hardness of the blades ranged from 11 to 50. The wear rates decreased with increasing hardness, but eventually the nonuniform wear pattern of peaks and valleys became visible and the carryback amount increased to 5 to 10 grams per square foot. Wear rates varied from 1 to 6 mils per year for the test blades.

Company logos or other patterns recessed into the conveyor belt working side allowed material to be carried between the blade and belt, which accelerated blade wear by 55 to 60 percent. The wear pattern of the metal blade edge will be characteristic of the recessed pattern filled with the conveyed material in the belt.

This study showed the existence of a critical operating pressure applied to belt cleaning blades for maximum cleaning and minimum wear of the blades and belt. Cleaner blade service life can be lengthened by using metal with greater hardness. All advantages can be negated with any defect on the belt surface that allows additional carryback. This additional carryback will shorten the cleaning system's service life and increase maintenance around operating conveyors.

For more information

Additional details concerning this research are available in U.S. Bureau of Mines Report of Investigations (RI) 9221, "Basic Parameters of Conveyor Belt Cleaning." For a free single copy of this RI, write to the Bureau's Publications Distribution Section, Bldg. 149, P.O. Box 18070, Cochrans Mill Road, Pittsburgh, PA 15236-0070. A contract report, "Safety Evaluation of Conveyor Belt Cleaning Systems," is available from the National Technical Information Service (NTIS). To obtain a copy, specify report PB 83-262592 and send $16.95 to NTIS, 5285 Port Royal Road, Springfield, VA 22161.

For answers to technical questions or additional details, please contact the Bureau's investigators for this research:

Terry L. Hebble or Charles A. Rhoades, Twin Cities Research Center, U.S. Bureau of Mines, 5629 Minnehaha Avenue South Minneapolis, MN 55417-3099 (612-725-4500)

Reprinted from the Bureau of Mines' Technology News of December 1989

Surrounding PDMI's 1992 Sentinels of Safety trophy are , left-to-right, Steven Whisler, president, Phelps Dodge Mining Company; John A. Knebel, president, American Mining Congress; Douglas C. Yearley, chairman, president, and CEO, Phelps Dodge Corporation; Vern Gomez, metal and nonmetal administrator, Mine Safety and Health Administration; and Timothy R. Snider, manager, PDMI.

PDMI captures nation's premier mine safety award

"Copper mining at its best with the best." For Phelps Dodge Morenci, Inc. (PDMI), this motto has earned its 2,200 employees and the Phelps Dodge Corporation (PDC) the mining industry's most prestigious mine safety award for 1992—the Sentinels of Safety (SOS) award.

When Morenci employees, corporate officials, local, state, and federal dignitaries gathered for the 11 a.m., awards ceremony Thursday, Sept. 23, at the Morenci Club, a standing-room-only audience listened attentively, as PDMI was officially recognized as the safest open pit mining operation in the U.S. during 1992.

The best leading indicator of operation excellence is safety, said Douglas C. Yearley, PDC's chairman, president and CEO, during his opening remarks at the ceremony.

"If you have a safe operation, you have one that is clean, and you have employees who have been trained and understand," Yearley said. "You have discipline; you have a commitment to doing something properly. And, if you have a safe operation, it's normally run well. If you don't have a safe operation, you will never find one that is run well."

The corporation's safety philosophy was adopted not only to provide good, safe jobs for the employees, but also to provide the underpinnings for operational excellence,

Yearley said. "I would like to add to that sign, if I may," Yearley said, as he pointed to a banner displayed at the ceremony. "It's the safest, most productive, and best copper operation in the world, which I firmly believe."

American Mining Congress (AMC) President, John A. Knebel, also spoke and his message contained a similar theme. "A safe mine is a productive mine," and companies that do the best are those who put safety on the top line, he said.

The SOS award is presented each year in eight mining categories to operations with the best safety record during the preceding year by the Mine Safety and Health Administration and the AMC. Morenci's record is unmatched by other SOS recipients, including competition from more than 800 other U.S. open pit mines.

During the ceremony, PDMI's Manager, Tim Snider, accepted the SOS award for PDMI and the PDC. "Morenci's employees and, of course, all of the employees of PDMC are the safest and most productive copper miners in the world," Snider said. "I have never doubted for a minute that Morenci would win it. "

"So far, 1993 looks like another good year," Snider said. "But of course our ultimate safety goal goes far beyond what we've done so far, and that's to continuously improve to the point at which we eventually eliminate all accidents from the work place. I think that's the common goal we all share, everybody from the bottom of the organization to the top."

The SOS award is the result of dedication and commitment from Morenci's 2,200 employees, Snider said. "This work force is a mixture of laborers, truck drivers, journeymen, engineers, and a whole lot of other occupations, and they all work in widely varying environments. And yet, we all work as a team, which is an incredible feat, I believe, with such a diverse group. It would be impossible to achieve this level of safety performance without direct involvement from every team member."

The second safest mine in the open pit category for the 1992 SOS award is PDC's Tyrone Branch in New Mexico, which earned the title of first runner-up for the award competition by accumulating 409,021 employee-hours with no lost-time injuries.

After accepting the award as the first runner-up in the 1992 SOS award competition, H.M. (Red) Conger, manager of PD Tyrone, extended his sincere congratulations to Tim Snider and the Morenci team for their accomplishments and promised fierce competition for the 1993 award.

Paying tribute to the employees for their commitment to safety continued to be the central theme communicated throughout the awards ceremony. At one segment of the program, Morenci's safety inspectors and safety technicians were individually recognized for performing their safety responsibilities in an exemplary manner. And later, Harold Boling, PDMI's safety and hygiene supervisor, was commended for his leadership, vision, and belief that PDMI could achieve the ultimate, safety record.

This was truly a team effort of all employees, and I've always believed that if anybody could do it, our employees could, Boling said. "I'm proud of every darn one of you out there, for the important job you are doing in safety."

Reprinted from the October 1993 issue of Phelps Dodge Morenci's employee newsletter: ***Copper Today.***

Holmes Safety Association Monthly safety topic

Fatal fall of face accident

GENERAL INFORMATION: A 44-year-old front-end loader operator, with 6 years of mining experience, was fatally injured when a large slab of rock fell from the roof and crushed him while he was examining the face for a possible misfire.

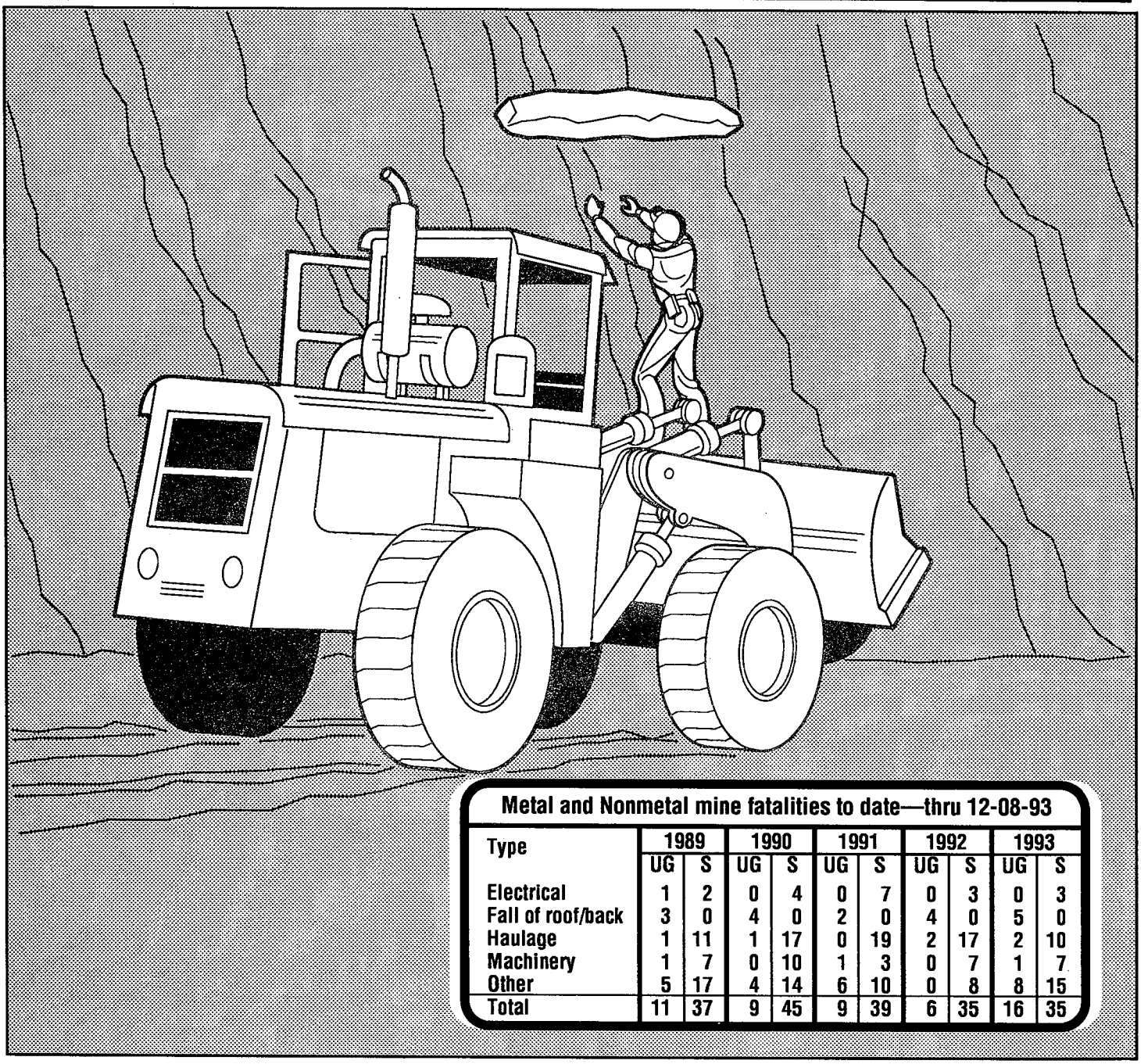
The operation was an underground limestone mine. The mine was normally operated two 10-hour shifts a day, 6 days a week. A total of 31 people were employed.

The mine was developed utilizing a room and pillar mining method. After drilling and blasting, broken stone was loaded into haulage trucks by front-end loader and transported to a primary crusher on the surface. The material was then sized and screened. The finished product was stockpiled for sale to customers.

DESCRIPTION OF ACCIDENT: On the day of the accident, the victim reported to work at 4:00 p.m., his normal starting time. He went to the M3, W21 heading and started mucking. Two truckdrivers, hauled four loads each to the outside crusher. When one of the truckers returned for the fifth load at about 5:30 p.m., he noticed the loader was running and the lights were on, but the victim was not in sight. When the other trucker returned for his next load, the first trucker told him that the victim was not in the loader. They started to look for the victim and found his hard hat on the muck pile. One of the truckers then went to get additional help. On the way to the portal he told the driller that the victim could not located. The trucker and the driller continued to look and discovered the victim underneath a slab of rock, laying partially in the bucket of the front-end loader. The loader was found running with the lights on. The bucket was loaded and elevated about 5 feet up and against the muck pile. The slab of fallen rock measured 4 feet, 9 inches by 21 inches by 12 inches. The fall extended approximately 3 feet from the center of the face and was about 18 feet above the muck pile. The slab covered the victim who was found 5 feet from the face partially in the loaded bucket.

After removing the slab, they checked for vital signs but none could be detected. Apparently, the victim positioned the loaded bucket of the front-end loader up against the muck pile, then climbed up the muck pile in front of the bucket to check a possible misfire when the slab fell and struck him. A piece of paper from the blasting debris was found in his hand

The local ambulance, county coroner, and state police were summoned and arrived a short time later. The victim was

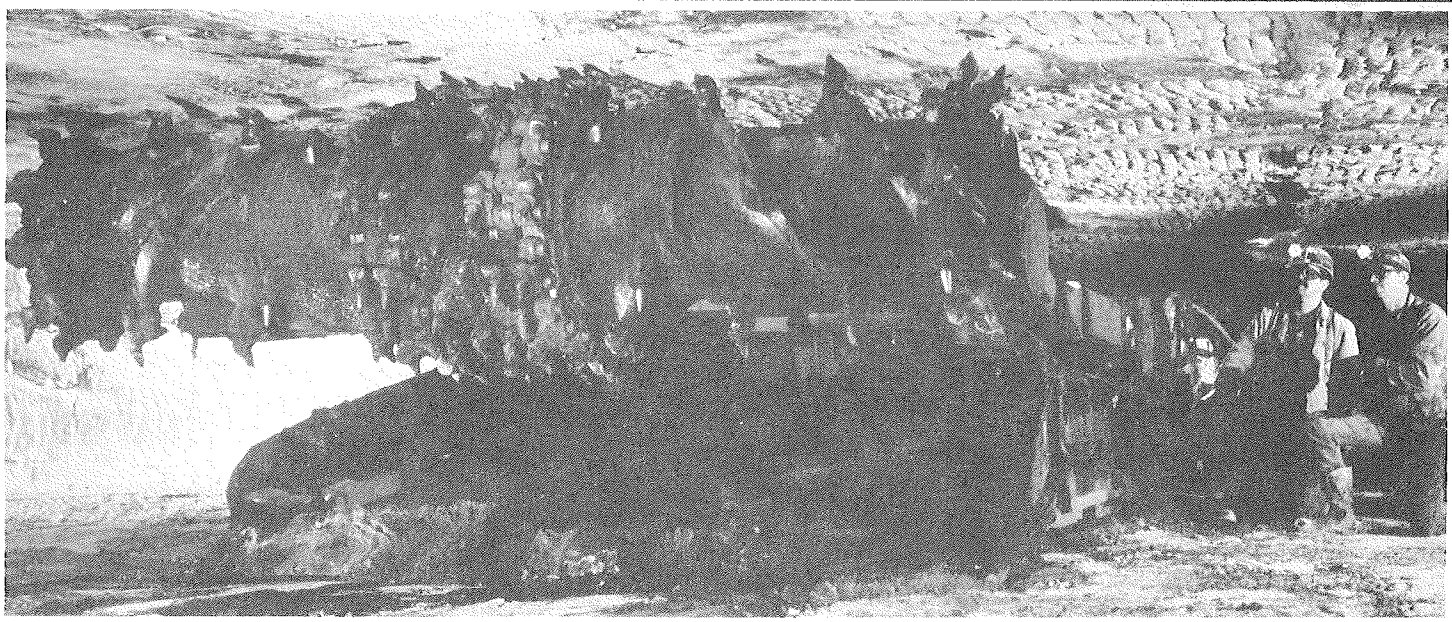


Metal and Nonmetal mine fatalities to date—thru 12-08-93

Type	1989		1990		1991		1992		1993	
	UG	S	UG	S	UG	S	UG	S	UG	S
Electrical	1	2	0	4	0	7	0	3	0	3
Fall of roof/back	3	0	4	0	2	0	4	0	5	0
Haulage	1	11	1	17	0	19	2	17	2	10
Machinery	1	7	0	10	1	3	0	7	1	7
Other	5	17	4	14	6	10	0	8	8	15
Total	11	37	9	45	9	39	6	35	16	35

pronounced dead at the scene by the county coroner.

CONCLUSION: The accident occurred due to ground failure at the face. The primary cause of the accident was failure to detect and remove loose ground before entering the area. A contributing factor was the failure to follow the established policy of contacting the foreman when loose ground was encountered. A subsequent examination of the face revealed that the possible misfire had fully detonated.



Regular bit replacement reduces dust generation

By A.W. Khair, I.D. Gehi and M. Ahmad

Bit wear presents problems to mining operations because it affects both productivity and economics. Most bit research deals with energy requirements and energy dissipation mechanics for ideal fragmentation during the cutting process.

Mechanical cutting leads to dust generation. Past studies involving dust generation due to bit wear concluded that dust concentrations increased considerably after a 7% bit weight loss; leading researchers recommend that the bits be changed at that point.

Bit wear is affected by three factors: machine operating parameters, in situ mining conditions, and rock properties. Operating parameters such as the depth of cut, tool material, spray position and the drum's rotating velocity are very important and have a definite impact on bit wear.

During the mining process, the amount of rock in coal and the strength of that rock is important as abrasion and adhesion take affect. Diffusive wear, or deformation, becomes dominant only when the temperatures exceed critical. Temperatures rise as a function of drum velocity, rock properties and the cutting tool itself.

Miner bit survey

In this study, 15 mines were surveyed, and of those, six responded for nine seams. The survey reflected a wide range of information about coal production and bit consumption from continuous miner sections. Also, used bits were collected to get first-hand information to analyze wear.

Three types of used bits were collected from different coal mines. On average, weight loss was 4% to 7%. The loss of height at the conical part was observed varying between 11% and 23%.

The survey results revealed that a continuous miner produces an average of 222,000 tons of coal and consumes 11,400 bits per year. On average, 19 tons of coal were produced for every bit consumed. Other than excessive wear, no specific cri-

teria for bit replacement exists.

Laboratory results

Besides the survey, a laboratory experiment also was performed which detailed two types of formations—the Tennessee sandstone and the Berea sandstone. The Tennessee sandstone had a compressive strength three times greater than the Berea sandstone.

During the experiment, an 18-inch x 12-inch x 2.5-inch block was firmly fixed in a confining chamber. The cutting head with 22 bit blocks spaced at 0.5-inch was rotated at 90 rpm and simultaneously advanced. The purpose was to determine the depth with which the machine could cut during both rotary and forward motion.

The machine cut up to 0.25-inch deep in the Tennessee sandstone for the first rotation, but then it stuck during the second. Gradually the advancing speed was reduced until the machine could cut for more than three rotations. An advancing rate of 1 foot per second was found to be suitable. During the cutting process, the drum kept rotation until an advance rate of 0.25-inch was made.

While cutting the Tennessee sandstone, wear increased dramatically after the bits had lost 6% to 7% of its weight. As the carbide tip wore, the contact area between the rock and the cutting tool increased, causing more friction and abrasion. This yielded comparatively more wear to the bit body and generated more dust. The wear was symmetrical, even after the bit lost more than 11% of its weight.

When the height losses increased from 2.8% to 9.3%, the corresponding increase in the weight loss was only 1.9%. During one test, a small piece from the conical carbide tip was found to be broken. The change in height was 4%, while the change in weight was measured at 3%. This indicated that, when the tip becomes flat, the abrasion to the bit body becomes a dominant factor and causes more weight loss.

Based on laboratory results, weight loss in bits cutting Tennessee sandstone was as large as nine times that in cutting Berea sandstone. For the same weight loss of 9%, the amount of Berea sandstone produced was 170 pounds and Tennessee sandstone was seven pounds.

Acoustic measurements were made as well. As bit wear increased the total number of acoustical events (emissions) decreased. One reason could have been that new bits, or less worn bits, were able to penetrate deep into the rock, creating more deep cracks and microfractures, which produces more acoustical emissions.

When the bit penetrates into the rock, the temperature of the bit increases due to impact and friction. An increase in temperature during every cut was recorded, as measured immediately after the bit came out of contact with the rock. The maximum increase in temperature was recorded at 458°F while cutting Tennessee and 262°F while cutting the Berea.

The wear for the same kind of bit changes as the properties of the rock and coal change. Hence, it is a function of rock properties and production. And, as bit wear increases, so does dust generation.

Reprinted from the May 1993 issue of ***Coal*** *magazine.*

Author information: *Khair, Gehi, and Ahmad are researchers in the mining engineering department at West Virginia University. This article was adapted from a paper presented at the 1993 Society of Mining Engineers (SME) annual meeting in Reno, Nevada. For more information contact SME at 303/973-9550 and ask for preprint no. 93-238.*

Nasty strain on its way?

FLU

Health experts' best guess is that the coming flu season is going to be a bad one.

The harsh Beijing flu is expected to hit the U.S. this fall, and a new variant of the strain means that most Americans will *not* have any natural immunity against it.

"Even though you were exposed to similar strains in the past, you might not be able to defend yourself against this new one," says Dr. Lone Simonsen of the Centers for Disease Control (CDC).

"It will be very important to get a flu shot this fall."

New strain

According to the CDC, the *new* virus strain emerged very late in the 1992-1993 flu season, infecting people and killing the elderly into May—two months after influenza usually disappears.

The *milder* form of the flu was dominant throughout the season, accounting for 73% of the cases between September 27 and May 15.

But last spring, the virus' genetic makeup mutated suddenly, which explains why some people who had gotten flu shots fell ill.

This mutation means that even people who have been exposed to Beijing flu (or who have had flu shots) in the past will be vulnerable this coming flu season.

Get your flu shot

The good news is that the new flu virus strain was caught early enough for scientists to incorporate it into this fall's flu vaccine.

Reprinted from the September 1993 issue of Arch of West Virginia's ***Health Letter.***

Step back from it

The following story illustrates the point that before we try to solve a problem, sometimes it's necessary to *step back from it*, relax, and even take a nap. Once we're refreshed, we can try a new approach:

A teacher tells of a first grade class that was being particularly unruly.

Finally she slammed her ruler down on her desk and said in a loud voice, "I'm *tired* of this, children. Do you hear me? I'm *tired*."

"I'm *tired* of telling you to be quiet, and I'm *tired* of telling you to sit down, and I'm *tired* of telling you to pay attention to what you're doing."

"I'm *tired* of it children. I'm *tired* of it."

There were several moments of silence before one little girl raised her hand and suggested, "Then why don't you go and take a nice little nap?"

"Fall seven times, stand up eight."

—Japanese proverb

Reprinted from the September 1993 issue of Arch of West Virginia's ***Health Letter.***

"TB or not TB?"

by Dr. Mark Delowery

You've heard about it, seen it on the news and read about it in the papers. But you never thought it would happen in your office. Now, one of your worst personnel nightmares is coming true: you've just been informed that one of your employees has tuberculosis.

Unfortunately, you were not the first one to find out. In fact, you may have even been the last to know, and rumors have multiplied faster than you can say "mycobacterium." You've already had four people call in sick, three people who've demanded an immediate chest x-ray and one person who refuses to come to work without a face mask! What should you do? What do you know about TB? Your first response is:

a) lock your door and take the phone off the hook
b) immediately book a two week cruise to Hawaii
c) call Federal Occupational Health STAT [immediately]

The answer, of course, is "C".

Recent attention in both the lay and medical press has led to an increased threat (both perceived and real) of tuberculosis in the public's mind. As a result, the Division of Federal Occupational Health (FOH) has received many new requests for consultations involving response to tuberculosis in the workplace. As in the case illustrated above, this has often required a swift response to a panicky, near crisis situation.

The initial and most important step requires a thorough investigation of the initial case reviewing their history, symptoms and results of any diagnostic tests that may have been performed. This data, combined with an analysis of the employee's specific work environment, are the critical elements used in determining the most clinically appropriate actions. Recommendations may range from simple educational programs and/or testing of selected individuals to mass screening of employees.

During the review, an important distinction must be made between someone who has an active case of tuberculosis and someone who simply has a positive reaction to a TB skin test. An active case is someone who not only has signs and symptoms of TB such as cough, fevers, night sweats and weight loss, but also has growth of the bacteria in secretions or tissues when cultured. It is these patients who are most infectious (contagious) to others as bacteria are spread through airborne droplets produced during coughing or sneezing.

On the other hand, healthy people who simply react positively to a skin test and are without any other symptoms are considered exposed and infected, but are nut necessarily contagious. In these cases, the tuberculosis bacteria are dormant, and because they are not released in airborne secretions

they are not transmissible to others. To prevent these from becoming active cases, however, physicians sometimes recommend a prophylactic course of antibiotics in these individuals for a period of six to twelve months.

Another critical fact is whether the positive reaction is old or new. A history of a previously negative test which has "converted" to a positive one may indicate a more recent (and possible workplace) exposure which should be investigated more thoroughly.

Once an exposure to an active case of TB has been confirmed, the decision as whether or not (or whom) to test is a complex one. Currently, there are no specific regulations regarding TB exposure in the workplace because each situation is unique and- must be evaluated on an individual basis. Particular circumstances such as adequacy of ventilation, population density and length of contact all affect risks and therefore influence decision making.

Recently, some federal agencies have requested TB screening for employees in the absence of a specific exposure. Although not inherently harmful, the Centers for Disease Control and Prevention in Atlanta are recommending routine screening only for those people who work with high risk populations such as immigrants, the homeless, prisoners, drug users and those with AIDS/HIV infection. In the Federal sector, these recommendations could apply to health care workers, prison employees, immigration officers, criminal investigators and others in law enforcement. *Working with the public, in general, is not considered high risk at this time.* Ideally, any screening program should include an educational component. Without it, testing can be interpreted as validation of unwarranted fears, which is not in the best interest of the employees or the public health.

The increase in the incidence of tuberculosis since 1984 is certainly alarming, but it is important to note that much of that increase has been confined to the high risk groups noted above. Still, because more and more of the new cases are resistant to traditional antibiotic medications, TB does loom as a major public health concern. But it is concern, not panic, caution not fear, and education, not ignorance that will help us control this resurgence of an old disease.

FOH physicians and nurses are available for consultation in evaluating your agencies' risk of tuberculosis exposure. Services can be obtained both before and after an exposure through a simple interagency agreement. Contact us and let us help you protect your employees' health, morale and productivity.

For More Information Please Contact:

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Reprinted from the Department of Health and Human Services Fall 1993 issue of ***Consult.***

Use aspirin with caution

Scientists say aspirin is beneficial for many heart and stroke patients, but should not be taken by everyone.

The American Heart Association recently released new guidelines regarding the use of aspirin to prevent heart attacks or strokes.

The report, *"Aspirin as a therapeutic agent in cardiovascular disease"* was published in the February issue of the AHA journal, ***Circulation.***

The report notes that aspirin is effective in treating heart attack, preventing a second attack and preventing stroke, as well as preventing complications from bypass surgery and coronary angioplasty. But, the report goes on to stress that the decision to use aspirin on a *regular* basis should be made **only** in consultation with a physician.

> ***"Aspirin should not be used by everyone.***
>
> ***The decision should be made by the physician—or health care provider—after the patient's cardiovascular risks are weighed."***

How aspirin may help

Aspirin was first recognized to be beneficial in reducing and treating some forms of cardiovascular disease in the 1970s. Here's how.

The inside wall of the artery is normally round and easily expandable. Atherosclerosis, often called hardening of the arteries," is a build-up of cholesterol and other fatty substances on the inside arterial walls. As the build-up accumulates, the artery becomes narrow and stiff.

So much build-up is eventually collected that the artery looses its ability to expand. The accumulation also makes the passageway small and narrow. As this occurs, it becomes harder and harder for blood to flow through the artery. When enough build-up has collected inside the artery, the stage is set for a heart attack or stroke.

The final event that causes a heart attack or stroke is usually the formation of a blood clot that becomes lodged in the narrow artery. The clot blocks the flow of blood and cuts off the supply of oxygen to the heart (in the case of a heart attack) or to the brain (in the case of a stroke).

Aspirin may help some patients by keeping blood platelets from sticking together and preventing clots from forming.

Not for everyone

Preliminary data was released in the late 1980s indicating that aspirin could be beneficial in preventing heart attack. The data was based on the *Physicians Health Study,* a trial comparing the risk for heart disease in 22,000 physicians. In the blind study, one group of doctors were given aspirin while the others received a placebo (a fake pill containing no medicine).

Since the release of that data, many people have begun popping aspirin on a daily or every other day basis. The problem is: People frequently take aspirin without their doctor's knowledge *and* without weighing the benefits and risks.

According to the AHA panel of experts who prepared the aspirin report, "Aspirin should not be used by everyone. The decision to use aspirin should be made by

the physician or health care provider after the patient's cardiovascular risks are weighed."

Prevention first

The experts are quick to point out that aspirin is not a substitute for individual responsibility such as:

- Not smoking,
- Keeping high blood pressure under control,
- Eating a low fat/low cholesterol diet,
- Staying at or near ideal weight,
- And getting regular exercise.

Who can benefit from aspirin therapy? They suggest that *"aspirin should be reserved for middle-aged and older men whose risks of a first heart attack are high enough to warrant the possible side effects of long-term aspirin use."*

What about middle-aged women? Scientists are waiting to make recommendations for females until results are in from the *Women's Health Study,* a trial analyzing aspirin's benefit in 40,000 female registered nurses 45-years-old and up.

Side effect alert

Aspirin carries its own set of side effects: stomach pain, heartburn, nausea, vomiting, and risk of increased gastrointestinal bleeding. Aspirin should not be taken during pregnancy or by people with:

- Liver or kidney disease
- An allergy to aspirin
- Peptic ulcer
- Gastrointestinal problems
- Bleeding problems

Because aspirin affects the blood clotting process and prolongs bleeding time, the panel of experts recommend that it's use be regulated for those undergoing *any kind* of surgery, even minor surgery.

*Reprinted from: "Aspirin as a therapeutic Agent in Cardiovascular Disease," **Circulation**, Vol. 87, No. 2, February, 1993*

Virginia Mining Institute, Northern Division

The Virginia Mining Institute, Northern Division, 1993 Safety Day Contest was held in Blacksburg, Virginia at the Blacksburg Recreational Park August 11, 12, and 13, 1993. The contest consisted of benchman, first-aid, and two-hour mine rescue competition events. Twenty-four teams from Va., W. Va., Ala., Ky., Ohio, and Tenn., competed in this year's contest.

The first-aid and benchmen contests were held on August 11, 1993. Eight teams competed in the first-aid event, and twelve benchmen competed in the bench contest.

Twenty-two mine rescue teams competed in the elimination round of the mine rescue contest on August 12, 1993. The top ten teams from the elimination round advanced to the Grand Championship competition held on August 13, 1993.

Contest officials and judges for all contests were employees of the Virginia Division of Mines and MSHA.

Trophies were presented at the banquet held on August 12, 1993 to the following for the events held on August 11 and 12, 1993

First Aid:

Overall Winner: Jim Walter Resources, JWR #1 Team, Brookwood, Alabama
1st Runner Up—State: Island Creek Coal Co., "B" Team, Oakwood, VA
2nd Runner Up—State: Island Creek Coal Co., "A" Team, Oakwood, VA
1st Runner Up—Visitor: Peabody Coal Co., Coal River Team, Charleston, WV
2nd Runner Up—Visitor: Cannelton Industries Inc., Kanawha Division Team, Cannelton, WV

Bench:

1st Place: Robert Osborne, Cannelton Industries Inc., Kanawha Division Team, Cannelton, WV
2nd Place: Gerald L. Saunders, Consolidation Coal Co., Buchanan #1 Mine Rescue Team, Mavisdale, VA
3rd Place: Steve Sims, Jim Walter Resources, Inc., No. 3 Mine Team, Brookwood, Alabama

Mine Rescue—Thursday's competition:

1st Place State: Pittston Coal Group, Virginia Division Team, Dante, VA
2nd Place State: Westmoreland Coal Co., Team No. 1, Big Stone Gap, VA
3rd Place State: Consolidation Coal Co., Pocahontas Team, Bluefield, VA
1st Place Visitor: Eastern Associated Coal Corp., Harris Team, Charleston, WV
2nd Place Visitor: Wolf Creek Collieries, Wolf Creek #1 Team, Lovely, KY
3rd Place Visitor: Interstate Coal Co., Inc., Interstate Coal Mine Rescue Team, London, KY

Best Combination Mine Rescue/First Aid Team:

Peabody Coal Co., Coal River Team, Charleston, WV

The top ten teams competing in the Grand Championship mine rescue competition on August 13, 1993 were:
1st: Eastern Associated Coal Corp., Harris Team
2nd: Wolf Creek Collieries, Wolf Creek #1 Team
3rd: Interstate Coal Co., Inc., Interstate Coal Mine Rescue Team
4th: Pittston Coal Group, Virginia Division Team
5th: U.S. Steel Mining Co., Inc., Pinnacle Blue Team
6th: Jim Walter Resources, Inc., No. 7 Mine Team
7th: Peabody Coal Co., Coal River Team
8th: Westmoreland Coal Co., Team No. 1
9th: Southern Ohio Coal Co., Meigs No. 31 Mine Team
10th: Consolidation Coal Co., Pocahontas Team

The following trophies were presented on August 13, 1993, following the completion of the Grand Championship mine rescue competition:

Grand Champion:
Interstate Coal Co., Inc., Interstate Coal Mine Rescue Team, London, KY

1st Runner Up: U. S. Steel Mining Co., Inc., Pinnacle Blue Team, Pineville, WV
2nd Runner Up: Southern Ohio Coal Co., Meigs No. 31 Mine Team, Athens, Ohio

Laura Elkins, Secretary, Virginia Mining Institute, Northern Division

Development of a cost-effective personal diesel exhaust aerosol sampler

Objective Develop a cost-effective diesel aerosol sampler that can be used by industry and regulatory agencies to determine the diesel exhaust aerosol concentration in mine atmospheres. The sampler must be easy to use, wearable by mine personnel, compatible with current personal sampling protocols, and inexpensive.

Approach The University of Minnesota (UM) and the U.S. Bureau of Mines (USBM) have developed and tested a prototype diesel exhaust aerosol sampler. The sampler, however, was complicated and expensive to fabricate. Consequently, the USBM redesigned the sampler to simplify both manufacturing and use, and to ensure equivalency with the prototype.

Background The National Institute for Occupational Safety and Health (NIOSH) has 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." In addition, MSHA has been directed by an advisory committee to establish a diesel exhaust aerosol standard and regulations to minimize exposure to diesel pollutants in underground coal mines.

Both reports point out the need for development of measurement techniques for respirable diesel aerosol and the MSHA report specifically requests support from the USBM and NIOSH to develop these techniques.

How it works The USBM, in cooperation with the UM, has conducted studies of coal aerosol in both the laboratory and underground coal mines. These studies have shown that respirable coal dust and diesel aerosol can be differentiated by size. The measured particle size distribution has two maxima or modes with the primary mode separation at 0.8 μm. Diesel aerosol has been shown to be predominately less than 0.8 μm in size and coal dust greater than 0.8 μm in size. Based on this, the UM designed a three-stage sampler that preselects for respirable aerosol and then separates this into two parts by size. These sizes are greater and less than 0.8 μm. This sampler utilizes a 10-mm Dorr-Oliver cyclone, a 0.8-μm cut point impactor, and an after-filter. The impactor and after-filter are housed in one unit. The UM sampler was designed to minimize sample loss. Minimizing manufacturing cost was not a primary design goal. It is commercially available for a cost of $1,500.

Retaining the internal geometry of the UM sampler, the USBM modularized the design by separating the impactor section and filter. As shown in figure 3, the impactor section can be added to a commercially available sampler assembly to complete the diesel sampler. The cost objectives were satisfied: The impactor section can be manufactured in quantity for about $10 and would sell for less than $60. The sampler assembly would have a commercial cost of about $150.

Testing the design The USBM sampler was shown to be equivalent to the UM sampler when the two were tested together. The comparative tests included impactor cut point, impactor losses, and an overall field evaluation in an underground coal mine.

The future The USBM is currently seeking a partner to enter into a Cooperative Research and Development Agreement. This will enable the USBM to develop the sampler into a commercial product.

For more information contact:
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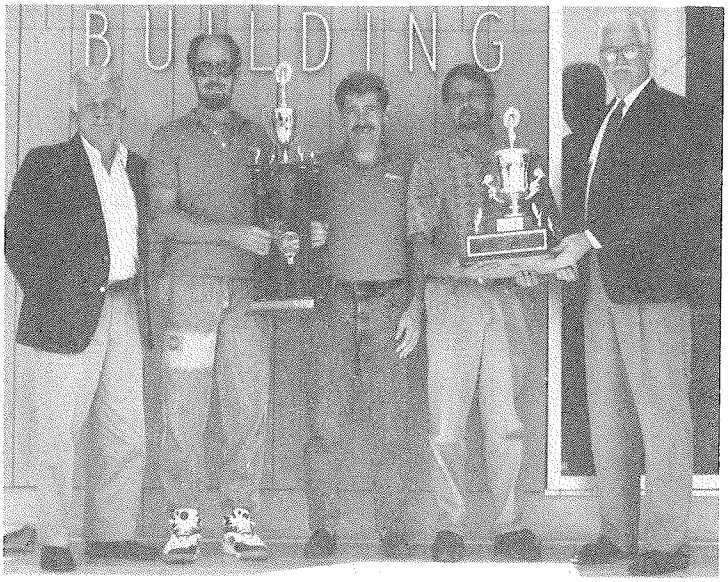
Reprinted from the Bureau of Mines' October 1992 issue of ***Technology News.***

Winners of the 1993 Kentucky EMT/Manikin Contest

The winners of the 1993 Kentucky State Emergency Medical Technician and Manikin Assembly Contest have been announced as Wade Maggard, Winford Cornett, and Mike Eslinger of the Interstate Coal Company, Kemco EMT Team. Wade Maggard is a drill operator at the Kemco surface mine; Winford Cornett a bull dozer operator, and Mike Eslinger works in the safety department at Kemco. Although Wade and Winford work ten-hour shifts at the surface mine, they still take time out to practice their skills in order to compete on a national level. These three gentlemen have been the EMT champions of Kentucky for two consecutive years, and they are determined to be the champions for a third year in 1994.



Left-to-right: Ben Spears, President of the Kentucky Mining Institute (KMI); Wade Maggard, Winford Cornett, and Mike Eslinger of the Interstate Coal Co., Kemco Mine; and Bill Caylor, Treasurer of KMI.

At left, Burl Scott, Commissioner of Kentucky's Department of Mines and Minerals, presents winner's trophy to Jesse Hatfield.

The Manikin Assembly Contest was new to the Kentucky State Emergency Medical Technician Contest this year. Jesse Hatfield of New Horizons Coal Company was the 1993 winner. The Manikin Assembly Contest is related to the EMT contest as the Benchman Contest is to the Mine Rescue Contest.

Burl Scott, Commissioner
Kentucky Department of Mines and Minerals
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Lexington, Kentucky 40512-4080

The last word...

"It is better to debate a question without settling it than to settle a question without debating it."

"Work is of two kinds: first, altering the position of matter at or near the earth's surface relative to other matter; second, telling other people to do so."

"Whoever said money can't buy happiness didn't know where to shop."

"To get back on your feet, miss two car payments."

"If it's beautifully arranged on your plate—you know someone's fingers have been all over it."

"The British tourist is always happy abroad so long as the natives are waiters."

"France is a country where the money falls apart and you can't tear the toilet paper."

"Schizophrenia beats dining alone."

"A well-written life is almost as rare as a well-spent one."

"Autobiography is an unrivalled vehicle for telling the truth about other people."

"Writing is turning one's worst moments into money."

NOTICE: We welcome any materials that you submit to the Holmes Safety Association 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 1993 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

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