

*The Holmes Safety Association*

# **BULLETIN**

*December 1998*



**INSIDE:**

- Solving the Y2K puzzle*
- Moving car bunkers*
- Backup cameras*



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# contents:

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Managing the human elements of workplace safety .....	3
Ventilation of a 40-foot, two-pass, extended cut .....	5
Safety practices for oxy-fuel cutting and welding.....	7
Proper handling eases concerns on non-refillable gas cylinders .....	9
Coal use and fly ash disposal in Israel .....	10
Coal accident summary .....	13
Safety eyewear saves worker's sight .....	14
Metal/Nonmetal accident summary .....	16
Moving car bunkers .....	17
The case for cameras on reversing vehicles .....	18
Pit and quarry operators get productivity tips... from a utility .....	20
Solving the Y2K puzzle .....	22
DWI contributed to haulage accident at Iowa clay operation .....	25

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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:** Thanks for this month's cover goes to Ann Dougherty, Program Manager (Environmental/Process Technology) for the Portland Cement Association of Skokie, Illinois. The photo was received as a response by the PCA for a "Best Safe Practices" photography contest. There will be other photos by winners in upcoming issues of the *Bulletin*. The Phoenix Cement Co. of Clarkdale, Ariz. is responsible for the innovation pictured—"Cable tie-off at bridge area."

The cover illustrates a fall arrest system on the bridge area of the reclaimer allows employees cleaning on top of the bridge to attach their safety harnesses to an overhead cable secured to both ends of the machine, with guides through the digger wheel structure. The cable tie-off has allowed safe access for clean-up, production for inspection, maintenance and lubrication. Approximate cost: \$250.

If you have a potential cover photo, please send an 8" x 10" print to the editor, Fred Bigio, MSHA, 5th floor—EPD #535, 4015 Wilson Blvd., Arlington, VA 22203-1984

**KEEP US IN CIRCULATION  
PASS US ALONG**



## ***Managing the human elements of workplace safety***

By David Szczepanik—J.J. Keller & Associates Inc.

A recent study notes that about 85% of all workplace injuries and fatalities can be prevented by assuring proper employee training on the job, by adherence to safe work practices, and by getting managers as well as the rank-and-file to genuinely commit to worker safety. Interestingly, all these elements are among OSHA's recommended components of a safety and health program. So why did so many companies with employee training programs, safe work practices and top-down "commitments" to safety, succumb to an average of 17 fatalities and 16,000 serious accidents every workday in 1996 across America?

### ***Improving worker behavior is key***

A growing number of environmental, health and safety (EHS) practitioners are beginning to look beyond better training and safer work practices to "behavior-based safety"—which got its start in industry in the late 1970s, and has only really taken off in the past sev-

eral years. An industry-leading survey reports that 56% of its EHS respondents will give behavior-based training a priority in 1998, up from 20% in 1994. Simply stated, proponents of behavior-based safety believe that improving behavior is key to preventing workplace injuries. More specifically, substituting safe for at-risk behavior is recognized as critical for a proactive, "upstream" approach that prevents unsafe acts from ever taking place.

### ***Observation and feedback: a narrow view***

Many subscribe to a narrow perspective of behavior-based safety, considering it only a tool to manage workers' observable actions. They use a "checklist" approach to conduct an observation and feedback procedure that may in fact reduce the quantity of at-risk behaviors because it focuses solely on employee actions. But, what about factors other than observable behaviors? Factors like workers' attitudes, and actively caring about safety—the way they

feel about their job, their company and their fellow workers. A reduction in unsafe behavior is certainly well and good, but it doesn't produce a fundamental cultural shift, one that assumes a broader, "total-system" approach to behavior-based safety.

### ***A broad-based shift toward interdependency and teamwork***

Having a written respiratory protection program "whenever respirators are necessary to protect the health of employees" is spelled out in OSHA's newly revised 29 CFR 1910.139. Employers are dependent on the Respiratory Protection Standard to motivate them toward compliance for fear of a citation. Still others were more proactive, or independent of the OSHA threat, because they believed a written plan was "the right thing to do" before the January 8, 1998 publication date.

One of the industry's leading proponents of a broad-system approach to behavior-based safety, E. Scott

Geller, Ph.D., believes that you must go further. "Dependence or independence will not work if we are going to improve safety. Improvement of a safety program because it follows common sense, or because it complies with mandates isn't good enough. Fifty years of empirical research supports that what works best is an interdependent system where all of the individuals in an environment must work together," said Geller. "We must go beyond imposed regulatory statutes and our common sense to apply the principles of research and the scientific methods, to learn what works best in your business culture to influence behavior in positive directions."

It's clear to Dr. Geller that individualism or dependence, even independence, will not work if we are going to improve workplace safety through reduced injury rates. We need to make a transition to a "systems" thinking and interdependence, which is based on feedback and teamwork. But first, we need to take a closer look at the "system" within which the dynamics of behavior-based safety take place.

### ***It all happens within three interactive domains***

Dr. Geller, a senior partner at Safety Performance Solutions Inc. of Blacksburg, VA, believes that generally, workplace safety requires continued attention to three domains.

- 1.environmental factors, including equipment, tools, physical layout, procedures, standards, lighting, temperatures, etc;
- 2.person factors, including attitudes, beliefs and personalities;
- 3.behavior factors, including safe and at-risk practices, and going beyond the call of duty to intervene on behalf of a fellow worker's safety.

"These domains are dynamics and interactive: a change in one factor will eventually impact the other two," said Dr. Geller. It's relatively easy to control

the environmental factors contributing to workplace injuries (e.g., improve lighting). And, it's feasible to measure and control the contributing behavioral factors (e.g., in an 8-hr period, six workers failed to use proper eye protection). But, the complex, all too often intangible, person factors are quite illusive. They are difficult to define, to measure objectively, and to manage efficiently, and often lead to the occurrence of some work injuries that are unpreventable. It is beyond the scope of this article to elaborate more on these person factors. What they do to the dynamics of behavior-based safety may warrant more attention in a future article.

### ***Getting started is easy: "DO IT"***

Too many behavior-based safety psychologists and consultants share the previously noted "narrow perspective" focused only on observable behavior (positive and negative), and then providing feedback (interventions) to modify that behavior. It tends to focus on "common sense" interventions, neglecting other factors that affect behavior, as well as the application of scientific methods (empirical research data) to get people to feel more interdependent. Although Dr. Geller admits this as the key challenge, he believes that following a simple principle, represented by the acronym, "DO IT" can become the means to an end.

### ***Define target behaviors***

- Develop a list of critical behaviors to target/change.
- Focus on actions that will prevent injuries, get input from workers.
- Observe Behaviors.
- Watch for target behaviors and record numbers that are "safe" and how many "at-risk" (unsafe).
- Be sure to get permission to observe.
- Intervene.
- Provide positive feedback to recognize/reward (encourage) safe be-

haviors and correct (discourage) at-risk behaviors.

- Attempt to make safe behaviors routine and turn unsafe behaviors into safe behaviors.
- Test Interventions.
- Keep what works to change target behaviors, modify what doesn't work or implement another strategy.
- On a continual basis, define/test other behaviors, get continuous feedback from workers.

Essentially, use the "DO IT" process to avoid at-risk behaviors and maintain safe behaviors. By using it, you will motivate yourself and others in your work environment to actively care about safety—and most importantly—to work safely. Because acting safely (behavior) leads to thinking safely (attitude). Research documents it.

Behavior-based safety is not "rocket science," it's about human dignity. As an EHS professional responsible for the welfare and very lives of your workers, you have the power to encourage and assist others to actively care about safety and to work safely! Integrating behavior-based safety into your current system will increase self efficacy, personal control and optimism of your workers. Dr. Geller calls it empowerment, or the "I can make a difference" process.

Whatever you call it, behavior-based safety can help get you closer to your vision of "zero injuries." It can help lower your MOD, workers' comp-related costs, and lost workdays. It can help increase productivity, quality and employee morale. And, most important, it can help save lives.

*For additional information, contact J.J. Keller & Associates Inc., 3003 Breezewood Lane, P.O. Box 368, Neenab, WI 54957-0368, 1-800/843-3174, ext. 7304  
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# Ventilation of a 40-foot, two-pass, extended cut

## Objective

To evaluate the quantity of ventilation air reaching the face of a 40-ft box cut during a 40-ft, two-pass, extended cut and to examine ways to increase this quantity of air.

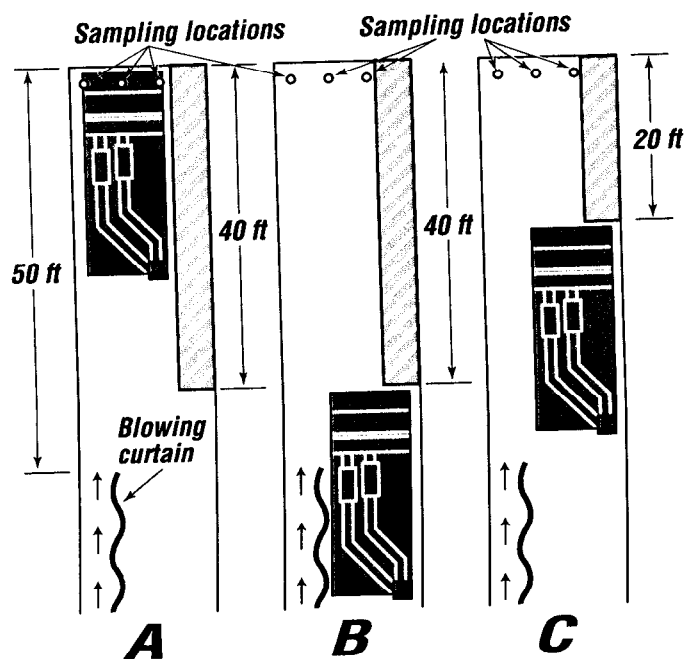
## Background

About one-half of all continuous mining faces in the United States are using extended cutting, i.e., advancing more than 20 ft past the last row of bolts. Most of these extended-cut approvals are for cutting depths of approximately 40 ft. Almost all of the continuous miners on these faces are equipped with machine-mounted dust scrubbers and water spray systems for dust control. Little is known about how much ventilation air reaches the box-cut face during various parts of the cutting sequence. This is of particular concern when a 40-ft, two-pass, extended cut is taken, because at the start of the 40-ft slab cut, the continuous miner is located 40 ft from the point of deepest penetration—the face of the 40-ft box cut. The National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Research Laboratory (PRL), undertook a study to evaluate this situation.

## Approach

Testing was conducted in PRL's full-scale methane test gallery, which was configured to simulate a 16.5-ft-wide, 7-ft-high entry and has a full-scale model continuous miner with scrubber and water spray system. The first series of tests was conducted with the continuous miner at three locations in the 40-ft, two-pass, extended cutting sequence: at the completion of the 40-ft box cut, at the start of the 40-ft slab cut, and 20 ft into the slab cut (figure 1). The curtain setback location was established at 50 ft. At each continuous miner location, the curtain air-flow was set at both 4,000 and 10,000

cfm, and the scrubber flow was matched to the curtain flow or the scrubber was turned off. The water sprays were either operated at 120 psi for a total flow of 22 gpm or they were turned off. Methane gas was released at a constant rate through a manifold at the face of the box cut and monitored using three Bacharach methane monitors evenly spaced across the box-cut face, 1 ft from the roof and face. The quantities of fresh air reaching the box-cut face were calculated for each set of operating conditions using the average methane concentrations and methane release flow rates. A second series of tests demonstrated how advancing the blowing curtain closer to the face of the box cut impacted how much air reached the



**Figure 1.—Continuous miner in the 40 ft., two-pass, extended-cut sequence (A) at the completion of the 40-ft. box cut, (B) at the start of the 40-ft. slab cut, and (C) 20 ft. into the slab cut.**

box-cut face, with the continuous miner at the start of the 40-ft slab cut and 20 ft into the slab cut. The curtain setback was varied at 50, 40, and 28 ft from the 40-ft box-cut face. This places the 40-ft curtain at the last row of bolts, while the 28-ft curtain requires a 12-ft extensible curtain beyond the last row of bolts. Blowing curtain flow rates of 4,000 and 10,000 cfm were tested with matching scrubber flow rates; the water spray system was always operated at 120 psi and 22 gpm.

## Results

Figure 2 shows the results of the first series of tests for curtain and scrubber flows of 10,000 cfm. With the continuous miner at the face of the 40-ft box cut and the scrubber and water sprays

6

operating, more than 50% of the curtain air reaches the box-cut face. With the scrubber and water sprays turned off, this is reduced to about 5%. With the continuous miner at the start of the 40-ft slab, only about 5% of the available curtain air reaches the box-cut face regardless of the operation of the scrubber and water sprays. As the miner advances 20 ft into the slab cut, ventilation at the face of the box cut improves, especially with the use of the scrubber and water sprays. Similar results were observed for curtain and scrubber flows of 4,000 cfm.

Figure 3 shows the results of the second series of tests for a 10,000-cfm blowing curtain and matching scrubber flow. With the miner at the start of the 40-ft slab cut, advancing the curtain from a 50-ft to a 40-ft setback results in a greater than 100% increase in the airflow reaching the box-cut face. Advancing from a 50-ft to a 28-ft curtain setback results in a greater than 600% increase in the airflow to the box-cut face. With the continuous miner located 20 ft into the slab cut, advancing the curtain from a 50-ft to a 40-ft to a 28-ft setback improves ventilation to the box-cut face, but not as significantly as with the miner at the start of the 40-ft slab cut. Similar results were observed for curtain and scrubber flows of 4,000 cfm.

For more information on these research findings, contact Edward D. Tsimons or Charles D. Taylor, NIOSH Pittsburgh Research Laboratory, Cochran Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070, phone: (412) 892-6683 or (412) 892-6692, fax: (412) 892-4259, e-mail: edt17@cdc.gov or cdt15@cdc.gov

To receive additional information about mining issues or other occupational safety and health problems, call 1-800-35-NIOSH (1-800-356-4674), or visit the NIOSH Home Page on the World Wide Web at <http://www.cdc.gov/niosh>

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

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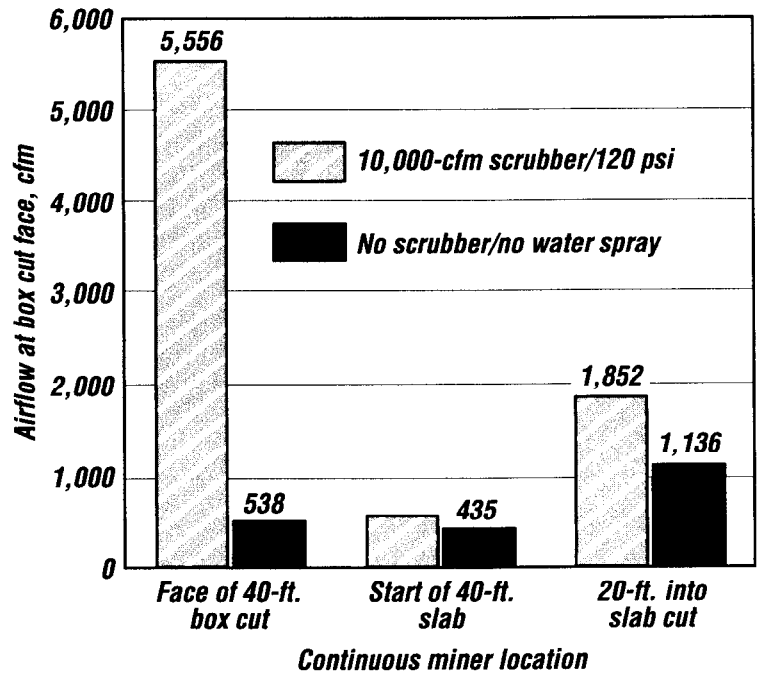


Figure 2.—Airflow to box cut for 10,000-cfm curtain with 50-ft. setback

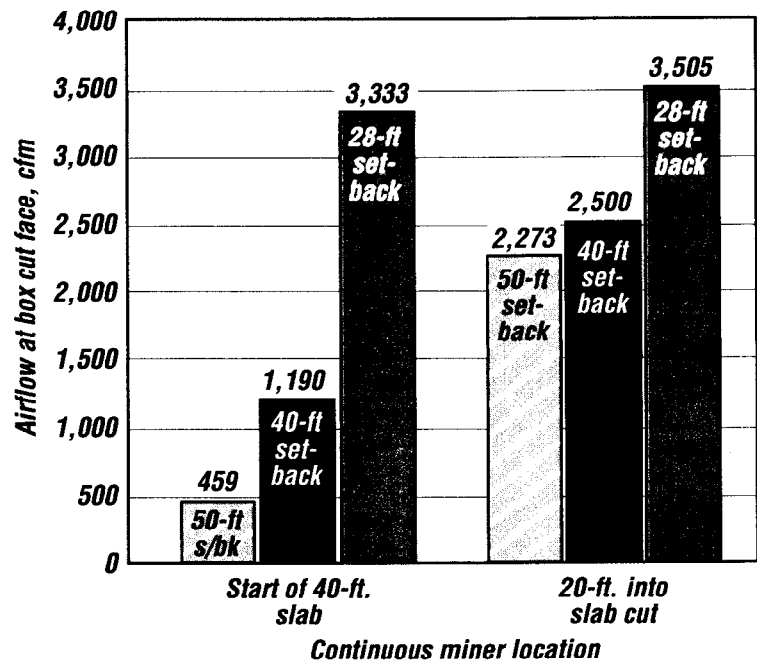


Figure 3.—Brattice setback effect for 10,000-cfm curtain/scrubber flow and 120-psi water pressure.

# Safety practices for oxy-fuel cutting and welding

By Dave Bell, Marketing Manager, CONCOA

We learn by experience. Learning safety through personal experience, like a child touching a hot stove, is harmful, wasteful and unwise. Let the experience of others teach you the safe use of cutting and welding equipment.

Safe practices developed from experience in the use of welding and cutting equipment are described in this article. Through research, development and field experience, we have evolved reliable equipment and safe installation, operation and servicing practices.

Accidents occur when equipment is improperly used and maintained. The reasons for safe practices may not always be given. Some are based on common sense, others may require technical volumes to explain. It is wiser to follow the rules.

Failure to observe these safe practices may cause serious injury or death. When safety becomes a habit, the equipment can be used with confidence.

## Oxy-fuel welding and cutting safe practices

Oxy-fuel equipment, properly used, can safely weld, heat and cut metals; but carelessness creates such hazards as fire and explosions. The equipment mixes flammable fuel gases and oxygen under pressure to support a flame. Oxygen is not flammable, but it vigorously accelerates combustion of fuel gases and combustible material. Sparks, flying slag, fumes, hot metal as well as heat, are normally under control. The wise operator avoids unnecessary risks by protecting himself and others from accidents as describes here and in the referenced sources.

### Always follow these rules

- Always carefully read the manufacturer's operating instructions prior to using equipment. If you do not have operating instructions, obtain a copy from the manufacturer or the local distributor of the equipment, or obtain a copy of general instructions.
- Always follow the manufacturer's operating instructions at all times. Deviation from these instructions can result in injury.
- Always obtain qualified instructions before attempting to install or use the equipment unless already familiar with the equipment.
- Always have equipment periodically inspected and repaired by a qualified repair shop.
- Always inspect the filter in the inlet nipple of oxygen regulators to insure the filter is in place and clean. If the filter is missing, have the regulator inspected and cleaned, and the filter replaced by a qualified repair shop.
- Always keep your oxygen from combustibles. Oxygen cylinders, cylinder valves, couplings, regulators, hoses and apparatus shall be kept free from oil, grease and other flammable or explosive substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves.
- Always have at least one special cylinder wrench available for immediate use. Cylinders not having fixed hand wheels shall have keys, handles or non-adjustable wrenches on valve stems while these cylinders are in service so that the gas flow can be turned off quickly in case of an emergency.
- Always close the cylinder valves whenever the equipment is unattended.
- Always drain the regulator. Before a regulator is removed from a cylinder,

the cylinder valve shall be closed and the gas released from the regulator.

- Always "crack" the cylinder valve. Before connecting a regulator to a cylinder valve, the valve outlet shall be wiped clean with a clean cloth free of oil and lint, and the valve shall be opened momentarily and closed immediately.
- Always perform these steps after the regulator is attached to oxygen cylinders:
  1. Engage the adjusting screw and open the downstream line to drain the regulator of gas.
  2. Disengage the adjusting screw and open the cylinder valve slightly so that the regulator cylinder pressure gauge pointer moves up slowly before opening the valve all the way.
  3. Stand to one side of the regulator and not in front of the gauge face when opening the cylinder valve.
- Always leak-test the connections after assembly and before lighting the torch. Flames shall not be used.
- Always purge the hoses individually before lighting the torch for the first time each day. Hoses shall not be purged into confined spaces or near ignition sources. Hoses shall be purged after a cylinder change.
- Always follow the manufacturer's instructions for lighting, adjusting and extinguishing torch flames. A friction lighter, stationary pilot flame or other suitable source of ignition shall be used. Matches, cigarette lighters or welding arcs shall never be used.
- Use pressure reducing regulators only for the gas and pressure for which they are labeled. The regulator inlet connections shall comply with ANSI/CGA Standard V-1, Compressed Gas Cylinder Valve Outlet and Inlet Connections.

- Always inspect connections and union nuts on regulators before use to detect faulty seats which may cause leakage when the regulators are attached to cylinder valves or hoses. Damaged units or connections shall be replaced.
- Always ascertain that gauges used for oxygen service are marked "USE NO OIL."
- Always drain oxygen regulators of oxygen before they are attached to a cylinder or manifold, or before the cylinder valve is opened. Oxygen cylinder or manifold valves shall always be opened slowly.
- Always have repair maintenance for regulators or parts of regulators (including gauges) performed by qualified technicians.
- Always replace hoses showing leaks, burns, worn places or other defects which may render the hose unfit for service.
- Always close torch valves in confined spaces. Additionally, the fuel gas and oxygen supply to the torch shall be positively shut off at a point outside the confined area whenever the torch is not to be used, such as during lunch or overnight. Unattended torches and hoses shall be removed from the confined space.
- Always ascertain that hoses for oxy-fuel gas service comply with the Rubber Manufacturers Association IP-7 Specification for Rubber Welding Hose and that hoses for oxy-fuel gas service are color-coded according to the authorities having jurisdiction.

**Things that you NEVER do**

- **Never** use oxygen as a substitute for compressed air. Oxygen shall not be used in pneumatic tools, in oil preheating burners, to start internal combustion engines, to blow out pipelines, to dust clothing or work, or to create pressure for ventilation or similar applications. Jets of oxygen shall not be permitted to strike any oily surface, greasy clothing, or enter fuel oil or other storage tanks.

- **Never** interchange oxygen cylinders, equipment, pipelines, or apparatus with any other gas.
- **Never** use attachments for mixing gases. No device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at a burner or in a torch, shall be allowed unless approved for the purpose.
- **Never** attempt to repair or substitute parts on equipment, particularly the regulators. Special techniques and tools are needed to safely repair oxy-fuel gas welding and cutting apparatus.
- **Never** handle, lay or store oxygen regulators or other oxygen equipment on oily or greasy surfaces. The equipment can become contaminated with oil or grease which might result in a fire or explosion.
- **Never** use acetylene pressure above 15 psig. Acetylene pressure above 15 psig can result in a fire or explosion.
- **Never** empty the oxygen cylinder below 25 - 50 psig. If the oxygen cylinder is allowed to become completely empty, it will lose its positive pressure and contamination may enter the cylinder and create an unsafe condition.
- **Never** transfill (refill) empty oxygen or fuel gas cylinder. Return them to the gas supplier for proper filling. Special procedures and techniques are necessary to safely fill cylinders.
- **Never** change regulators from one gas service to another or replace a pressure gauge with one taken from any other service. Contamination resulting in a fire or explosion can take place by changing pressure gauges or regulators from one service to another.
- **Never** leave pressure on a regulator when not in use.
- **Never** open a cylinder valve wide open. An acetylene cylinder valve shall not be opened more than approximately one and one-half turns and preferably no more than three-fourths of a turn, unless otherwise specified by the manufacturer.
- **Never** exceed the manufacturer's recommendation for withdrawal rate from gas cylinders.



- **Never** use compressed air from a cylinder without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold, unless the equipment used is designed to withstand full cylinder pressure.
- **Never** use acetylene at a pressure in excess of 15 psig (103 kPa) or 30 psia (206 kPa). This requirement shall not apply to storage of acetylene dissolved in a suitable solvent in cylinders manufacturer and maintained according to U.S. and state departments of transportation requirements, or to acetylene for chemical use.
- **Never** stand in front of the outlet when cracking the cylinder valve, stand to one side. Fuel gas cylinder valves shall not be cracked near other welding work or near sparks, flame or other possible sources of ignition.

**Conclusion**

To paraphrase an old saying, you're never too old to learn new safety tips. If you follow these *always* and *never* tips, you will work safer and smarter.

For additional information, contact Controls Corporation of America (CONCOA), 1501 Harpers Rd., Virginia Beach, VA 23454, 800/225-0473 in USA, 757/422-8330, [www.concoa.com](http://www.concoa.com)

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# Proper handling eases concerns on non-refillable gas cylinders

9

Two questions are frequently raised regarding DOT 39 Non-Refillable Cylinders (NRC) used for calibration gas mixtures. "Do they contain hazardous gases?" and "How do I dispose of these cylinders?"

The answer to the first question, according to Andy Tryfonos, product manager for Air Liquide America Corporation's CALGAZ line of calibration gases, is simple: no, the cylinders do not contain hazardous materials. Federal regulations expressly forbid the filling of hazardous materials in cylinders conforming to DOT 39 regulations. A separate DOT exemption covers an aluminum aerosol package that contains 11 liters of product at 160 psig. This exemption, DOT-E 10704, states that the cylinder may be filled only with non-flammable, non-liquefied gases. This package may be shipped as non-hazardous unless it is shipped by air.

The contents are non-toxic. Most gas mixtures supplied in DOT 39 NRCs are used to calibrate equipment that alerts workers of environmental hazards. In most cases, the cylinder contains 99% air or nitrogen. Other gases in the blend that could be classified as 'hazardous' typically are in the low part per million range, well below toxicity levels.

Flammable gas mixtures may be placed in DOT 39 cylinders, as long as the cylinder's internal volume does not exceed 75 in 3.

Care must be used in handling NRCs, however, not because of the contents, but because of the pressure at which these cylinders are filled. Aluminum cylinders, such as the 8AL, are filled to 500 psig. Steel cylinders, such as the 6D, have a maximum pressure of 1000 psig. To avoid injury, always wear safety glasses when handling any system that is under pressure; make sure you are using

the manufacturer's recommended regulator; and if in doubt, always refer to the manufacturer's guidelines.

## Cylinder disposal

How to dispose of the cylinders? Recycling them into scrap metal is the most environmentally sound approach. There are certain steps that should be taken to do this safely.

Before disposing or recycling the cylinder it is important to relieve the cylinder of its pressure. To do this, attach the regulator to the cylinder and turn it on. (This should be done outdoors to avoid any odors associated with some of the gases.) Do not puncture, drill or attempt in any way to physically destroy the cylinder. Remember, the cylinder contains no toxic or hazardous gases. Once the cylinder is empty dispose of it along with other non-hazardous material or waste.

Air Liquide America Corp. has designed a special recycling tool that simplifies the task of emptying the cylinder. The tool, designed to work with the company's DOT 39 cylinders with either C-10 or CGA 600 valves, simply screws onto the cylinder like a regulator. It has special relief ports to safely vent any residual gas. "We are committed to environmental responsibility, and we go the extra mile to make recycling easy for our customers," Tryfonos said.

Once the tool is attached to the cylinder, turn the handle in a clockwise direction. When the handle will no longer turn, listen for the sound of the valve stem assembly falling to the bottom of the cylinder. Remove the recycling tool from the cylinder and a hole will be visible in the center of the valve assembly. The cylinder can now be shipped as non-hazardous scrap. There is no need to



pay high rates to dispose of these cylinders as hazardous waste.

Once depressurized, the cylinder, even if it contains residual gas, poses no danger to the environment. An empty spray paint aerosol can poses a greater environmental hazard.

Because the aluminum cylinder has a high recyclable value, large users of DOT 39 cylinders can negotiate with a local scrap dealer to collect them.

For those who do not want to handle depressurizing and recycling on their own, Air Liquide America Corp. accepts empty CALGAZ cylinders for recycling. Air Liquide destroys the cylinders safely, utilizing a specially designed pneumatic press. Scrap metal is then sent for recycling.

For more information, contact Air Liquide America Corp. at 1/800-638-1197 or [www.calgaz.com](http://www.calgaz.com).

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# Coal use and fly ash disposal in Israel

By Henry A. Foner and Thomas L. Robl, University of Kentucky Center for Applied Energy Research (CAER)

## Background

Traditionally all electric power in Israel has been generated from heavy fuel oil. However, the oil crisis of the 1970s and the fall of the Shah of Iran in 1979 so disrupted the traditional supplies of fuel, that the Israeli government decided to diversify its sources of power. For this reason the Hadera power station, which was under construction at that time, was modified to be run on either coal or oil. The power station was commissioned in 1982 and from that time on, all new major generating capacity has been based on coal.

Figure 1 shows the location and type of electricity generating plants in Israel. All the power stations are on the coast mainly because the only convenient source of cooling water is the Mediterranean sea. Also, all fuel is im-

ported and it is cheaper and more convenient not to have to move solid fuel inland. The coal used is of low sulfur content (<1%) and is imported from a number of countries as shown in Table 1. At Hadera a jetty was built to handle the coal, while the Ashkelon station is supplied by conveyer from a special

coal handling facility built at the nearby port of Ashdod. From the beginning of coal imports, the question of what to do with the resulting ash has been under much discussion. Many possible solutions have been suggested, including such unusual ones as building islands off the coast to increase the amount of land available for building. What has in fact been done is shown in Table 2. However, the alternatives shown here are now either no longer practicable or available. The amount of fly ash that may be added to Portland cement is limited by the Israel Standard to 10%. Dumping at sea caused damage to some forms of sea life over a limited area and has been forbidden by the Ministry of the Environment; also there is no more room around the power stations to build embankments. The Ministry of the Environ-

**Table 1. Sources of Coal Imported into Israel in 1997**

Country	No. of Mines	Percent
South Africa	8	50-52
U.S.A.	3-4	15
Colombia	2-3	17
Australia	4-5	11
Indonesia	1	5-7

coal handling facility built at the nearby port of Ashdod.

The population of Israel is increasing rapidly as the country is also becoming more industrialized. Figure 2(a) shows the exponentially increasing demand for electricity and Figure 2(b) illustrates the fuel imports for power production. Small scale use of coal is forbidden in Israel because of pollution concerns. Efforts to interest larger industrial concerns in the use of coal have been made but only with limited success; general industrial use is currently only about 30,000 tons per year.

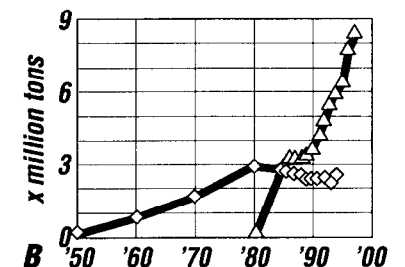
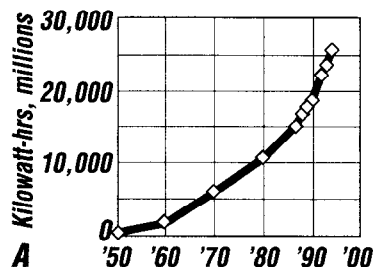
**Figure 1.—Location and type of electricity generating plants in Israel.**



**Table 2. Amounts of ash produced, utilized and disposed of in Israel: Total and recent years (tons in thousands)**

	'93	'94	'95	'82-'95
<b>Total production</b> ....	640	650	735	6060
<b>Utilization/disposal:</b>				
Cement production ....	420	440	630	3910
Embankments 150 ...	160	20	1120	
Disposal at sea . 70 .....	50	85	1030	

**Figure 2.—Electricity production and fuel uses from 1950 to recent years.**



ment has also been reluctant to approve the use of ash as landfill (or, for that matter, to dump it in embankments near the power stations) because of the possibility of contaminating the shallow drinking water aquifers with toxic trace elements leached out of the ash.

By the year 2001, Israel will produce about 1,300,000 tons of ash annually and of this, only about 600,000 tons can be used by the cement industry under the present regulations. The question is then, what to do with the rest? It is this question that we address in the remainder of this article.

**Fly ash**

About 85% of the ash produced in Israel is "fly ash," which is recovered from the power station chimneys (rather than from the boilers) and as this contains most of the trace elements, it is the major portion of the ash disposal problem. We studied two representative samples of Israel fly ash at the CAER this year. These samples, called South African (SA) and Colombian (CO) from their approximate source types, were prepared by the "Coal Ash Administration" set up in Israel to investigate problems of ash disposal.

The starting point of our study at CAER was the assumption that coal fly ash is a potentially valuable material and that it should not automatically be treated as a waste product that must be disposed of at considerable cost. Worldwide, there are numerous examples of economically beneficial fly ash utilization and the situation in Israel seems to us to be another promising case.

The type of fly ash available in Israel is classified by the ASTM as a class F material. Class F fly ashes are derived from relatively high grade bituminous or better grade coals and have low calcium contents. This type of fly ash is principally composed of small (10 mm or less) glassy aluminosilicate spheres. The latter are formed by the rapid cooling of the molten mineral matter in the pulverized coal used in

the power station boilers. The principal property of these spheres is that they are pozzolanic, i.e., they react with free lime (which is present in hydrated Portland cement). A good quality pozzolan improves many of the important properties of concrete, particularly its durability and permeability. By tying up the free lime, the pozzolan reduces the susceptibility of the concrete to sulfate attack, carbonation and chlorination.

In order to market fly ash as a pozzolan, it should be of good quality and consistent in nature. Many countries have standards for this purpose and these are usually very similar to those adopted in the USA by the ASTM. In our study of these fly ashes we have determined the chemical mineralogical and technical properties of the two representative samples. In order to test the possibility of beneficiating the original materials we have also carried out the same tests on various sized fractions of the ash.

**Table 3. Size fractions of the ash components and the percentage of carbon in each**

Size		South African		Colombian	
Fraction	size (m)	%	carbon %	%	carbon %
> 100 mesh	>150	1.9	24.6	4.5	46.8
100-200	150-75	8.2	13.7	10.0	16.2
200-325	75-45	10.6	4.16	9.2	4.11
< 325	<45	79.2	1.63	76.3	2.76

**Table 4.—Carbon content of classified ash samples**

Fraction	size	South African	Colombian
		Percent carbon	Percent carbon
Whole sample		3.3-4.2*	6.2-7.1*
<100 mesh	< 150 micron	2.90	4.30
< 200 mesh	< 75 micron	1.93	2.91

\*depending on the sample

**Some test results**

Table 3 shows the particle size distribution of the original samples and also the carbon content of the various size fractions. It can be seen that the larger sized fractions contain large proportions of carbon. Table 4 shows the carbon content of the fly ash after passing through the specified sieves. The carbon content of the ash is significantly reduced by removing the >100 mesh or >200 mesh material. With the gradual introduction of low-NO<sub>x</sub> burners, the amount of residual carbon in the fly ash is expected to increase, so carbon removal will become a more important factor in ash beneficiation. Although carbon is undesirable in the

**Table 5. Compressive strengths (in psi) and SAI (in %) at 7, 34 and 56 days for various sieve size ash fractions. Note: ASTM requirement for SAI = 75% at 7 or 28 days**

Sample	7 day	7 days	34 day	34 day	56 day	56 day
	Comp. Str.	SAI %	Comp. Str.	SAI %	Comp. Str.	SAI %
Cement	4310	100	6220	100	6900	100
CO -10 mesh	3540	82	5340	86	6100	88
CO -100 mesh	3330	77	5440	88	6240	90
CO -200 mesh	3670	85	5800	93	6500	94
SA -10 mesh	3770	88	6020	97	6710	97
SA -100 mesh	4070	95	6170	99	7150	104
SA -200 mesh	4150	96	6500	105	7460	108

**Table 6. Various Chemical and Technical Parameters based on ASTM Specifications (note: Fineness limit is for Portland Cement)**

Sample	Blaine Fineness (m <sup>2</sup> /kg)	Water requirement (%)	Retained on wet 45 mm sieve	SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub>	SO <sub>3</sub> (%)	LOI (%)	Moisture (%)	Multiple Factor
ASTM	C150-89	C618-89	C618-89	C618-89	C618-89	C618-89	C618-89	C618-89
Limit	280 min.	105 max.	34 max.	70% min.		10 max.	3 max.	255 max.
CO	328	101	25.7	88.4%	0.4	6.8	0.20	175
CO <100	319	99	23.0					
CO <200	322	97	16.4					
SA	363	97	20.7	81.2%	0.5	4.0	0.23	83
SA <100	370	96	19					
SA <200	375	95	11.9					

ash (as it adsorbs air entraining agent), it can be used for fuel or as an industrial adsorbent when separated.

The principal technical test of the suitability of a fly ash for use as a pozzolan is the Strength Activity Index (SAI). This is an accelerated test which compares the compressive strengths of two cement/sand mortars; one made with an Ordinary Portland Cement (OPC) and the other made with same OPC but with 20% of the cement substituted by fly ash. Table 5 shows the results obtained on the original Israel ash samples and on various size fractions obtained from them by careful dry sieving.

Both raw ash samples give SAI values greater than the minimum required by the ASTM standard (75%), with increasing values as the coarse fraction is removed. The South African sample is particularly good. Table 6 lists a number of other chemical and technical parameters referred to in various ASTM standards and the results obtained in tests on the representative ash samples and their various size fractions. The maximum or minimum values allowed in the standards are also shown.

**Discussion**

The test results show that the original samples are good quality Type F fly ashes. The SA ash is better than the CO. How-

ever, relatively simple separation processes (such as air or hydraulic classification) would produce a <200 mesh product which should be more marketable and would have the added advantage of supplying products which could easily be blended to give particular desirable properties. Some possible uses of fly ash which might be particularly suitable for Israel are listed in the next column. Although some of these uses simply replace existing materials with fly ash, others could be the basis of completely new industries. One or more of these uses might entirely solve the environmental and economic problems of ash disposal in Israel. This approach which utilizes the natural pozzolanic properties of the material seems preferable to more "exotic" approaches such as the extraction of aluminum or trace elements.

**Possible uses**

- A pozzolan for cement in addition to the amounts already used. In large scale projects such as dams, ports, etc., the proportion of ash that can be used is considerably more than the approximately 20% which is routinely added to OPC in the US. This has special importance in reference to the current "Peace Process" in the Middle East as many large scale construction projects are planned, especially in the Gaza area. The use of fly ash in these projects would represent a consider-

able money savings to all the parties involved. It should be noted that the Ashkelon power station is situated very close to the Gaza strip.

- As a replacement for the fine aggregate (sea sand or machine-ground sand) in concretes and mortars.
- As a raw material for light-weight aggregate production. Some commercial systems are available for this purpose.
- As a constituent of light-weight aerated concrete, especially for construction of insulating building blocks. These could replace many of the low-fines concrete blocks used presently.
- As a constituent of "flowable fill" for filling trenches, and surrounding insulation in building basements, shelters, foundations etc.
- Export of fly ash. The Middle East region is lacking in good quality pozzolans. Good quality fly ash can be sold for up to \$20/ton in many markets and for considerably more in the Red Sea States.

Dr. Henry Foner is with the Geological Survey of Israel in Jerusalem where he has served in a variety of tasks including Head of the Geochemistry Division. Dr. Foner was educated at the University of Leeds (U.K.). He was also a recent visiting scientist at the CAER.

*Reprinted from the Vol. 8, No. 5, 1997 issue of CAER.*

# Coal fatal accident summary

## Fatal roof fall accident (underground coal mine)

### General information

A 36 year-old continuous miner operator was using a remote controlled continuous mining machine to mine the second cut of a crosscut from the No. 1 entry to the No. 2 entry. After mining a distance of about 29.5 feet, the width of the continuous miner (12.7 feet), the operator parked the continuous miner and proceeded on foot inby the last row of roof supports to check centers. He had traveled about one foot inby the last row of roof bolts when a rock measuring seven feet long, six feet wide, and one to four inches thick fell on him causing fatal injuries.

The mine is located in Pike County, Kentucky and consists of one mechanized mining unit (003 section). The 003 section is developed into the Hazard #4 coal seam which has an average mining height of 82 inches, and is located about 800 feet underground from the drift portals. Seals separate the active area of the mine from other extensive areas of mining in this seam. A continuous mining machine is used to extract the coal. Shuttle cars are used for coal haulage to an underground feeder. Coal is then transported to the surface by a belt conveyor.

The mine currently employs 38 persons, on two production shifts, and one maintenance shift and normally operates five days-per-week, producing an average of 1,100 tons of coal per day.

### Description of accident

On June 11, 1998 at about 2:30 pm, the second shift crew entered the mine for the regularly scheduled production shift. A total of ten miners walked about 800 feet to the 003 working section and began their assigned duties. The victim; the continuous miner helper (normally a shuttle car operator); and two shuttle car operators, began coal production in the No. 3 entry. Upon completion of mining in the No. 3 entry, the victim trammed the Joy 12 CM radio-remote controlled continuous miner to the No. 2 entry and cut

coal from the face. After mining was finished in the No. 2 entry, the miner was trammed to the No. 1 entry. The section foreman had been in the faces observing the continuous miner and roof bolter. The section foreman proceeded to the No. 1 entry when a rock became stuck in the section feeder. The section foreman left the No. 1 entry, where the victim and the continuous miner helper were preparing to cut a crosscut from the No. 1 entry into the No. 2 entry, and traveled to the feeder. The section foreman remained at the feeder to observe its operation after freeing the rock. At about 4:44 p.m., the victim and the continuous miner helper had mined the No. 1 right crosscut, about 29.5 feet and cut into the No. 2 entry.

The immediate mine roof is made up of laminated shale and sandstone rock supported by forty-eight inch resin-type roof bolts in conjunction with eight- by eight-inch roof-bolt plates. Upon cutting into the No. 2 entry, both the victim and the continuous miner helper noticed a curtain hanging in the No. 2 entry. The continuous miner helper mentioned to the victim that it looked like they had mined "off centers" between the two entries. The victim told the continuous miner helper he didn't think he had cut "off centers" that bad. The victim backed the continuous miner out of the crosscut and parked it and, with the continuous miner helper following behind him, proceeded on foot inby the last row of roof bolts to check centers. When he had traveled about one foot inby the last row of roof bolts, a rock measuring seven feet long, six feet wide, and one to four inches thick fell on the him. The continuous miner helper unsuccessfully tried to lift the rock from the victim. He called to the shuttle car operator who was at his shuttle car about one break outby the No. 1 right crosscut. The shuttle car operator started calling for help and telling the

other men on the section that a man was down. The beltman called outside at about 4:59 p.m., to get an ambulance to the scene.

The crew traveled to the accident scene to free the victim. the continuous miner helper, the section foreman, and the roof bolter operator lifted the rock while the other shuttle car operator and a roof bolter operator pulled the victim from underneath it. The section foreman administer first-aid to the victim. The victim had a weak pulse and serious physical injuries. The men loaded the victim onto a battery-operated man-trip and proceeded toward the surface. About 120 feet from the surface, the section foreman was unable to get a pulse from the victim and attempted to perform cardiopulmonary resuscitation (CPR), but was unable to because of extreme chest injuries the victim had sustained. Ambulance and fire department personnel, who had arrived at the mine, could find no vital signs from the victim. The coroner was contacted and arrived at the mine site where he pronounced the victim dead at 6:00 pm.

### Conclusion

The accident occurred as the victim traveled about one foot inby the last row of roof bolts. Subsequent investigation revealed that the approved roof control plan was not being followed. The crosscut was mined out of sequence by cutting the right side of the crosscut first. Coal had been mined in the No. 3 and then No. 2 entries earlier in the shift using the approved mining sequence in the approved roof control plan. Information obtained during the investigation showed that the long cut taken by the operator and the failure to follow the roof control plan did not contribute to the cause of the accident.

*Edited from an MSHA accident investigation report by Fred Bigio.*

**Bruce Bingham  
of Phelps  
Dodge in  
Morenci, Ariz.  
wears his  
safety glasses.**



## ***Safety eyewear saves worker's sight***

*By David Roll, Vice President of Marketing, H.L. Bouton Co. Inc.*

H.L. Bouton received a thank you letter recently from Marie Forgay, a maintenance worker with the Oklahoma Department of Transportation, on how the [Model] 8200 Pinnacle II [safety eyewear] saved her eyesight. Bouton believes her story should be shared so other people will understand the importance of wearing the proper safety equipment at all times. Forgay's letter serves as an eye opening reminder that accidents happen and protecting your eyes while performing hazardous tasks requires top priority for everyone.

*Dear Sir:*

*I would like to take this time to write and tell you what your Bouton safety glasses did to spare my eyesight.*

*I am a Maintenance Worker for the Oklahoma Department of Transportation based out of Elk City. Division Five has approximately 200 employees. Last spring, our state truck was involved in an accident. An 18-wheeler was riding the edge line on I-40, his side mirror collided with ours and both shattered on impact, spraying broken glass and metal through my window.*

*I received minor cuts, scrapes on my face and part of my ear [was] sliced. I returned to work two days later and retrieved my glasses from the truck. I found deep gouges and scratches on the lens from flying glass. The E.R. doctor and I firmly believe these glasses saved my eyes from receiving severe damage, maybe even losing my eyesight.*

*I am truly grateful that our warehouse foreman ordered these glasses. Again, thanks for making them. I wear them all the time now.*

*Sincerely, Marie Forgay*

The Occupational Safety and Health Administration (OSHA) standards are in place to address the close to 1,000 eye injuries that occur daily in American workplaces. As many as 90% of the injuries could be prevented with the proper use of protective eyewear.

OSHA and its updated Personal Protective Equipment (PPE) regulations became effective in 1994. As a result, employers have been required

to take an entirely new approach to selecting and providing eyewear that must be used in conjunction with guards, engineering controls and sound manufacturing practices because the responsibility of a safe work environment is now with the employer.

The American National Standards Institute (ANSI) adopted an eye protection standard incorporating the major types of hazards encountered in the workplace. The standard is known collectively as Practice for Occupational and Educational Eye and Face Protection, ANSI Z87.1-1989.

Voluntary compliance in the workplace is a lot easier today with the vast selection of styles for specific applications available. Safety eyewear has also evolved to be more accommodating to the comfort of the individual wearing the spectacles.

Kenneth Duffie, engineering manager for H.L. Bouton Safety Eyewear Co., believes the design of safety eyewear has become influenced by fashion and price. "It seems that safety eyewear styling is following the

trends set by the major sunglass manufacturers, for example Oakley.

Unfortunately, many of the new styles of safety eyewear are too small to be providing sufficient coverage for effective use in a number of applications. This is a very dangerous trend happening in the industry."

Duffie explained how Bouton's standards for new safety eyewear designs begin with OSHA and ANSI standards in mind, along with what is considered a good style. He then evaluates the design concept for the safety market based on these criteria.

- Will it provide sufficient coverage?
- Is it rugged enough to hold up to impact testing and world standards?
- What is the target market and retail price?
- What type of features should the product have—adjustable temples, replaceable lenses, etc.?
- What materials will be used?
- Who is the end user?

### **What to look for in safety eyewear**

Companies are to follow the rules of OSHA that require all workers to acquaint and protect themselves from three main categories of eye hazards: impact, light radiation and liquid splash. Duffie explained that employers must use common sense while examining the workplace for potential hazards, determine where face and eye protection is needed and provide the necessary eye protection.

There is the possibility of multiple and simultaneous exposures in a variety of hazards and adequate protection against the highest level of each of the hazards should be provided. Operations involving heat may also involve light radiation and protection from both hazards must be provided.

If the occupational hazard involves debris from flying objects, side protection is recommended. Any employees who require prescription eyewear must incorporate it within a safety eyewear design or additional

protection must be worn over the prescription eyewear. There must be careful consideration for comfort and fit of a safety device because it fits poorly or won't provide the necessary protection.

Hazardous work areas that should be evaluated include, but are not limited to, carpenters, electricians, machinists, mechanics, and millwrights who require protection from flying fragments, objects, large chips, sand, and dirt. Spectacles with side protection, goggles, and for severe exposure, faceshields are recommended.

All metal work, including plumbing, pipefitting, sheet metal workers and tinsmiths, assemblers, sanders, grinders, lathe and milling machine operators, welders, and laborers require protection from hot sparks, flying particles and projectiles, lubricants, lint buffing compound, sparks, abrasives, rivets, sputtering solder, flux and liquids, fumes, gases, spattering welds, and welding flash. Eye protection should include a face shield and goggles. If the task involves light and radiation, welding for example, welding helmets or welding shields and spectacles with shaded or special purpose lenses are required.

Chemical process operators and handlers, as well as anyone within the medical field that encounter liquid splash or spill, flying particles and projectiles should wear goggles. For severe exposure, face shields may be necessary.

Duffie explained that the following hazards need to be evaluated on a regular basis to ensure the eyewear selected provides sufficient protection. Some applications involve all three.

### **Impact hazard**

There is a wide selection of safety eyewear available that is specifically designed for impact hazards that will help employers comply with OSHA standards. These include dual and single lens spectacles, goggles and faceshields. A safety spectacle with a strong polycarbonate lens, optically

correct side shields and an ANSI compliant frame with a brow bar will protect eyes in all three directions.

### **Light radiation hazard**

Ultraviolet light and infrared radiation are invisible, occur at the opposite ends of the light spectrum and can't be detected by the human eye. Without the proper protection, damage can occur to the eyes without knowledge, so it is necessary to be consistent about wearing the proper protection. Bouton polycarbonate lenses filter out 100% of harmful W radiation, regardless of whether the lens is tinted or not.

Infrared radiation (IR), which comes from torch welding and cutting, causes damage to corneas and retinas. The effect of IR exposure is felt within a few hours. For IR protection, it is necessary to select the proper IR lens shade for a specific task. Matching IR side shields will block out rays peripherally.

### **Liquid spill hazard**

The third type of hazard that requires protective eyewear is from liquid splashes. This includes harmful chemicals and bodily fluids. Again, adequate protection depends on the type of substance involved and varying working conditions. When goggles alone will not protect against splashes of gasoline, solvents, or infected blood, face shields in combination with spectacles are the first line of defense.

Duffie advises anyone contemplating setting up a safety eyewear program follow the OSHA standards and use a standard hazard assessment form. Employers will find it easier to organize and categorize hazardous areas to ensure they are identified, isolated and reassessed on a regular basis. If the assessment is followed properly, it will alert the employer to potential hazards before a work related accident occurs, resulting in a safer working environment for the employees.

*For additional information, contact H.L. Bouton Co. Inc., 11 Kendrick St., Wareham, MA 02571, 508/295-3300, 800/426-7881, FAX: 508/295-3521*

# 16

## **Metal/Nonmetal fatal accident summary**

### **Fatal slip or fall of person accident**

#### **General information**

A 73 year-old glazier was seriously injured at about 10:30 am on July 17, 1998 when he fell as he was descending from a front-end loader while replacing a windshield. He died on July 27, 1998 from complications as a result of the injuries. The victim had about forty years experience replacing glass in mobile equipment and buildings.

The pit was a crushed limestone operation in Florida. The mine was normally operated one, 8-hour shift a day, five days a week. A total of 28 persons was employed.

Limestone was drilled and blasted, then excavated by dragline from under water and stockpiled for drying. Primary crushing of the material was completed in the pit area by portable crushers. The material was then loaded by front-end loaders into haul trucks and transported to the milling area to be crushed, sized, screened and stockpiled. The product was sold for use as construction aggregate.

The primary contractor contracted work to complete drilling, blasting, excavating, and primary crushing of the material.

The subcontractor hired the victim, who ran a one-man glazing operation, to replace a windshield in a front-end loader.

#### **Description of accident**

On the day of the accident, the victim arrived at the mine site at about 8:30 am and met with the subcontractor superintendent. The victim was to remove the broken center section of a windshield on the front-end loader and replace it with a new one. The victim had been at the mine previously on several occasions to replace glass in various pieces of mining equipment for the subcontractor.

The victim placed the step ladder next to the left front tire. He carried the

plywood up the ladder, stepped onto the tire and placed it across the top of the boom to make a platform from which he could replace the windshield. The accident occurred in the pit area of the mine where the ground was level and mostly dry. Crushed limestone had been applied to raise the area about one foot above the water table.

The front-end loader involved in the accident was a Caterpillar 980G, powered by a Caterpillar 3406C diesel engine and equipped with an eight-cubic-yard bucket. It was parked in the pit area adjacent to a haul road at the time of the accident. The lifting boom was in the lowered position with the bucket on the ground. The top of the boom, where the work was being performed, measured 100 inches to the ground and was 31 inches above the top of the tire. The width of the boom from the outside edges was 42 inches. The center section of windshield being installed was 32 inches wide by 38 inches high.

After the broken windshield was removed, the victim asked the subcontractor superintendent for help to get the new windshield up on the platform. The front-end loader operator was sent to assist the victim. He went up the ladder with the new windshield, handed it to the victim, then left the area.

Work continued without incident until about 10:30 am when the victim ran out of caulk prior to finishing the seams on the new windshield. As he was getting down from the platform to step onto the tire, he fell, striking the tire and a ladder mounted on the side of the loader. He landed between the left front and rear tires of the loader. The plywood platform was found on the ground and the step ladder was in place against the tire, where the victim had placed it.

At about 10:45 am, a haul truck operator noticed the victim lying on the

ground and radioed the office to call the local 911 emergency assistance number. Paramedics arrived a short time later and administered first aid. The victim declined the paramedics' suggestion to go to the hospital for further treatment and observation.

After the paramedics left, the victim sat on the back of his truck and talked with the subcontractor superintendent and the supervisor for the prime contractor. The victim said that his glasses had fogged up and he didn't know if he just over stepped the platform or if it may have tilted with him. The victim asked the supervisor if he would finish caulking the windshield. After he finished, he and the subcontractor superintendent helped the victim into his pickup truck. The victim left the mine site between 11:30 am and 12:00 noon.

When the subcontractor superintendent called the victim that afternoon, the victim told him he felt OK as long as he was sitting, but he was having difficulty walking. The victim's son stated that the next morning the victim was in severe pain and was taken to the hospital by ambulance. His injuries included a broken pelvis and a ruptured spleen. He died on July 27, 1998, of a heart attack, attributed to injuries received in the fall.

#### **Conclusion**

The cause of the accident could not be determined. However, a major contributing factor may have been the fogging that occurred on the victim's glasses, due to heat and humidity, which made it difficult for him to see as he tried to step down onto the tire.

*Edited from an MSHA accident investigation report by Fred Bigio.*



# Moving car bunkers

# 17

Butterley Engineering reports that a recent survey has revealed that nine North American mines have increased their coal production by over \$80 million annually thanks to the use of its moving car bunkers.

The Butterley moving car bunker provides temporary live storage, for up to 2,000 t of coal with the minimum of

mine, Peabody's Peabody mine, Consol Rand Lake mine and Prince mine, Canada.

The analysis compared the capacity of coal carried in tonnes for each mine with the number of years the bunker has been in operation, to show an average cost saving per year, cost savings to

4. Cost per tonne of coal produced = \$20

The Butterley Engineering system is designed to provide the most efficient economical and reliable method of absorbing surge loading conditions on underground transportation systems handling the output from single- or multi-face mining operations.

## Butterley moving car bunkers—Typical increase in coal production analysis

Bunkers	Capacity (t)	Operational years	Avg. annual saving (\$)	Total saving to date (\$)	Saving/100 t stored per year (\$)
Emway mine	350	13.26	3,649,924	48,298,000	1,048,550
Jim Walters mine 7	1,850	8.84	19,303,620	170,644,000	1,043,439
USX Maple Creek	600	7.33	6,266,848	45,936,000	1,044,475
Bethlehem mine 60	1,500	7.00	15,651,429	109,560,000	1,043,429
AEP Meigs mine	1,000	7.00	10,434,286	73,040,000	1,043,429
Monterey No.1 mine	1,000	3.67	10,430,518	38,280,000	1,043,052
Peabody mine	300	1.83	3,140,983	5,748,000	1,046,994
Rend Lake mine	700	1.75	7,328,000	12,824,000	1,046,857
Prince mine	500	1.25	5,216,000	6,520,000	1,043,200

Note: Operational years is the total amount of time up to January 31 this year that the bunker has been operational. To determine the amount of savings Butterley used the criteria that: the bunker has been filled once only in each shift; coal is produced on two shifts per day and only five days per week; cost/t of coal produced is \$20.00.

degradation. Comprising a train of storage units, the system is used in conjunction with existing conveying operations. Belt flow is monitored and during periods when it would otherwise be necessary to halt material transfer—when a belt is inoperative or delivers quantities of material above its capacity—the system activates to store excess material. Discharge then occurs when the trunk belt returns to normal operation.

The company has now supplied hundreds of bunker systems to coal mines throughout the world. Earlier this year, it conducted an analysis of nine U.S. mines which had installed a moving car bunker in the last 13 years. The aim of the research was to examine the bunker's efficiency and cost savings.

The mines used in the research included Emway mine, Jim Walters mine 7, U.S.X. Maple Creek, Bethlehem mine 60, A.E.P. Meigs mine, Monterey No. 1

date and savings per 100 t stored per year.

The results show that mines with a capacity to mine between 300 and 1,850 t of coal, using a moving car bunker, save over \$1 million per 100 t stored per year.

Emway mine, U.S., with a capacity to mine 350 t installed a moving car bunker in October 1982. Continuous mining at 350 t per fill at a cost per tonne of coal produced at \$20 has resulted in total cost savings of over \$48 million. A full table of results is shown.

The study used four criteria to determine the increase in output following the installation of the moving car bunker:

1. That the bunker has been filled to capacity once only in each shift
2. That coal is produced on two shifts per day
3. That coal is produced only five days per week

A spokesman for another mine Silverdale, said: "We have achieved high impact results since the installation of Butterley's moving car bunker. The most significant of which has been the increase in coal production generated by the reduction in unplanned downtime."

Chuck Greyhosky, of Butterley Engineering USA said: "All of our moving car bunkers are designed to minimise delays caused by outbye transportation problems and subsequently improved production. Our customers have reported significant benefits over and above their expectations."

Reprinted from the March 1998 edition of Mining Engineering magazine—a publication of the Society of Mining Engineers.

# 18

## The case for cameras on reversing vehicles

**MSHA recently asked for comments on eliminating blind spots with vehicle cameras, such as the one shown here.**

*By Mick Webb, Sales Director Utopia Electronics Ltd., Chirtsey, Surrey, Britain*

*Ed. Note: The author states his arguments in support of cameras on vehicles at a time when MSHA has called for comments on ways to reduce surface haulage accidents. MSHA claims this type of accident is a leading cause of fatalities in the metal and nonmetal mining industry. In issuing its call for comments this past summer, the Agency specifically asked for comment on the use of video cameras for making any blind areas visible. The comment period closed September 28. While the aggregates industry may not fully be in agreement on this issue, NSA offers readers this viewpoint for their information.*

The use of camera systems to view the blind areas of vehicles such as dump trucks and front end loading shovels has now become an established practice throughout the U.K. market. Recent Health & Safety directives within the U.K. order the installation of cameras at manufacture on many types of vehicles, and rigorous measures have been taken to force many quarry operators to retrofit camera systems onto existing vehicles. The U.K. Health & Safety Executive is working on a long-term project aimed at reducing the risk of accidents on reversing vehicles.

It has taken operators in the U.K. many years to appreciate fully how they benefit from cameras on vehicles. To understand fully why such a simple principle has taken so long to become established, we must consider the basic workings of these camera systems and examine the negative attitude of certain operators towards cameras on vehicles.



### How they work

Vehicle camera systems are actually quite simple. A monitor in the cab is connected to the power supply (the voltage is normally regulated to 12V within the monitor). The monitor shows a reverse image as if a mirror is being viewed, thus giving the operator the correct perspective while reversing. The camera is line fed from the monitor. This means power is fed to the camera via a single cable, which also carries the return video (picture) signal from the camera to be viewed at the monitor. Line feeding makes the installation of these camera systems quite simple.

### Required system features

For optimal performance, camera system monitors must be shock-rated to withstand the continuous buffeting within the cab. The camera must also have certain features deemed necessary for correct performance, including:

- a wide angle lens for a clear view around the rear of the vehicle;
- a particularly strong housing to endure the harsh quarry environment;
- a strengthened lens cover to prevent breakage when in contact with quarry materials;
- a low lux (light) rating to ensure good operation in low light conditions; and
- a 1/100,000th/sec shutter action

for rapid response to changing light conditions.

The system can either operate in reverse gear only or be left on permanently via the on/off switch on the monitor. Although debate continues between operators and safety officers regarding when the system should operate, most seem to agree leaving it on permanently is better. Advocates argue that it is best to view potential problems at the rear of a vehicle before reverse is engaged rather than after. Some are puzzled by the amount of time taken for many to accept camera systems on vehicles, considering they are now proven to reduce the risk of death and injury to pedestrians on site. Not only do these systems also reduce the risk of vehicle damage, they improve the efficiency and confidence of machine operators. Our company has supplied many systems over the years and has seen an increase in confidence of the operators, many of whom now feel uncomfortable using machines not equipped with cameras.

### So why the delay?

So why the delay? There are several reasons. The first of these is cost. Until very recently, the cost of investment has been prohibitive. The price U.K. operators were expected to pay for a single camera monochrome system equated

to around \$2,000. This alone was often enough to kill the idea.

Second, quarry owners and managers felt the responsibility was on the operator to offer due care while operating machinery. Some also pointed out that they never had accidents on their site. Others felt the use of such equipment as cameras actually distracted the operator, and others went for the more economical method of reverse alarm sounders and combinations of mirrors. Finally, some considered using radar type systems.

### Looking at the options

The cost of camera systems has dropped markedly; they can now be purchased for \$650-\$700. Machine operation is certainly in the hands of the driver, but blind areas do exist, and the only way an operator can truly see what is there is to use a camera. Besides, if a citable accident occurs, MSHA will cite the owner and the owner's insurance premium may be adversely impacted.

As for accidents never happening, well, this really is tempting fate. If accidents never happen, then why do we need safety measures? We all understand quarries and such sites are potentially dangerous areas. A site that has gone accident-free for 10 years cannot gamble that a second's lapse in human concentration is not going to occur tomorrow, with disastrous consequences.

Regardless of what type of safety equipment it is, if it is operated incorrectly, it will not serve its purpose, and may even prove harmful. This applies to vehicle cameras as well, which means the operator must be taught how to use them properly.

The market for reverse alarms has given way largely to cameras on many applications in the U.K. for two reasons. The first is an environment consideration. Since many quarries and landfill sites in the U.K. are close to populated areas, sounders have become a noise nuisance and their use has become restricted to certain times. This can prove inconvenient for the quarry wishing to operate outside these times.

Second, reverse alarms are not always effective. For example, an alarm cannot alert the operator to the nonmovable object, such as masonry or stationary vehicles. Nor can a person who falls in the vehicle's blind area be seen by the operator or heard over the backup alarm.

Mirrors are an alternative to cameras, although it still is not normally possible to achieve all around vision with a combination of wide-angle mirrors. Additionally, mirror combinations can be a little confusing to view. We have found many feel comfortable using a combination of mirrors and cameras.

Finally, radar type systems can work in several ways: some models simply alert the operator to the existence of any object, while others will actually stop the vehicle when an ob-

ject is detected. This equipment has some potential problems though. The degree of detection to activate an alarm has to be adjusted, and this can represent a difficult balance. Set too sensitive and small objects can activate the alarm unnecessarily, while an under sensitive setting may cause some sensitive objects which need detection to be missed. If the radar applies the brakes automatically and the system is too sensitive, then inconvenience and annoyance can soon occur. With more advanced models, the price can also reflect the technology within.

### Summary

We have seen the U.K. vehicle camera market take a dramatic upturn recently, partly because of the acceptance of such equipment and partly because of official pressure. The main users at present in the U.K. are the quarry and waste markets. From January 1999, all refuse vehicles must have camera systems before leaving manufacture in the U.K.; otherwise, the vehicle cannot carry the required 'CE' marking.

The simple fact remains that if a vehicle has a blind area that needs to be viewed, the best way is to use an extra eye, a camera. One large U.K. organization was recently fined \$250,000 for a reversing accident that killed one of their employees. A figure of that magnitude makes camera systems a bargain.

*Reprinted from the October/November 1998 issue of Stone Review.*



**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 frequent applications of rock dust. ● Make frequent visual and sound checks of mine roof during each shift. **NEVER** travel under unsupported roof.

# Pit and quarry operators get productivity tips... from a utility

A one-day seminar designed to help quarry and mining managers make their operations more productive, more efficient and less expensive was held in Harrisburg PA. "Rock-Solid Productivity" was sponsored by Pittsburgh Power & Light (PP&L).

The seminar, one of a series sponsored by PP&L in 1997, proved to be well-organized and provided valuable information to the many quarry and mining professionals who attended.

The information presented included a comparison of on-site diesel power vs. electric power, discussions of equipment improvements and topics on environmental management.

### Keynote address: Strategies for moving forward

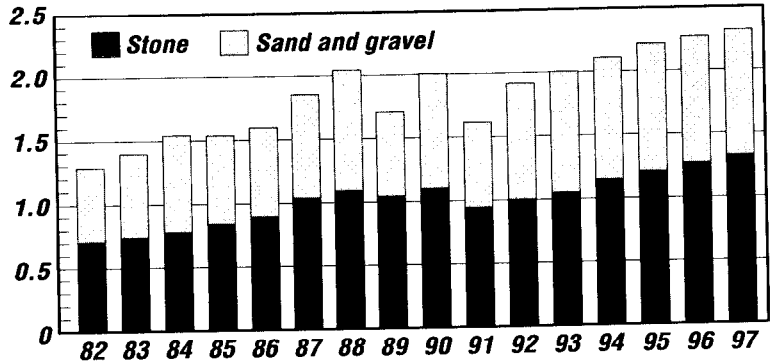
The success of a quarry or mining operation depends on keeping equipment operating and product moving at the lowest possible cost.

Robert Bartlett is corporate vice president of US Aggregates Inc. and former president of the National Stone Association. He presented a keynote address titled "Strategies for moving forward."

Bartlett stressed several areas that he believes everyone in the industry needs to consider. Among these are production. It must meet the demands of the marketplace. And it must maintain product quality. According to Bartlett, aggregate production in the United States is now increasing at the rate of 3.5% a year. He pointed out that, on average, 81 t (90 st) of stone and aggregate are used in building each new home in the United States. He further noted that 40% of the nearly 2.3 Mt (2.5

### U.S. aggregates consumption

Metric tons in millions



Source: Robert G. Bartlett—U.S. Aggregates, Inc.

million st) of aggregate mined annually is used in highway maintenance and construction.

Stewardship was another area mentioned. According to Bartlett: "We are no longer just a quarry that has a perimeter; we are part of a community." Among the challenges are public attitudes and concerns about dust trucks and blasting and, of course, the not-in-my-backyard problem.

Bartlett recommended that operations participate in the community and recognize the environmental standards that are now expected of them. Professionalism was also stressed. He commended attendees for taking the time to attend the seminar and learn more about their business.

### Diesel power vs. electric power

Fred Brazia of PP&L presented a discussion titled "Diesel power: Flexibility vs. economics." He compared the advantages and disadvantages of on-site diesel power vs. electric power. The discussion pointed out that "both systems have advantages and disadvantages (Table 1)." What it usually comes

down to is economics. The best approach is a comparative cost analysis of the options. Each site is unique—some sites will favor diesel and others will favor bringing in electric power.

### Equipment and improvements

Three vendors made presentations concerning equipment improvements. Charles Anderton of Motor Technology Inc. discussed when to repair and when to replace motors, fans and pumps. Considerations should include the value of improving motor efficiency. But if a motor is to be repaired, one must select a vendor with full capabilities.

Robert Mullen of Scandura Inc. discussed conveyor systems. Today's conveyor systems contain new technological innovations. These include new carcass materials, new cover compounds and improved manufacturing processes. However, even with these improvements, according to Mullen, the number one cause of failure is poor maintenance of the system. Preventive maintenance, such as visual inspections, ultrasound testing,

X-ray inspections and sampling, are required. However, these are often overlooked or poorly performed.

Crushing and screening was the topic of Christopher Rettew of Svedala Industries. He pointed out that new products are constantly being developed to reduce the cost of the quarry product, increase production and meet the changing production demands. Rettew said that the focus is now on increasing capacity slowly (3% to 4% annually) rather than completely rebuilding plants.

What is hot in the marketplace? According to Rettew, what is hot are automation packages on cone crushers, horizontal shaft impactors, vertical shaft impactors, specialized screening media and specialized screens.

### Strategic environmental management

Robert Zaccano of the Pennsylvania Department of Environmental Protection (DEP) discussed environmental management. According to the DEP, the definition of pollution prevention is: "source reduction or other practices that reduce or eliminate pollutants through increased efficiency or conservation."

Pollution prevention strategies include disposal, treatment, recycling and reuse. Zaccano stressed the development of a strategic environmental management system that:

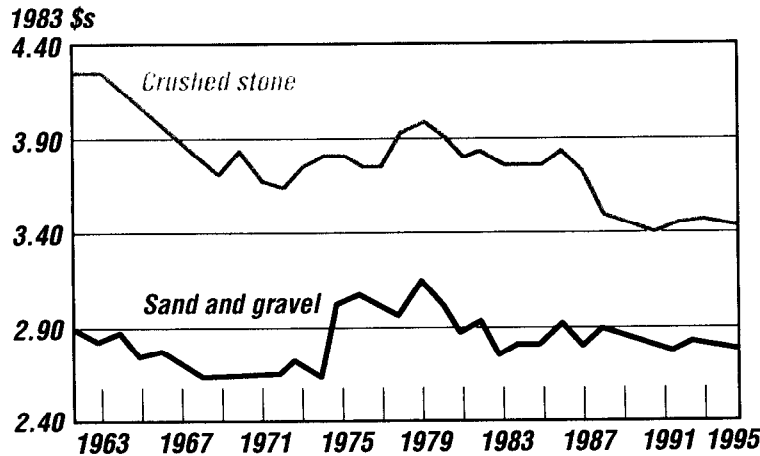
- Integrates environmental objectives into goals.
- Helps the organization gain competitive advantage.
- Enhances operational effectiveness and efficiency.

Planning, implementation and compliance were stressed. It was pointed out that the biggest problem in the aggregates business is particulate emissions.

### Blasting vibration

James Reil of Vibra-Tech presented a discussion of blasting vibration problems. He said that "despite our very

### Real prices of aggregates, 1963-1995



Source: Robert G. Bartlett—U.S. Aggregates, Inc.

best public relations efforts, people do not like having quarries and mines as neighbors." At public meetings, the biggest complaints are noise, dust, truck traffic and blasting. These problems can be remedied by restricting hours, the use of water trucks and the construction of berms.

But, as Reil pointed out, blasting is different—ground vibrations can extend outside the property. According to Reil, "all blast vibration complaints are due to house vibrations and not ground vibration." Studies performed by Vibra-Tech found that there are three factors that determine how much a house will vibrate:

- The amplitude of the vibrations.
- The duration of the vibrations.
- The frequency of the vibrations.

Structural response is directly and linearly proportional to ground vibration amplitude. According to Reil, "if you cut the vibration in half, you cut structural response in half. This is a simple one-to-one relationship." Duration is interesting in that the important factor is the duration of the vibrations and not the duration of the blast. Reil pointed out that "the longer the ground vibrations continue, the more it will shake the house and the higher the amplitude of the response—that is what gets you complaints." So, according to

Reil, "any time you can shorten the duration of the ground vibrations you can reduce how much your neighbors shake." Frequency is the most important of the three causes. Here, Reil is talking about the natural frequency of structures. Residential structures are complicated and respond to many frequencies. But all residential structures will vibrate at between 4 and 16 hertz.

However, if you can double the frequency you can achieve a 10 times reduction in structural response. Vibra-Tech discovered that "the biggest cause of vibration complaints resides in the geology where the houses are built." As Reil put it: "Many houses are built on a 'mound of Jell-O.'" Just as the house has a fundamental frequency, so does the ground.

Reprinted from the March 1998 edition of *Mining Engineering* magazine—a publication of the Society of Mining Engineers.

# Solving the Y2K puzzle

by Michael Snyder, Mechanical Engineer, Approval and Certification Center, MSHA

## Introduction

If you think assembling a 1,000 piece jigsaw puzzle is challenging and time consuming, imagine if you didn't have the picture from the top of the box. Attempting to solve the Y2K puzzle without a clear picture of your goal is just as difficult. Whether you are finalizing your Y2K project or you haven't started, keep in mind, you are not the only one impacted by this problem. Its scope is worldwide and it will not go away on its own. With little less than 400 days left you should be wrapping up your testing phase of your Y2K project and moving toward verification and validation, followed by compliance certification. Like puzzle pieces, each item that is identified, assessed and fixed will help you develop the final picture of how your company will be prepared to conduct business in the new millennium. If your company hasn't started putting the pieces of the Y2K puzzle together yet, you should begin NOW!

For many years it has been known that as the calendar turns to January 1, 2000, problems will occur with computer software, hardware and any device relying on the use of a two-digit date function. The origin of the Year 2000 (Y2K) problem is simple and understandable and can be traced back to the early computers of the 1960s. The first computers had a small fraction of the memory compared with today's computers. Memory space in the early computers was limited and costly. Computer programmers conserved precious memory space by using only two digits for date references instead of the entire date value. For example, years were referenced using the last two digits, dropping the century value ("1980" = "80").

While the practice of using two digit dates solved the immediate

problem of limited memory space, it created a very real century change problem. Many of today's powerful computers cannot correctly interpret the year "00." For example, a date calculation for the difference between the year 2000 and year 1999 to some computers will be 00-99 = -99 or 99 years, instead of one year. Additionally, the mathematical routines used to calculate leap years and days of the week may not work properly after February 29, 2000. To compound the problems, programmers sometimes used special dates to control program operation. Many programs will return an error message if the year "00" is greater than "99." Due to the volume of equipment and systems impacted, coupled with the fact that computers and programs have changed so dramatically over the years, there is no one simple solution to this problem.

Just as in solving a jigsaw puzzle, all the pieces must be examined with a goal toward making all the pieces fit. Failure to completely solve the Y2K "puzzle" has consequences. They range from minor inconveniences to loss of production, creating unforeseen safety hazards, and exposure to litigation. In extreme cases the result could be financial ruin. The threat is so real that some companies have invested in Y2K insurance.

## What are the potential problems?

Most attention has been focused on large mainframe computers and personal desktop computers. Mainframe computers may operate with extremely complicated programs in a variety of machine languages to manipulate huge amounts of data. The programs and databases that process and house the information may be up to 20 years old. As such, there could be up to 20 years of evolutionary maintenance of the pro-

grams and databases that have occurred without extensive system documentation. As a result, these legacy systems are almost impossible to troubleshoot and repair by hand. Y2K software has emerged to check and fix source code on a line by line basis. However, the use of current Y2K troubleshooting software can locate only about 80% of the affected code, leaving the detection and repair of the rest of the code up to programmers.

Personal computers will have problems associated with the Basic Input/Output System (BIOS). BIOS is the program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, keyboard, mouse and printer. An older BIOS will tell the computer it is 1900 when a date code of "00" is encountered. Free fixes for most machines have been developed, and many can be downloaded from the Internet. [Box 1, on page 23, lists several Y2K resources that may provide assistance to a variety of users.] Major personal computer manufacturers have established help lines for users to contact. [Box 2, on page 24, describes a methodology for you to test your personal computer].

Another category of hardware susceptible to the Y2K problem is the embedded system. Embedded systems consist of one or more devices that control, monitor or assist in the operation of equipment. Embedded system devices may consist of a single microprocessor commonly called a "chip." Simple embedded systems will perform a single function or select from a small set of functions; however, other embedded systems can be quite complex. The chips can be op-

erated by increasingly complex application programs. The ability to integrate an application program into an embedded system results in flexible devices that can perform a variety of tasks. However, this also makes it more difficult to pinpoint date sensitive problems. The following are examples of equipment that may contain embedded systems:

- Process control equipment;
- Hoists and elevators;
- Maintenance monitoring in newer equipment (draglines, trucks, dozers, etc.);
- Security and Alarm systems;
- Office equipment such as telephones, facsimile machines, postage meters.

Like puzzle pieces, equipment specific to your business should be examined to determine where it fits into the overall Y2K picture.

### **MSHA's efforts**

The Mine Safety and Health Administration (MSHA) has made Y2K compliance an agency priority. MSHA's interests and efforts are twofold: to ensure

internal compliance and to assist the mining community. Operating groups within MSHA are working to accomplish the goal of being Y2K compliant as soon as possible. MSHA began its efforts in June 1997 by completing a thorough review of its systems and equipment inventories in order to identify those impacted by the Y2K problem. By March of 1998, assessment and contingency planning was well under way. MSHA's assessment results indicated that mainframe systems required about as much work as expected. These systems should be compliant by press time, two months ahead of schedule. MSHA's office equipment and laboratory equipment needed much less work than expected, due to ongoing efforts in updating its equipment in the past several years. Personal computers, software and network equipment needed more work than anticipated. Due to the fact that affected equipment is dispersed across the country, addressing this area has taken more effort than was originally planned. Personal computers are

scheduled to be Y2K compliant by December 1999.

Assistant Secretary J. Davitt McAteer has made known throughout the agency that MSHA is taking a proactive approach in helping the mining industry become Y2K compliant. The industry is encouraged to view the Y2K information now available on the MSHA Internet site. A report of the findings of an industry survey is available at [www.msha.gov/y2k/y2kcover.htm](http://www.msha.gov/y2k/y2kcover.htm). This report also contains up to date information from mining equipment manufacturers on the Y2K impact on their products. As more information is acquired and verified, it will be posted. If you are not able to access the Internet site, the report is available through the Approval and Certification Center's Quality Assurance Division (304) 547-2042, and other sources.

### **MSHA survey**

In July of 1998, MSHA conducted a survey of various types of mining and processing facilities in the industry. As directed by Assistant Secretary

## **Internet sites that may provide further assistance**

**www.y2k.com**—This site has vendor links, news updates, technical information and discussions on legal issues.

**www.sba.gov**—This site has a multitude of information for small businesses.

**www.zdy2k.com**—This site is listed as a comprehensive guide to Y2K. From the largest corporation to the end user, this is a great place to start.

**www.year2000.com**—Sponsored by Y2K expert Peter de Jager.

**www.y2knews.com**—This site is a news magazine, and has the latest articles from around the globe.

**www.y2ktoday.com**—This site has information categorized by industry.

**www.pcmag.com/y2k**—This site has useful information on Y2K testing and analysis tools; downloads are available and you can test your PC on line.

**www.garynorth.com**—This site has papers which articulate a viewpoint that the Y2K problem will have catastrophic impacts.

**www.year2000.com**

**www.compinfo.co.uk/y2k/manufpos.htm**—contains links to computer manufacturers' home pages

**www.software.ibm.com/year2000/**—IBM's Y2K page

**www.microsoft.com/office/office97/documents/y2k/**

**default.htm**—Microsoft's Y2K page

**www.isquare.com/y2k.htm**—The Small Business Advisor Web site

**www.open.gov.uk/hse/hsehome.htm**

**www.engine.ieee.org/usab/Y2K/index.html**

#### *Publications:*

• *"Health and Safety and the Year 2000 Problem,"* ISBN 0-7176-1570-7, authored by the Health and Safety Executive, UK.

• *"Safety and the Year 2000,"* ISBN 0-7176-1491-3, authored by the Health and Safety Executive, UK.

• *"Testing Safety-Related Control Systems for Year 2000 Compliance,"* ISBN 0-7176-1596-0, authored by Anthony Wray.

McAteer, the goal of this project was to assess how the mining industry is aware and prepared to handle the Y2K problem. Based on the mine site and plant visits, all of the companies were aware of the Y2K issue. The range of Y2K plans discussed varied from relying primarily on manufacturers and equipment suppliers to developing internal Y2K teams to work on the problem.

Larger companies are attacking the problem more aggressively. This is due to the amount of resources at their disposal and the magnitude of potential negative consequences. While small companies do not have as many pieces of potentially affected equipment, the impact to their bottom line may be equal to larger com-

panies if only one piece of equipment is lost. Medium sized companies could be significantly impacted if they fail in their efforts to achieve compliance or do nothing at all. Regardless of company size, the consequences of doing nothing are twofold. First, the ability of a company to conduct business is threatened. Second, internally compliant companies could suffer severely if they rely on businesses that do not achieve Y2K compliance. This follows the "weakest link in the chain" theory. Thus, a company unprepared for the Y2K problem may impact your business from a variety of perspectives.

### Accomplishing your goals

The first thing you can do is continue to increase the awareness of the Y2K problem. Remember, everything you do toward identifying, assessing, fixing and testing helps to ensure that you will be conducting business on January 3, 2000 (Monday).

### Suggestions

- Establish your Y2K team and develop your plan. A good team must include representatives from all phases on your operation. These problems cannot be solved by information systems people alone.
- Give your Y2K team the authority it will need to make or obtain decisions quickly. The remaining 400 days of cal-

## Testing your pc

Create a bootable test diskette. Insert a blank floppy diskette into the PC's A: drive.

From a DOS prompt, type `FORMAT A:/S`. or from Windows File Manager, click on `DISK/FORMAT` and check `MAKE SYSTEM DISK`.

With the bootable diskette created in Step 1 still in your PC's floppy drive, shut down your system (close Windows) and turn off your PC. Don't just hit the reset button or warmboot (`CTL-ALT-DEL`).

- Turn on the power to your PC, and allow the PC to boot from the diskette.
- After bootup, DOS automatically shows the current date. Make sure that the correct date is displayed. Otherwise, you may have to set the correct date on your PC's BIOS.
- At the Enter new date (mm-dd-yy) prompt, type 12-31-1999.
- After changing the date, the current time will be displayed. At the Enter new time: prompt, type 23:59:00.
- Turn the power off on your PC and wait at least one minute. If you don't, DOS will appear to transition correctly to the year 2000. However, once you reboot the PC, it will display the incorrect date if your system's Real Time Clock (RTC) has the flaw.
- Turn the power back on and wait for the boot process to complete.
- Type in Date at the ready prompt. If Sat 01-01-2000 is displayed, your PC's BIOS passes the test.
- At the Enter new date (mm-dd-yy): prompt, type 02-28-2000. This will test your system's ability to recognize the year 2000 as a leap year.
- After changing the date, the current time will be displayed. At the Enter new time: prompt, type 23:59:00.

- Power off your PC again and wait at least one minute.
- Turn the power on the PC. Type in Date at the Ready prompt. If Tue 02-29-2000 is displayed, your PC's BIOS passes the leap year test.
- To conclude testing, at the Enter new date (mm-dd-yy): prompt, enter today's date.
- After changing the date, the current time will be displayed. At the Enter new time: prompt, type the actual current time.
- Remove the bootable diskette from the floppy and power off your PC.

*NOTE: The above test scenario only validates your PC hardware for Y2K compliance. You still may have affected software programs that need to be repaired or replaced. Consult with the software manufacturers in order to determine the best approach to fix your software.*



ender time means less than 250 working days. Keep in mind that equipment acquisition takes time, and equipment retrofit and installation is usually scheduled around production.

- Document all your Y2K efforts. Users who cannot visualize their overall efforts will benefit from developing a good strategic plan as part of their efforts. The potential for litigation is also a consideration for companies of all sizes. Essentially, companies may have to prove their good faith efforts, should things go awry.

**Experts recommend that a basic Y2K plan should include the following:**

an inventory of all potentially affected equipment, hardware and software. Missing a critical item here could be a fatal error.

an assessment of your inventory and the categorization of your findings from

most to least critical to your operation. fixing those problems with the most critical impact on health and safety or your ability to remain in business first. This will probably involve contacting equipment manufacturers. Decisions related to permanent solutions versus temporary corrections will need to be made.

testing your solutions. This may require assistance from a manufacturer or consultant for certain applications.

If you take Y2K seriously and become compliant, you still may be impacted through no fault of your own. It is important to evaluate the potential impact on your company if the companies you do business with fall short in their own Y2K efforts. Therefore, contingency planning becomes a necessity. Contingency plans will be useful not only in areas where you feel problems may occur in your company, but also in areas where

other companies affect how you do business. For example, if an extended power outage would be detrimental to your business, will you have backup generators in place and enough fuel for them? Will they be ready to operate for extended periods?

By now, you have probably pieced together enough of the puzzle to understand that the Y2K challenge will not solve itself. Solving the puzzle takes a lot of time, thought and action by a dedicated team. The best time to start was YESTERDAY. The second best time is NOW! The only bad time to start is TOMORROW! The challenge is here and the deadline is set. Solving problems and piecing the Y2K puzzle together will help you better manage your company's ability to conduct business into the next millenium.

## ***DWI contributed to haulage accident at Iowa clay operation***

Owners of a clay operation in Woodbury County, Iowa, violated safety requirements when they connected a 4,000 gallon water tank trailer to a truck, MSHA has established. The two pieces of equipment were not designed to work together and resulted in an accident that killed the mine operator. Driving while intoxicated also contributed to the fatality.

On July 23, 1998, the victim started up his 1954 DW15 Caterpillar truck. He had attached a tanker trailer of unknown make to the truck. Investigators found that the trailer tongue was attached with a goose-neck connector which didn't provide clearance for the truck's rear tires and left fender. They also discovered that braces supporting the fender and cab had broken long be-

fore the fatal accident and hadn't been replaced.

The victim, 42, began watering the haul road between the clay pit and the brick stockpile around 7:00 am. He made one pass, then drove to the top of the stockpile and began making a U-turn. As he turned to the left, the right rear tire dropped into a depression, crushing the truck's left rear fender between the tire and the trailer tongue. The force pushed the fender into the rear of the truck's driver compartment which collapsed, crushing the victim against the steering wheel and windshield.

The victim's son, who also worked at the mine encountered the accident scene on his way to the stockpile. He and another worker attempted first aid, but the victim didn't

respond and they couldn't free him from the truck. Firemen used the jaws of life and torches but by the time they reached him he was dead.

Post-mortem testing revealed blood alcohol levels above the legal limits in Iowa.

MSHA concluded that the improper connection between the two units caused the accident because the setup didn't allow clearance for the tire and fender to move freely under the trailer tongue. Both the broken fender and cab supports and the driver's intoxication were possible contributing factors.

*Reprinted from the September 18, 1998 edition of Mine Safety and Health News by Legal Publication Services.*

# 26

## **THE LAST WORD...**

**“There’s a fine line between participation and mockery.”—Scott Adams**

**“It is easier to fight for one’s principles than to live up to them.”—Alfred Adler**

**“Teaching kids to count is fine, but teaching them what counts is best.”—Bob Talbert**

**“It’s what you learn after you know it all that counts.”—John Wooden**

**“Slumps are like soft bed. They’re easy to get into and hard to get out of.”—Johnny Bench**

**“Seeing is deceiving. It’s eating that’s believing.”—James Thurber**

**“You must do the things you think you cannot do.”—Eleanor Roosevelt**

**“We know what a person thinks not when he tells us what he thinks, but by his actions.”—  
Isaac Bashevis Singer**

**“What’s real in politics is what the voters decide is real.”—Ben J. Wattenberg**

**“I am free of all prejudice. I hate everyone equally.”—W.C. Fields**

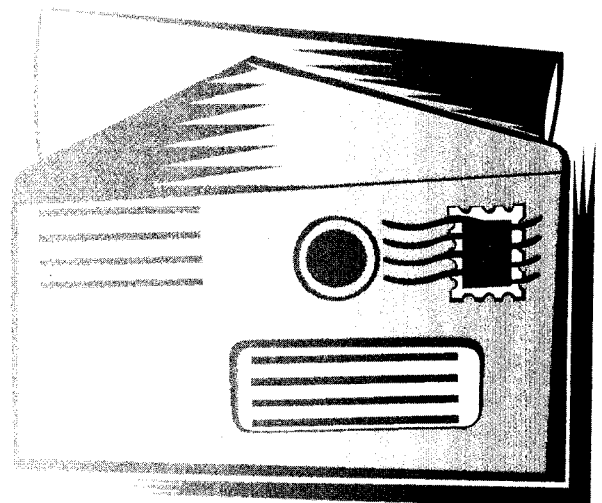
**NOTICE:** We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at [www.msha.gov](http://www.msha.gov). We **DESPERATELY** need color photographs suitable for use on the front cover of the *Bulletin*. We cannot guarantee that 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>
<b>First Vice President</b> .....	<b>Steve Lipe</b> .....	<b>Supplier</b> .....	<b>AZ</b>
<b>Second Vice President</b> .....	<b>Joseph Scaffoni</b> .....	<b>State</b> .....	<b>PA</b>
<b>Third Vice President</b> .....	<b>Doyle Fink</b> .....	<b>Federal</b> .....	<b>TX</b>
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<b>Secretary-Treasurer</b> .....	<b>Pat Hurley</b> .....	<b>Federal</b> .....	<b>VA</b>

<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>
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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
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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
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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:***

- ***Dec. 1, MSHA Independent Contractor Seminar, Beville State Community College, Summerton, AL***
- ***Dec. 3, MSHA Independent Contractor Seminar, Tower West Lodge, Gillette, WY***
- ***Dec. 8-9, Safety Seminar for UG Stone Mines/ Hearing loss Prevention Workshop, Holiday Inn, Greater Cincinnati-Northern KY Airport***
- ***Dec. 14-16, 1998 Construction & Mining Expo, KY Fair and Expo Ctr., Louisville, KY***
- ***Feb. 9-10, South Central Conference, San Antonio, TX***
- ***Mar. 23-27, CONNEXPO-CON/AGG '99, Las Vegas Convention Ctr., Las Vegas, NV***

