

INCIDENTS IN OPENCUT COAL MINES

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ABSTRACT

A study has been undertaken to review incidents and injuries in both opencut and underground coal mines in Queensland. The incident and injury data has been compiled from Monthly Inspectors Reports of the Senior District Coal Inspectors and the Lost Time Accident (Injury) Database. The review was initially aimed to provide SIMTARS with statistics on incidents for use in mine safety education programs. Further benefits included information for building a classification system to provide for an integrated electronic data capture system for both injury related and other coal mine incidents. This is a part of the development of an improved injury and incident surveillance system being undertaken by the Department of Mines and Energy.

This paper presents data on opencut incidents that have been recorded from 1990 to 1995 in the Monthly Inspector Reports that are held in the Brisbane Office of the Department of Mines and Energy. A limitation of this study is that all reported coal mine incidents could not be included due to lack of resources and the need to obtain records held in district inspectors offices.

The review of data indicates that the majority of opencut incidents involve the loss of control of vehicles (29%). Other major incidents include explosive incidents (20%), fires (16%) and electrical incidents (15 %). All other incidents accounted for only 19% of the total. The most common of these are slips/trips/falls, falling/flying objects, and ground slips.

Data has been compiled from the Lost Time Incident (injury) Database for an equivalent period. In terms of injuries, 51% were strains and sprains, 10% were contusions, 9% were open wounds and 8% were fractures. Analysing breakdown agencies, 18% were associated with vehicles while 34% were associated with powered and non-powered tool and other objects. Other and unspecified agencies accounted for 26% of injuries.

This study has highlighted current limitations in reporting of incidents and injuries in the coal mining industry. It has accelerated work currently being undertaken by the Department of Mines and Energy in upgrading their health and safety information systems.

INTRODUCTION

The need to develop a more comprehensive mining injury and incident database was identified by Inspectors and reinforced by the Department of Mines and Energy (DME) Health and Safety Information Value Management Study (1). Progress from that study to date has mostly focussed on the Lost Time Accident (Injury) Database (LTAD).

As a result of the 1994 Moura Mine disaster and the ensuing Warden's Inquiry (2), it became increasingly obvious that better information systems were necessary for the underground coal mining industry. A joint steering committee comprising of SIMTARS (Safety in Mines Testing and Research Station), DME Coal Inspectors, and the Queensland Coal Board, worked together to review the nature and frequency of incidents in Queensland coal mines. This project was undertaken to compile information on incidents that have been reported in the Monthly Inspectors Reports. Both opencut and underground incidents were examined, however this paper focuses on the results for opencut mines.

AIM

The aim of this paper is to identify common opencut incidents and analyse frequently occurring causes. Injuries resulting from the collated incidents are compared with data collected from the Lost Time Accident (injury) Database.

METHODOLOGY

The joint steering committee set the study parameters, arranged access to data in the DME files and provided other necessary resources. Due to exploratory nature of the exercise, it was decided that attention should focus on the Coal Inspectors Monthly Reports from each of the three districts. While not all recorded coal mine incidents are referred to in these reports, the reports of the District Senior Coal Inspectors were considered to be a good measure of the more serious incidents occurring in the coal industry. For opencut mines, records dating back to 1990 were reviewed. The information collected included the type of reported incident, the most prominent cause or factor of the incident and the occurrence of injury.

It must be emphasised that the data is not complete and does not represent every opencut incident that has occurred since 1990. The monthly summaries from which this data has been extracted were not compiled for this purpose and consequently there is a wide variation in the amount of detail supplied.

Under the Queensland Coal Mining Act (3), section 71, the Mine Manager is required to report to the Coal Inspectors the following -:

- accidents causing death or serious bodily injury;
- accident with winding arrangement;
- collapse or fall of ground;
- fire;
- inrush of water;
- accidental ignition of gas or dust;
- discovery or outburst of gas; and
- fault in electrical circuits.

Part 4 of this section requires all injuries to be reported. Reports submitted for the Lost Time Accident (injury) Database meet this requirement.

Similar information is required of the minerals industry under the Mines Regulation Act (4) under section 39 Notice of an accident. Additional information to that required under the Coal Mining Act includes -:

- accidental ignition or detonation of explosives;
- uncontrolled movement of mobile equipment and
- incidents involving dredges and dredge ponds.

In practice, these items are recorded in coal mining incident reports in Queensland. This and more information on dangerous incidents at coal mines is recorded by the DME on each mine file. The Monthly Inspector's Reports are compiled by the coal mining inspectors for each of the three districts - Mackay, Rockhampton and Brisbane. These monthly summaries have been the focus of this study.

Each reported incident needed to be placed in an incident category for analysis. A classification of incidents was developed based on the legislation and commonly occurring incidents in coal mines. This is presented in Table

Table 1: Classification of Incidents

Fire
Gas Ignition
Loss of Control Of Equipment
• (Collision, Overturn, Loss of Control, Damage & Other)
Spontaneous Combustion
Fall of Roof/Side/Ground
Falling/Flying Object
Electrical Incident
Uncontrolled Release of Energy
Dangerous Gas Accumulation Release
Hazardous Substance Release
Slip/Trip/Fall
Miscellaneous

The majority of the reported incidents were easily classified into one of the above categories. Only a few were placed into the miscellaneous category. The class of incidents with equipment was described as 'loss of control'. The category was split into 5 sub-categories being 'equipment collisions, equipment damage, equipment - loss of control, equipment overturn and equipment other.

Equipment was classified as either :

Mobile Equipment - Rubber-tyred vehicles and tracked surface vehicles e.g dozers, coal haulers, loaders, 4WD etc.;

Semi-mobile Equipment - Equipment that moves in increments e.g. augers, draglines, surface lighting plant, mobile pumps, drills etc

Fixed Equipment - Equipment that operates in a fixed location e.g coal preparation plant, conveyors, bins, substations; or

Portable Equipment - Equipment that is easily transferred e.g tools, gas cylinders.

Injury was also recorded if associated with a reported incident. The degree of injury is recorded as one of the following:

- fatality(s);
- serious - if injuries require hospitalisation or more than 10 days are lost;
- minor - if injuries require minor treatment by the occupational nurse on site; and
- nil

The Lost Time Accident (injury) Database was interrogated to analyse total recorded injuries for the same period. A comparison is made between the information gathered from the Monthly Inspectors Reports and that in the Lost Time Accident (injury) Database.

RESULTS

Overview

The number and the type of the incidents occurring at opencut coal mines are outlined in table 2. The results indicate that the majority of opencut incidents involve the loss of control of vehicles (29.3%). Other major incidents include explosive incidents (20.4%), fires (16.1%) and electrical incidents (15.2%). All other incidents accounted for only 19% of the total. The most common of these are slips/trips/falls, falling/flying objects and ground slips. Each of the major incident groups is analysed further by the factor / cause.

Table 2: Reported Incidents in Qld Opencut Coal Mines (1990-1995)

REPORTED INCIDENT	NUMBER REPORTED	PERCENTAGE (%)
Dangerous Gas Accumulation/Release	3	0.6%
Electrical Incident	81	15.2%
Loss of Control (Equipment)	156	29.3%
Equipment Collision		
Equipment Damage		
Equipment Loss of Control		
Equipment Other		
Equipment Overturn		
Explosives Incident	109	20.4%
Fall of Roof/Side/Ground	13	2.4%
Falling/Flying Object	24	4.5%
Fire	86	16.1%
Gas Ignition	1	0.2%
Hazardous Substance Release	2	0.4%
Slips/Trips/Falls	18	3.4%
Spontaneous Combustion	3	0.6%
Uncontrolled Release of Energy	14	2.6%
Miscellaneous	23	4.3%
TOTAL	533	100

The injuries reported in association with the incidents reported in the Monthly summaries number 119. These include 5 fatalities, 37 serious injuries and 77 minor injuries as shown in table 3.

Table 3: Number and Degree of Injuries Reported with Incidents in Qld Opencut Coal Mines (1990 - 1995)

REPORTED INCIDENT	FATALITY	SERIOUS	MINOR	TOTAL
Electrical Incident	0	0	42	42
Loss of Control of Equipment	3	6	24	33
Fall of Roof/Side/Ground	0	0	1	1
Explosives Incident	0	1	0	1
Falling/Flying Object	1	6	2	9
Fire	0	0	5	5
Gas Ignition	0	1	0	1
Slips/Trips/Falls	1	13	0	14
Uncontrolled Release of Energy	0	3	2	5
Miscellaneous	0	7	1	8
TOTAL	5	37	77	119

Loss of Control of Vehicles

The most common incidents reported are the loss of control of equipment. Most of these related overturns and collisions of mobile equipment in 87% of the 156 cases as shown in table 4. Semi-mobile vehicles were involved in 21 cases. In most cases, the contributing factors were not identified. Operator error and work procedure were identified in 37 incidents. The loss of control incidents were responsible for three of the five fatalities identified in the study. Of the 115 non-fatal injuries in the monthly reports, loss of control vehicle incidents accounted for thirty other injuries.

Table 4: Reported Loss of Control Incidents by cause and Equipment Type in Qld Opencut Coal Mines (1990 - 1995)

POSSIBLE CAUSE	MOBILE EQUIPMENT	SEMI-MOBILE EQUIPMENT	TOTAL
Poor Visibility	1	0	1
Brake Failure	3	0	3
Electrical Fault	1	0	1
Equipment Failure	1	0	1
Explosives Incident	0	2	2
Fall of Roof/Side/Ground	9	3	12
Operator Loss of Control	17	0	17
Materials Failure	8	4	12
Road Conditions	5	0	5
Speed	3	0	3
Steering Failure	1	0	1
Work Procedure	10	3	13
Other/Unknown	76	9	85
TOTAL	135	21	156

Explosives Incidents

Most explosives incidents were misfires (72%) as shown in table 5. Other causes were not classified, but typical circumstances include unidentified misfires, mechanical failures, incorrect work procedures, falls of ground preventing exit from blast area and premature detonations.

From all the explosive incidents, there was only one injury. This was an eye injury from a burst explosive delivery hose. While injuries are uncommon, it should be noted that explosives incidents have a high potential for multiple fatalities.

Table 5: Reported Explosives incidents occurring in Qld opencut Coal Mines by Cause (1990 - 1995)

POSSIBLE CAUSE	NUMBER REPORTED
Misfire	79
Other	30
TOTAL	109

Table 9: Breakdown Agency of Injury Reported in Qld Opencut Coal Mines (1990 - 1995)

BREAKDOWN AGENCY	NUMBER OF OCCURRENCES	PERCENTAGE (%)
Earth Moving Trucks	255	8
Haul trucks	153	5
Other mobile equipment	141	5
Bulk handling equipment	73	2
Semi-mobile equipment	98	3
Electrical equipment	93	3
Other fixed plant	84	3
Powered tools and appliances	258	9
Non-powered tools	202	7
Other non-powered equipment and objects	549	18
Outdoor environment	175	6
Indoor environment	59	2
Other and non-specific	1116	34
TOTAL	3256	100

DISCUSSION

Given the limited time and financial resources available to this project, the joint steering committee focussed the study on data from available Coal Inspectors Monthly Reports. The data compiled should be considered only as a selected sample of incidents occurring in the coal mining industry. It is acknowledged that there may be incidents that have occurred in opencut mines that are not included in the data.

One of the challenges of the study was to develop a classification system in which ambiguity was minimised. It was obvious that clear categories were necessary to group incidents, causes, etc.. As work proceeded, the categories selected were shown to have their limitations. Because there is a degree of professional discretion required in identifying to which class certain incidents belong, examples agreed by a working party of professionals are needed to define the margins between one group and another.

One of the limitations of using summary data on mechanism of injury and breakdown agency is no distinction is made in relation to minor and serious injuries. More detailed interrogation of the data is required to identify the impacts of various types of injuries and the circumstance of their occurrence.

Experience gained through this study has highlighted the need to collate and analyse incidents in mines as a useful tool in focussing health and safety resources. The benefits are however limited by the detail of information recorded.

In terms of injury prevention and control, the incident analysis has identified areas of focus that may be useful in reducing injuries. By comparison the Lost Time Accident Database information has limited use because it recognises only damage but not cause.

A proposed Incident Reporting form has been developed and is attached in Appendix 1. There is potential for this to be come part of a common injury and incident reporting system for both coal mines and the Coal Inspectorate.

CONCLUSIONS

Through the five year period reviewed, loss of control (of vehicles), electrical and explosives incidents and fires were the most common in opencut mines according to the data analysed. Incidents relating to loss of control of vehicles had the highest number of fatalities. The greatest number of serious injuries were associated with slips/trips/falls although this type of incident was not commonly reported. Electrical incidents accounted for the greatest number of injuries but these were generally minor burns and shocks.

From a total of 533 incidents in this study, there were reported 119 injuries. Over the same period, there were 3256 injuries reported in the Lost Time Accident (injury) Database.

This study has collated and classified data recorded in monthly summary reports on incidents compiled by Senior Coal Inspectors in the Mackay, Rockhampton and Brisbane offices. The results may be used to focus attention to injury and incident prevention issues across the coal industry. There is significant potential benefit in improving the current reporting systems in order that mine safety can be improved by sharing both the problems and solutions relating to dangerous incidents.

ACKNOWLEDGEMENTS

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The views discussed by the authors are their personal views and not necessarily those of the steering committee nor the organisations involved.

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REFERENCES

- 1 Health and Safety Information Management Study, Qld. Department of Minerals and Energy, internal document, 1994.
- 2 Windridge F.W. Wardens Inquiry - Report on an Accident at Moura No 2 Mine on Sunday, August 1994, 1996.
- 3 Queensland Coal Mining Act 1925 - 1994, Qld Govt Printer.
- 4 Mines Regulation Act - 1964

PART A

(dropdown menus)

Incident Id

Incident class

Code

(computer generated)

Cause / Factor

Code

Mine code

Mine Name

Mine Type

Region Id:

Code

Date

Time

Injury Degree

Injury Code

PART B Complete part B only if no injury is reported

Major Equipment Code

Major Equipment Type

Minor Equipment Code

Minor Equipment Type

Worksite Location Code

Description

PART C

Number of Injuries

LTAB Report Numbers

Incident description

Environment Description

Incident Control Actions

Preventative Action

Significant Incident or Engineering Alert code / number

Reference