WORKING ADJACENT TO AREAS POSSIBLY CONTAINING EXPLOSIVE ATMOSPHERES - THE PROCESS & FINDINGS OF THE MIP 10 COMMITTEE

Roger Bancroft
Senior Inspector of Mines
Department of Mines and Energy

Bill Allison
District Inspector
United Mine Workers

SUMMARY

One of the issues to emerge from Queensland underground coal mines following the Moura No 2 mine disaster is the conduct of mining operations in close proximity to goaf and waste areas. The particular concern is the possible combination of ignition sources and explosive atmospheres that could initiate a mine explosion. The issues to be resolved were considered in detail by a tripartite technical committee.

Following workshops in which all hazards were identified, the committee established a program to categorise the risks and evaluate the control mechanisms available. The risks identified were broadly placed into four groupings, ie adequately controlled or minimal risk, evidence inconclusive - further research required, no controls are available - other factors must be controlled or the event needs additional improved or new controls to manage the risk. Key issues that were found to require further on-going diligence include methane emissions, spontaneous combustion, frictional sparking and damage to and faults in electrical equipment

INTRODUCTION

After considering the findings and recommendations from the Wardens Inquiry (1), the principle coal mining union, the United Mine Workers, remained concerned about the safety of current mining systems. The main concern was in relation to the risk of explosions occurring in close proximity to mining operations conducted adjacent to goaf areas that may contain explosive gas mixtures. This was expressed as

Resolution No 24:
'**That convention determine that employers and the Queensland Government be placed on notice that unless satisfactory and acceptable methods of atmospheric inertisation are in place in underground coal mines by 1 August, 1996 to negate the possibility of explosive mixtures developing behind seals and behind longwall faces, then seals will not be erected and longwall faces will not be operated beyond that date'.**

PROCESS

In order to effectively deal with the concern, key industry operators requested that the Moura Implementation Committee examine the issues and make recommendations that would effectively meet the concerns of the mining unions. Following a meeting of key industry, government and union officials, a technical group was convened comprising of mine management, the unions, Mines Rescue Brigade and the Government. This committee was to address the tenth of a series of issues that emerged out of the Moura implementation process and so was called the MIP 10 Committee.

The committee is chaired by Senior Inspector of Mines and Manager of the Safety and Health Division - Technical Support Group, Roger Bancroft, and includes Mike Walker, Inspector of Mines - Rockhampton; David Reece, Mine Manager, German Creek Central Colliery; Kevin Carey, Ventilation Officer - Gordonstone Colliery; Ron Barker, Mine Superintendent, New Hope Collieries; Lester Anderson, Rescue Station Superintendent, Queensland Mines Rescue Brigade; Bill Allison, District Check Inspector, U.M.W.; David Cliff, Manager, Mining Engineering; and Stewart Bell, Acting Director, SIMTARS, with Bruce Ham, Mining Engineer, Queensland Coal Board as secretary.

Where outside technical expertise such as fault tree analysis and electrical systems were required appropriate technical expertise was solicited. Mr Bill Danaher provided assistance in relation to the development of fault tree analysis. The Department of Mines and Energy Electrical Inspectors provided expertise on electrical systems.

The focus of the MIP 10 Committee was to examine the accumulation of explosive gas mixtures and the sources of ignitions in the goaf and the adjacent coal face. While this has necessarily remained the focus of deliberations, it is

also obvious that the process followed and the findings made can apply to most facets of mining operations.

The process followed was to -:

- identify all hazards,
- rate each cause in terms of potential risk,
- document the many facets of such hazards
- discuss how they could be controlled
- where necessary identify the needs for future controls and research
- plan a program to ensure the information is effectively passed on to the industry.

POLICY

While the key issues were clearly defined in the Moura Report and the terms of reference , the MIP 10 Committee believed that to convincingly address the perceived risks and the concerns of the mine-workers and the operators, their deliberations would have to commence with an exhaustive fault tree process to show that all the relevant issues had been adequately addressed.

This process was complementary to the contemporary introduction of legislation that required all underground coal mines to develop safety management plans. This legislation which is now in force, requires that all mines identify the risks faced by their workforce and introduce appropriate control measures and management practices to effectively address the risks. It was obvious that in many areas there was a paucity of technical information to assist mines in preparing such plans.

HAZARD EVENT SHEETS

A series of 23 Hazard Event Sheets were compiled for various causes that might result in explosive gas mixtures. Causes that might result in an ignition were compiled in a further series of 34 sheets. These Hazard Event Sheets included the following information -:

1. Event (eg. Explosive gas mixture accumulating in the goaf)
2. Reference number
3. Cause (eg. Seam gas evolution, including adjacent seams)
4. Action class (eg. A, B, C or D depending upon the potential and ability to control)
5. Fault tree reference
6. Typical examples
7. Contributing factors
8. Monitoring and data acquisition
9. Existing controls
10. Future controls
11. Research requirements, and
12. Additional comments

DEVELOPMENT OF HAZARD MATRIX

There existed a challenge to translate the Hazard Event Sheets into a format that was going to be useful in terms of developing management tools and educational material. The first step was to group the many controls into 30 categories and produce a matrix that identified which controls could be applied to the 57 identified different causes. This same format was also applied in identifying future controls and research needs.

CLASSIFICATION OF PRIORITIES

The Hazard Event Sheets needed to be prioritised so that the more important issues could be addressed first and in the most detail. The committee developed the following categories -:

A- This event needs additional, improved or new controls to reduce or eliminate the risk of explosions.

B- This event cannot be practically eliminated (eg. goaf falls and propensity to spontaneous combustion). The controls must be applied to other categories of event to reduce or eliminate the risk of explosions.

C- Evidence of this risk is inconclusive, research may change this item to another category.

D- The risks of explosion occurring from this event can be currently adequately controlled or the risk is minimal.

In subsequent work, most attention has been focussed on the 'A' Category Items

CLASSIFICATION OF CONTROLS

In order to produce a final product that clients could readily assimilate into their operations, SIMTARS was contracted to prepare some material and collate additional material from committee and external experts.
All controls were grouped under the following headings -:

1. Mine design

2. Equipment and systems
3. Electrical
4. Methane drainage
5. Inertisation
6. Monitoring and data collection
7. Legislation
8. Standards and procedures
9. Human factors
10. Assessments and Auditing

FINDINGS - EXISTING CONTROLS, LEGISLATION, RESEARCH ISSUES

The majority of causes identified had adequate existing controls although the current literature on these controls was often found to be wanting. While there were a few problematical issues, these are restricted to a small number of mines at present. Key issues are high levels of methane, spontaneous combustion, frictional ignition (cutter picks), and some high voltage electrical systems.

A number of issues could be effectively resolved using legislated standards or prescriptive legislation. These may be applied as technology now exists that allows the removal of these hazards form coal mines. These issues include open brakes, live electrical testing and possibly high voltage systems.

REVIEW PROCESS

In order to ensure the findings of this exhaustive process are readily accepted by industry, a review process was established to solicit opinions from key industry decision makers before finalisation of the report. This process will provide for the inclusion of up-to-date information on technical, political and legislative developments.

DISSEMINATION OF INFORMATION

Having collated a substantial body of industry safety information, it is the view of the MIP 10 Committee that it is imperative to share this information across the coal industry as far as possible. The various proposed formats include the following -:

1. Conference papers,
2. Final Report of MIP 10
3. Manual of controls
4. Chart of controls
5. Maintenance of a Hazard database
6. Compilation and presentation of educational material.

CONCLUSIONS

It is the belief of the MIP 10 Committee that the work undertaken demonstrates that joint working parties on safety issues can efficiently address the issues from a broad range of perspective's and produce conclusions that have industry acceptance and credibility.

It is the nature of the geological environment in which underground mining is conducted that even with good planning, unexpected situations will arise. Apart from abandoning underground resources, there is no single control measure that can be expected to prevent fires and explosions in gassy underground coal mines.

This study has identified a series of controls which in the view of the committee members will if used properly, provide the coal mining community with an acceptable level of confidence in preventing fires and explosions where mining operations are conducted.

In the worst case scenario, where there is both high gas make and high frictional ignition or spontaneous combustion activity, the latest research and field trials on induced inertisation appear to indicate that this approach has possibilities for a future control mechanism.

The effective use of the controls identified will largely depend on the level of technical competence of the mine personnel to effectively identify the problem and introduce effective controls.

The final report may become dated very quickly as research and development projects define new ways to control existing hazards and as emerging technologies create new hazards requiring new solutions

REFERENCES

(1) Wardens Inquiry into the Accident at Moura No. 2 Mine.