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John L. Collinson
Chief Safety Engineer of the National Coal Board

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SAFETY IN THE UNITED KINGDOM'S DEEP COAL MINES

JOHN L. COLLINSON*

INTRODUCTION

There is pleasure in discussing coal mine safety as it is an objective of the National Coal Board and is regarded as a matter of extreme importance by the whole industry. There is also some pride in the United Kingdom's achievements in the mining accident situation and yet more improvements are envisioned. The question of safety in any mining industry must be addressed if only to ensure the continuing lifeblood of such industries—manpower. The issue is timely considering the growing importance of coal in the world energy scene and the increasing acknowledgement of the vital role of the United Kingdom's coal industry—already the largest and cheapest coal producer in the European Community. The United Kingdom's deep mining industry is committed to heavy investment and there is no doubt that further investment in improved safety and health is a constituent part. It is therefore an opportune time to take stock of the safety situation.

Any responsible enterprise will recognise its moral duty to pursue accident reduction programmes superimposed on any clear legal obligation. But a perceptive employer will construct

*BSc (Min) 1949, Leads University; BSc (Mech Eng) 1950, Leads Univeristy; CEng, FIMinE, MIISO, FBIM.

The author is the Chief Safety Engineer of the National Coal Board. He has won the Douglas Hay Medal for his many contributions to The Mining Engineer on matters of safety and in particular for his paper "Safety-Risk Rationalization" published in the November, 1979 issue. The views expressed are those of the author.

Ed. Note. The National Coal Board has, with limited exceptions, the exclusive right to extract coal, but may license private operators to work small mines and opencast sites. Under the Coal Industry Act of 1977, the National Coal Board has been given powers to work other minerals, where discoveries are made in the course of searching for, or working of coal; to engage in certain petrochemical activities beneficial to the future of the coal industry; and wider powers to undertake overseas activities, subject to the consent of the Secretary of State for Energy.
and pursue such programmes for a quite separate reason. Accidents cost money and certainly demonstrably cost effective means of accident reduction will beneficially affect the balance sheet. Such a realization, especially at a time of severe energy competition, demands action.

The United Kingdom's deep coal mining industry would assert that safety goes with efficiency and so at this time safety looms large not only due to legal requirements and recognized moral responsibilities, but because of its relationship with the efficiency of the mining process and certainly because of the business efficiency demanded by market place competition.

The United Kingdom has a lot of experience with the improvement of safety in the mines. This article briefly reviews the progress, current practices and some of the thinking in the mine safety field in Great Britain.

**HISTORICAL REVIEW**

Whilst coal has been mined for many centuries, useful data on accident experience has only been available from the middle of the nineteenth century. At this time a corps of Government mining inspectors was established and began to grow.

A broad, but illuminating picture of safety improvement in the intervening period can be gained from the fact that in the 1850's over 1,000 men were killed annually in the United Kingdom's deep mining activities compared with the current figure (still far too high) of about 40 per year. The fact that the number of employees in the industry is the same as it was 130 years ago, about a quarter of a million, permits a valid comparison to be made. These fatality figures are indicative of an evolution toward safer mining.

In addressing the question of coal mining safety it may be useful to identify the factors contributing to this improvement. The spur to improved safety is composed of evolving technical legislation, mining research, training, technology, the establishment of a corps of safety specialists and the industry's continued and determined efforts in the behavioural field of improving the safety consciousness and awareness of all mining personnel. These factors must be responsible since such a dramatic improvement is quite unlikely to have occurred spontaneously. The
major impact of all these elements have not been concurrent. For example, much of the technical legislation had its main beneficial effect before Nationalization in 1947. It was subsequent to Nationalization, however, and to some extent because of it, that industry wide safety training policies could be pursued and widespread, coordinated efforts in the behavioural field conducted.

When reviewing recent improvements, no one would fail to identify the rapid technological changes that have occurred and continue to occur in the mining industry. A deeper technical examination of deep mining safety during the last quarter of a century would reveal how evolving mining technology has significantly lessened the risks associated with deep coal mining.

Clear examples of the benefits in safety, productivity and efficiency arising from technological innovations are the virtual elimination of waste withdrawal and packing on longwall faces in favour of caved systems, and the elimination of labour intensive stable holes on power loaded faces. During recent history, the technology of the powered support, of remote control and monitoring, and the large investment in modern mining systems have had an enormous beneficial impact on accident rates. The view is held in the United Kingdom's mining industry that evolving technology will continue to entrain smaller and smaller mining accident rates.

THE CAUSE OF ACCIDENTS

Despite the declining accident rate, hazards continue to exist in deep mining operations, as they do in other industries and even in the home. The mere presence of hazards cannot generate injury producing accidents. Coexisting with the hazard, however, is the miner. It is at the interface between the hazards and the individual that the injury/accident occurs.

The fundamental cause of any such accident is the simultaneous presence of a potential hazard which is triggered and the individual. It is important to consider accident causation in this clearly simple manner because either of two solutions to the problem of reducing accidents immediately manifest themselves. Basic accident prevention comprises either physical hazard reduction through technically upgrading the working environment, or removing the individual from the environment.
Accident prevention demands the skilled and dispassionate identification of the causes, of whatever degree, of accidents in order that solutions can be developed and implemented to prevent recurrences. A more sophisticated approach requires the identification of the factors which may result in a future accident, with an analysis of the causes of past accidents being of only secondary concern. The goal here is not the prevention of a recurrence but the avoidance of a particular type of accident completely.

The question of the primary cause of mining accidents is a difficult one. One problem is that any assessment of the primary cause is likely to be highly subjective. Different investigators with perhaps diverging vested interests may well subjectively arrive at quite different conclusions. It is facile for one investigator to say that the cause is the workman's negligence in general. It is much more difficult, if there by any negligence at all, to ascribe a degree of contributory negligence. It is equally as easy for another investigator to assert categorically that the mining system was inherently hazardous and the primary cause of the accident, ignoring completely any action on the part of the workman.

There are two further points which virtually prohibit either an unequivocal affirmation or denial that mining accidents are primarily the result of the negligence of the mineworker. First, accidents frequently arise not from a single cause but from several causes acting simultaneously or in a closely linked sequential chain. Secondly, there are many different classes of mining accidents, some of which are more likely to have negligence as a primary cause while others involve no negligence at all. It is suggested therefore that the polar views on the cause of mining accidents—one placing responsibility on the miner's negligence, and the other on substandard mining equipment and systems—are the result of a superficial approach to the problem.

The view held in the United Kingdom is that whilst frequently some contributory negligence in an accident may be identifiable it can rarely be regarded as a primary cause. No mineworker aims to get hurt. However, all mineworkers, being human, are fallible and are going to make mistakes. A responsible employer cannot shelter behind a view that his employees
are always negligent and that his systems are perfect. A close investigation of any accident will reveal few, if any, systems or equipment that cannot be made less hazardous. Moreover, whatever the cause of an accident it is the employer's moral and legal duty to upgrade his employees' workplaces.

In the United Kingdom's mining industry maximum effort is put into reducing the likelihood of negligence. The effort at permanently reducing accident rates, however, is through continually improving mining systems. Such improved systems, allowing for the individual workmen's differing degree of attentiveness and fallibility, are better able to tolerate human shortcomings that would otherwise cause injuries.

Any view that mineworkers' negligence is the primary cause of mining accidents would depress efforts to make mining systems safer, and incidentally more efficient. Employers do not hold such simplistic views in the United Kingdom's deep coal mining industry.

CURRENT ACCIDENT PREVENTION PRACTICE

It will be evident from the foregoing that in the National Coal Board professional judgement is exercised in devising accident prevention policies. Such important judgements are not fettered by preconceived notions as to primary cause. Not unexpectedly there is a strategic approach to accident reduction. This strategy embodies four elements: 1) designing inherently safer systems and equipment, 2) developing and using safety devices, 3) the extensive training of mineworkers and 4) the pursuit in the behavioural field of means of enhancing safety consciousness and awareness. These four elements are ranked above in correspondence with their relative ability to permanently reduce accident rates and are pursued accordingly.

Two main thrusts arising from this strategy of accident prevention are: 1) the physical/technical upgrading of the workplace, and 2) improvements through effecting behavioural changes. The first of these two concurrently practiced techniques has the more permanent effect in making mining safer in the United Kingdom. It comprises what may be broadly termed "technology." Examples abound and range from substantial reductions in the labour intensity of operations to the application of quite small but effective safety devices. These include such
aspects of mining technology as powered supports, the elimination of longwall stable holes, whole arch setting techniques, remote haulages, fire resistant belts and hydraulic fluids, pre-start warnings, and all forms of monitoring and remote control of operations. The second part of this dual strategy seeks to reduce the rate of mining accidents by affecting behavioural change. Here many diverse programmes are conceived and executed. Safety films are made for widespread distribution, poster campaigns are mounted, and safety competitions are run within the industry. These competitions range from substantial inter-colliery safety contests, held both underground and on the surface, to competitions designed for individual participants. Competing quiz teams are organized and extensive use is made of the industry's own in-house newspapers. Substantial prizes are awarded in such competitions. Additionally there has been the pioneering of closed circuit television, with the considerable involvement of local personnel, in the making and showing of safety programmes at individual collieries.

The industry implements miner training programmes far in excess of those required by statute. Both mineworkers and supervisors are trained in job skills and knowledge at their induction into the mines and receive periodic refresher training throughout their career.

The question of mining safety is taken very seriously in the United Kingdom. This is evidenced by the establishment of a permanent corps of professional safety engineers and by the practice of consulting representatives of all levels of management and the Unions on issues concerning the safety and health of the miners. Through the programmes mounted, considerable resources are devoted to accident prevention.

THE PHILOSOPHY

Current mining accident rates are not inevitable. Rather, most colliery accidents can be avoided. In addition to its statutory duty to provide a safe working place, the National Coal Board recognizes that as an employer it also has the moral responsibility to continually strive to minimize the number and severity of mining accidents. On this issue, philosophy is easily extended to business realism. A consideration of the cost effectiveness of accident prevention leads to the conclusion that the
Board not only has a legal and moral duty, but also a corporate business duty, to reduce accidents. There is no doubt that the pursuit of accident reduction costs money, but it is equally certain that injury producing accidents are expensive. Even accidents which do not cause injury always, often substantially, interrupt the mining process and are, therefore, extremely costly in terms of lost production and replacement of damaged plant. Accordingly, any accident, whether injury producing or not, substantially erodes the industry's profitability. The Board's safety philosophy seeks to reduce the accident, injury rate with the knowledge that by stopping the causative agency the many expensive interruptions in the mining process will also be beneficially reduced.

This aspect of the Board's safety philosophy directly effects the industry's competitiveness and the retention and expansion of its markets. United Kingdom coal is substantially the cheapest produced in Western Europe. The pursuit of safety, largely through technological advancements with the consequential greater reliability of the mining systems, will further improve the competitiveness of the United Kingdom's coal.

The importance of technology in furthering safety and improving efficiency and productivity is regarded as vital. Not only is current technology available for further exploitation, but there also is real feasibility of improving mining technology. The increasing implementation of advanced mining technology systems evidences the former, with the Board's technical research programmes evidencing the latter. Advances in technology increase productivity and efficiency and this, in turn, creates the wealth which will permit further investment in creating safer and more efficient coal mining operations.

The question of occupational health is equally important. The practices, policies and philosophy briefly reviewed in respect to safety are regarded as equally appropriate for ameliorating the environmental health situation of the mineworker.

Finally, accident prevention requires professional management. The policies, resources and skills which are demanded here are the same demanded by the management of any other area of an industrial undertaking.
CONCLUSIONS

Coal mining in the United Kingdom has become safer but if there is to be no complacency, the issue of mineworker health and safety must be continually probed by the minds of all in the industry. Whilst the Board's mines are the safest in Europe, stagnation is not acceptable. Society rightly continues to regard any form of industrial risk as less and less acceptable. The high level of safety already achieved is largely the result of responsible, well cast, effective technical legislation and the ever evolving mining technology utilized in the United Kingdom. In the future, however, the returns from further safety and health legislation will diminish. Continued accident reduction will be achieved, however, through advanced mining system design containing two major elements: (1) the reduction of inherent hazards at the work place, and (2) the removal of manpower from immediate hazards through deep mining operations which are more capital intensive and less labour intensive. Such systems are already providing mining processes with higher reliability and improved efficiency. These policies and practices programmed to ensure greater safety and health are wholly compatible with sharpening competiveness in the market.

Risk reduction requires the deployment and professional management of extensive resources. The National Coal Board will not shelter behind the easy view that current mining accidents are primarily due to the mineworker's individual negligence. Fallibility is a human trait which we all share. The Board recognizes its duty to minimize the risks occasioned by human failings and knows how to achieve this goal through the utilization of technology. Continuing success in designing out risks is possible and any failure to pursue such a rewarding policy by the employer invites a charge of professional negligence.