

Risk Analysis/Adaptation DM-M3 Ingersoll Rand Drill

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INTRODUCTION

The Bulga Coal complex is located in the Hunter Valley in New South Wales 16km south of Singleton and 9km by rail to the port of Newcastle.

The Hunter Valley includes important sectors of the industrial framework of New South Wales with significant industries in steel and aluminium as well as a substantial portion of the electricity generating capacity of the state.

Coal mining has been a traditional industry in the area for over one hundred years. In the past, mining was centred around the cities of Newcastle and Cessnock. However, new large coal mines were developed in the 1980's near the township of Singleton and Muswellbrook.

Mining of the Saxonvale lease began in 1981 with a truck and shovel bench mining operation of mine distinct, steeply dipping seams in the deep pit.

Oakbridge took control of the mine in mid 1989 and soon after commenced a strip mining operation in the Whybrow Pit.

In 1992 a further strip mining operation started in the Bulga Pit from which both Glen Munro and Woodlands Hill seam coals were extracted as the mine develops in a westerly direction from the Bulga Pit. Further seams will be recovered in prestripping operations in advance of a P&H 9020 Dragline.

In 1994 the mine has a lost time injury frequency rate of 54 which was above industry average for open cut operations in New South Wales.

As part of an upgraded safety program a Risk Assessment Policy was established.

Risk assessment was to be conducted when:

- 1) A high risk process is identified.
- 2) Before the arrival of new equipment/machinery.
- 3) Modification of new equipment/machinery.
- 4) A system of work to be changed.

Through this process of hazard awareness and in conjunction with other safety initiatives Bulga Coal is currently achieving 15 LTIFR for 1996.

TENDER PROCESS

A tender was sought to supply Bulga Coal with a 90 000 lb rotary blast hole drill.

The relevant safety requirements were all materials specified and practices listed in the execution of the contract, if not specified or described in the specification, drawings or schedules, shall comply with the relevant Australian Standards or, if there be no Australian Standard the corresponding American Standard.

The following Standards were required to be adhered to:

Electrical AS1023, AS1029, AS1136, AS1359, AS1360
AS1431, AS1674, AS2802, AS1931, AS1939
AS2005, AS2006, AS2052, AS2067, AS2081
AS2086, AS2184

Distribution in Mains Supply

AS2374, AS2375, AS2768, AS2232, AS2264
AS2279, AS2373, AS2471, AS2650, AS2700
AS2802, AS2926, AS3000, AS3010, AS1025
AS1028, AS1033, AS1078, AS1125, AS1137
AS1202, AS1243, AS1306, AS1429, AS1543
AS1603, AS1675, AS1767, AS1775, AS1864

AS1930, AS2006, AS2024, AS1026, AS3116
AS3007, AS3100, AS3137, AS3147, AS3190
AS3191

Drawings AS1100, AS1101

Structural and Mechanical

AS1657, AS1111, AS1112, AS1131
AS3678-90, AS1594-89, AS1205, AS1654
AS1403, AS1426, ASC B18, AS1200, AS1210
AS1428, AS2987, AS1418, AS1511

Gears AS2075, AS B62, AS B61, AS B66, AS B214
AS2037

Welding AS1554, AS1665, AS1988, AS1553
AS1586, AS1552

Non Destructive Testing

AS1710-75, AS2207
AS1065, AS2452-3, AS2177

Safety AS1319, AS1269-68, AS2012-1, AS2012-2
AS1217, AS1670, AS2118, AS1768

- NSW Minerals Department MDG15.
- Noise levels set by Bulga Coal 80dB(A) internal, 118dB(A) external to the Drill.
- Comply with the NSW Occupational Health and Safety Act.
- Conduct a safety system risk analysis with mine site personnel.

The successful tenderer was NS Komatsu to supply a DM-M3 Ingersoll Rand which is a crawler mounted, hydraulic tophead drive, multi pass rotary drilling rig specifically designed for the blasthole drilling of 9-7/8" (251mm) to 12-1/4" (311mm) diameter holes with onboard depth capability up to 200 feet (61m) utilising 10-3/4" (27.3cm) diameter drill pipe and to 240 feet (73m) using 8-5/8" diameter (219mm) drill pipe and a five rod carousel STANDARD PIPE LENGTH IS 12.2m.

Bit loading is rated at 90 000lbs (40 824kg) using a patented hydrostatic closed loop system acting through twin, double rod hydraulic cylinder and cable, rotary head torque is up to 10 183 Ft-lbs (13 805Nm) with a rotation speed of up to 200RPM maximum.

RISK ANALYSIS PROCESS

As per the tender agreement a quantitative risk analysis was requested using Bulga Coal personnel.

Participants were chosen from the different sections that would be required to operate, maintain or repair the drill with Komatsu representatives.

Participants:

G Burgess	Komatsu	Technical Representative
C Merhi	Komatsu	Workshop Supervisor
T Maytom	Fitter	Bulga
A Knight	Driller	Bulga
R Vickers	Driller	Bulga
C Cox	Electrician	Bulga
D Brooks	Open Cut Examiner	Bulga
S Gentle	Maintenance Supervisor	Bulga

The analysis was facilitated by the Safety Manager.

The Mechanical and Electrical Engineers in charge consulted at all times during the process.

Aims and objectives were established.

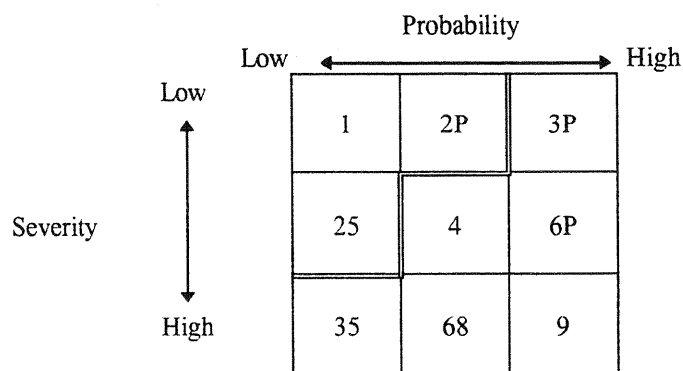
AIM: To ensure a safe environment for the operation and maintenance of the Ingersoll Rand Drill DM-M3 No 3918

OBJECTIVE: To recommend improvements, alterations and additions to the Ingersoll Rand Drill DM-M3 No 3918 so it meets New South Wales standards and Bulga Coal safety standards.

The risk analysis team toured Komatsu in Sydney and spent a day inspection the drill as it had arrived in Australia from America.

The process is as follows:

Establish a hazard ranking criteria to establish what recommendations are mandatory. The hazard ranking was simplified and was



Areas below the double line to have more stringent barriers imposed on them.

The drill operation was dissected into all personal activities which are:

- Initial inspection at ground level of full circumference of drill.
- Access to machine.
- Access to check radiator.
- Access to filters.
- Access to mast.
- Control Room access.
- Facilities location.
- Visual inspection of working platform and access whilst operating drill.
- Seat position/operating position in cabin.
- Starting machine.
- Position machine over drill hole sight.
- Level and stabilise drill.
- Raise mast.
- Drill hole.

- ♦ Reposition Drill for next hole.
- ♦ Towing Drill.
- ♦ Lube and service Drill.
- ♦ Bit change.
- ♦ Change Drill rod, drill steel on and off machine.
- ♦ Electrical maintenance/change lights.
- ♦ Fault finding.
- ♦ Change batteries.
- ♦ Hydraulic component change.
- ♦ Change insert in wrench.
- ♦ Deck seal change.
- ♦ Air conditioning changeout.
- ♦ Mechanical fault finding.
- ♦ Welding and Grinding.
- ♦ Rope change.
- ♦ Head guides - change or adjust.

Each operational step was considered for hazards UNDER the following energy sources:

- ♦ Gravity and acceleration energy.
- ♦ Electrical energy.
- ♦ Mechanical energy.
- ♦ Chemical energy.
- ♦ Thermal energy.
- ♦ Pressure energy.
- ♦ Noise and vibration energy.
- ♦ Radiation energy.
- ♦ Explosive energy.
- ♦ Human energy.
- ♦ Microbiological energy.

The hazards were noted and written corresponding to each process step.

Each hazard was ranked for its severity and probability.

Each hazard was assessed for existing controls for each hazard. Then each hazard was assessed for recommended controls thus completing the following format.

PROCESS	HAZARD	RATING	EXISTING CONTROL	RECOMMENDED CONTROL

Each hazard after being ranked and rated is to be assessed to determine what is the objective to control the hazard.

Objective to control hazards.

- ♦ Eliminate or avoid the hazard.
- ♦ Reduce the hazard at source.
- ♦ Enclose the hazard.
- ♦ Remove employee from hazard.
- ♦ Reduce employee exposure to the hazard.
- ♦ Issue personal protective equipment.

All recommended controls are then placed in a task chart to determine who is to activate control with a timeframe.

These task charts are then used to audit the controls in the future.

ITEM NO	PROPOSED CONTROL	PRIORITY	PERSON RESPONSIBLE	ESTIMATED HOURS	COMPLETION DATE	COST

There were 73 recommended controls of which all were acted on e.g.

- Expand mesh guard around radiator bases.
- Walkway altered around left hand radiator.
- Battery packs moved for steps - left hand side.
- Fire extinguishers 4kg 80BE dry chemical.
- Fire suppression system (AFFF).
- Window washer and wiper main window to Drill pad.
- Earth leakage 02 240 volt circuit
- Seal around doors of cabins.
- Bostrom seat with swivel attachment.
- Dual glass with perforated shade cloth blinds.
- Warning lights on dashboard when ladder left down
- Mast interlock
- Infra red interlock (rail safe).
- Lighting to Bulga specifications.
- Hydraulically controlled inspection hatch to drill site.
- Two inclinometers with label of maximum angle of Drill operation.
- Flashing green light on cab roof.
- Overhead warning sign in cab.
- Total height of mast in cab - mast up, mast down
- Field of vision plan.
- Karl Haak mirrors.
- Lifting brackets on deck seal assembly.
- Swagged fittings and slings on compressed air.
- Safety air bleed off value with baffle manifold.

Guard for brake lines on tramping motors.
Towing point labelled.
Towing attachment to suit 475 Komatsu dozer.
Correct location of quick fill and evaluation point.
Bit change procedure.
Lights to be individually switched.
Illumination of electrical control box signs

No naked flame
No welding
No smoking

Component exchange deck seal.
Gas labelled, compressor painted green.
Gauges to be metric, single scale kg/cm².
Lights to illuminate ladder access.
Lights activated on ground level time delay switches.
Reflective tape low head beams.
Sharp edges removed around base.
Stair pads non slip.
Variable height stairway compressed air controlled
Mechanically levelling of step treads.
No tram lockout when ladder down, warning.
Lights on dashboard.
Ladder lights at front of machine.
Egress ladder at front of machine.
Ladder to access cab roof.
Hand rail around cab roof.
Steps to access top of radiators.
Safety pressure relief cap on radiator.
Safety bar to isolate back of radiators.
Two air filters turned 90° to left hand side and accessible to standing height.
Motor air filter turned 90° to right hand side and accessible to standing height.
Ladder access to mast to be made permanent.
Mesh platform extended length of mast.
Swinging hand rail guard behind radiators.
Safety bar isolating drilling platform.
Brackets and shelf for crib bags.
Non slip floor matting in cab.
Air operated venture cleaner.
Doorways to meet Australian Standards.
Water hose for cleaning (small hose reel on deck).
Cover all areas around face of radiator.
Brackets on hydraulic cooler moved.
Hydraulic hoses moved out of walkways.
Hydraulic hoses separated.
Lag exhaust pipes or house cover.
Visual level gauge/sight glass on radiator.

These recommended controls accounted for over \$150 000 worth of changes and improvements.

CONCLUSION

The risk analysis process is not new or in this case the results are not that unique or dramatic.

The machine has worked for twelve months without an incident or accident being registered. The significant result of the risk analysis is Ingersoll Rand, America have adapted a majority of the changes as standard on a DM-M3 Drills and alterations have been made to their range of Drills for tenders to the Australian market.

The proactive approach to put safety and productivity on an equal basis has proven beneficial to Bulga Coal.