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Appin Colliery explosion reassessed

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APPIN COLLIERY EXPLOSION REASSESSED

Bob Kininmonth¹

ABSTRACT: The Judicial Inquiry into the Appin Colliery explosion on 23rd July 1979 made a specific finding that the fan starter box was the location of the initial ignition of gas. The subsequent Coronial Inquiry recognized the possibility of the fan starter box being the source but also recognized the possibility that the Deputy's flame safety lamp could have been the trigger. Neither Inquiry detailed the mistakes that must have been made for either of those options to be the cause. It is contended that the flow of factual information at such Inquiries can be influenced by the high-profile legal representation used by the interested parties. It is important to ask whether an Inquiry before an independent technical expert would give the industry a better explanation of the factors that led to and caused the event.

INTRODUCTION

At 11pm on Tuesday 24th July 1979 an explosion of methane gas in K Panel of Appin Colliery resulted in the deaths of 14 workers. This disaster was associated with a changeover of ventilation that was intended to create a situation whereby a central intake, in a three heading development panel, would be shielded from intake gas by returns on each side. Prior to the changeover the panel had two intakes and one return. The then Minister for Mineral Resources directed that a Judicial Inquiry be held. His Honour Judge A.J. Goran conducted the Inquiry and delivered his report on 9th May 1980 (Goran, 1980). Subsequently a coronial Inquiry under the Coroners Act was held before Stipendiary Magistrate J. Hiatt and a report delivered on 19th December 1980 (Hiatt, 1980).

PLANNED VENTILATION CHANGEOVER

Ventilation conditions in K Panel prior to the changeover and the intended affect of the changeover are shown in three stages in Figure 1 as follows:

Stage 1 shows the panel layout on the morning of Tuesday 24th July with A and B headings as intakes and LW8 Maingate as the return. The overcast at the intersection of C/T 3 and A heading was being built. The LW8 Maingate stub was brattice ventilated. An auxiliary fan in C/T 4 provided ventilation for A heading while B heading that had been advanced 70 m as an intake stub, was ventilated on brattice

Stage 2 shows the post-changeover ventilation flow. This situation was planned to be reached, after completion of the overcast, by erection of the temporary brattice in B heading and removal of the brattice stopping in C/T 3.

Stage 3 was to be the completion of the changeover with a fan, that had been placed in B heading being used to ventilate the stub.

Near the end of the afternoon shift the overcast had been completed and the brattice in B heading had been erected. The Deputy who was meant to remove the C/T 3 brattice did not do so because he noticed leakage from the overcast. It was near the end of his shift and he left the panel. During the inquiries it could not be established what messages were passed to the evening shift Deputy, but it is clear that for some undetermined time the whole of B heading inbye of C/T 3 was virtually unventilated.

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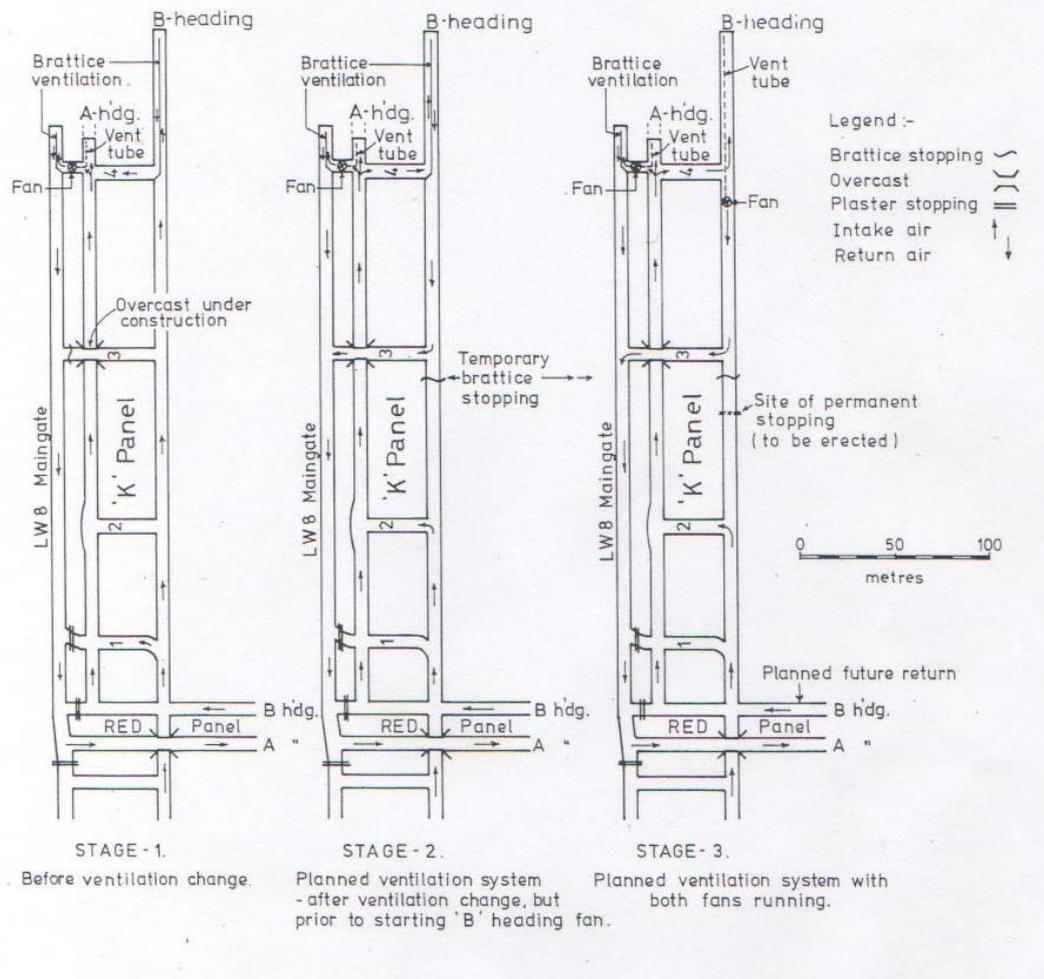


Figure 1 - Changeover plan

INQUIRY FINDINGS

The report by Judge Goran (1980) included the following statements:

1. 'It is now obvious that I cannot accept as any form of probability the proposition that the deputy's safety lamp caused the first ignition.'
2. 'I am therefore left, as a result of the whole of the evidence, with the conviction that the explosion began by an ignition in the fan starter-box. I do not suspect that the deputy's lamp contributed in any way to the explosion.'
3. 'My finding necessitates a finding of gas in the starter-box and around the back of the fan. I am unable on the evidence to say in any precise manner how this collected, there being no eye witnesses and the evidence itself having been largely destroyed by the explosion. The following means are, however open on the evidence:
 - i. The failure of adequate ventilation of B stub, because of the non- removal of the No3 cut through brattice.
 - ii. A possible failure of ventilation due to an occurrence such as a fall in a stopping outbye.
 - iii. The substantial leakage in the overcast and through B heading stopping creating a serious deficiency of air available to the B heading fan.

- iv. The failure, deliberate or accidental, of the B heading stopping'.

Coroner Hiatt (1980) stated:

'I have spent considerable time on my deliberations concerning the question of the source of ignition and referred to many aspects both in support and against each of the alternatives advanced. Other alternatives were excluded on consideration of the evidence and another raised by Mr. Lloyd as to a spark caused by friction on the use of the steel wedge has been left up in the air, however I have determined that such a proposition is less likely as a probability than the fan starter switch in B heading or the Oil Flame Safety Lamp in the possession of Mr. Rawcliffe. If it was the former then it is probable that some person now deceased was at fault. If it was the latter, such act or omission not being deliberate or without exercise of reasonable care, the cause of the ignition could have been without fault or accidental.

An examination of the evidence in respect of those two alternatives discloses:

In one, the fan starter switch chamber, a higher probability of an ignition source and less probability of gas being present in explosive proportions with a readily ascertainable flame path to the face of the headings and in the other, the Deputy's defective Oil Flame Safety Lamp, there is a higher probability of gas in explosive proportion being present with a readily exposed flame path (the vent tube or layering) with a less probable source of ignition than that available in the case of an alive electrical source in my view neither can be responsibly excluded on the evidence before this Court.

The evidence adduced does not enable me to say what was the source of the ignition which caused the explosion of methane gas at the face of the heading. Therefore I am not able to determine what the proximate or direct cause was of the explosion but I have concluded that there was a condition existing for a period of time whereby the B heading stub was not properly ventilated. The precise reason for that has not been disclosed on the evidence but on the balance of probability there is evidence that the acts and omissions of persons on the previous shift contributed to inadequate ventilation.'

ESTABLISHED INFORMATION

At the time of the explosion ten of the crew members were in the cribroom in the intake roadway and four employees were in the face area. The Undermanager, the Deputy and the electrician were near the fan.

The following significant matters relevant to the incident appear to have been accepted:

1. The starter box of the fan was not in a flameproof condition, most of the studs had been removed. It was considered that the fan had been started and found to be running in reverse. Change of direction could be achieved from inside the starter box but should not have been attempted with the power on.
2. At the time of the explosion the fan cable was live.
3. There was a distinctive pattern mark inside the fan starter, which later tests indicated could only have been formed by an internal ignition.
4. The Deputy was equipped with a flame safety lamp for gas detection. The Undermanager, who arrived in the panel at a late stage, had both a flame safety lamp and a methanometer. The Deputy's flame safety lamp, which was damaged in the explosion, was shown by later examination to have some defects. In particular it was found that the relighter key was missing.
5. There was a brattice stopping in C/T 3, which should have been removed to allow flow of air into the return, it was not removed as expected and the time of its removal could not be determined.
6. The roadway in which the fan had been installed was almost completely unventilated for an undetermined period but possibly as long as five hours.
7. Scientific investigation indicated that the explosion was initiated at the face end of the standing stub entry. It was considered that flame had traveled up the vent tubes leading to the gas accumulation at the face.

8. The inspectorate did not enforce the requirement of General Rule 1 of the Coal Mines Regulation Act 1912, that intake gas levels should not exceed 0.25 per cent.

Comments

In assessing the circumstances that led to the explosion there are a number of matters that are fundamental to an understanding of the event.

Gas control

There were three levels of methane covered by legislation in New South Wales: a level of 0.25 per cent in the intake, a level of 1.25 per cent when electric power would be disconnected and a level of 2.5 per cent when workers would be withdrawn.

In addition it is important to acknowledge that methane in air will burn on a flame and can be recognized between 1.25 percent and 4.5 per cent. At 5 per cent an ignition occurs. When present at higher percentages methane is most easily ignited at 7.5 percent and has its maximum explosive strength at 9.8 percent.

Flameproof enclosures

A flameproof enclosure is designed so that the lid of the enclosure fits on a wide edge that absorbs heat and prevents an internal explosion being transmitted with sufficient energy to ignite an external explosive mixture. It is essential that the lid is tightly held in place –usually by a number of screwed studs. If a flameproof enclosure is to be opened where gas may occur it is important to disconnect the power supply

After the explosion at Appin the fan starter-box was found to be in a non-flameproof condition with only one of the 24 studs in place. The starter-box immediately became suspect as the source of the ignition.

Flame safety lamps

Apart from the ability to show the presence of methane, safety lamps have also been regarded as being an important tool in providing warning by being extinguished in low levels of oxygen. They have the characteristic that when they are placed in contact with methane at 5 per cent an ignition inside the lamp extinguishes the flame and the flame does not pass outside because of the protective gauze construction.

A post-explosion investigation showed that many safety lamps at Appin and in the Illawarra, had minor defects. A series of tests of safety lamps with these defects indicated that in some circumstances they could transmit an ignition to an outside explosive mixture. MacKenzie-Wood (1980) reported:

‘Glasses with ‘non-parallel’ ends, found in colliery stock fitted to a safety lamp in otherwise good condition, were found to ignite an external flammable atmosphere with internal ignition’

The safety lamps issued to Deputies and other officials at Appin were of the Protector type with a pyrophor relighting facility. The approval for that type of safety lamp contained a condition that a lamp should not be relit in a place where gas was likely to be present.

Judge Goran (Goran, 1966) in his report on the Bulli Colliery fire commented.

1. ‘The oil flame safety lamp has a long and successful history in mines as an instrument of safety. Its flame can readily detect carbon dioxide or methane. Despite any criticisms which have been levelled at it during my Inquiry and elsewhere it is truly the miners friend and, in my opinion cannot at present be supplanted.’
2. ‘There has been demonstrated before me an improved oil flame safety lamp manufactured in Great Britain which has a relighting device within it, whereby the lamp can be relit by use of a lever which generates by friction a spark in the safety of the lamp itself, without the lamp being unlocked for this purpose it should not be relit except in the main body of the air current. This is

because there may be an explosive mixture within the lamp itself. A repeated explosion would render the lamp ineffective, since its gauzes would become red hot.'

Strang and Mackenzie-Wood (1990) wrote:

'If a lamp is defective then it is during the act of relighting that the moment of greatest potential danger lies.'

It is of interest to note that safety lamps have always been suspect in conditions of high air velocity and that the relighting of lamps can be a source of danger.

Pamely (1898) wrote in the following terms:

'Again if the lamp were extinguished in any other way, and subsequently filled with an explosive mixture, the sudden flash of re-lighting and the internal explosion might cause sufficient pressure within the lamp to force the flame through the gauze and fire the external gaseous mixture.'

Platt(1924) wrote:

'The most severe test that can be made on a lamp in a still atmosphere is the 'internal ignition test' and while it should be made on all types of lamp, it is particularly appropriate to lamps fitted with internal relighters for it is during the act of relighting that the moment of potential danger lies if the lamp is defective.'

Strang and Mackenzie-Wood (1990) continued:

'The pyrophor relighter lamps were banned in Germany, their country of origin, in 1953.'

Following the explosion at Moura No4 Mine in 1986 an Inquiry (Queensland Government, 1986) concluded that safety lamps were not considered to be safe in atmospheres containing methane and coal dust and they were withdrawn from general use in Queensland coal mines.

Although approval for the use of safety lamps was not revoked in New South Wales they were gradually removed from service and it appears there are now none in use.

Removal of accumulations

The use of a fan to remove an accumulation of gas from a roadway is not an unusual event. The essential features of such use are:

1. The area around the fan should not contain more than 1.25 per cent of methane.
2. The exhaust gas passing through the fan should contain less than 2.5 per cent methane.

It would be the duty of the deputy to ensure the area was free of gas and to arrange for the vent tubes to be separated at a convenient point so that enough fresh air entered the tubes to ensure the exhaust was kept below 2.5 per cent. The vent tubes inbye of the separation point carry high levels of methane and these are diluted by fresh air feeding in. When the fan stops the methane-rich flow will not stop immediately.

The Appin circumstances

The changeover from two intakes to one intake and two returns was an unusual procedure for Appin. It was not possible to establish whether each of the on-site officials was kept in touch with progress in the changeover period. It is clear however that the final stages of the changeover had been reached by the start of the evening shift on the day of the explosion.

On the previous shift the overcast in 3 cutthrough was completed and a temporary brattice stopping was erected in B heading outbye of C/T 3. It was planned that the brattice stopping in C/T 3 would be removed so that B heading would become a return. The deputy who was on-site did not remove the C/T 3 brattice because he became aware that there was leakage of intake air through the overcast. It was not possible to establish when or if the C/T 3 brattice was removed. It is obvious however, that until it was taken down B heading was almost completely unventilated.

The brattice for the stopping in B heading was found after the explosion to have been erected on the wrong side of the props. Assuming this did not affect its efficiency and that the leakage from the overcast was not as significant as suggested, removal of the C/T 3 stopping was all that was necessary to establish B heading as an operational return.

Once this was done the final step to be undertaken was the establishment of fan ventilation for the standing stub of B heading inbye of C/T 4.

The Deputy's role

Apart from his responsibility to ensure safety in his panel the Deputy should have carried out the following actions before starting the fan:

1. Test for gas in the area around the fan.
2. Assess that there was an adequate flow of air down the newly opened return.
3. Arranged for the vent tubes to be separated so that when the fan was started the exhaust from the fan would contain less than 2.5 per cent methane.

Operation of the fan

It was accepted that the fan was started and was found to be running in reverse. In reverse the fan could still pass air in the correct direction but at a much lower volume (approximately 40 per cent of its rated capacity). Correction of reverse running can be achieved by disconnecting the power, opening the starter box and making suitable adjustments. It is, of course, important to reclose the starter box and ensure it is in a flameproof condition before power is restored.

Blast pattern

After extensive testing at Londonderry and elsewhere it was agreed that the blast pattern in the starter box could only have been formed by an internal ignition. Even though the cover was only held in place by one stud the explosion in B stub could not have caused the pattern in the box.

It was accepted that the trigger for the explosion was an ignition of methane that travelled inside the vent tubes. If the starter box provided the spark for the ignition then, apart from the fact that power was left on to the fan, the following events must have occurred:

1. The flow of air in B heading was insufficient to prevent recirculation (possibly even when the fan was running in reverse and passing a low flow volume).
2. The recirculation was undetected.
3. An explosive mixture was allowed to pass through the fan perhaps because the vent tubes had not been separated.
4. The cloud of recirculated air remained stationary around the fan and the starter box during the time taken to open the starter box.
5. Both the Deputy and the Undermanager, who were equipped with safety lamps, must have failed to notice or failed to act on the fact that their safety lamps were extinguished by the presence of the explosive mixture.
6. The starter button must have been pressed while the fan was not in a flameproof condition.

There is, however, one alternative possibility that is supported by the fact that B heading was left virtually unventilated for an extended interval. During the period before the C/T 3 brattice was removed gas continued to accumulate. The build-up may well have extended into the zone between C/T 3 and C/T 4 and also into the starter box. Under that condition the first application of power, that is when the fan was run in reverse, would have led to ignition in the box and could have led to formation of the blast pattern at a time when the box was in a flameproof condition.

After the explosion the body of the Deputy was found in the shuttle car. There is no logical reason for him to be there unless he was either on the boom of the miner or in the shuttle car controlling the gap in

the vent tubes and ensuring that the fan exhaust was carrying a low percentage of methane. It is possible that he did not realise he was in a spill of methane from the separated vent tubes and caused the ignition by attempting to relight his lamp. Withdrawal of the key can cause a spark sufficient to ignite methane in the lamp. This proposition is reinforced by the fact that the Deputy's lamp was found without the relighter key. It is difficult to imagine how the force of an explosion could remove the key from a lamp if the key was fully home.

Inspectorial tolerance

For a number of years prior to 1979 the problem of maintaining intake gas levels at less than 0.25 per cent had been discussed with the management of the colliery. Intake quantities had been increased without solving the problem. Trials with methane drainage holes had been carried out but were not at that time considered to be successful in controlling the make of gas.

The preamble to the General Rules of the Coal Mines Regulation Act (NSW Government, 1978) contained the statement that those rules shall be observed as far as is reasonably practicable. It was in the spirit of that statement and in recognition of ongoing efforts to control gas-make that mining continued. Although an increase in intake gas levels was bound to make face ventilation more difficult there was never any attempt to accept higher than prescribed levels at the face or elsewhere.

When it became obvious, during the Judicial Inquiry, that inspectors had allowed levels higher than 0.25 per cent in the intakes some concern was expressed and Judge Goran referred to the matter as "inspectorial tolerance".

Goran (1980) recorded two relevant and somewhat contradictory statements about that matter:

1. At page 87 'I hasten to say that the Minister and the Undersecretary were quick through Counsel to deny knowledge of the practice and to disassociate themselves from it'
2. At page 91 in reference to an exemption granted before the explosion '...the Minister saying that the quantities of methane being liberated in the colliery were giving him cause for considerable concern'

A letter to the manager requesting details, of action he proposed to take to control the intake gas situation was included in a Departmental file. That file which also contained follow-up reports by inspectors was available to Counsel but was not presented to the inquiry. When asked about this, Counsel assisting the Inquiry indicated that though he was representing the Minister he was not representing Departmental officers. That fact, together with a further comment at page 87 by Goran (1980), puts into question the objectivity of the Department. The comment, by Goran, was:

'I have received a document from Inspectors in the Department who are not coal mining Inspectors and are appointed under different legislation They wish me to make it clear that they should in no way be confused with those Inspectors whose duty it is to enforce the Coal Mines Regulation Act.'

When notice of the Coronial Inquiry was received a letter signed by six Inspectors requested approval for one of their number to be their representative.

Approval was granted by the Coroner.

INQUIRY RECOMMENDATIONS

In a press release, the Minister for Mineral Resources, (Mulock, 1980), identified 27 recommendations from the Judicial Inquiry. Kininmonth (1981) listed 14 of the ones that may have had an immediate or major effect. It is appropriate at this time to consider an abbreviated version of all 27 with the Minister's comments and an indication of the current position:

- Official circulation of specific material on limitation of explosions.

Minister's comment: *Instructions given for booklets and films to be prepared and distributed.*

Current position: A document Guideline for coal dust explosion prevention and suppression was prepared (NSW Department of Primary Industries, 2001).

- Reference should be made to overseas work in determining the adequacy of legislation dealing with fires and explosions.

Minister's comment: Stonedusting and control of flammable gas will be given specific attention in the current review of the Coal Mines Regulation Act.

Current position: This matter is covered in the Coal Mine Health and Safety Regulation 2006 (NSW Government, 2006).

- All collieries should review whether their precautions against propagation of an explosion are sufficient.

Minister's comment: Chief Inspector to commence an examination. If necessary, action will be taken to require management of mines to revise their precautions

Current position: This is covered by Hazard Management Plans in Regulations 35 and 36 of the Coal Mine Health and Safety Regulation 2006 (NSW Government, 2006)

- Legislation should be strong in areas of known danger to attempt to prevent any foreseeable risk of an incendive nature.

Minister's comment: The need for legislation to prevent any foreseeable risk of an incendive nature is indisputable.

Current position: A booklet titled "Preventing Frictional Ignitions" was made available to the industry.

- The gas problem will become apparent to most deep-mining projects. The Department should act to inspect and advise collieries on new techniques.

Minister's comment: The department is considering the need to employ a "gas control engineer"

Current position: The Department does not have such a staff employee.

- General Rule 4 reports are vague in the extreme and give no real information as to actual gas conditions or ventilation.

Minister's comment: Action has been taken on the revision suggested.

Current position: There is now no standard form.

- There should be some check upon the Deputy's safety inspections. The ideal officer to perform this task is the Federation's Check Inspector.

Minister's comment: This issue will require detailed consideration. The parties concerned will examine ways in which the recommendation may be given effect.

Current position: Although there is no specific supervisory role in regard to deputies, the Coal Mines Regulation Act 1982 (NSW Government 1982) made provision for District Check Inspectors to suspend operations if they became aware of a condition of danger or a breach of regulations.

- The Deputy must be given a methanometer as well as his safety lamp.

Minister's comment: I agree. Specific training programmes for the Deputies on the proper use of methanometers will be introduced.

Current position: Since the withdrawal of flame safety lamps all deputies are issued with multi-gas detectors.

- I would recommend the appointment of a ventilation officer perhaps with a part-time but prime responsibility whose duty it would be to supervise the whole question of ventilation in a mine.

Minister's comment: Action is being taken to determine the legal mechanism to define the duties of such an officer.

Current position: All mines are required to have a Ventilation Officer and to have a biannual audit from a Ventilation Engineer

- The system of policing an Act designed to keep mines safe must be kept as tight as possible.

Minister's comment: The act dealing with health and safety must be observed. It is unfortunate that it must be policed.

Current position: The Act and Regulations are enforced by Departmental Inspectors.

- All experiments (related to an Inquiry) should be departmentally official, permitted and conducted under the supervision of one director.

Minister's comment: Any such appointment will be made by me.

Current position: The Department now has an Investigation Unit and there is provision in section 147 of the Coal Mines Health and Safety Act 2002 for the appointment of investigators (NSW Government, 2002).

- The dearth of competent Inspectors. Inspections sometimes are separated by months and then do not involve the whole mine.

Minister's comment: I believe that there will continue to be difficulties in recruiting competent Inspectors because of the competing demands of an expanding coal mining industry.

Current position: It is apparently still difficult to recruit and retain Inspectors. Their functions are supplemented by the appointment of Mine safety Officers who have limited powers but do carry out audit and inspection duties.

- There appears to be a totally inadequate number of Electrical Inspectors.

Minister's comment: Immediate action be taken in relation to this particular staffing matter.

Current position: Present staff levels appear to be satisfactory.

- No record of the result of an inspection (by a local Inspector) seems to be left at a mine.

Minister's comment: The fact that no record of the results of inspections is left at the mine is an obvious deficiency in the current system and I have arranged for this matter to be corrected immediately.

Current position: Although reports of inspection are not made as a routine procedure any matter of concern is covered by a notice in writing.

- A duplicate copy of exemptions should be sent to the local check inspector.

Minister's comment: I agree that the check inspector should be supplied with a copy of exemptions which may be granted in respect of the mine at which he is employed.

Current position: This is now done.

- I feel that it is dangerous to raise the present statutory limit of .25%. If there is any tolerance, it should be limited to a low departure from the statutory provision and only given on written application to the Chief Inspector for exemption.

Minister's comment: It is my intention that the present statutory limit should be maintained. If there is a situation where tolerance may be required, it will only be given on written application to the Chief Inspector.

Current position: This is now standard procedure.

- I feel that it would be an advantage for collieries to be graded in terms of gassiness.

Minister's comment: I have asked the Chief Inspector to determine what advantages would accrue from adopting the recommendation. I will require urgent action.

Current position: Gas monitoring is used to determine the standard of stonedusting to be used.

- I specifically recommend that every lampman be supplied with an illuminated magnifying glass for the inspection of faults in gauzes.

Minister's comment: The Department has commenced action towards preparation of a code for the use and maintenance of oil flame safety lamps.

Current position: this was done until the withdrawal of safety lamps.

- In the more gassy mines there needs to be a requirement that an automatic monitoring device of a sufficiently portable nature be installed at strategic points to give a continuous reading of CH₄, CO and O₂.

Minister's comment: The matter of automatic monitoring in gassy mines needs to be separated into two areas of concern. One is the matter of general monitoring of the mine atmosphere by way of automatic devices. The second is that of provision of an individual air sampler which can provide an automatic alarm to the person carrying the device.

Current position: Gas monitoring is widely used and Deputies carry automatic alarming instruments.

- It appears that there is a grave danger in driving a lengthy stub in a gassy panel and leaving it stand on brattice ventilation alone particularly on the intake side. As a suggestion only I put forward the figure of 50 metres as the limit.

Minister's comment: I have directed the Chief Inspector to investigate as a matter of urgency the manner in which the recommendation can be given effect.

Current position: The overall problem has been reduced by improvements in methane drainage. There is also some use of supplementary compressed air ventilation at times of power failure.

- I have been asked to make a special recommendation that the Regulations make provision for not removing any (stone dust or water) barrier once it has been placed in position.

Minister's comment: I have directed that a complete review be made of the present requirements in respect of stone dust and water barriers.

Current position: This matter is dealt with in the Guideline for coal dust explosion prevention and suppression. (NSW Department of Primary Industries, 2001).

- There is need for proper policing of those parts of the Act and Regulations which deal with the opening of flameproof enclosures under voltage.

Minister's comment: I have directed that all regulations dealing with the safety provisions of flameproof enclosures under voltage must be placed under continual review.

Current position: This matter was already covered by Reg. 31 of the 7th Schedule of the 1912 Act (NSW Govt., 1978). It was adopted into the 1982 Act and is now covered by Reg.19 of the Coal Mines Health and Safety Regulations, 2006 (NSW Govt., 2006).

- Regulation by legislation is required for a breaker system to prevent any flameproof enclosure being opened without the automatic disconnection of power. This kind of device and the necessary circuitry are already known to the Departmental electrical inspectors and it should be an essential requirement.

Minister's comment: I have no hesitation in agreeing with this recommendation.

Current position: Not all flameproof enclosures have interlocks. Electrical equipment is now required to meet IEEE Standards. It appears that those Standards do not insist on interlocks.

- Advocates addressing me have expressed dissatisfaction with the qualification of two distinct classes of mining people:
 - i. the man with a certificate from abroad who receives endorsement of his certificate of competency without the necessity to show sufficient local competency;
 - ii. the method of recruitment of "new starters" and their induction training.

Minister's comment: There will be a requirement for all persons registered for practice in New South Wales to obtain a qualification in New South Wales mining practices and law. I have noted the comments made and particularly those attributed to the Miners' Federation, that they consider the current training requirements to be inadequate. I support this view

Current position: There is now a mutual recognition scheme covering all Australian States and New Zealand. Holders of certificates from other areas are required to sit for the full relevant examinations.

- I am still concerned, however, about the discomfort self-rescuers cause to those who are forced to use them.

Minister's comment: I have asked the Chief Inspector, in co-operation with the Director of the Chemical Laboratories of my Department to investigate the current status of research and development into this type of equipment overseas and whether or not it is possible by local innovation, to introduce an improved model.

Current position: Most mines now provide oxygen producing self-rescuers.

- It would be a pity, however, if experimenting remained the sole use of the Department's research and testing centre at Londonderry, even though this ranks highest in the galleries importance. It should be used as a teaching aid for men in the industry.

Minister's comment: For some years the department has run training sessions for officers from the coal mines in this state. During these courses the facilities at the Chemical Laboratories and the Londonderry Centre have been used as a training and demonstration aid. Their use will continue.

Current position: Londonderry is now not part of the Department. It is used as a central meeting point but not for training purposes.

- The Judge referred to separate comments, which he made privately on the draft of the legislation designed to replace the existing Coal Mines Regulation Act.

Minister's comment: A number of these comments have already been referred to my Department for consideration.

Current position: It is impossible to comment on such private submissions.

THE ROLE OF INQUIRIES

Goran (1980) in the report of his Inquiry made the following statements as part of his preliminary observations:

1. Most inquiries into fires, explosions and disasters in coal mines which occur in the United Kingdom are non-judicial inquiries, the investigation itself being conducted at a senior administrative level. The resultant report takes the form of a description of the colliery and the relevant equipment, followed by a narrative setting out the events. Conclusions are in short form and there is a list of recommendations for future improvements in coal mines generally.
2. I make no criticism of this method of reporting. The report which I now tender, however, is the report of a Court which has investigated an explosion. The conclusions drawn are based upon a mass of evidence tendered before me and tested in the greatest detail by the cross-examination of learned counsel.
3. I have adopted standards of proof as any Judge must do, accepting some evidence and rejecting other evidence at times which experience in judgment has told me I cannot accept.
4. It must always be borne in mind that the duty of this Court is to assist in so regulating the industry that events such as that which occurred at Appin Colliery are not repeated and that men who work in this industry should do so with such safety as can be afforded to them by legislation or by proper practices.

There is no doubt that many of the recommendations of the Appin Inquiry have led to significant changes in the NSW coal industry. Since 1965 there have been four Judicial Inquiries in NSW; Bulli, West Wallsend, Appin and Gretley. Looking at these from an industry perspective, there are valid questions that may be asked about the economic cost of such inquiries and whether legal representation is given on the basis of a search for the facts or in an attempt to protect clients.

Carver (1981) speaking from his experience as a retired Chief Inspector in Great Britain said:

'Some twenty years ago the representatives of the Unions, Management, and Inspectorate decided they would not employ lawyers in future Inquiries and that each interested party would appoint someone from within its own ranks to present its case and cross-examine witnesses. The reason for this interesting decision was to keep the Inquiry on a purely technical basis without the introduction of legal niceties and even 'red herrings.'

Hargraves (1996) in a letter to the Bulletin of The AusIMM, included the following comments:

1. 'As expected with their background of generally adversarial work, the thread of the Moura No2 Explosion Inquiry conducted essentially by members of the legal profession had elements of laying blame and appearing to attempt to have some witnesses contradict themselves.'
2. 'Inquiry barristers have been known to withhold evidence ' because it will not help our case'. So much for the threefold aim of, how, why and non-repetition. There are some in the Industry who consider that the careers of others have been unfairly hurt entirely due to partial ignorance behind some attitudes and decisions of legal participants.'
3. 'Perhaps it is time to consider more seriously a purely technical inquiry on the UK pattern,.

It should be noted that whereas the Coal Mines Regulation Act 1912 as amended (NSW Government, 1978) made provision for Judicial Inquiries the Coal Mine Health and Safety Act 2002 (NSW Government, 2002) in section 113 makes provision for a person (obviously, including a Judge) to be appointed as a Board of Inquiry. Despite the fact that, under section 114 (9), evidence given by a witness is not admissible in any criminal proceedings, there is still the following provision of section 113 (5):

'If the Board of Inquiry agrees, an agent (including a legal practitioner) may represent a person or body at the inquiry'.

It is not clear how involved that representation could be.

CONCLUSIONS

A disaster, such as that at Appin, has a devastating effect on the mine and the mining community. It can only be small compensation for those affected to be given an understanding of how the event occurred but it is important to give assurance that the cause is understood and that action will be taken to prevent a recurrence.

The current legislation provides for use of Boards of Inquiry but does not remove the possible involvement of legal representation. The fact that many recommendations from past Inquiries have led to improvements in mine safety does not alter the feeling of many in the industry that legal representation sometimes prevents the achievement of believable conclusions about the cause of disasters. It may be time to look, in retrospect, at the Appin disaster and to ask if a technical investigation would have given a clearer understanding of the event and led to better procedures being adopted.

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