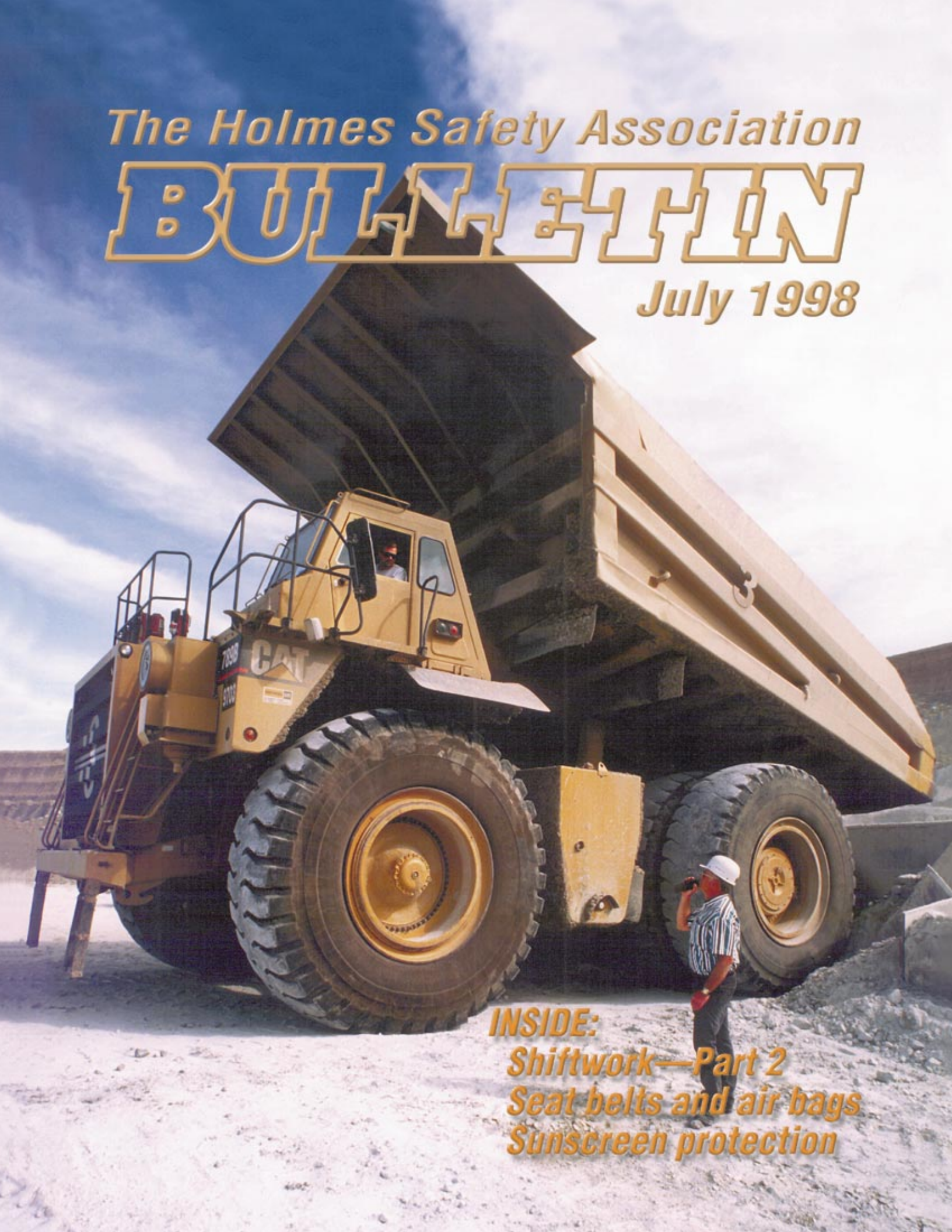
The Holmes Safety Association

BULLETIN

July 1998



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HSA Bulletin *July 1998*

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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***

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COVER: This month's cover thanks to Tana Burrows of U.S. Borax Inc. for this photo of their 190-ton CAT 789B trucks in use at the largest borax mine in the state of California at Boron. [If you have a potential cover photo, please send an 8" x 10" print to the editor, Fred Bigio, MSHA, 4015 Wilson Blvd., Arlington, VA 22203-1984]

KEEP US IN CIRCULATION
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Economic decision making for methane drainage systems for underground coal mines

Abstract
This article defines the elements of a basic economic model for decision making when considering a methane drainage system for an underground coal mine. A drainage system entails significant capital and operating expense; hence the decision to utilize drainage must be made carefully. The model outlines the basic structure of decision making and considers the costs and benefits when the methane is marketed and when the methane is vented to the atmosphere. The effects on mine safety and the dust levels in the mine are also considered, both in a general format and as economic variables. Sources of information for executing this decision making are provided for an actual mine decision.

Introduction

Over the past few decades, the emission of methane into coal mines has increased significantly due to higher productivity, greater comminution of the coal product, faster moving faces and the trend towards recovery from deeper coal seams. Under current Federal coal mine regulations, methane must be controlled at the working faces and at other points in the mine layout. This has traditionally been performed using ventilating fans and a well-designed ventilation system. However, this task is becoming more difficult to achieve economically in modern coal mines. In the meantime, it has been established that methane is a major greenhouse gas, second only to carbon dioxide in its contribution to potential global warming. To decrease the danger to miners and the amount of downtime as a result of excess methane in the mine openings, numerous mines are now using a degasification or drainage system to extract much of the coal bed methane prior to mining. Methane drainage offers the added advantages of reducing the ventilation costs, reducing the mine development costs reducing the global-warming threat and allowing a significant source of energy to be productively utilized. It is the subject of this paper to outline the logic of evaluating whether degasification technology can be implemented economically.

Methane degasification methods

By law, methane concentrations must be below 1.0% at the working faces (CFR; 75.323b), below 1.5% where the return air split enters another air split (CFR; 75.323c), and below 2.0% where a bleeder enters the main return (CFR; 75.323e). With the increasing production and depth of coal mines, traditional ventilation methods are not always the most economical methods of handling methane in the coal seam. Degasification systems have been developed that recover the gas before, during or after mining. The degasification methods, coupled with mine ventilation, may be the most economical method of keeping methane concentrations low in many mines. Degasification methods include vertical wells, gob wells, horizontal boreholes and cross-measure boreholes. Pertinent variables related to each of these methods are outlined in the following sections. Further descriptions of these methods can be found in Hollub and Schafer (1992) and Rogers (1994).

Vertical wells. Vertical wells recover high-quality gas from the coal seam and the surrounding strata and are used to predrain the methane before the mining operation begins. The gas quality is ensured in most cases because the methane will not be diluted by ventilation from the mine. The total amount of methane recovered depends on site-specific conditions such as the gas content of the coal seams and surrounding strata, permeability of the geologic materials, the drainage time, the amount of negative head applied and other variables of the geologic and extractive systems. Vertical wells can recover 50% to 70% of the gas content of the coal and are normally placed in operation three to seven years before mining commences.

Gob wells. Gob wells differ from vertical wells in the sense that they are normally drilled to a point 2 to 15 m (6 to 50 ft) above the target seam prior to mining and are operated only after mining fractures the strata around the well bore. The methane emitted from the fractured strata is then allowed to flow into the well and up to the surface. The flow rates are controlled by the natural head created by the low-density methane gas or can be stimulated by blowers on the surface. Gob wells can recover 30% to 50% of the methane emissions, depending on geologic conditions. Gas quality varies but is higher at the beginning of production and can be controlled to some degree through control of the flow rate.

Horizontal boreholes. Horizontal holes are drilled into the coal seam from development entries in the mine. They drain methane from the unmined areas of the coal seam shortly before mining, reducing the load of methane that is expected to be handled by the ventilation system. Because methane drainage occurs only from the mined coal seam and the period of drainage is relatively short, the recovery efficiency of this technique is low. Normally,

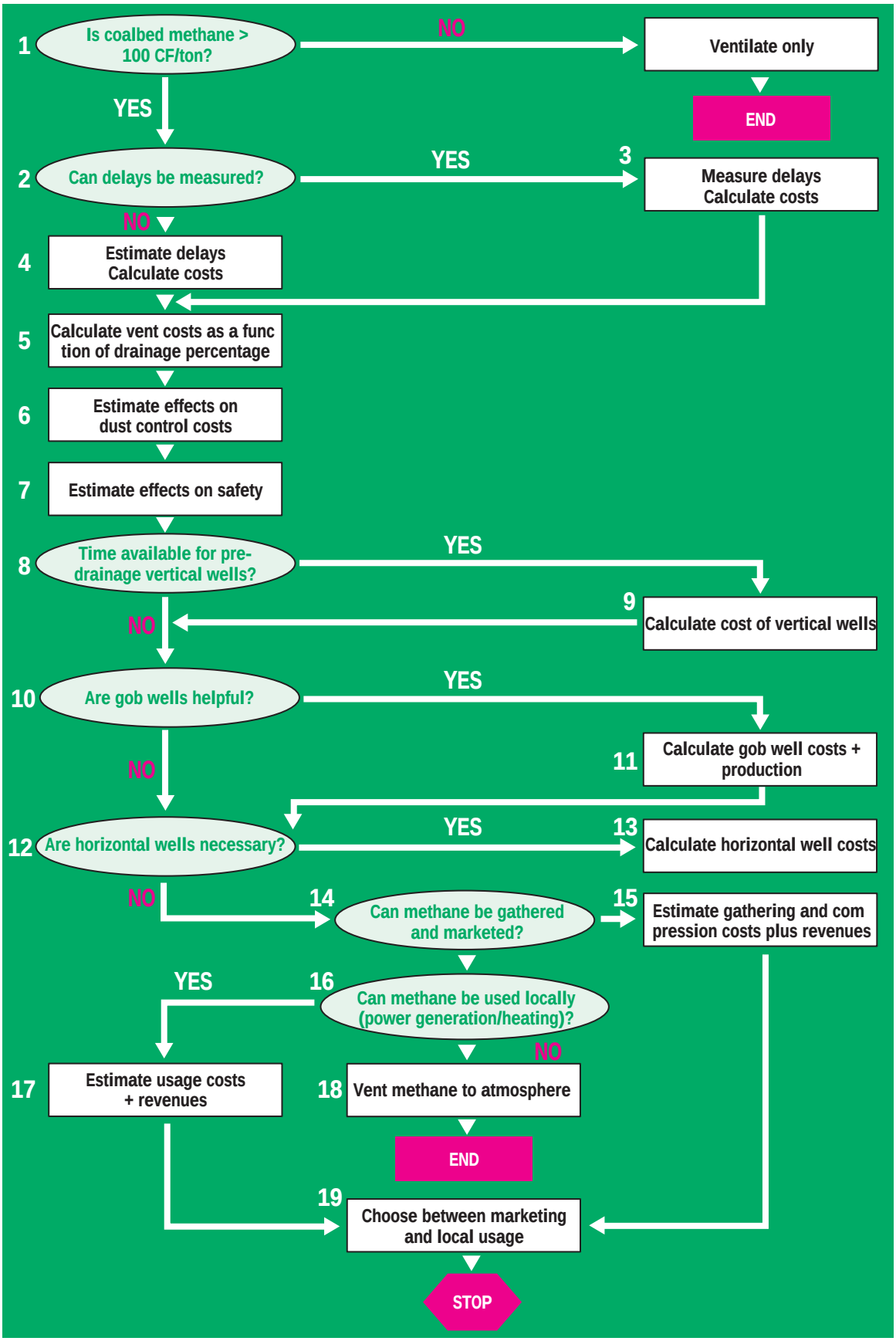


Figure 1.—Model for decision-making in coalbed methane projects.

about 10% to 18% of the methane is recovered from the drilled area. The gas quality is high and can be utilized as a pipeline product in most cases.

Cross-measure boreholes. Cross-measure boreholes are drilled at an angle to the strata, normally from existing mine openings. The boreholes are strategically placed above areas to be mined with the goal of predraining the strata in a manner similar to horizontal boreholes. The methane produced is generally of high quality. However, the return on investment of this method makes it suspect in most US mining situations. In most cases, mining companies will choose to use gob holes and/or horizontal holes to achieve a similar reduction in the methane released into the mine atmosphere.

Decision-making logic

Methane drainage systems are becoming increasingly productive as mines are placed in deeper seams and as techniques for methane recovery are improved. However, one must always consider whether or not methane drainage systems are economic in the overall sense, i.e., when all significant costs associated with the decision (drilling, collection, marketing, ventilation, production, safety, etc.) are considered. This paper defines the basic considerations in the decision-making process for an underground coal mine. The basic model outlines the economic structure of the decision and considers the costs and benefits if the methane is marketed and if the methane is vented to the atmosphere.

A basic logic model for decision making is outlined in Fig. 1. The model considers the mining-related variables first, followed by the gas production variables. Some of the logic steps can be ignored (assigned an economic benefit of zero) without affecting the decision process significantly. Information on the individual blocks in the decision model are outlined in Table 1, where the level of knowledge is assessed and references are provided for use of the reader. From Fig. 1 and Table 1, it can be seen that the mining blocks in the decision process are less thoroughly treated in the literature than the gas production variables. There are a number of reasons for this that are not important in this paper. The attempt here will be to provide the reader with as much general information as possible, first on the mining variables and then on the gas production variables.

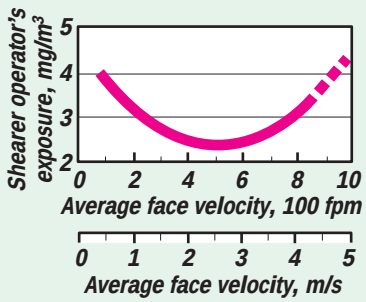
Table 1.—Comments and reference for block in the decision-making model (Fig. 1).

Block	Comments	References
1	Methane level is arbitrary	Anon., 1994; 1995 a
2	Obtain data from individual mine	
3, 4	Calculate based on Block 2	
	Relation between ventilation costs and drainage percentage	Aul and Ray, 1991; Kim and Mutmansky, 1990
	High air speed results in a high dust concentration	Breuer, 1972; Mundell, et al., 1979
7	High-level methane emission is hazardous to mining	Ely and Bertard, 1989; Mills and Stevenson, 1989
8	Decided by the time of developing a coal mine	
9	Investments on the vertical wells	Anon., 1990 a; 1990 b; 1991; 1992; 1995 b; Fraser, Peden and Kenworthy, 1991; Kuuskraa and Boyer, 1993; Rogers, 1994
10	Are gob wells helpful during mining?	Cervik, Garcia and Goodman, 1985; Diamond, 1995
11	The costs of gob wells	Kline, 1987; Niederhofer, 1987; Lambert, 1989; Hanby, 1991
12	Are horizontal wells useful?	
13	The costs of horizontal wells	Cervik, 1980; Cervik and Garcia, 1985; Baker, Garcia and Cervik, 1988
14	The concentration and the amount of methane drainage decides whether the methane can be marketed	
15	The methane can be marketed after being treated	Anon., 1995 b; Hanby, 1991
16	Determine if methane can be used locally	
17	Estimate benefits of using methane locally	Anon., 1995; Flaim, Hemphill and Chon, 1987
18	Decided by Block 16	
19	Decided by Block 15 and Block 17	

Mining-related costs and benefits. There are many mining benefits that accrue from a methane drainage system. Methane drainage systems can:

- enhance coal productivity because of less frequent downtime or production slowdowns caused by gas;
- lower fan operating costs resulting from reduced air requirements for methane dilution;
- reduce dust concentrations due to excessively high velocities at the working face;
- improve mine safety due to lower methane contents in the face, returns, gobs and bleeders; and improve worker comfort through reduction of velocities in the working faces.

Figure 2.—Shearer operator dust exposure vs. average face air velocity (Mundell et al., 1979)



Enhanced coal productivity is probably the most significant benefit to be obtained from methane predrainage systems where coal bed methane is encountered in significant quantities. The benefits come in the form of added production that occurs when downtimes are avoided. The value of such a benefit can be extremely large when you consider that the value of coal that comes off of a longwall in a shift averages about $80,000 to $100,000 for an average modern longwall. Any lost production due to gasouts results in a sizable cost (around $100 to $200/min. of downtime in this case). The significance of this cost can be realized when it is considered that downtimes of up to 11,000 min./month for a single longwall have been reported in the literature (Auf and Ray, 1991) and that many longwalls will experience slowdowns as well as times where the longwall is completely down due to the methane. The economic benefit of having a methane drainage system will thus be substantial in such a case. This will ordinarily be the most significant mining-related economic benefit of a drainage system. To determine these benefits, a mining company must measure its production losses due to methane and calculate its downtime opportunity costs.

The power costs associated with the mine ventilation system will ordinarily be the second most significant benefit associated with the addition of a methane drainage effort. Several papers have outlined costs associated with ventilating high-methane mines (Mills and Stevenson, 1989; Kim and Mutmansky, 1990; Aul and Ray, 1991). In many mines, ventilation to ensure continuous production is quite expensive and methane drainage would normally be used instead of increased production because the overall costs associated with drainage will be much lower than the costs associated with ventilation. One of the references (Auf and Ray, 1991) cites situations where a drainage system reduced the ventilation requirements for methane dilution to about half, thus greatly reducing the ventilation power costs. Kim and Mutmansky (1990) performed ventilation analyses to determine power cost savings over a 20-year mine lifetime for several scenarios. One conclusion was that a mine with 12.5 m^3/t (400 cu ft/st) of methane using vertical wells to reduce its ventilation quantities can reduce its power cost an estimated $11 million over 20 years. An additional estimated $3 million in ventilation power costs can be saved if horizontal holes were used in addition to vertical holes in the same mine. Actual costs will of course be a function of the mine size, the ventilation plan, the electrical power costs, and the actual air quantities saved in a particular mine ventilation network.

Another important issue in assessing the costs and benefits associated with mining is the possibility that a reduction in the ventilation requirements will result in a reduced requirement for development openings. In a longwall mining operation, the coal produced from development openings will be much more costly than that produced in a longwall panel. These can be significant, as shown in previous studies (Kim and Mutmansky, 1990). These benefits may not occur in all mines. They occur only if the number of openings can be reduced as a result of the decreased air quantities. In Fig. 1, it is assumed that the savings in development costs are calculated and included in the Block 5 costs and benefits.

Other mining-related costs and benefits are not as easy to measure. For example, the reductions in dust levels may be significant if the ventilation on a longwall is reduced from about 47 m^3/s (100,000 cfm) to 24 m^3/s (50,000 cfm). This results in the air velocity being reduced from about 10 m/s (2,000 fpm) to 5 m/s (1,000 fpm) at the worst position along the face. Previous measurements by Mundell et al. (1980) indicate that the dust concentrations at a longwall face normally rise if the air velocity increases above 4 m/s (800 fpm), as shown in Fig. 2. This will result in added costs for dust controls, additional dust sampling and less comfortable work conditions. However, obtaining a reliable estimate of this cost will often be quite difficult. The curve shown in Fig. 2 may not be accurate for today's longwalls due to better dust-control technology. In addition, relating the dust concentrations and costs are also a problematic step. Thus, costs and benefits of a degasification project in this area may be quite difficult to obtain.

The benefits of safety and comfort of the workers are other variables where costs will be difficult to estimate. It is without question that the safety and comfort of workers will often be enhanced when ventilation quantities are reduced on a given working face. However, placing economic benefits on these variables will be difficult for most companies without an

Table 2.—Range of costs for coalbed methane drainage methods.

Drainage method		Expenditure item	Cost ($/well)	References
		Geological, geophysical and aquisition	20,000-30,000	Logan, Clark and McBane, 1987; Zuber, Kuuskraa and Sawyer, 1990; Fraser, Peden and Kenworthy, 1991; Kuuskraa and Boyer, 1993; Rogers, 1994
		Well drilling and completion	110,000-300,000	
		Lease equipment, including gas gathering	60,000-120,000	
Vertical wells	Investment	Water disposal system	40,000-50,000	
		Well stimulation	60,000-80,000	
		Engineering and general and administrative	30,000-100,000	
		Total	320,000-640,000	
	Operating Cost 20,000-40,000 ($/yr)			
		Project planning, surveying and mapping, surface rights	17,900-31,000	Kline, Mokwa and Blankenship, 1987; Niederhofer and Lambert, 1987; Baker, Garcia and Cervik, 1988; Lambert, 1989; Hanby, 1991
		Site and road preparation	56,000-122,000	
Gob wells	Investment	Well drilling and completion	112,000-182,000	
		Lease equipment	72,000-120,000	
		Supervision, office and general overhead	50,000-80,000	
		Total	307,900-535,000	
	Operating Cost 20,000-40,000 ($/yr)			
Horizontal borehole	Investment	Cost per unit length	33-66 ($/m) 10-20 ($/ft)	Baker, 1988; Kim and Mutmansky, 1990; Kravitz, 1996
Cross-measure borehole	Investment	Cost per unit length	125-184 ($/m) 38-56 ($/ft)	
	Operating cost 105,000-640,000 ($/yr/project)			

Note: Costs reflect the range for three major coal bed basins in the continental United States.

extensive and complicated evaluation effort.

Gas production costs and benefits

The decision to implement a gas drainage system is a major one for any underground coal mine. The amount of the capital investment to initiate a drainage program is considerable, and only two possibilities will ordinarily make the decision a simple one: the lack of ability to readily operate the mine as a result of the high methane content or a favorable opportunity to market the gas. However, the operation of a gas drainage system may be of interest even if neither of the previous two conditions is evident. The production benefits alone can make a drainage project economically viable if the gas ever disrupts the production significantly. In addition, local uses for the gas as a heat source may increase the usefulness of a gas drainage project.

When considering the possible use of a methane drainage system, the mining company must consider the capital and operating costs of the drainage system and the possibility of marketing the gas. Fortunately, significantly more economic data is available in the public domain on gas-well-related expense than is available on the mining-related costs. As a result, the information available for dealing with Blocks 8 through 10 in Fig.1 of the economic model will be more plentiful than information dealing with mining-related costs in Blocks 1 through 7. The information in Table 1 will provide references useful in analyzing the economic viability of a gas drainage project. However, some useful general information on both capital and operating costs is provided in Table 2.

The sources of this data are the more than 6,000 wells that were producing methane and that were drilled between 1985 and 1994. The San Juan end Warrier Basins were the primary locations of these wells, though many have also been drilled in the Appalachian region. Many of these wells were placed into operation to take advantage of the Section 29 (Unconventional Fuels Tax Credit) incentives placed on coal bed methane operations. These tax credits resulted in a tremendous surge in coal bed

methane wells being drilled prior to the end of the incentives in 1992. However, the economics of coal bed methane operations has been so favorable that many wells are still being drilled with positive economic benefits even without the tax credits. This is the result of increased knowledge of coal bed methane technology and recognition of the many economic benefits of coal bed methane utilization.

In determining coal bed methane drainage costs, both capital and operating costs must be estimated. The capital investment costs include development costs, site preparation, surface equipment, drilling equipment, borehole drilling, supervision, office costs and overhead. However, these various categories of costs will be quite different based upon whether the drainage operations are performed underground or on the surface. In addition, both the drilling equipment and the drilling operations themselves will differ significantly from surface to underground. The underground use of horizontal or cross-measure boreholes will normally require vertical boreholes to remove the methane in pipelines from the underground workings plus the laying and maintenance of the underground gas gathering lines. These underground systems will also require that the drillers be properly trained in the techniques of drilling and in safe drilling and operating procedures in an underground mine.

The greatest difficulty in the gas gathering part of the model will usually be the evaluation of the blocks in the model that pertain to local uses for the methane and the marketing through conventional gas distribution companies. The benefits to be gained from the gas must therefore be evaluated individually for each case with the localized uses and general marketing benefits evaluated based upon the existence of gas lines, the current market for gas and the potential uses on a local basis. Mining companies can utilize the gas for running compressors, for heating in thermal dryers, for the heating of buildings, for heating intake air in winter conditions and for other energy-replacement opportunities.

Summary and conclusions

The decisions to be made in adopting a degasification project in an underground mine are often quite complicated. They involve developing cost estimates of both the mining-related and the gas gathering costs and benefits. The degasification industry is currently advancing rapidly with increasing numbers of mines involved in the degasification process and the related endeavors of marketing the gas. However, many mining companies have not carefully analyzed their own needs or the opportunity to realize the economic, safety and energy advantages that can come from a methane harvesting operation.

This paper has attempted to provide a basic decision-making model to help in analyzing degasification procedures. The orientation of the model is toward the possible use of vertical, gob and horizontal holes in the coal seam. The model is general in structure, which does not enable an analyst to make the decisions required without gathering more data. However, it does provide references to aid in that effort. In achieving conclusions related to the adoption of coal bed methane-reduction processes in underground coal mines, both the logic presented in this paper and the analysis of the general trends in the coal bed methane industry have been utilized. Both types of conclusions are presented here to help mining company personnel in their decision-making with regard to degasification.

The following conclusions were achieved:

- Coal bed methane projects are now being undertaken economically, even though tax incentives are no longer available. While the number of degas wells being drilled has slowed since the end of incentives, the economics are still favorable in many mining situations.
- Mining-related costs and benefits of methane degasification are not readily available in the technical literature. However, the production and development costs can be calculated relatively easily by mine technical personnel.
- The economic benefits of reducing production delays and reducing the requirements for development openings are the most substantial benefits for most operating coal mines. Mines should develop procedures for assessing these economic factors for every underground mine that will encounter significant methane.
- Dust and safety benefits achieved using methane drainage operations are normally difficult to calculate. However, they can be ignored without seriously affecting the overall analysis of benefits to be had from degasification.
- Data related to gas-well drilling and gas-gathering costs are relatively easy to find with many sources of information in the public domain. This work is often contracted out to commercial entities in the drilling and gas industry.
- The ability to find a commercial buyer for methane produced during degasification is a major benefit in the overall economics of a methane-drainage project. This ability can make or break a project.
- The economics of marketing must be worked out for each individual project. Information on the economics of marketing is usually available from companies involved in the drilling and gas-distribution industries.

Methane drainage operations are often overlooked by mining companies because of intense competition

in the coal marketplace and the general scarcity of long-term coal contracts. However, the economics of coal bed methane should be worked out for every underground mine that has any significant amount of methane.

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10

Plain language about shiftwork

Part 2 of 2
Improving shiftwork through the organization

Work schedule design

There are few laws or regulations governing work hours or work scheduling in the U.S. The federal government has placed a 10-hour limit on the length of time a long-haul trucker can drive each day. There also are federal regulations governing flight time and rest time for commercial airline pilots. Various state laws establish rules for overtime pay and child labor. Other than these regulations, the law does little to guide design of a work schedule to reduce stress or fatigue. Nevertheless, research has suggested that work schedules can be improved. Older, poorly designed work schedules might even be dangerous because new technologies can change both the physical and mental demands placed on a worker. A well-designed work schedule can improve health and safety, worker satisfaction, and productivity. Therefore, a good work schedule is an advantage for both the organization and the worker.

Changing a schedule is not easily done and must be handled carefully. Designing a work schedule has a large and immediate impact on all workers. All people on the job must abide by the work hours, or they will lose their jobs. Also, working hours affect how people arrange the rest of their lives. So any time a work schedule is changed, many aspects of job life and home life must be considered. It is recommended that any work schedule change should first be temporary and evaluated carefully. The benefits of the change must outweigh the possible negative aspects. If it really is a change for the better, then it can be established on a permanent basis. Because such a change is complex, it is a good idea to consult *ergonomics, or human factors,* specialists for help in work schedule design and evaluation.

Shown below are some possibili ties that the organization could consider to improve a shiftwork schedule. Given the limited amount of knowledge and research at this time, these should be considered as suggestions and not as strict guidelines or regulations. Remember, all aspects of job and home life must be considered when changing a work schedule. Some suggestions may be useful in a particular work situation, and some may not.

Improving shiftwork schedules
- Avoid permanent (fixed or non-rotating) night shift.
- Keep consecutive night shifts to a minimum.
- Avoid quick shift changes.
- Plan some free weekends.
- Avoid several days of work followed by four- to seven-day “mini-vacations.
- Keep long work shifts and overtime to a minimum.
- Consider different lengths for shifts.
- Examine start-end times.
- Keep the schedule regular and predictable.
- Examine rest breaks.

Consider alternatives to permanent (fixed or non-rotating) night shift: Most workers never really get used to night shift because they go back to a daytime schedule on their days off. Also, some workers on fixed night shifts lose contact with management and the rest of the workers in the organization. They may end up feeling too isolated or somehow “different” from the rest of the workers. This could make communication difficult. If possible, consider a rotating night shift schedule, but take measures to ease the burdens often experienced in the typical weekly shift rotation. Some suggestions for making rotation less taxing are given below. We realize, however, that permanent night shift sometimes is the only choice, such as in a nighttime security guard job.

Keep consecutive night shifts to a minimum: Some researchers suggest that only 2 to 4 nights in a row should be worked before a couple of days off. This keeps circadian rhythms from being overly disturbed and limits sleep loss.

Avoid quick shift changes: A break of only seven to ten hours should be avoided before rotating to a new shift, such as going from morning to night shift on the same day of the week. With so quick a change, it is difficult to get much rest before going back to work. On return to work after a quick change, most people are very tired and sleepy. At the end of a night shift, at least 24 hours are recommended before rotating to another shift. Some researchers even suggest that 48 hours should be the minimum between shifts.

Plan some free weekends: If a seven-days-per-week schedule is required, allow one or two full weekends off each month. Loss of contact with friends and family is a major problem for shiftworkers. Weekends are the best time to meet family and friends who are on a day schedule.

Avoid several days of work

followed by four- to seven-day "mini-vacations": Working several days in a row followed by several days off can be very fatiguing. For example, some schedules require 10 to 14 days of work followed by five to seven days off. Frequent 'mini-vacations' are well liked by some workers, especially younger ones. However, older workers find it difficult to recover during the mini-vacations before they return to another long spell of work. Poor recovery from fatigue can produce accidents and damage health. A long work spell should be used only when there is no other choice, such as when long travel distances are required to do the work (e.g., mining or oil exploration).

Keep long work shifts and overtime to a minimum: Extra work hours add to fatigue. They also allow less rest time per day. If 12-hour shifts are used, two or three 12-hour shifts in a row should be the maximum. Two in a row is probably best for night shift. One or two days off should follow these night shifts.

Consider different lengths for shifts: Try adjusting shift length to the workload. Heavy physical or mental work or monotonous boring work is especially difficult at night. Maybe night shifts could be shorter. If possible, move heavy work to shorter shifts and lighter work to longer shifts.

Examine start-end times: Flexible start-end times, or "flextime," can be useful for those with child care needs or a long commute time. Consider moving shift start-end times away from rush hour. Morning shifts should not start too early (5 to 6 a.m.) because night sleep often is cut short before an early shift.

Keep the schedule regular and predictable: Workers should know their schedule well ahead of time, so they can plan their rest, child care, and contact with family and friends. Studies of train accidents showed that very irregular schedules contributed to the accidents by producing sleep loss and fatigue.

Examine rest breaks: Sometimes the standard lunch and coffee break are not enough to recover from fatigue. For example, card dealers in gambling casinos get a 10 to 15 minute break every hour because their jobs require so much concentration. If their concentration is low, it is easier for a player to cheat at cards, and the casino will lose money. In jobs requiring repetitive physical work, brief rest breaks each hour seem to be best for recovery from muscle fatigue.

Workload distribution

In some jobs, it might be possible to schedule heavy or demanding work at times when workers are most alert or at peak performance. We mentioned that the afternoon and early evening hours are times of peak performance. If possible, avoid doing the heaviest or most dangerous work in the middle of the night or early morning hours. This is the time when circadian rhythms are low, and sleepiness is high. Especially avoid heavy or dangerous work if the worker is at the end of a 12-hour shift in the early morning hours. Extra fatigue from long work hours can combine with early morning sleepiness to increase accident risk.

Work environment

Poor working conditions add to the strain of shiftwork. Adequate lighting, clean air, proper heat and air conditioning, and reduced noise will avoid adding to the shiftworker's burden. Shiftworkers also may be particularly sensitive to toxic substances because circadian rhythm changes make the body more sensitive to toxic exposure at certain times of day. Workers also should have access to hot and nutritious meals during evening and night shifts. If a cafeteria is not available, a microwave will allow workers to warm meals brought from home or bought from vending machines.

Electronic monitoring

Modern computer technology makes it possible to check a worker's performance every minute of the day. Some people have suggested that a monitoring or test system could be used to check a worker for dangerous levels of fatigue. There are performance tests on the market that claim to test fatigue or determine whether the worker is using drugs. However, many of them have not been tested scientifically, so we cannot recommend them at this time.

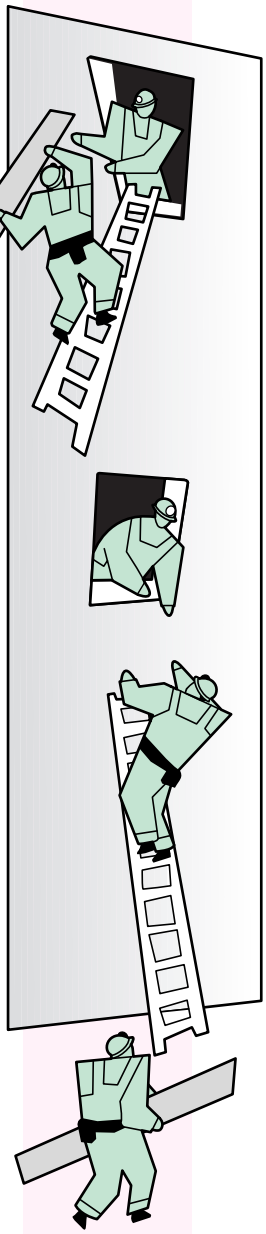
Some computer systems actually measure worker output or productiv ity. For example, a computer might measure the number of times a worker taps a keyboard or how many phone calls are completed in an hour. If a worker slows down too much, it could be a sign of fatigue. It may be possible to use this system as a fatigue test. But this is tricky business. The feeling of being watched constantly can be very stressful to workers. (Big brother is watching you.) It can make workers feel they have no control over their jobs. We suggest that computer monitoring be used only when the workers themselves choose it for safety purposes.

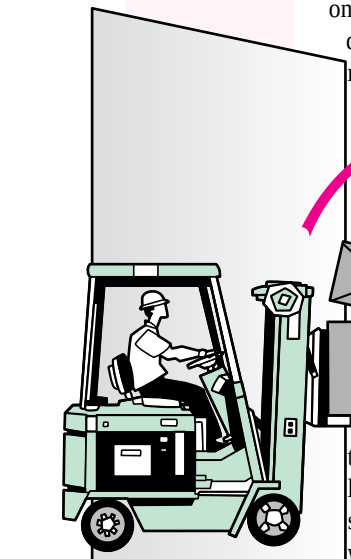
Access to health care and counseling

Often, going to one's health clinic or to personal or marriage counseling is not possible in the evening or at night. Expanded access to these services will help improve shiftworkers, physical and mental health and boost morale. If services are not available within the organization, a directory of community health and counseling facilities with expanded hours could be provided.

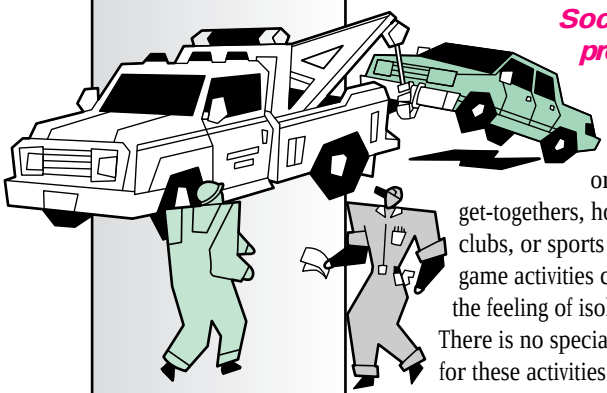
Training/awareness programs

Meetings to make all workers aware of the ups and downs of shiftwork can be useful, especially for new shiftworkers. It is important to invite family members



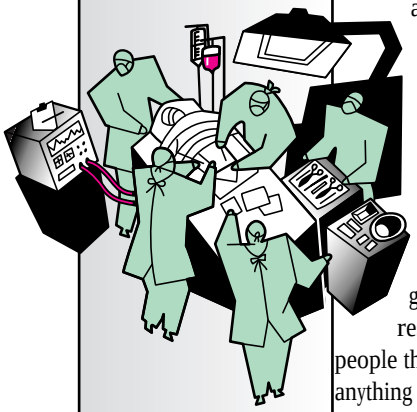


to these meetings so they can know what to expect from the shiftworker. Use the meetings to share information on all issues mentioned in this document and in the recommended reading. Talking about personal experiences also is very valuable in these types of meetings. If people are having trouble adapting to shiftwork, it is important they know they are not alone. They might learn some tricks from other workers that could make their job life easier. The family will learn just how tough the work schedule can he. It will help to know when to go easy on the worker because of the schedule.



Social programs

A little extra effort at organizing get-togethers, hobby clubs, or sports and game activities can lessen the feeling of isolation. There is no special reason for these activities to take place only in the day or evening. For example, nighttime or early morning bowling leagues are available in some places.



Coping strategies for the individual

Getting enough good sleep

Take responsibility for getting enough sleep to feel rested and restored. For some people this happens without doing anything special. However, most shiftworkers need to become more aware of what to do to get satisfying sleep and when to do it.

When to Sleep after Night Shift: This depends on the individual. Try different times and see what works best for you. As you experi ment with different sleep times, keep a written record of when you go to sleep, when you wake up, and how rested you feel. This will he]p you identify which sleep schedule works best for you.

Some workers like to sleep in one longer period, but many workers need two shorter sleep periods to get enough sleep after the night shift. It is a good idea to go to bed as early as possible after the night shift in order to maximize sleep. A second sleep also could be taken in the afternoon to get ready for night shift. Try taking advantage of the natural tendency to be sleepy in mid-afternoon. You might get your most satisfying sleep at that time.

Does Rest Equal Sleep? Just resting without sleep is not enough. The brain has to have sleep, or you will be sleepy later in the day or during night shift. However, rest without sleep still is valuable for body and muscle recovery. Schedule at least seven hours in bed, even if you don't sleep the whole time.

What is the Minimum Amount of Sleep? The vast majority of workers need ***at least six hours of sleep but most need more than this***. Most people do not feel refreshed and at their best with just six hours. Staying with your own preferred amount of sleep is best in the long run. You might find that you need less as you become more experienced with shiftwork.

Switching Back to Days: When switching back to days after the night shift, it is best to get most of your sleep the following night. Sleep just a couple of hours shortly after night shift to shake off sleepiness. Then stay awake all day and go to sleep at your regular bedtime at night.

Napping: Shiftworkers frequently nap, especially when working night shift. Added to your regular sleep, a short afternoon or evening nap will help fight sleepiness during the night. However, napping is not long enough to replace regular sleep. If you nap, allow enough time for drowsiness to wear off before starting work. If you have time to nap at work during your break, don't make the nap too short. A nap of 15 minutes or less might actually make you more sleepy. Twenty to 30 minutes should be the minimum for a nap during a work break. Again, allow enough time for drowsiness to wear off before doing hazardous work. And don't use work-break naps to replace your sleep at home. Naps work best when they are extra sleep time. They don't work as well when you are trying to make up for lost sleep.

Protect sleep

Block Out Noise: Switch off the phone and disconnect the doorbell. Use ear plugs. Ask the family to use headphones for the stereo or TV. Set strict times for noisy activity, such as vacuuming, clothes washing, or children playing. Don't allow these activities during your sleep times. Locate your bedroom in the quietest place. If possible, get away from outside noise and also away from the kitchen or bathroom. Soundproof the bedroom with insulation and heavy curtains. Put signs out to say you are sleeping. Tell friends and neighbors when not to call.

Keep a Regular Sleep Routine: Make the bedroom as dark as possible. Always sleep in the bedroom. Follow your regular bedtime routine every time you go to sleep. For example, wash up and brush your teeth so you feel comfortable. This can serve as a signal to your body that it is time to sleep. Don't use the bed for anything except what it is intended for. For example, don't read, eat, watch TV, write bills, or argue with your spouse in bed. Make sure you have a comfortable bed that won't disturb your sleep.

Avoid Heavy Foods and Alcohol Before Sleep: Heavy, greasy foods are anti-sleep because of stomach upsets. If you must eat, a light snack won't disturb your sleep. Alcohol might make you feel sleepy, but it will wake you up too quickly after falling asleep. Don't drink alcohol in the hour or two before sleep.

Exercise

In general, keeping physically fit helps resist stress and illness. Regular exercise also keeps a person from becoming tired too quickly. A big question for the shiftworker is when to exercise. The timing of exercise is important, so that it does not make a person too tired to work. Exercise also should not interfere with sleep. If a worker does physical labor, too much exercise before work might make work too tiring. Twenty minutes of aerobic exercise before work (for example, a brisk walk, bike ride, jog, or swim) is enough to help any worker wake up and get going and also keep the heart in shape. Try to avoid exercise in the three hours before sleep. Exercise tends to activate the body or wake it up. This might make it difficult to fall asleep.

The timing of exercise also might help a person rotate from one shift to another. Since brisk exercising activates the body to produce energy, it also might help the body rhythm shift to the new work time. Try exercise before going on shift. Early morning exercise is good for day shift, afternoon exercise is good for evening shift, and early evening exercise is good for night shift. Don't overdo it or you will be too exhausted to work.

Relaxation techniques

Being able to wind down and take it easy is just as important as being able to wake up and get going. Give yourself time to relax and get rid of work-time stresses. This will make home life and sleep easier. Find out what is best for you personally to help you relax best. It could be just sitting down and closing your eyes for a while. Or it could be meditating, praying, reading, taking a bath, or watching TV.

The following simple exercise may help you start your quiet relaxation time. Try lying down on the carpet or bed, or sitting in an easy chair. One by one, slowly tense each muscle group in your body, then slowly let them relax. Do this for your arms, legs, stomach, neck, and face muscles. Breath deeply during this exercise and go slowly. Try to feel all the muscle tension draining away from your body. This is a simple way to let go of all the stresses of the day and to slow down.

Diet

TV and the newspapers have highlighted diets recommending certain foods to help people wake up and other foods to help them relax. Right now we cannot recommend either diet for the shiftworker. There have not been enough scientific tests to decide whether either diet really helps a person wake up or relax. In some cases the two diets recommend the same kinds of foods to do opposite things: one diet recommends eating protein to wake up, while the other diet recommends eating protein to relax or become sleepy. This conflict makes it even more difficult to decide whether either diet really works. There simply are not enough studies of people using these diets to be able to recommend them.

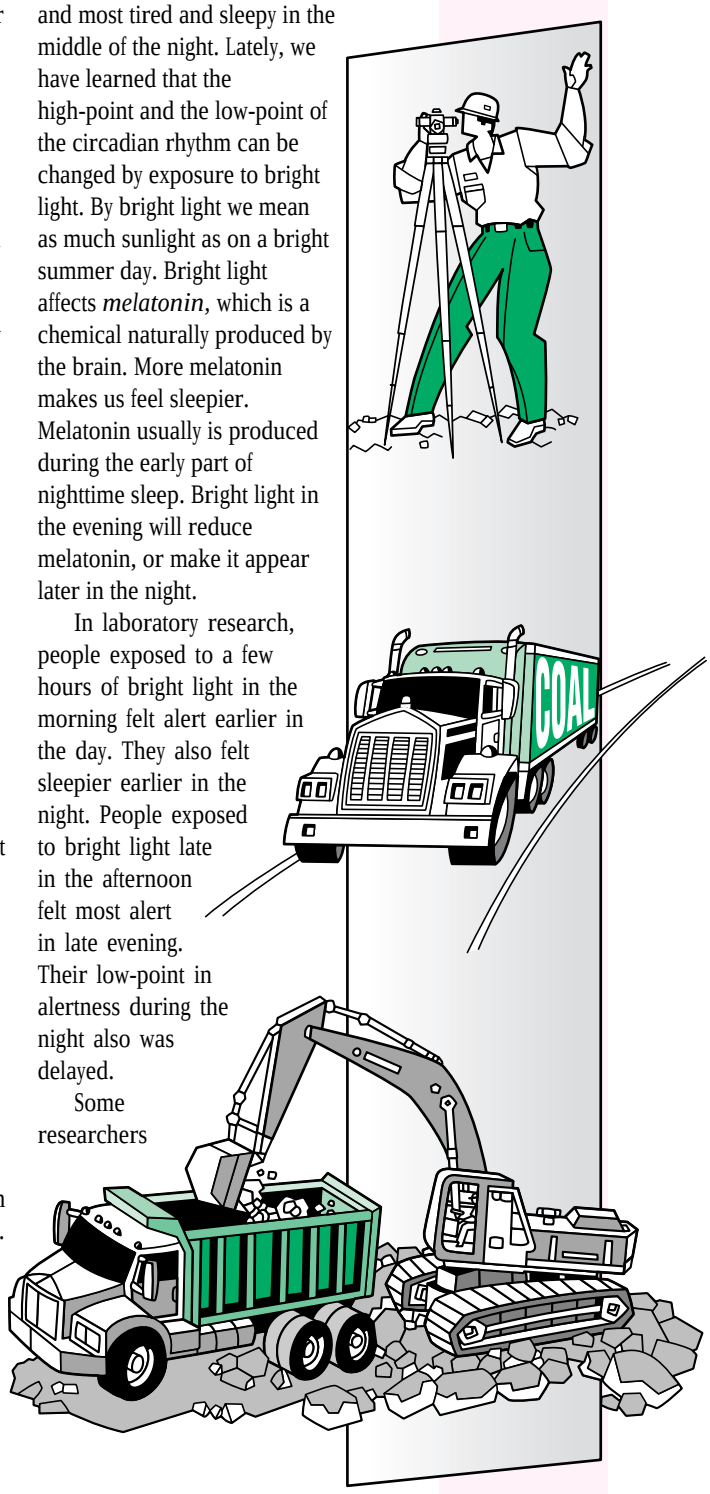
We can recommend sticking to a diet that, along with exercise, helps a person stay physically fit. This means avoiding fatty and sugary foods, which make a person gain too much weight. Heavy or fatty meals should be avoided especially in the middle of the night because they are the most difficult to digest at that time. Eating lighter meals in the middle of the night helps reduce stomach upsets.

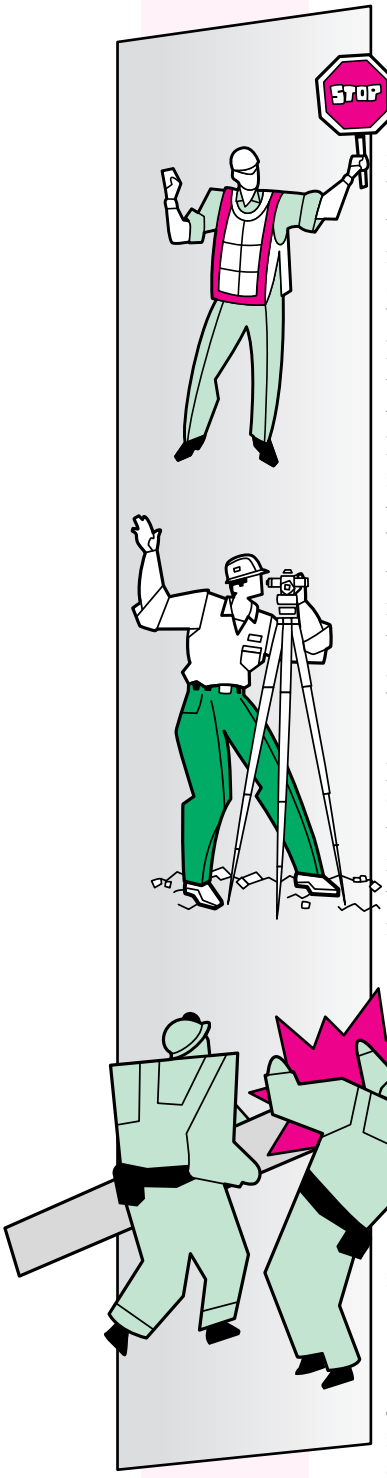
Bright light

Recent research tells us that bright light can affect our circadian rhythm. As we mentioned already, the circadian rhythm normally makes us feel most active and alert in the late afternoon, and most tired and sleepy in the middle of the night. Lately, we have learned that the high-point and the low-point of the circadian rhythm can be changed by exposure to bright light. By bright light we mean as much sunlight as on a bright summer day. Bright light affects *melatonin*, which is a chemical naturally produced by the brain. More melatonin makes us feel sleepier. Melatonin usually is produced during the early part of nighttime sleep. Bright light in the evening will reduce melatonin, or make it appear later in the night.

In laboratory research, people exposed to a few hours of bright light in the morning felt alert earlier in the day. They also felt sleepier earlier in the night. People exposed to bright light late in the afternoon felt most alert in late evening. Their low-point in alertness during the night also was delayed.

Some researchers





have suggested that exposure to bright light could control the alertness of shiftworkers. The well-timed exposure of a worker to bright light could quickly increase alertness at night. After exposure to more bright light, they then could quickly switch back to being alert during the day. Right now, we see this as a promising idea that needs more work to be practical. Unlike use of drugs, it appears that there are no bad side effects from controlling bright light exposure. Still, workers have to be careful about using bright light, so that they will be alert at the right time. For bright light to work, a worker also must stay in low light or in darkness during some times of day. In other words, if you get too much bright light at the wrong time, this might change the circadian rhythm in the wrong direction. If this happens, you won't be alert at the times you really need to be.

To sum up, we think it is possible to use bright light to change peak alertness to different times of the day. But right now, it takes an expert to work out the right light-dark schedule to fit a particular work schedule. If workers are exposed to bright light and low light at the wrong times, they might end up moving their circadian rhythm in the wrong direction. Using this strategy requires a lot of careful effort from the worker. This might make it too impractical for some shiftworkers.

Caffeine, alcohol, and other drugs

Just like many people in our society, some shiftworkers drink caffeinated beverages as a pick-me-up before or during work. They also might drink alcoholic beverages to relax or to be social. Other types of drugs, such as amphetamines and sleeping pills, also have been used to help people wake up or relax and go to sleep. Here we discuss these substances and whether we can recommend them at this time.

Caffeine: Caffeine is a mild stimulant that helps a person feel more alert and perhaps perform better. Caffeine is the most widely used drug in the world. It is a natural ingredient in coffee and tea (iced tea too!), and it is added to many soft drinks (for example, most colas, some root beers, Dr. Pepper, and Mountain Dew). Caffeinated beverages are a common part of our everyday diet and are easily available.

Because of this, caffeine is used more than any other drug to maintain alertness and performance, or to help fight off sleepiness. Research backs up our everyday experience. There are many studies that show caffeine does help maintain alertness and performance. Research also tells us that caffeine is a fairly safe drug if used in small doses. By a small dose, we mean one to three cups of coffee or tea, or one to three soft drinks per day.

In small doses, caffeine is the only drug we can recommend as an aid for the shiftworker. If you drink caffeinated beverages, do so before the shift or early in the shift. Try to avoid caffeine late in the shift, especially late in the night shift. Too much caffeine, or caffeine late in the shift, makes it difficult to fall asleep after the shift. If you do get to sleep, caffeine makes sleep lighter and less satisfying. So don't drink too much and don't drink late in the shift.

If you now are drinking a lot of caffeine (say five to six cups of coffee every day), we recommend that you cut down. Cutting down may make relaxation easier and might improve sleep. Reduce caffeine use gradually over several days. Cut down only by one-half cup or one cup every couple of days. Cutting down too fast could produce headaches, nervousness, and bad moods or irritable feelings.

Amphetamines, Diet Pills, "Uppers": These types of drugs are very strong stimulants that increase alertness and can eliminate sleep all together. Unfortunately, they are too strong and cannot be recommended. Most of these drugs are either illegal or can be obtained only by prescrip tion. It is too easy to become addicted to these drugs. A worker might end up using them every day just to get going. Also, over the long run a person has to take more and more of these drugs just to make them continue to work. This increases the possibility of becoming addicted. Frequent use produces extreme nervousness and mood changes, and performance actually becomes worse.

Alcohol: One or two alcoholic drinks per day, taken with food, is OK for relaxation and to be social. By one drink, we mean eight to twelve ounces of beer, four to six ounces of wine, or one ounce of hard liquor. However, we recommend avoiding alcohol during work time, even during meal breaks. Also, we do not recommend using alcohol to help sleep. Alcohol can make a person sleepy, so *falling* asleep is easy. But, alcohol actually disturbs sleep. After drinking alcohol, a person wakes up more frequently and sleeps more lightly. Alcohol can also reduce sleep so a person doesn't sleep as long as they want or need to. Avoid alcohol for one to two hours before sleep, especially if you have to go to work after sleeping.

Sleeping Pills: These drugs can be divided into prescription and nonprescription (over-the-counter) types. Nonprescription sleeping pills usually contain the same drug used in allergy and sinus medicines. Nonprescription drugs sometimes make a person drowsy and help them fall asleep. However, most are fairly long acting, which means that the

user can still feel drowsy after waking up. If used often (e.g., more than once or twice per week), nonprescription pills usually stop working and fail to make a person drowsy.

Prescription sleeping pills work pretty well to help a person fall asleep and stay asleep, even during the daytime. However, we cannot recom mend regular use (e.g., more than once or twice per week) because there is no research on shiftworkers and long-term use of sleeping pills. It probably is not a good idea for shiftworkers to use sleeping pills every time they want to sleep during the day. For some people, it is too easy to become dependent on sleeping pills. They might end up using them every time they have to sleep. When this happens, they become nervous or irritable if they run out of pills. Also, some long-acting sleeping pills produce too much drowsiness after waking from sleep. This is less of a problem with the newer, short-acting sleeping pills. However, before considering prescrip tion drugs, we recommend trying the other techniques for improving sleep. If all else fails and there still are problems with sleep, the worker should discuss taking prescription sleeping pills with his or her doctor.

Melatonin: As we mentioned already, melatonin is produced naturally by the brain at certain times of the day. The timing of the brain's melatonin production can be controlled by bright light. Melatonin also can be taken as a drug. Taken this way, melatonin makes a person feel sleepy. So it might help improve daytime sleep for the shiftworker.

Melatonin often is sold in health food stores and can be bought without a prescription. However, we cannot recommend melatonin for regular use by the shiftworker until more research is conducted. We need to find out how much melatonin should be taken. We need to learn the best time to take melatonin for a particular work shift. We also need to know if taking too much can damage your health. If taken too often, melatonin could create unknown problems. Also, the different brands of melatonin sold in stores might have different strengths or potency. So, we don't know whether taking one amount of one brand works as well as taking the same amount of another brand. Right now, we will have to take a wait-and-see attitude about melatonin until more research is done.

Reprinted from the NIOSH booklet Plain Language About Shiftwork, published July 1997.

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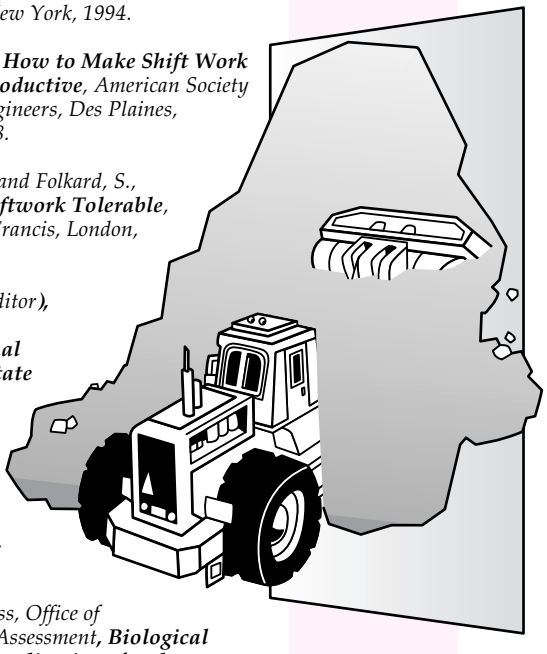


Two dirt-bike riders killed at sand pit

Two men riding off-road motorcycles were killed March 29 after the vehicles slammed into each other in a sand and gravel pit in southern New Jersey.

The two men, both in their mid-twenties, were riding their bikes at an open pit mine when the crash occurred, said Voorhees police Capt. John Prettyman.

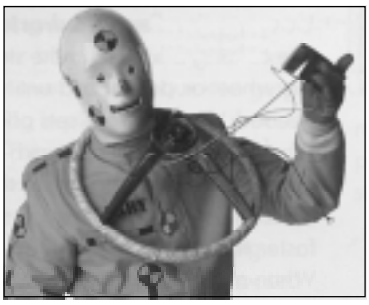
"Apparently, they weren't able to see each other," Prettyman said. "One of them was going south, the other guy heading west. It was a right-angle situation."

One was pronounced dead at the scene. The other victim died after he was taken to the hospital. Both died of blunt trauma with multiple injuries.

Voorhees police have had problems with trespassing at the 500-acre mine for years, and there have been other accidents in the mine, but no fatalities. Prettyman said the police get called to the site at least once a weekend to chase away motorcycle and dirt-bike riders. He also noted that the police had been called earlier that day to chase off trespassers.

"Unfortunately, once a patrol car goes in, they take off in all different directions," Prettyman said. "They take the trails and go off to wooded areas where patrol cars can't go. The police cars simply aren't capable of going after them." He added that the company has put up fences around the property, but they are quickly knocked down.

*Reprinted from the April 3, 1998 edition of **Mine Safety and Health News**.*



Vince and Larry on belts and bags

Hi! We're "Vince and Larry" and we've been on the road for a long time trying to convince humans about the importance of safety belts and air bags. We're crash dummies for the National Highway Traffic Safety Administration, but we're smarter than you think.

Vince: **I've been in the business for more than 20 years. I graduated from the School of Hard Knocks with very high marks—skid marks. Larry is fresh out of Notre Dumb where he was a Road Scholar.**

We love our job of going through windshields and eating dashboards to demonstrate how safety belts and air bags make a difference. We'd give an arm and a leg (and usually do) to convince even one person to buckle up.

Since many of you don't know about safety belts, air bags, and automatic belts, let us give you a "crash course" Here are five important lessons to learn:

Lesson one:

Motor vehicle crashes are the number one killer of Americans under the age of 34. Every 22 minutes someone is killed in a crash and every 2 minutes a crash injures someone severely enough to require hospital treatment.

Lesson two:

Use safety belts on every trip. If your car has an air bag, you get added protection. The best way to protect yourself is to have an air bag and use your safety belts—the winning combination.

Lesson three:

People who ride unrestrained will be tossed around inside the vehicle or ejected during a crash. At 30 mph, a 150-pound person who is not buckled in will crash into the steering wheel or dashboard with a force of more than two tons. But, when you use your safety belts properly, you significantly improve your chances of escaping injury or death.

Lesson four:

Safety belts and air bags absorb some crash forces and spread the remaining ones over the relatively strong portions of the body. The safety belts also keep you inside the vehicle, which improves your chance of remaining conscious and in control during a crash.

Lesson five:

Belts and air bags are so effective, the government requires *all* new cars sold in the United States after Sept. 1,1989, to be equipped with automatic crash protection—either air bags or automatic safety belts—for front-seat occupants.

Safety belts

Larry: **Hey Vince, do you realize that thousands of lives have been saved by safety belts?**

Vince: **I hope so Larry.—I'd hate to think we've been beating our heads against the wall for all those years for nothing!**

Wearing a safety belt and driving a car with an air bag can reduce your chance of fatality by 45 to 55 percent.

Vince and Larry: **There's a right way and wrong way to wear a safety belt. So don't be a dummy!**

Wear the lap belt low and snug across your hips. Be sure not to tuck the shoulder belt under your arm or behind your back. The belts are designed so the impact of a crash is absorbed in the strongest areas of your body—the bones of your hips and shoulders.

Vince and Larry: **Buckle up no matter what kind of belt it is.**

For cars that don't have automatic belts, it's important to buckle the manual safety belts. The moment it takes to buckle a safety belt can help save a life or prevent an injury. And don't forget to fasten the manual lap belt in cars where only the shoulder belt is automatic.

Vince: **Don't let safety take a back seat. Make sure everyone is buckled in.**

Everyone in the vehicle should be buckled up. Even in the back seat. Young children need to be buckled into a child safety seat that's installed and used properly. Older children and adults should buckle themselves in no matter where they are sitting. Don't drive off until everyone is buckled up. If you make that a habit, you'll have a

better chance of reaching your destination safely.

Air bags

Vince and Larry: **Hey Vince, how do air bags work? And do they really taste like marshmallows?**

Air bags work great in frontal or near-frontal collisions. In these types of crashes, sensors in the front of the car send a signal that inflates the air bag in less than one-tenth of a second and then quickly deflates. The bag then provides a cushion to keep the driver from crashing into the steering wheel, dashboard and windshield. Air bags reduce the chance of injury to the head, face, neck and chest—the parts of the body that are most likely to receive serious injuries in a crash.

Vince: **Remember Larry—If someone tells you that you don't have to buckle up if your car has an air bag, tell them they're full of hot air!**

Air bags are only added protection. You must wear your safety belt so you're in place for the air bag's protection. It's important, too, to always buckle up since air bags inflate only in head-on crashes. Without your safety belt fastened, you might be injured in a side, rear or rollover crash.

Larry: **Tell me more Vince! How do the sensors work?**

The air bag is hidden in the steering wheel or dashboard until it is needed. When a crash sets off the sensors, an inflation cycle produces harmless nitrogen gas that inflates the bag. It all happens faster than the blink of an eye. When an air bag inflates, you'll see a lot of white powder that may appear to be smoke. This is a cornstarch-based talcum used to lubricate the bag so it releases smoothly. It is harmless and quickly disappears.

Vince: **Do air bags have a proven track record?**

They are extremely reliable and have worked as designed in thousands of serious frontal crashes and have logged more than 10 billion highway miles. Unexpected inflations almost never occur, and even if one did the small size of the bag and its quick inflation and deflation cycle enable the driver to safely stop the car.

Vince and Larry: **Air bags are easy to take care of 'cause they're usually good for the life of your car.**

Most air bag systems require no maintenance. They are designed to last the life of the car. But once the air bag is used, it must be replaced. Most insurance policies cover the replacement cost.

Vince and Larry: **Can an air bag hurt me?**

The air bag inflation cycle necessarily must be very quick to get the bag in place in time to protect you. There is a loud noise when it inflates, but not so loud that it causes hearing damage. The bag itself may cause slight chafing (similar to a rug burn) on exposed skin on the face, neck and arms. But these injuries are rare and - minor compared to the serious injuries that are likely without an air bag.

Vince and Larry: **How about child safety seats? Where's the safest place for one in an air bag-equipped car?**

The safest place for a child safety seat in any vehicle (with air bag or not) is the rear seat. If the car has a passenger-side air bag, a forward-facing child safety seat may be used in the right front passenger seat. The safety seat must still be secured by a safety belt.

Automatic belts

Vince: **Hey Larry, these newfangled automatic belts are a snap aren't they?**

Automatic safety belts come in a variety of styles, but there are basically two types: motorized and non-motorized. They all move into place automatically when the car door is closed.

Vince and Larry: **What's a motorized belt?**

Motorized belts are shoulder belts anchored to small electric motors in the door frame; when you turn on the ignition, these motors move the belts into place. All motorized safety belts have manual lap belts. These lap belts must be buckled to provide the best protection possible and prevent the occupant from "submarining" (sliding out of the shoulder harness).

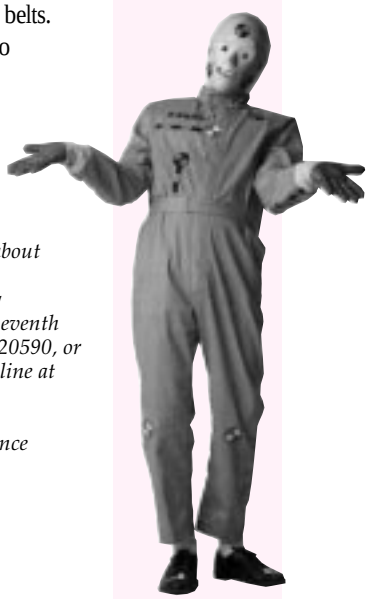
Vince and Larry: **What's a non-motorized belt?**

Non-motorized automatic belts are anchored to the car door. When you close the door, the belt automatically moves into position around you. Many non-motorized automatic belts are combination shoulder and lap belts, but some manufacturers have automatic shoulder belts with manual lap belts. The lap belt must be fastened to provide maximum safety.

Reprinted from a pamphlet provided by the National Highway Traffic Safety Administration.

If you have any more questions about occupant protection, write to the National Highway Traffic Safety Administration, NAD-51, 400 Seventh Street, S.W., Washington, D.C. 20590, or call the toll-free Auto Safety Hotline at (800) 424-9393.

Air bag photo courtesy of Insurance Institute for Highway Safety.



Coal accident summary

Fatal electrical accident (underground mine)

General information

On Sunday, December 21, 1997, a repairman, not certified as an electrician, was fatally injured while performing electrical repair work on a 995 Volt AC (VAC) continuous mining machine receptacle.

The mine is an underground coal operation and consists of two working sections developed into the Hazard No.4 coal seam.

The operation currently employs 90 persons on two production shifts and one maintenance shift. The mine normally operates five days-per-week and processes an average of 3,000 tons per day.

Description of the accident

On Saturday, December 20, 1997, at about 11:00 pm, the third shift crew of the mine reported to work for a special shift. The shift was scheduled to allow the miners to take a four-day vacation over the Christmas holiday. The third shift crew of the 007 working section was under the supervision of the maintenance foreman and the bull crew foreman. This was the maintenance foreman's first night as third shift foreman. A total of 7 men traveled to the 007 working section to complete a power move and perform maintenance work on the section equipment. At this mine, instructions for the maintenance personnel were normally left on work orders prepared by the previous shifts. Maintenance which could not be conducted on the production shifts was scheduled to be completed on the third shift.

The greaser and the repairman helper proceeded to the face area of the 007 working section to perform maintenance work on a continuous mining machine. The other members of the crew began preparing for a power move. The maintenance foreman made arrangements to take the second shift roof bolter operators to the surface. Before the mainte nance foreman left the section, he gave orders for the power center to be moved before he returned. Two general laborers arranged to get two scoops to pull the section power center into place. A general laborer and the bull crew foreman also disconnected cable plugs (catheads) from their receptacles, gathered chains, and removed the mats from around the power center prior to the move.

The high-voltage disconnect switch, (located on the back of the power center) was placed in the open position prior to the move. Investigators could not determine who opened the switch.

When the maintenance foreman returned to the section, the power center move had not been completed. The move then began with the bull crew foreman at the power center. Two general laborers operated the two scoops that were used to reposition the power center. The victim (a repairman) and the maintenance foreman assisted in the move by placing timbers under the power center as it was being pulled through a dip in the mine floor.

The power center was moved up the belt entry about one crosscut. A general laborer waited in the cab of one scoop while another general laborer traveled to the battery charging station to place his scoop on charge. The bull crew foreman was located inby the power center. At some point the victim began work on the 007 section power center to replace a female electrical receptacle for the 995 VAC continuous mining machine. Six alien bolts that secured the receptacle to the frame of the power center were removed. The maintenance foreman crawled past the victim, between the power center and beltline, (traveling inby) to remove the chains from the front of the section power center. About five minutes after the maintenance foreman crawled past the victim, he heard a loud boom and crawled back to the rear of the power center. He observed the victim lying across the splice box adjacent to the power center and pulled the victim off the splice box. The miners on the section either heard a noise or saw a flash and traveled to the accident area.

At 1:23 am, the repairman helper called outside and requested an ambulance.

A general laborer (and a mine emergency technician) obtained the section first-aid kit and provided first aid treatment to the victim.

At 1:33 am, the repairman helper and general laborer began adminis tering mouth-to-mouth resuscitation while enroute to the surface. At 1:55 am, the repairman helper checked and found a pulse. Mouth-to-mouth resuscitation continued.

At 2:00 am, the emergency medical service arrived at the scene and transported the victim to the regional hospital. The county coroner examined the victim and pronounced him dead at 3:30 am.

Conclusion

The victim was performing electrical work in a 7,200 VAC splice box on the 007 working section when he contacted at least two phases of the high-voltage system. The circuit had not been deenergized, grounded, locked out, or suitably tagged prior to electrical work being performed.

Edited from an MSHA accident investigation by Fred Bigio.

Metal/Nonmetal fatal accident summary

General information

A 32-year-old contract driller was fatally injured at about 12:00 pm on September 3, 1997, when he fell from the edge of the quarry wall to the quarry floor about 90 feet below. The victim had nine years of mining experience as a contract driller and had drilled at this mine site many times over the past nine years.

The operation was a single bench, open pit limestone quarry. The quarry and plant normally operated one shift per day, five days per week. A total of three persons normally worked at this mine.

Limestone was drilled, blasted, crushed, sized, and stockpiled for sale as construction aggregate.

A private blasting service was contracted to perform drilling and blasting at this mine location for about 20 years. The shot pattern being drilled at the time of the accident was the sixth blasting contract conducted at the mine this year.

Description of the accident

On the day of the accident, the victim arrived at work at about 6:00 am, his normal starting time. He proceeded to the quarry drill area and was observed by several employees throughout the morning. Drilling had commenced on August 28, 1997, and 12 holes, 94-feet in depth and 3 inches in diameter, had been drilled at the time of the accident. The overlying strata was composed of multiform mud seam fissures. A 13th hole was in the process of being drilled about 5 feet from the highwall edge, 28 inches from a mud seam crack. It had been drilled to a depth of about 60 feet. The cracked and separated rock made footing adjacent to the drill controls uneven and insecure. About 14 additional holes needed to be drilled to complete this shot pattern. At the time of the accident five 12-foot drill steels were in the thirteenth hole with a 10-foot and 12-foot steel found lying on the ground adjacent to the drill. Another section of drill steel was observed on the face of the highwall, about 35 feet from the top, in direct line with the drill and the location where the victim was found on the quarry floor. It was not safe to retrieve this steel due to its location. The victim's safety belt was found lying against the brake pedal in the cab of the compressor truck which was located about 60 feet from the hole being drilled. Two safety lanyards were found on the drill. One lanyard was attached to the boom hoist cylinder and dirt present in its latches made it inoperable. The second lanyard was lying on the drill crawler controls and showed signs of recent use. Both lanyards were 10 feet long and were of the web strap-type with double locking attachments.

At about 11:45 am, the contract truck driver was driving down the quarry ramp of the pit to get a load of material when he observed the victim on his hands and knees on the quarry floor near the highwall. The driver had seen the victim drilling earlier that day and assumed at this time he had fallen to the quarry floor.

The driver immediately told the loader operator that there was a man down by the highwall below the drill. At that time, another loader operator, the driver, and the loader operator immediately went to the victim. They found the victim conscious, stating he was having trouble breathing.

The rescue ambulance was called and arrived at the mine site within 8 minutes. Rescue personnel adminis tered oxygen and transported the victim to the hospital. The coroner pronounced the victim dead at 1:15 pm from chest and abdominal injuries caused by the fall.

Based on the evidence, informa tion from the accident scene, and interviews of persons at the mine, it was determined that the victim was in the process of adding a drill steel. The position of the drill controls would have placed him about 5 feet from the edge of the highwall. Changing the drill steel required the victim to balance the 78 pound steel upright, on top of the coupling of the last steel in the hole, using his left hand while operating the control levers with his right hand. During this process the feed chain broke, allowing the hammer to free-fall, possibly striking the steel held by the victim. When this happened, the victim may have attempted to catch the steel and lost his balance, falling over the highwall. Additionally, the footing adjacent to where the victim was working was uneven and cracked and may have made it difficult for him to keep his balance.

Conclusion

The direct cause of the accident was the failure to ensure the work area adjacent to the highwall and drill had secure and stable footing. The structural defect of the drill feed chain, causing it to break when adding a section of drill steel, contributed to the accident.

Contributing to the severity of the accident was the failure to wear a safety belt and line while conducting drilling operations near the edge of the highwall.

Edited from an MSHA accident investigation by Fred Bigio.

Heat stress

Heat stress/Heat stroke/Symptoms/ Preventive strategies

Heat stress

Heat stress is likely to affect people in all parts of the United States during our summer months. The effects of heat stress range from simple discomfort to life threatening illnesses such as heat stroke.

What causes heat stress?

Heat stress may occur as the result of a heat wave or a constant source of heat at the workplace. Six main factors are involved—temperature, humidity, movement of air, radiant temperature of surroundings, and a person's clothing and physical activity.

How does heat stress affect me?

Heat stress causes increased sweating, depleting the body's fluid and causing heat intolerance. This reduces work capacity and efficiency. Other signs of heat stress include tiredness, irritability, inattention and muscular cramps. These factors all increase the risk of you having an accident.

Are some people more prone to heat stress?

People who are medically unfit, overweight, suffer from heart disease, abuse alcohol, or are not acclimatized, are at greater risk of heat stress and should heed medical advice. Some people are less tolerant of heat stress than others. Care should be taken to have a safe system of work (but not to penalize heat-sensitive people).

Factors to consider to control heat stress

Inside:

- Insulation of roof, walls, or other sources of heat;
- Ducting hot exhaust to the outside;
- Providing fans, ventilation or air conditioning.

Outside:

- Air-conditioned vehicles and rest areas;
- Provision of suitable protective clothing;
- Sunscreen creams and adequate instructions.

Make the Job Safe—Talk about health and safety at work. If you believe there are problems in this area you should discuss them with your employer and your health and safety representative.

How can I avoid heat stress?

By a few simple principles:-

- Reduce the heat load by replacing fluid loss; (drink more water, juices, and other non-alcoholic drinks). Drinks of 4-8 oz. cool water (water does not have to be—and probably should not be—iced) at frequent intervals will be adequate to replace fluid lost in sweating;
- Have rest pauses in a cool place;
- Help your sweat evaporate by increasing air circulation; and
- Maintain a healthy lifestyle.

To relieve acute symptoms, such as painful muscular cramps, a solution of one tablespoon of common salt to 4 quarts of water or one teaspoon of electrolyte replace ment formula to one glass of water may be drunk. This provides a quick source of salt replacement.

How should heat stress be treated?

Have the patient rest in the coolest available place and drink cool but not cold fluids. Contact a doctor, nurse or first aid officer if the patient does not rapidly improve.

Should I take salt tablets?

The [Australian] National Health and Medical Research Council [as well as a variety of American medical organizations] does **not** recommend the use of salt tablets, which should only be taken on the direct advice of a physician. Usually sufficient salt is absorbed from food eaten to provide replacement of all salt lost in sweating. However, in cases of extreme sweating, extra salt may be added to food, during cooking or eating.

What are the signs of heat stroke?

Heat stroke is more severe than heat stress. A person will stop sweating, body temperatures will be high (oral temperatures 40-43˚ C), skin will be hot and dry. Confusion and loss of consciousness may occur.

How should heat stroke be treated?

The person should be treated by a doctor as soon as possible. Until medical aid is available, cool the person down as quickly as possible, such as soaking the victim's clothing in cold water and increasing air movement by fanning.

Western Australia. Department of Occupational Health, Safety and Welfare

For further information on heat stress refer to the following documents:

Encyclopedia of Occupational Health, Safety, Third Edition, International Labor Office;

Effects of Heat on Health, Comfort and Performance, National Health and Medical Research Council;

Health and Safety Bulletin No. 15, 28, 64 and 65 Guidelines on Working in Heat, ACTU-VTHC Occupational Health and Safety Unit;

Working in Hot Environments, US Department of Health and Human Services;

Sunscreen protects outdoor workers

By Brad Bierman

Employers are becoming increasingly aware of the dangers to outdoor workers of unprotected sun exposure. Perceptions of the sun's healthy benefits are being discarded with the knowledge of the relationship between the sun's ultraviolet radiation and the epidemic increase in skin cancer. It now appears that the sun has the potential for being one of the worst enemies of outdoor workers. The American Academy of Dermatology expects reported skin cancer to top 1.2 million this year. At greatest risk? Outdoor workers.

Mounting research suggests thinning of the ozone layer as a prime contributor. Little by little, at a rate estimated at 7 to 10% every 10 years, the ozone is thinning and allowing more and more ultraviolet radiation to penetrate to the earth's surface. The earth's natural sunscreen, which once protected outdoor workers, has been significantly diminished.

The problem is apparent and well documented: Unprotected exposure to ultraviolet radiation from the sun is hazardous to outdoor workers.

The solution: Take proactive measures to educate and protect those affected.

As part of a total program of protection, employers should provide sunscreen in the same way they provide hearing and eye protection. Mount a sunscreen dispenser in a strategic location with an accompany ing warning sign. This makes good health sense and business sense, and avoids potential serious problems down the road.

When selecting a sunscreen product, order a good "professional" sunscreen that is designed for outdoor workers, not the kind of sunscreen used at the beach to get a golden tan. After all, a tan means that the skin has been damaged. And, the "recreational" sunscreens are normally greasy and/or sticky; not so with the professional sunscreens. The sunscreen should be an SPF 25 or 30. Anything higher than SPF 30 provides negligible additional protection and greatly increases chances for an allergic reaction.

Additional suggestions for protecting workers include selecting clothing that has a tight weave. Blue jeans are ideal. Suggest a shirt that when held up to the light, can't be seen through. There are specially treated SPF rated clothing items that have been tested to protect the wearer from ultraviolet for workers that want to go a step further. Cover as much skin as possible: wear long sleeve shirts, wear gloves, wear hats with a 4" brim and a flap that covers the neck, wear long trousers, and wear sunglasses that block 100% of UVA/UVB rays.

Outdoor workers will find it hard to stay out of the sun from 10 am through 3 pm as most doctors recommend. When possible, they should work in the shade during these hour. If riding equipment, the worker should find out if the manufacturer offers a sun shield.

Remember, sun damage may occur in as little as five years of cumulative exposure and may not give any advance warnings of the problems to come.

For additional information on sun protection, contact the American Academy of Dermatology, 847/330-0230.

For information on the sunscreen, contact SmartShield Sunscreens for a "Practice SafeSun" kit, 3311 Oak Lawn Ave., Suite 200, Dallas, TX 75219, 800/ 343-1504, FAX: 800/431-1568, e-mail: srl@dallas.net

Reprinted from the May 1998 issue of the Rimbach Publishing Co.'s ***Industrial Hygiene News.***

Protect your eyes

With sunny days already here and trips to the beach on the horizon, make sure you keep your sunglasses in easy reach. Medical studies have linked the formation of cataracts and other eye diseases to over-exposure to the ultraviolet light from the sun's rays.

"We recommend glasses that block 100 percent of the ultraviolet rays," says Howard Cupples, MD, of Georgetown's Department of Ophthal mology. "Regular reading glasses block about 10 percent of light, and all sunglasses must have a blocking of 60 percent."

Your sunglasses should have a mark on them telling you the percentage of ultraviolet protection. Both over-the-counter and prescrip tion glasses should be marked.

Reprinted from the Summer 1997 edition of Georgetown University's ***Healthy Decisions.***

A LOOK BACK: How perfect records in accident prevention are accomplished

As related by some of the winners in the 1929 contest

Shortly after the United States Bureau of Mines announced the winners of the National Crushed Stone Association Safety Contest for 1929, it occurred to us that it would be most interesting information for those of our members interested in accident prevention (and this should include the entire membership) if those plants which had made perfect safety records would briefly describe the procedure followed in their accident prevention work. We therefore corresponded with the various winners in the contest asking if they would submit for publication in the *Journal* a brief digest of the methods pursued. The following companies whose comments are given responded to our request and we are deeply indebted to them for their helpful cooperation in thus assisting in the accident prevention movement.

Accident prevention work of the General Crushed Stone Company

Two General Crushed Stone Co. plants with perfect safety records entered the 1929 Contest. The following briefly describes their accident prevention procedure:

"The Rock Hill quarry of the General Crushed Stone Company is situated in Bucks County, Pennsylvania, near Quakertown, and is in the charge of Mr. E.E. Dotter. It is a trap rock quarry and has a daily capacity of about 1,200 tons. Up to this year it was a handloading quarry and during 1929 operated more than 194,000 man-hours without experiencing a lost-time accident, and on August 1st, 1930, this clear record has been maintained. The hand-loading feature naturally adds considerably to the hazardous nature of the operation. During the operating season of 1929 the force amounted to about one hundred men.

The Safety Committee of the Rock Hill Plant, General Crushed Stone Co.

"The Geneva quarry is located at Oaks Corners, about seven miles from Geneva, New York, and the plant has a daily capacity of about 2,000 tons. The deposit is limestone and during 1929 the plant operated almost 116,000 man-hours and lost no time due to injuries. The organization consists during the operating season of about fifty men and is in charge of Mr. Linford M. Croll.

"There is organized at each of our quarries a safety committee composed of from five to seven men representative of the various departments of the quarry and plant. The committee at Rock Hill consists of Roy Craghead, quarry foreman, who is also chairman of the safety committee; Thomas Foltz, plant foreman; E. K. Barndt, carpenter; Dan Dieose, oiler; John Angney, crusher foreman; Clyde I. Feist, timekeeper; E. E. Dotter, superintendent. The timekeeper at each plant acts as secretary of the safety committee. The committee at Geneva is composed of Charles P. Wise, powderman, who is chairman of the committee; Allen R. Nash, quarry foreman; Ernest Eddings, oiler; Alpheus Carter, dinkey operator; William Newhall, electrician; Leslie Champion, timekeeper; Linford M. Croll, superintendent.

"Each plant safety committee meets once a month, which meetings are attended by the representative of the company in charge of accident prevention at all the quarries, H. F. Yotter. At these meetings the sugges tions and recommendations previously approved are reviewed to ascertain whether they have been carried out.

"Each week a complete inspection of the quarry and plant is made by one or two members of the safety committee and, to assist them in checking certain hazardous conditions, we have adopted a form containing some thirty questions covering mechanical guards, safe practices, and general safety conditions. The reports of this kind covering inspections made since the last meeting are discussed and any new recommendations made are approved or rejected.

"There is sent out monthly to each plant by the home office a letter listing the accidents occurring at all the operations during the previous month, the record of time worked and days lost through injuries at each quarry for that month and for the year to that time. This acquaints each plant with its record and gives a comparative standing of each operation. This letter is read and thoroughly discussed at the monthly meeting.

"The members of the committee are then requested to present sugges tions with reference to accident prevention, which are likewise reviewed and passed upon.

"These meetings serve to maintain and stimulate interest in accident prevention, and by the members of the committees passing along to the

workmen the ideas presented at the meetings we aim to interest in the movement each man in the organiza tion, which is essential if accidents are to be reduced to a minimum.

"We have erected at each of our operations, in a conspicuous location, an attractive bulletin board for the display of safety posters and other literature or notices dealing with this phase of the operation.

"We feel that the credit for the excellent records made at our Rock Hill and Geneva plants during 1929 is due chiefly to the keen interest and earnest effort of the superintendents in charge of these quarries and the safety committees which have cooperated with them so faithfully."

What the John T. Dyer Quarry Company has to say

The following was submitted by the John T. Dyer Quarry Company which in addition to winning second honorable mention in the 1929 contest was in the forerank in the 1928 contest, having won first honorable mention that year.

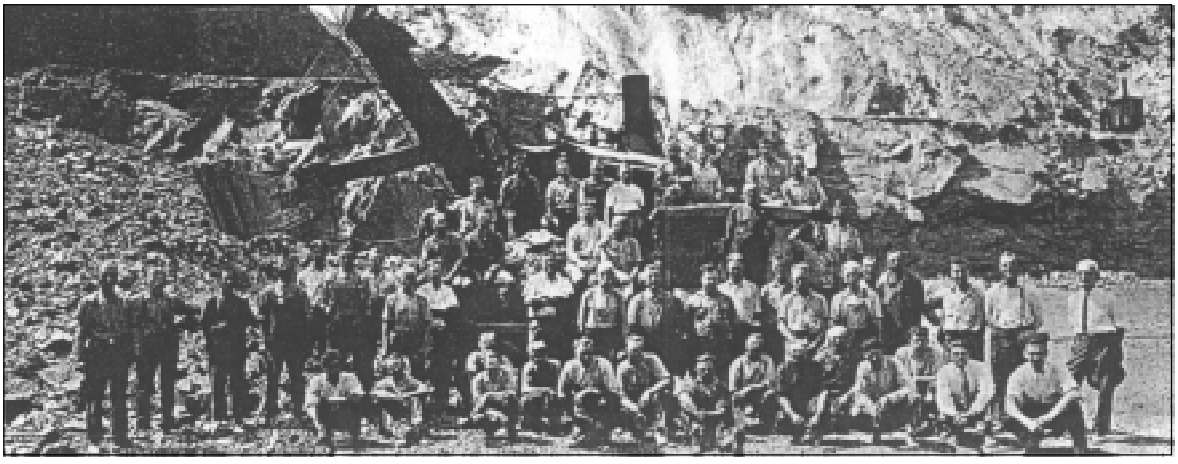
"During 1929 the Trap Rock quarry of The John T. Dyer Quarry Co. worked 166,876 man-hours without a lost-time accident, thus continuing its no-accident record through the second consecutive year. In recognition of this record the company was awarded an honorable mention in the safety competition, conducted by the Explosives Engineer, among the quarries operated by members of the National Crushed Stone Association. "The safety program at the Trap Rock quarry is conducted by a committee of eight men, composed of the superintendent, foreman, two clerks and men in charge of the various operations. This committee meets monthly with the company Safety Engineer at which time all problems concerning safe conditions and methods are discussed. The company is fortunate in having on this committee men who are sincerely interested in the safety of themselves and their fellow workmen. The success or failure of any program depends to a large extent on the safety committee.

"Particular emphasis in the safety work is placed upon the education of the men. The goal towards which all efforts are directed is the ideal condition when all employees will have safety so firmly fixed in their minds that they will be unconsciously careful in everything they do. No doubt, the ultimate goal will never be reached but any progress in that direction will mean improvement in the accident record.

"Two safety bulletin boards are located at the plant. National Safety Council posters are displayed on one board and are changed weekly. The other board contains space for three posters, two of which pertain to safety or some similar subject and are changed semiweekly, the third pertains to some topic in the current news and is changed daily. The news item poster has been found successful in drawing the men to the board. The 'Safe Worker' is distributed to the men monthly. Annually a mass meeting is held, on the company's time, for all the men in the Company's employ. There is a large plaque awarded at this meeting to the quarry having the best safety record for the preceding year. Safety guards are erected with two purposes in view, first to guard the men from injury due to the particular hazards they cover and second to serve as a reminder to work safely at all times.

"At the present writing the Trap Rock quarry is working on a new safety record. The no-accident record which extended through 1928 and 1929 was ended shortly after the start of the present year, by an accident causing the loss of twenty-five days. This accident was a keen disappointment to all the men at the quarry and particularly to the unfortunate employee who was injured. However the record in itself meant nothing. The fact that for something over two years no man had experienced the pain or loss of an injury was the commendable feature involved. The employees realize this and while the breaking of their record

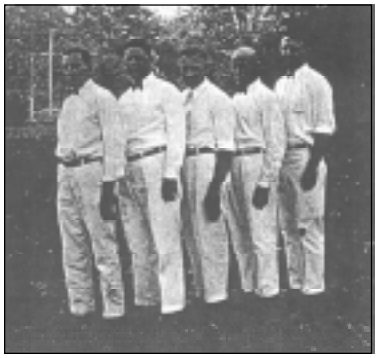
Far left, the Safety Committee of the Trap Rock Quarry, John T. Dyer Quarry Co., with their award



At left, the employees of the Trap Rock Quarry, John T. Dyer Quarry Co.

caused disappointment it did not cause discouragement and they are still as actively interested in preventing accidents as ever.

"The Trap Rock quarry is, therefore, out of the competition for a perfect record in 1930, but in passing they wish to express their heartiest congratulations to the quarries who enjoyed a no-accident year in 1929 and to also express a sincere hope that their safety activities will all meet the same success during 1930."



At center top: the Safety Committee of the North Baltimore Quarry at the France Stone Co.

Lower photo at center: the First Aid Squad of the Speed Quarry, Louisville Cement Co.

Methods used by the France Stone Company

The France Stone Company won first honorable mention in 1926, fourth honorable mention in 1928 and fifth honorable mention in 1929, which would indicate that their methods have produced real results.

"A complete article, if one could be written," writes D. B. Buettner, Jr., of the France Stone Company and affiliated companies, "dealing with accident prevention activities of our organization would be too lengthy for publication in this magazine. The writer has, therefore, confined his statements in this write-up to such procedure and instructions as are furnished to and followed by each plant office.

"Our experience has convinced the management that accident prevention or reduction in frequency and severity is unquestionably of financial gain to the workmen and their employer. If a sincere attempt is made by the employer and his workmen it tends to bring out a closer spirit of cooperation and results in better industrial and home welfare.

"Since much depends on enforce ment and discipline of the worker to realize the benefits of this work, the Plant Superintendent is recognized as the Plant Safety Committee Chairman and he, of course, is as responsible for continuous safety practice at his plant as the production of our product.

"*Conducting Safety Meetings:* A general plant safety meeting is held once each month and as many plant employees attend this session as possible. The Committee Chairman has the right to call as many additional meetings as he may deem advisable. Such meetings may be called whenever there is a topic, condition, or accident to be discussed or brought to the attention of the employees and result in a better understanding of Safety."

"*Permanent Safety Policies:* The minutes of all meetings are submitted to the General Office of the companies in our organization and are compiled in detail by the plant clerks, who act as committee secretaries at their respective locations. All matters defining perma nent safety policies at the plants are governed by the General Office of the employer. The General Safety Committee, comprised of officials of the Company, does not hold back or retard the operations or activities of the plant safety organization but acts as a clearing house for recommendations and ideas in order to create just and applicable rules and regulations which bind the entire work together. This eliminates personal or temporary ideas that may harm or hinder safety work progression.

"*Safety Rules:* Formulated after years of study and research, they represent only those instructions that are practical to follow. All employees are to abide by the rules outlined in small numbered booklets furnished each employee immediately after beginning work for us and to which he must pledge himself in writing. These rules are enforced to the fullest extent since each plant discussed them many times at their meetings before their final adoption.

"*Safety Inspections:* The plant Safety inspection is made at least twice each month (preferably once during the first and once during the third week) before the monthly meeting in order that conditions noted by inspection may be brought up for discussion and disposition. The plant inspector is appointed by the superin tendent and is changed from time to time at the discretion of the plant official. A special form pertaining to our industry's hazards must be completed or answered by the inspector as he views the plant and its physical conditions.

"*Investigating Accidents:* The word 'accident' in this connection means an injury or a near injury. On each accident report made by the plant office, space is provided for a foreman's investigation. A recent innovation at the majority of our plants calls for an investigation of the case by three employees appointed by the safety chairman. They must determine as near as possible the exact cause and manner of accident, fix the responsibility, and set forth practical recommendations to offset recurrence by way of a written report to the safety chairman; Incom plete or vague reports are returned by General Office with criticisms. This is seldom necessary as the plants usually furnish clear concise information.

"*Safety Interest:* This is furnished, primarily, by suggestions and discus sions of the workers. Periodically posters are mailed to each location dealing with either specific or general conditions. Health articles are sent and news-letters mailed to the plants, also. A plant safety trophy is awarded at the

end of each calendar year to the plant having the best safety record. This is held by the plant for the ensuing year. Briefly, this large bronze safety plaque depicts scenes individual to our industry and our workmen. It is held in high esteem by the workmen and a year-plate thereon states the name of each annual winner.

"In closing, the writer is glad to state that there are eight plants in our organization which have not experienced a lost-time accident in the first 7 months of 1930. The North Baltimore, Ohio, quarry has gone over 22 months without a lost-time injury (an accident to an employee resulting in disability extending beyond the actual day of accident). This location, now possessing the Company Trophy and receiving Honorable Mention in the 1929 National Safety Competition, is still going strong.

Louisville Cement Company's record exceeds six years

The outstanding record in accident prevention so far established for the crushed stone industry is that held by the Speed quarry of the Louisville Cement Company at Speed, Indiana, which up to the middle of this summer had completed six years and three months with no lost-time accidents. J.M. Buchheit, Superintendent of the quarry, in sending in his comments has been exceedingly brief, but we believe very much to the point. He writes as follows:

"I will classify these standards as I see them:

• "First, Cooperation of plant executives with foremen and men;

• Second, holding foremen responsible for safe work and provide safe working conditions;

• Third, compelling men to work safely.

"Foremen and men must cooperate to have success in safety work. Some men seem to lack the faculty of cooperation and never seem to be able to acquire it; such people usually make themselves miserable and everyone else about them, and the result is that they are ultimately compelled to relinquish the positions they hold in favor of other people who are able and willing to cooperate with others in safety work.

"Success in safety work is cooperation and education."

The source of this story is from a xerox copy (the reason for the poor quality of the photos) provided by one of our readers. Unfortunately, because of the length of the backup for filler (which this is and filler is the only thing that I have in abundance), the donor's name and the original source have been lost—my apologies. — Editor

We're looking for a few good pictures!

Are you proud of your mine? Its equipment? Its people and their safety record? Of course you are!

Now's your chance to share your pride with the rest of your colleagues in the industry. The only limit is your imagination!

MSHA is looking for pictures of mining activities, well-maintained equipment (old and new), and miners demonstrating safe work practices to use in its nationally-distributed 1999 Metal and Nonmetal Mine Health and Safety Calendar. You and your organization will be credited for each item we use.

Here's what we need:

• 35mm color slides or sharp, preferably 8 x 10, color prints of surface or underground subjects. If you do not wish to pay for 8 x 10 prints, send the negatives along with your selected print and we will have them enlarged.

• Please include the following information on a yellow 3M Post-it® note (or similar) to the back of each print:

1. Your name, your mine's name and address;
2. A brief description of the action depicted; and,
3. Your phone number.

• Make sure your name is on the frame of each slide you submit and include the above information on a separate sheet with a numbered legend to match each individual slide—if more than one.

• Send as many slides or prints as you like.

• Deadline for submissions is September 1, 1998.

DO NOT write on the back of any print. Ball point pens damage the surface of the print and the ink from water-based felt-tip pens does not dry and can easily be transferred to the front of another photo—if you send more than one. If you use felt-tip pens with permanent ink, the ink seeps into the paper and will seriously discolor the image side of the photo.

Send your submissions to:

Stephen J. Hoyle
Printed Materials Development Branch
National Mine Health and Safety Academy
1301 Airport Road
Beckley, WV 25813

Questions?

Call: Stephen J. Hoyle, Training Spclst.
Nat'l Mine Health and Safety Academy
Telephone: (304) 256-3264
e-mail: shoyle@msha.gov

THE LAST WORD…

When human power becomes so great and original that we can account for it only as a kind of divine imagination, we call it genius.—William Crashaw

Gossip is the art of saying nothing in a way that leaves practically nothing unsaid.—Walter Winchell

Deliberate with caution, but act with decision; and yield with graciousness, or oppose with firmness.—Charles Hole

Moderation in temper is always a virtue; but moderation in principle is always a vice. —Thomas Paine

I don't like these cold, precise, perfect people, who, in order not to speak wrong, never speak at all, and in order not to do wrong, never do anything.— Henry Ward Peecher

If a little knowledge is dangerous, where is the man who has so much as to be out of danger?—Thomas Huxley

We cannot banish dangers, but we can banish fears. We must not demean life by standing in awe of death.—David Sarnoff

If we survive danger it steels our courage more than anything else.—Reinhold Niebuhr

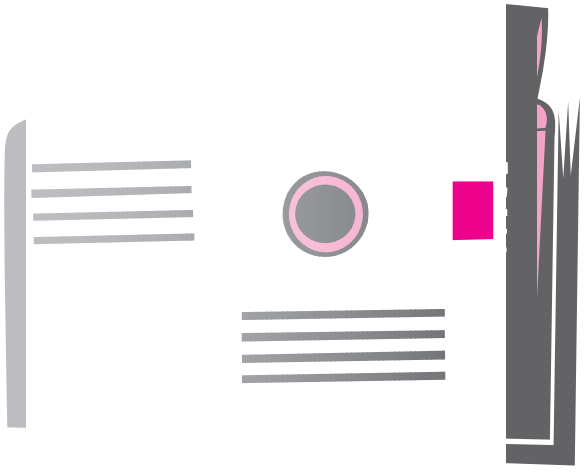
NOTICE: We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at www.msha.gov. We **DESPERATELY** need color photographs suitable for use on the front cover of the ***Bulletin.*** We cannot guarantee that they will be published, 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).



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*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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Mark your calendar NOW!

Upcoming events:

- ***Jul. 7-9, Metal/Nonmetal National Mine Rescue Contest, Convention Ctr., Las Vegas, NV***
- ***Aug. 4-6, 17th International Conference on Ground Control in Mining, Lakeview Resort, Morgantown, WV***
- ***Aug. 15-22, 45th Annual Pennsylvania Bituminous Coal Show, Carmichaels Fire Hall/High School, Carmichaels, PA***
- ***Sep. 7-11, 4th International Conference on Land Reclamation, E. Midlands Conference Center, Nottingham, England***
- ***Sep. 22-24, Safety, Health, and Environmental Conf., Charleston Civic Center, Charleston, WV***