



SAFETY ALERT

Miner crushed by drill jumbo

INCIDENT

An operator working in an underground metalliferous mine was crushed between the feed beam assembly of a drill jumbo and the wall of the drive. The operator sustained serious internal and spinal injuries that resulted in him being paralysed below his waist.

CIRCUMSTANCES

The jumbo was being serviced by a maintenance fitter. It was a short distance back from the face with its two booms parallel to the drive and the top of the feed beams at approximately chest height (see photograph 3).

While the service was being completed the jumbo operator and another employee were readying the machine for drilling.

During the routine service, the repair of an oil leak around one of the two check valves on the feed beam rotation motor was attempted.

The function of the check valves is to prevent movement of the rotation motor (and hence rotation of the feed beam) except when the motor is driven in the desired direction. They therefore prevent unintended movement of the rotation motor if oil leaks occur within the system – for example, if a hydraulic hose bursts. One of the two valves prevents rotation in the clockwise direction, the other rotation in the anti-clockwise direction.

The repair involved removing the check valve to replace an O-ring oil seal. The maintenance person carrying out the repair checked to see if the operator was in the area. He then loosened the valve slightly to see whether oil would flow from around the valve, in the belief that this would reveal any tendency for the feed beam to rotate when the valve was removed. He did not observe any escaping oil and removed the valve completely.

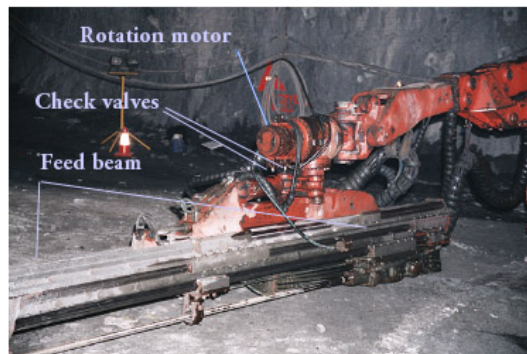
When the valve was removed the feed beam began to rotate. The fitter moved to a safe area at the front of the machine. When he turned he found the operator crushed against the wall of the drive by the feed beam assembly.

The feed beam apparently was near the point of balance when the valve was removed and so initially showed no tendency to rotate.

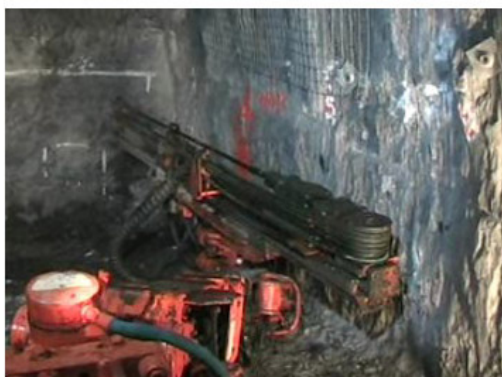
It would have been simple to position the feed beam on the ground (see photograph 2) before attempting to remove the check valve. This would have eliminated any possibility of the feed beam rotating.



Photograph 1
Side view of the drill jumbo



Photograph 2
Feed beam positioned on the ground



Photograph 3
Reconstruction showing position
of the feed beam before the incident



Photograph 4
Reconstruction showing position
of the feed beam after the incident

INVESTIGATION

Preliminary investigation has established the circumstances of the incident, however, further investigation is being carried out by the NSW Department of Primary Industries Investigation Unit.

DISCLAIMER

This Safety Alert describes the circumstances of an incident and discusses ways in which employers and employees may prevent similar incidents.

Readers should not infer from this discussion that shortcomings in the matters discussed were a major contributing factor to this incident.

RECOMMENDATIONS

Employers should review their maintenance practices, particularly those involving the maintenance of hydraulic systems. The issues to consider are:

1. Employers have a duty under the *NSW Occupational Health and Safety Act 2000* (OHS Act) to **ensure** the safety of their employees and to ensure that others in the workplace are not exposed to risks. To do this, employers must identify and minimise risks to safety **to the maximum extent which is reasonably practicable**.

Employees have a duty to **take reasonable care** for the health and safety of people who are at the employee's place of work and **to co-operate** with their employers so that the employer can meet its obligations to provide a safe workplace.

2. To meet their duty employers must actively identify hazards and ensure the risks which arise from these hazards are eliminated or reduced to a minimum.
3. The employer must implement controls in the following order:
 - **Elimination** of the risk
 - **Controlling the risk at source** (by substituting a lower risk, isolating people from the risk or engineering controls)
 - Minimising the risk by the design of **safe work systems** ('administrative controls' such as safe work procedures and training)
 - Reducing the risk through **personal protective equipment**.
4. 'Administrative controls', such as training and safe work procedures, rely on people and so are less reliable than physical controls. Where these controls are necessary 'human error' must be considered. Training and safe work procedures must address the hazards encountered on the job, be practicable and be actively used.
5. Employees must have a clear understanding of what management expects and this must be reinforced by the actions of both managers and supervisors through active supervision.
6. Job Safety Analyses (JSA) should be used for unusual tasks or where it is necessary to modify a safe work procedure for a particular job.
7. Consideration of 'energy sources' is a useful way of identifying hazards when carrying out risk assessments and JSAs.

DISCUSSION

Introduction

The incident raises a number of safety issues which employers should consider in relation to the safety of their operations generally, as well as maintenance of hydraulic systems specifically. These include:

- Risk assessment and job safety analysis
- Hierarchy of controls and human error
- Training and safe work procedures
- Management expectations, supervision and adherence to safety procedures
- Energy sources and unintended release of energy.

These factors are all relevant to the prevention of this type of accident and are presented for that reason. It should not be inferred from this discussion that shortcomings in any of these areas was a major contributing factor to this incident.

OHS Act obligations

Employers and persons working in mines are reminded of their obligations under the *NSW Occupational Health and Safety Act 2000*.

Employers

Employers have a duty under Section 8, to '**ensure** the health, safety and welfare at work' of all their employees and to '**ensure** persons other than their employees are not exposed to risks to their health or safety arising from the conduct of the employer's undertaking'.

In relation to employees an employer must at least:

- ensure that any plant provided for use by the employees at work is safe and without risks to health when properly used
- ensure that systems of work and the working environment of the employees are safe and without risks to health
- provide such information, instruction, training and supervision as may be necessary to ensure the employees' health and safety at work.

Employees

Employees likewise have a duty under Section 20 to '**take reasonable care** for the health and safety of people who are at the employee's place of work and who may be affected by the employee's acts or omissions at work'. Further, an employee 'must, while at work, **co-operate** with his or her employer'... 'so far as is necessary to enable compliance with any requirement under this Act or the regulations'.

Statutory defence

The Act provides a defence in Section 28 which limits the obligations of both employers and employees if they can show:

- it was 'not reasonably practicable' to comply, or
- the failure to comply was 'due to causes over which the person had no control and against the happening of which it was impracticable for the person to make provision'.

For more information on the *OHS Act*, *OHS Regulation* and Codes of Practice visit the NSW DPI Minerals website at:
www.dpi.nsw.gov.au/minerals/safety/legislation

Risk assessment and job safety analysis

Risk is a measure of how serious the consequences of a particular event would be and also of how likely it is the event will occur. Thus an event which is likely to occur and would have serious consequences is a 'high risk'.

The process of identifying risks is commonly referred to as 'risk assessment' and is the basis of occupational health and safety.

As noted previously employers have a duty to **ensure** the safety of their employees and that other persons are not exposed to risks arising from their operations.

In the occupational health and safety context, the word '**ensure**' means that employers must:

- actively identify all risks arising from their operations, and
- reduce these risks to the maximum extent which is **reasonably practicable**.

After all control measures are in place, some residual risk may remain but both effort and expenditure may have been required to ensure this is the lowest level of risk which is 'reasonably practicable' to achieve.

A job safety analysis is an 'on-the-job' risk management procedure used to identify potential hazards and to manage risks when unusual tasks are being undertaken. Workers identify potential hazards and then devise a means of doing the job so that risk is controlled.

Hierarchy of controls and human error

There are statutory requirements setting out the preferred methods of controlling risks.

- Risks must be **eliminated** if possible. If elimination is not possible, controls must be implemented in the following order:
- Risk **controlled at source** (by substituting a lower risk, isolating people from the risk or engineering controls)
- Risk minimised by the design of **safe work systems** (by administrative controls such as safe work procedures and training)
- Risk reduced through **personal protective equipment**.

This is referred to as the 'hierarchy of controls' and recognises that elimination of risk and physical means of control are more reliable than 'administrative controls' which rely on people. People are prone to error either through lack of knowledge, lapses in concentration, memory failure, etc or through intentional non-compliance.

Training and safe work procedures

Training and safe work procedures are some of the least preferred methods of controlling risk. More effective control methods ('elimination' and 'control at source') must be implemented first and the remaining risk should be managed by training and safe work procedures.

If training and safe work procedures are to be used, they must be based on managing identified hazards (a 'risk assessment') and must consider how human error may limit their effectiveness.

Management expectations, supervision and safety procedures

Workers' actions are based in part on what they believe management 'really' wants. They are more likely to engage in 'risky' actions to speed the job up if they believe management expects or condones this type of behaviour.

It is important that managers and supervisors communicate what is expected clearly through both their actions and their words.

To be effective, safe work procedures must be practicable, consider all the hazards and be actively used. They must also be enforced by managers and supervisors.

Energy sources and unintended release of energy

When carrying out risk assessments and JSAs the existence of energy sources should be specifically considered and steps taken to prevent an unintended release of energy. In the incident described above the heavy feed beam was raised above the ground. The elevated position meant that energy could be released (for example by the removal of the check valve) and therefore suitable measures would be required to prevent this.

NOTE: Please ensure all relevant people in your organisation receive a copy of this Safety Alert, and are informed of its content and recommendations. This Safety Alert should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's notice board.

Signed



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NSW DEPARTMENT OF PRIMARY INDUSTRIES