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Implementation of the Moura Recommendations - A Managers Perspective

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INTRODUCTION

The tragedy of the Moura No. 2 incident has lost much of its emotional mileage for those organisations that thrive on loss and suffering. However, for the families, workers, mine owners and operators in the Queensland underground coalfields, the challenge of delivering a positive outcome, though well underway, is in its infancy. The pressure created by interested parties is necessary for overcoming the inertia involved in change; but they cannot deliver the change. The responsibility ultimately resides at each individual minesite with the people who work there each day.

Moura No. 2 has progressed through a number of stages. The Warden's Inquiry generated a wide range of recommendations for the industry to address. Representatives from Government organisations, mine management, union bodies and the general workforce were then organised into taskgroups and delegated the responsibility of expanding the recommendations so that they could be practically integrated into mining operations. A number of sub-committees were also initiated in order to adequately cover particular, often individual issues in detail. The results of the taskgroup and sub-committee efforts has generally fallen into the areas of legislative changes, operational changes, or research activities.

At the time of delivering the Moura No. 2 recommendations, the then Queensland Labor Government unequivocally committed to instigating each and every one. This was also accepted by the following Liberal Government. This has been fairly controversial for the Queensland industry at the time because it has brought wide sweeping changes very quickly and will continue to do so for an extended period of time.

The focus of this paper is on the practical application and integration of the suggested or required changes into an underground coal mine in Queensland. It is not exhaustive but concentrates on those recommendations that have already provided safety, operational or financial benefits. It is specifically related to Central Colliery but will have a general similarity to other underground coal mines in Queensland due to the overriding mechanism for change, that is legislation.

CHANGE MECHANISMS AND PROCESSES

The system for driving the change at Central (and the Capricorn Coal Venture) is via the process mapping and re-engineering discipline. This provides the framework, logic and rationale with which each objective of the Moura recommendations is addressed and locked into present and future procedures. The topics to be covered fall into three broad categories:

Equipment - oxygen self rescuers and means for self escape, monitoring and analytical systems, seals, inertisation apparatus and refuge chambers;

Management Systems - training, sealing and monitoring procedures and management plans; and

Legislation - which is linked, in principle at least, to all the topics that are discussed.

Capricorn Coal Management Pty Ltd Central Colliery

SELF ESCAPE

The emphasis for escape is on self escape rather than immediate reliance on mines rescue. This is covered with a range of options: personal oxygen self rescuers (30min duration); emergency breathing apparatus (60min duration) at each crib area, longwall face end and caches every fifteen pillars in the main headings; the refuge chambers previously described; life lines or emergency lighting/sound guidance systems and mobile refuge chambers in each panel.

Segregated intakes are standard throughout Queensland mines as per legislation and so provide a fresh air second escapeway from most areas of the mine.

Various scales of evacuation are mandatory at each site on an annual basis. These are designed to audit and retrain in the full range of protocols; management plans, trigger points, alarms and responses and personal preparedness.

Whilst the issue of escape is focused on after the event, the discipline of planning and auditing has provided the mine management and workforce with a greater degree of confidence and knowledge in both the ongoing control of the mine and the minimisation of loss if something were to fail.

GOAF SEALING

The requirement for sealing goaves with seals rated to withstand an overpressure of 20 psi initially created problems with cost, a backlog of sealing and labour requirements. However, these have been offset by the advantages gained. Following extensive testing a number of suppliers entered the market for supplying and/or installing these seals. This competition has led to more economic alternatives whereby a seal can be installed in about half the time and cost of those previously installed by mine personnel. Quality is also superior due to the degree of specialisation provided by the supplier.

Trials were conducted, at the mine, of the various types of seals available. This investigation resulted in a selection based on robust design, resistance to convergence, sealing ability, speed of installation and cost competitiveness. The same type of seal is installed in each cut-through of the longwall, on retreat. This has reduced the previous problem of methane contamination from the adjacent goaf into the existing tailgate.

Thirty seals and two bleeder ventilation shafts were installed at Central in order to effectively seal the old goaves and reduce the number of bleeder roads. This has greatly reduced the extent of roads that are required to be inspected and maintained.

Permanent refuge chambers are installed adjacent to the shafts because the bleeders are essentially single entries. Emergency winding facilities are available in each shaft. Hence, at the mine extremities emergency refuge or escape facilities are readily available. The additional seals along the main returns have provided greater control of the extensive goaf area and a reduction in the methane concentration in the returns.

A recent spin-off to this extensive sealing regime has come in the area of gas utilisation. Utilisation in the form of power generation or direct gas usage has been considered for some time. The main delays for this occurring have been:

- the ability to guarantee supply during longwall relocations;
- the ability to generate sufficient electricity to be of benefit to the extended site; marginal rate of return in the current economic climate.
- The benefits gained from the extended and improved integrity of the goaf area mean that there is now good potential to overcome the first two issues.

MONITORING

The full gas monitoring system comprises a range of software and hardware. Tube bundle and telemetric systems are both used for environmental sampling. Tubes are predominantly connected to each goaf area (nominally each longwall panel has at least one sample tube), as well as duplicating the telemetric system in the critical areas. Telemetric points (covering CO, CH₄, velocity and pressure, as appropriate) are provided at belt driveheads, return splits, shafts and electrical installations. These are both linked to a PC based analysis system. The first provision of the system is for detailed information on the environment in the mine. The system also provides immediate warning when predetermined alarm points are exceeded. In accordance with recent legislative changes this must be acknowledged, logged and corrected in accordance with formal procedures. This system has demonstrated its reliability to the extent that the response is measured in minutes - for a diesel vehicle in a panel, to rib crush at a seal allowing oxygen ingress or, a collapsed stopping that leads to a pressure change at the main fans.

The monitoring system is coupled to analytical software that provides information on gas explosibility via Coward or Ellicott diagrams as well as a range of ratios. This means that an accurate assessment of the changing environment in the mine or in a sealed area can be rapidly determined.

Legislation requires mine evacuation during and after sealing operations and close monitoring of the atmosphere to ensure the safety of personnel. Where previously this has meant outages as long as six days for the mine, the combination of improved sealing techniques, responsive monitoring and a greater level of understanding of spontaneous combustion and the sealing process throughout the workforce, now result in one and a half days outage (i.e. a weekend), with the further target of less than twenty four hours being achievable. This will become less of an issue with continuing experience and the utilisation of various inertisation methods as part of regular procedures.

The tube bundle system can also be coupled to a gas chromatograph for more accurate gas analysis and for the detection of products of combustion. Though this capability has been available and required in Queensland mines for a number of years the chromatographs that are now available provide results in about ninety seconds, to an accuracy of ten ppm, compared to the previous time of one and a half hours at fifty ppm.

This range of technology remains predominantly academic without the integration of the equipment into the mining system. This is done via a series of management plans that require the equipment, analysis and communication constantly being cycled and assessed. The required education and communication processes that support this system means that all mining officials and a large proportion of the workforce are familiar with and understand the analysis of explosive gas mixtures and their interpretation.

MANAGEMENT PLANS

Legislation requires the assessment of the principle hazards at each mine and the development of management plans for each one by a cross section of the mine workforce. This has not been carried out "piece meal" but rather as an integrated process of risk assessment to determine all hazards followed by the development of all necessary plans and training to specific deadlines. Management plans typically cover, Spontaneous Combustion, Gas, Ventilation, Strata Control, Evacuation, Outburst and Water.

Whilst this is clearly a huge task, again a number of benefits were realised. There has been a certain amount of co-operation between mines in order that the result would be achieved; cross checking with consultants, suppliers, contractors and other operators occurred as part of this process; the requirement to include a range of representatives yielded a more "friendly" document and also commenced the process of training and communication.

The training aspect cannot be understated in this process. It has provided not only an avenue for communication but also confidence through increased knowledge. The requirement for Quality Assurance type document control; whilst a principle for good business; is even more applicable to Queensland where the workforce is typically transient that information is naturally harder to control.

Though there has also been a huge workload for the Inspectorate, this process will ultimately simplify their systems by having benchmarks and standards across the industry and in turn lead to more professionally run operations.

LEGISLATION

Much of the required change to the operating structures was brought about by legislative changes. These have been far reaching - touching on areas of equipment acquisition, operating and management standards and procedures, statutory positions and competencies through to mandatory audits and reviews. Though initially seen as being dictatorial in nature, these directives served to catalyse owners, operators, unions, inspectors, suppliers and contractors very quickly into the same direction for mutual benefit. Each organisation responded to the challenge, not with 'can it be done?', but rather as "how is it best achieved?", e.g. seal types, oxygen self rescuers and self escape systems, monitoring systems, refuge chambers, etc. This clear direction actually assisted mine operators to achieve the task set. This was because suppliers had the opportunity to make products available within a known time frame for a clearly defined market to an expected standard. Not only has a healthy level of competition been evident between suppliers (and is still evident), but there has also been healthy cooperation with mines and previous competitors in order to achieve the goals to everyone's benefit.

CONCLUSION

The recommendations and required actions from the Moura No. 2 Inquiry and following Task Groups have been onerous and extensive in the accountabilities and responsibilities placed on the operators of Queensland's underground coal mines. The immediate response is to resist the imposed change and look for an easy way out.

However, the acceptance of this change as being necessary. It has seen energy, otherwise used in resistance, channeled into education, training, investigation and management and has resulted in demonstrable benefits in cost control, and significantly improve levels of workforce knowledge and commitment

There is very little that is new in the work that is underway in the Queensland mines when compared to a more global focus. However, the comprehensive range of issues being grappled with in a short time span is demonstrating just how much can be achieved when necessity dictates.

There are far more changes occurring due to the Moura recommendations than has been presented in this discussion. The points described have been those that have delivered benefits to the operation and should be considered for other operations not respondent to the Queensland requirements. They are cost effective business solutions providing step change improvements to an industry needing an overhaul in the areas of safety, cost structure and commitment.

REFERENCES:

Warden's Inquiry, Report On An Accident at Moura No. 2 Underground Mine on Sunday, 7 August 1994.