

ISEE Chapter Meeting Brisbane October 2018

Mitigating and managing risks from drilling activities

Silicosis, Fire and OEM Engagement



Mitigating and managing risks from drilling activities

Introduction

Who we are?

Action Drill and Blast is one of Australia's largest integrated drilling and blasting providers

We provide drilling and blasting services nationwide for mining and civil operations.

Action has over 375 employees and 18 projects nationwide

Currently operating in excess of 70 rigs nationally.

Major offices in Brisbane and Perth, servicing the respective markets.

Integrated Approach to D&B Safety - Dust Management

Emerging Risks - Silicosis

Review of data associated with re-emergence of black lung causes in QLD mines has highlight that silicosis risks are far higher than previously thought.

Risk of silicosis is potentially 20 to 80 times higher than the current risk of black lung depending on the mining process and occupation /exposure profiles.

Drillers and Blast crews are 2 of the 3 highest risk occupations on a open cut mine site for contracting silicosis.

As a result the QLD government has been quick to provide a legislative response and develop a recognized industry standard for mining and quarry operations, in order to ensure workers are not exposed to unacceptable levels of risk

Integrated Approach to D&B Safety - Dust Management

Mining and Quarrying Safety and Health Act 1999

QGL02 - Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries

The SSE shall evaluate the RCS risk at their operations. The SSE should consider :

- materials containing crystalline silica on site or brought to site:
substances being processed or used for processing,
products, by-products or waste products of operations.
- activities that may generate RCS include (release of crystalline silica into the air):
 - drilling
 - blasting
 - excavating
 - grading
 - mucking or loading

Coal Mining Safety and Health Regulation 2017

From November 1, clause 89 of the Queensland *Coal Mining Safety and Health Regulation 2017* will be amended to reduce the exposure limit for respirable dust in coal mines from an average of 3mg per cubic metre over eight hours, to 2.5mg

Integrated Approach to D&B Safety - Dust Management

Regulatory Risk Reduction Framework

The SSE shall ensure that controls to reduce RCS exposure are applied according to the hierarchy of control as depicted below in Figure 1.

Hierarchy of controls must be applied for the control of RCS³

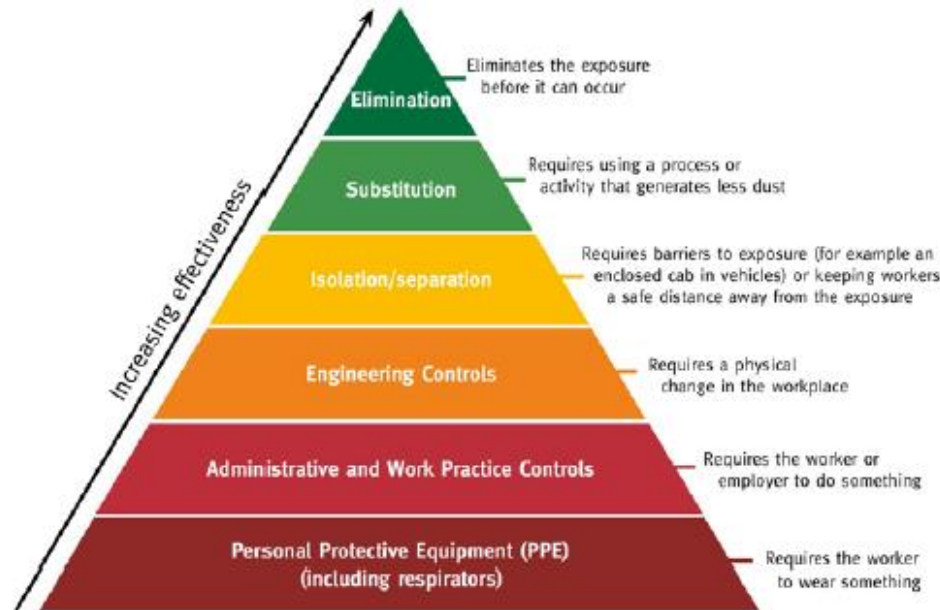


Figure 1 - Hierarchy of controls

PPE or RPE is a short term control measure for RCS exposure

The SSE shall ensure that use of personal protective equipment (PPE) is a short-term control until higher order controls are developed and implemented. The selection, use and maintenance of respiratory protective equipment must conform to AS/NZS 1715⁴.

Integrated Approach to D&B Safety - Dust Management

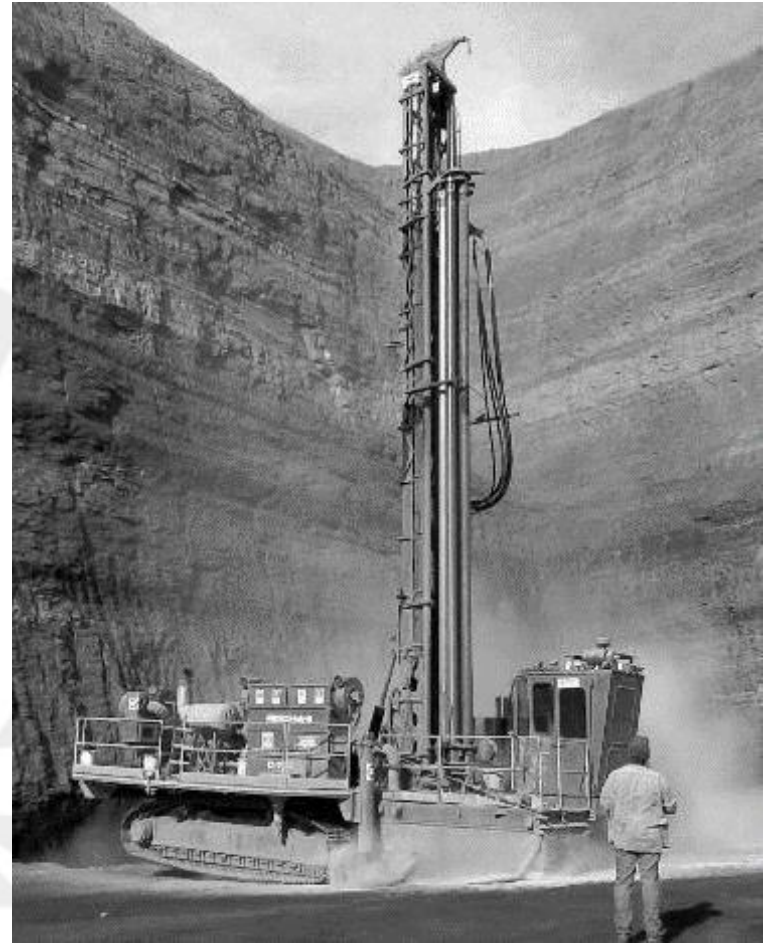
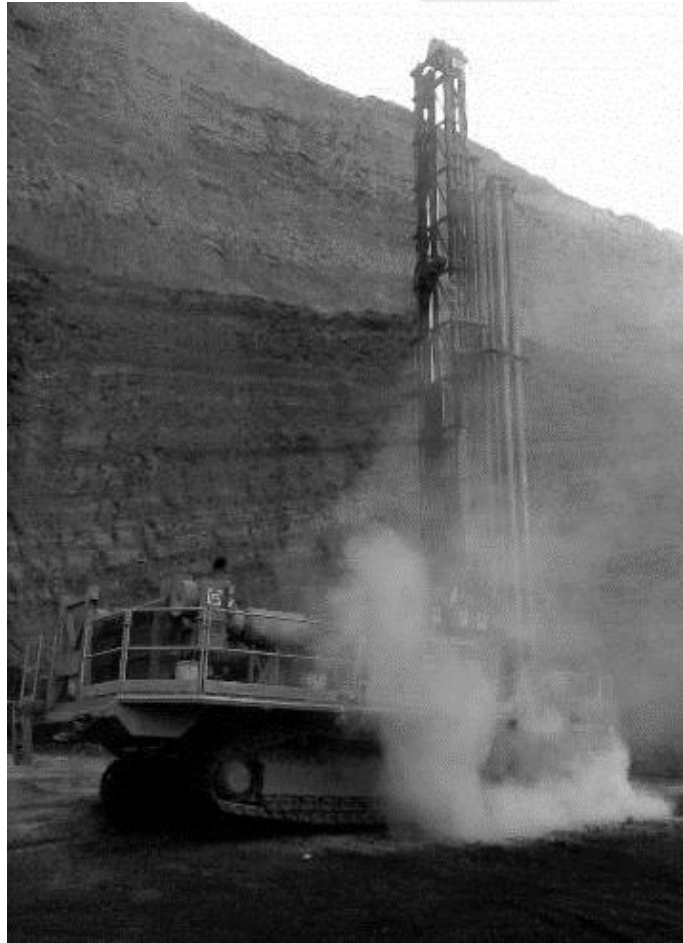
Exposure Profile Drill and Blast teams

Risk Profile	Drillers	Blast Crews	Maintainers
Active Dust Risk environment	Drilling		
	Cleaning of carry back from drill deck		
Active and Passive Dust Risk environment		Loading operations	Machine Cleaning
		Stemming	
Passive Dust Risk Environment	Bit Changing	Working on active pads with concurrent drilling operation.	General servicing
	Daily inspections / pre-starts	Dipping QA,	Breakdown repairs
	Installing/ placing Pegs	Dewatering	
	Dipping holes	Tying in	
	Installing hole savers	Pre firing checks	
	Bag holes	Blast guard duties	
		Dust from vehicle movement of adjacent roadways and work areas	

- Active dust risk are often easier to assess and manage than the passive risks.
- Passive risks predominant risk profile for blast crews and maintenance crews
- Passive risks reduction is best achieved by techniques based on elimination followed by substitution.

Integrated Approach to D&B Safety – Historic Position

Historic acceptance across industry of dust creation and poor control



Integrated Approach to D&B Safety – Historic Position

Poor drilling practices resulting in pulverized material - high risk to blast crew from passive exposure during loading and blasting operation



Integrated Approach to D&B Safety – Historic Position

Excessive carry back - Increases maintenance and operator risks



Integrated Approach to D&B Safety – Historic Position

How Do We Reduce Risks ?

Risk Reduction via Design of the Drilling Process

The drilling processes must aim to eliminate or significantly reduce the quantity of respirable dust produced during drilling. This is not only important in reducing the drillers exposure, but critical in reducing the blast crew and maintenance crews exposures.

The drilling process should aim to produce work areas for blast crew that systemically reduce the quantity and propensity for secondary (passive) dust creation during the loading and firing process.

Integrated Approach to D&B Safety – Historic Position

How Do We Reduce Risks ?

Risk Reduction via Design of the Drilling Process – Cont.

Drilled material should resist becoming airborne during subsequent activities, whether they be by maintenance, blasting operation or subsequent drilling operations

Question: What can drilling achieve that reduces the passive risk for other users?

Answer: turns out to be quite a lot!

Action has identified 4 levels of pad condition that present different risk profiles for other users based on drilling practices

Level 1 - No or little reduction of dust by drilling practices



No attempt to mitigate either generation or to reduce secondary dust generation by the drilling process.

High level of fine dust creation during drilling.

No surface retention

Easily disturbed and easily entrained due to surface movement of air.

Level 2 - No Reduction – but controls in place to reduce secondary dust generation



Drilled material excessively fine, but effective crusting of material will reduce surface generation and exposure levels for blast crews.

Control is only good until disturb, once the crust is broken, free dust level will increase.

Crusting can be applied either during the drilling process or post.

Level 3 - Reduction in dust produced due to optimized drilling process and techniques



Drilling process designed to reduce the quantity of small dust particles generation.

Resulting surface in drill areas effectively blanketed with chips.

Significant reduction in quantity of dust produced in working areas due to environmental (wind) and operational actions/ surface moments

Level 4 - Reduction in dust produced due to optimized drilling process and surface control via binding/ crusting of drilled material



Drilling process designed to reduce the quantity of small / dust particle generation.

Resulting surface in drill areas effectively blanketed with chips, smaller particles bound within be effective crusting of drilled material

Highest level of reduction in quantity of dust produced in working areas due to environmental (wind) and operation actions / surface moments

Integrated Approach to D&B Safety – What can be achieved?



Integrated Approach to D&B Safety – Dust Control

Action Position Statement

The drilling process is a critical risk mitigation factor for CWM/MW exposure to silicosis within the mining process, and it needs to be considered in your total strategy of risk reduction.

Integrated Approach to D&B Safety – Dust Control

On Machine Dust Mitigation and Control – Engineering and Administration levels

Multi-prong approach being undertaken to reducing risk

- Review operating practice and control systems to eliminate/reduce the the need for operators to leave the cab.
- Improved cabin environment addressing pressurization, air conditioning management, pressurization levels and ongoing maintenance. Cab seals, and incoming and recirculation filtration effectiveness.
- New deck and throat seals aiming to reduce (all but eliminate) carry back.

Integrated Approach to D&B Safety – Dust Control

On Machine Dust Mitigation and Control – Engineering and Administration levels

- Move back to water suppression from dust filtration units
- Revise machine layouts to minimize material retention on decks
- Revised curtain materials and configuration
- Cab hygiene to be part of pre-start inspection

Integrated Approach to D&B Safety – Dust Control

On Machine Dust Mitigation and Control – Engineering and Administration levels

Action Drill and Blast currently trialing 2 different approaches to water based suppression.

To be evaluated against both their ability to suppress/ reduce dust in the active drilling phase and their ability to provide effective control of dust post drilling activities.

Both systems in very early phases of testing and configuring.

Integrated Approach to D&B Safety – Dust Control



Integrated Approach to D&B Safety – Dust Control



OEM Support – Improvements, layout and ergonomics

Action Drill and Blast developed a functional specification for a rebuilt drill addressing:

- Operator environment.
- Productivity enhancements
- Reliability enhancement
- **Fire Reduction Engineering**
- **Hydraulic risk management**
- **Improved maintainability**
- **Dust reduction strategies (deck seals, throat seals, reduced carry back retainment on deck , water suppression)**

and Incorporating principals from MDG 15, MDG41, ISO 4413 and AS5062

OEM Support – Improvements, layout and ergonomics

Cram Australia (OEM distributor) engaged to develop redesigned machine and deliver a factory supported product.

Action personnel worked directly with Cram during design and construct phases to develop 2nd Generation drill for local operations.

Design is a collaborative effort based on joint experience.

Final product is a fully factory supported design.

Fire Risk Reduction and OEM Engagement - Key Driver

Reducing fires in mining equipment a major focus to both NSW and QLD Mining Inspectorate /regulator.

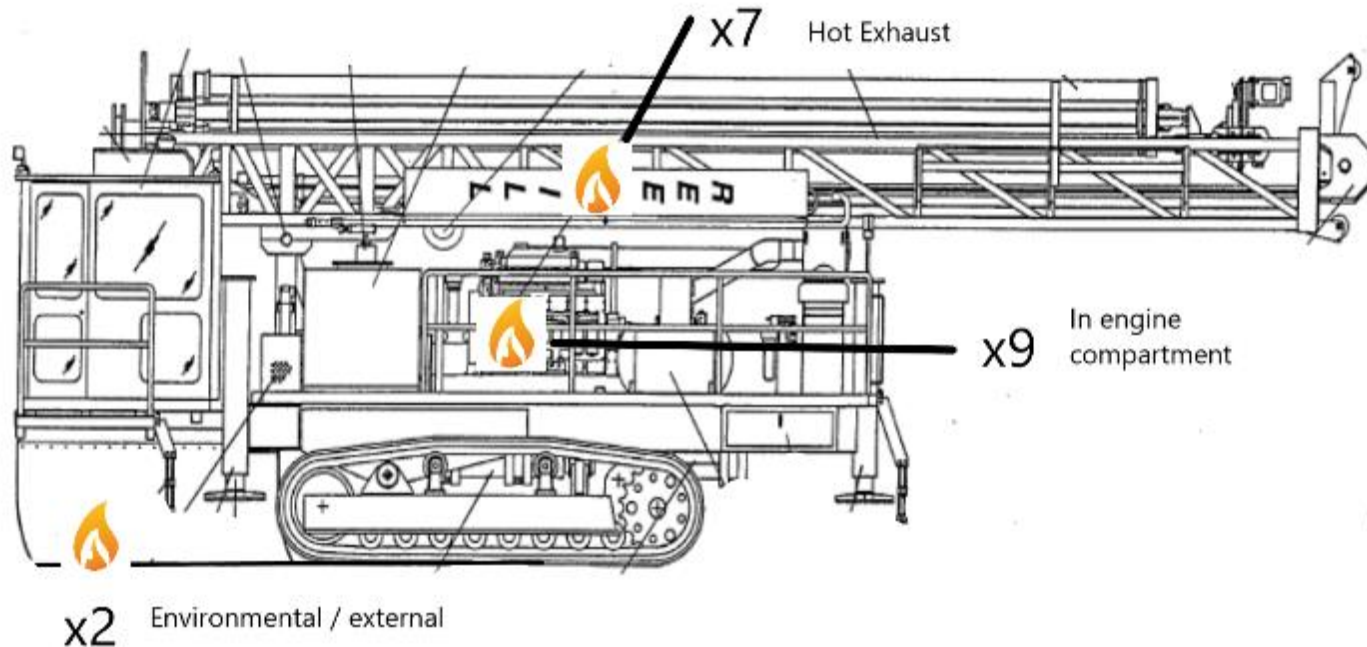
NSW regulator has just completed a regulatory consultation period on a range of new legislative approaches to reducing fires.

QLD about to adopt a revised version of ISO 4413 Hydraulic Fluid Power – general rules and safety requirements for systems and their components,

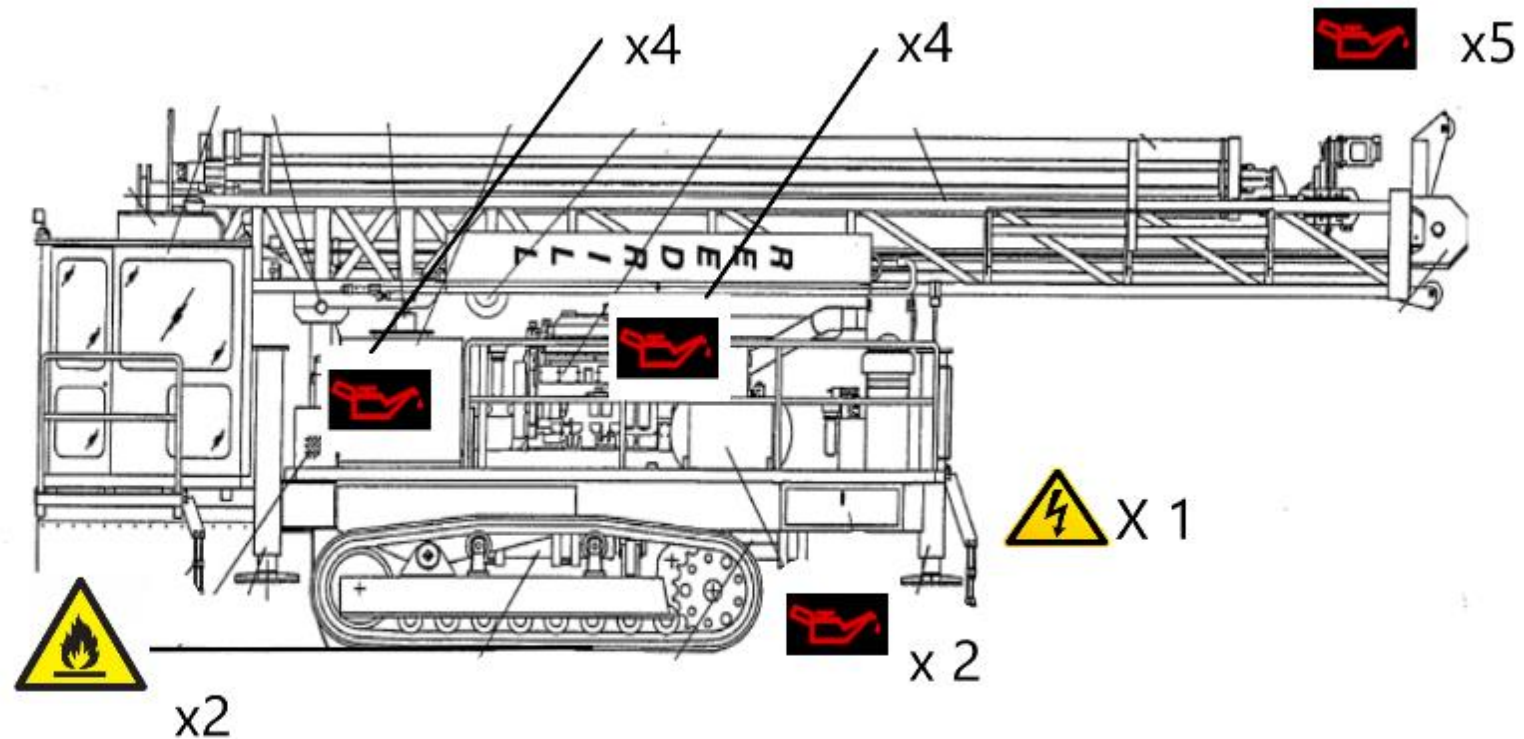
Drills historically have been over represented in mine site equipment fires

Fire Risk Reduction and OEM Engagement

ADB Fire by Location



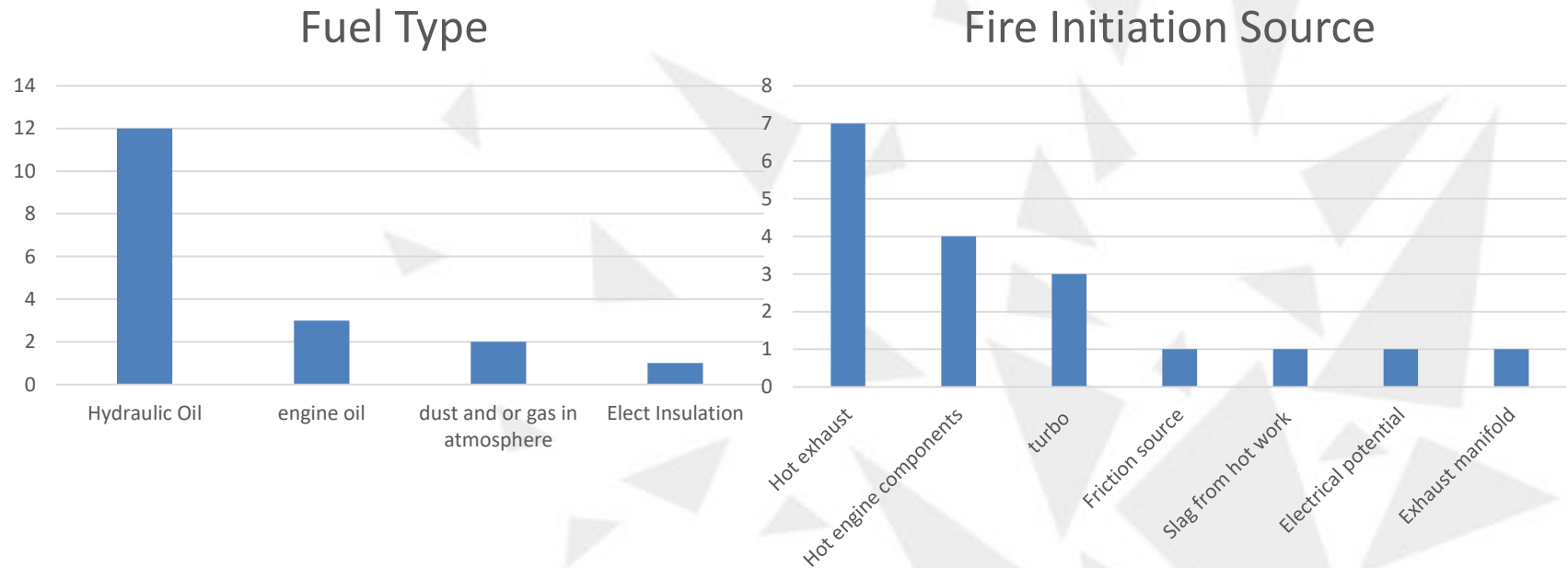
Fire Risk Reduction and OEM Engagement



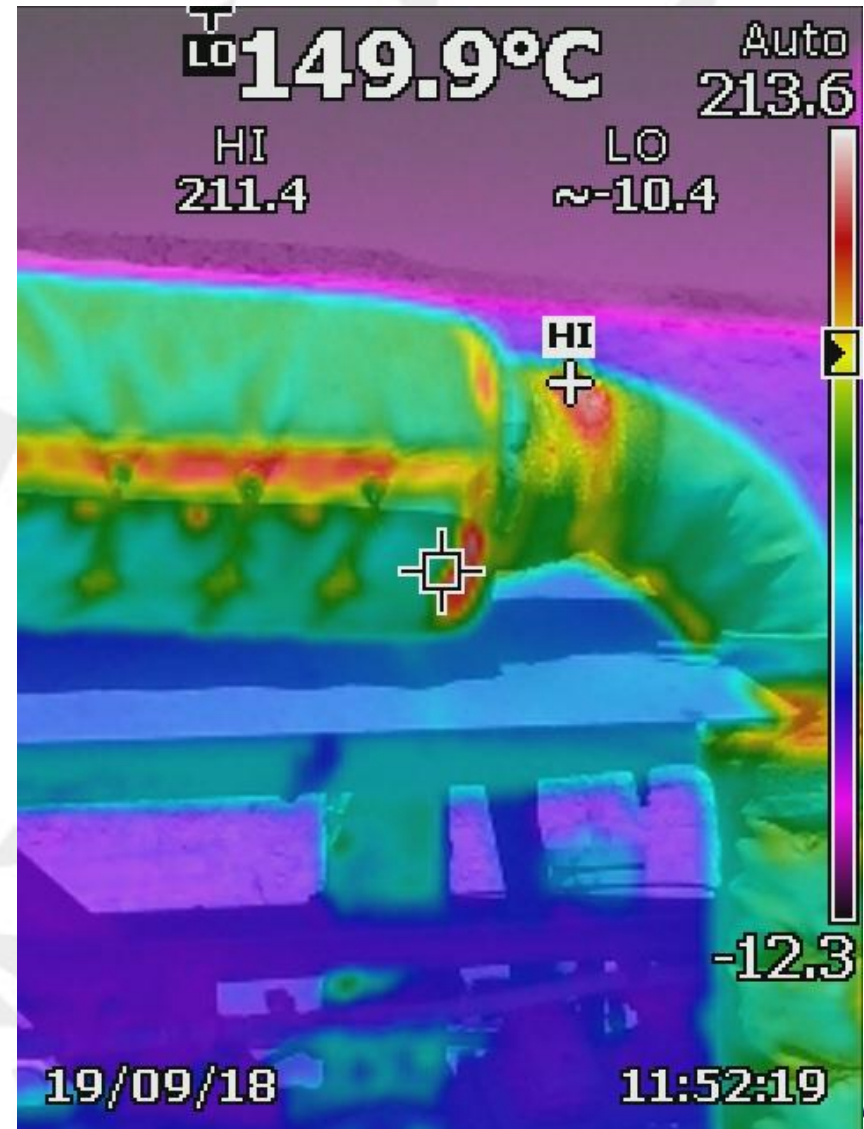
ADB Drill Fire History Fuel Source and Type

Fire Risk Reduction and OEM Engagement

Fire Details Fuel type and Initiation Source

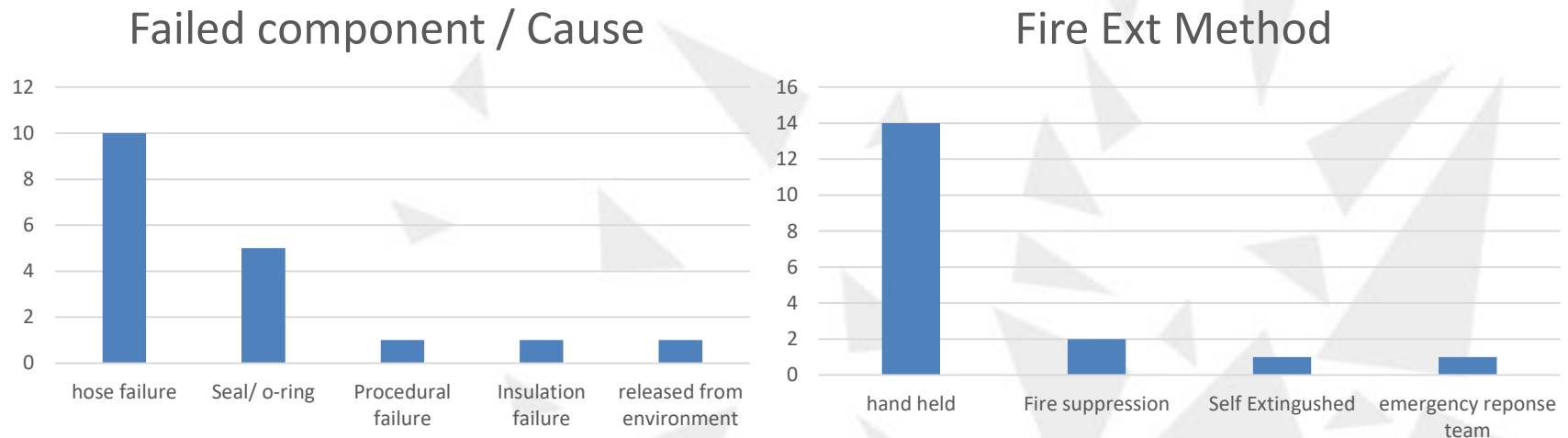


Fire Risk Reduction and OEM Engagement



Fire Risk Reduction and OEM Engagement

Fire Details – Failure cause and Method of Extinguishment



In practical terms, why are drills so prone to fires?

OEM Support – Fire Risk Reduction Improvements

Elimination – removed approximately 45-55% of the hoses from the machine (use of piping and revised component layout)

Improved maintainability - remaining hose are shorter, individually run and easy to handle and replace in service. Reduces ergonomic risk

Longer seal and hose life – Heat reduction in system should increase seal and hose life by 6 fold (approximately 20 degrees reduction in system temperature. (reduced rate of leaks and failure resulting in uncontrolled leaks

Accessibility – Revised access to all maintenance areas improves maintenance performance and reduces the risk associated with incorrectly fitted hoses etc, reduces ergonomics risk

Residual risk in hydraulics. – extensive use of burst sleeving protection to control leaks and reduce the chance of fire.

OEM Support – Fire Risk Reduction Improvements

Each Solution had to support the outcomes of the other requirements

Aim was to produce a safer, more efficient design that not just solved our problems, but addressed them in such a way that they added value to our processes

OEM Support – Improvements, layout and ergonomics



OEM Support – Improvements, layout and ergonomics



OEM Support – Improvements, layout and ergonomics



OEM Support – Fire Risk Reduction Improvements

Design Overview

Fire engineering strategies and hydraulics addressed as per ISO 4413. Leaks and failure addressed during the design phase for impact and engineering control put in place to separate high risk areas from potential heat sources. Design process draws on the requirements of AS5062:2016 (Fire protection for mobile and transportable equipment).

Risk approach to hosing as per MDG41 applied in design (addressing injection and fire risk) and ISO4413

Fire Risk Reduction Engineering



Fire Risk Reduction Engineering



OEM Support- Hosing standards

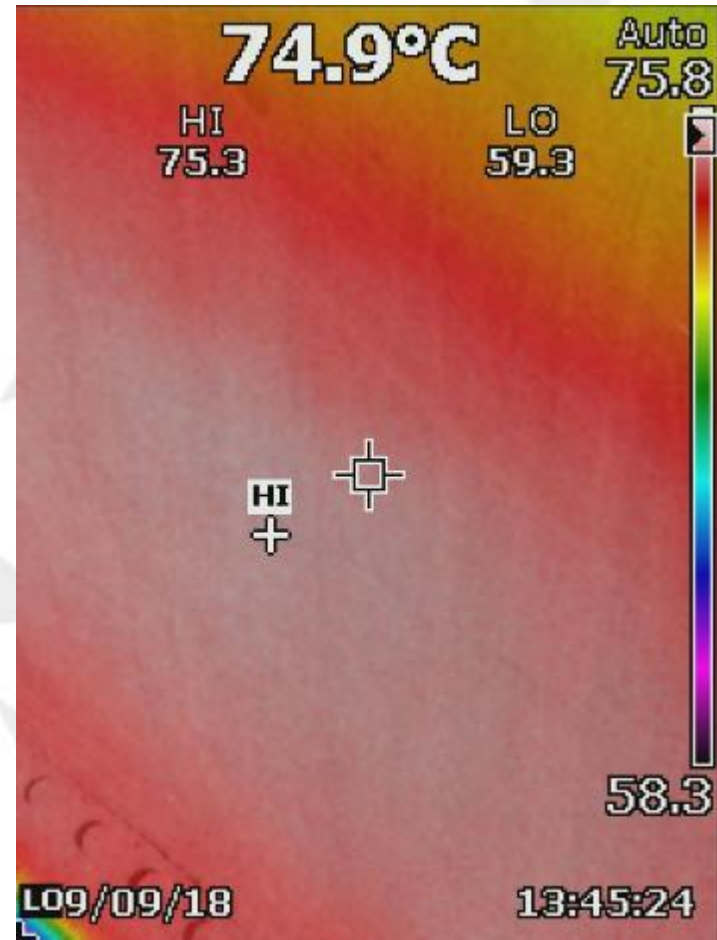
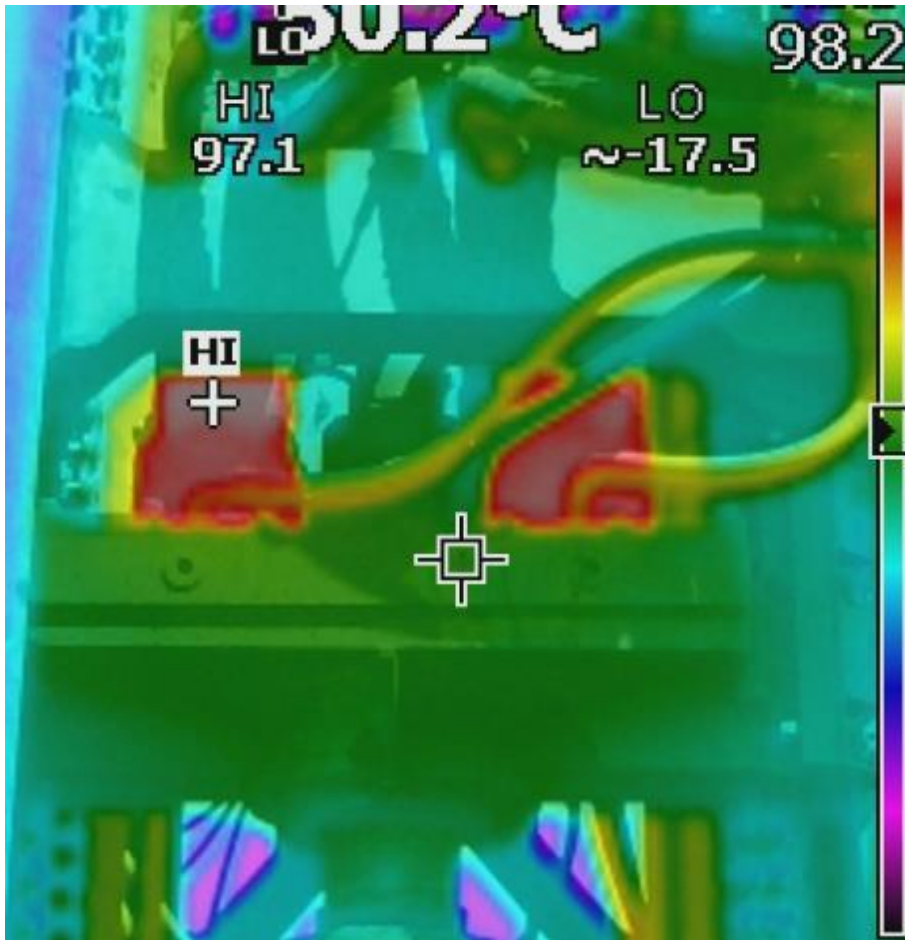


OEM Support- Hosing standards



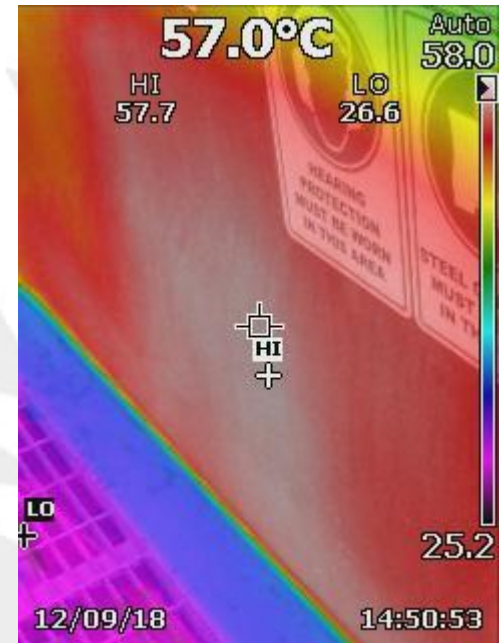
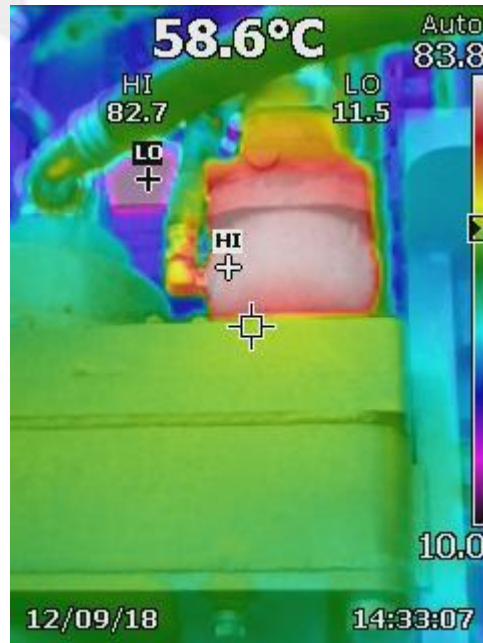
OEM Support - Improvements

Stock C750D rotation head temps and oil temperature



OEM Support - Improvements

Generation 2 machine rotation head motor temperature and oil temperature



OEM Support - Improvements



OEM Support - Improvements

Net Improvement to Date

Massive reduction in carry back and material on machine deck , ease of cleaning and reduction in dust exposure while working on the drill deck

Overwhelmingly positive acceptance from both operators and maintainers on layout, access and ease of cleaning.

Improve access for maintenance having positive impact on downtime / MTTR

Design targets long term availability of 92-94%, With MTBF >60 hours. Initial indication is that we are well on track to achieving this.

All modifications are factory designed and supported.

Productivity enhancement exceed design target substantially

Safer by Design!

