

# FIRES ON MOBILE PLANT

January-March 2019

## Mobile plant fires present safety and production losses

### Large equipment

Major mine operators started the first quarter of 2019 with several fires on large critical equipment. Five machines experienced fires including four large excavators and a large loader.

*Figure 1 Excavator fire*



### Exposure

A dozer air conditioner fire exposed the operator to smoke and fumes when the cabin was inundated with combustion pollutants. Air conditioning systems must be maintained and kept clean. The accumulation of dirt and dust particles in the vents, filters, coils and fins will obstruct normal air flow and may result in a malfunction or fire.

## Recurring events

Escape of fluid onto engine system hot surfaces underpins 64 per cent of fires. Mine operators and equipment manufacturers must implement engineering solutions to control surface temperatures, so far as is reasonably practicable. Controls, such as turbo lagging, double-skinned exhaust and water-jacketed turbo and exhausts must be considered as part of this process.

Electrical fires were represented in nine of the 33 fires that occurred in the first quarter of 2019.

In underground metalliferous mines, two similar fire events have identified a solenoid design as the source of ignition.

## Maintenance work a contributing factor

Several fires have had maintenance work identified as a contributing factor. Sufficient time and resourcing must also be allocated to maintenance and repair tasks. Stringent monitoring and quality control maintenance and repair activities must be undertaken to prevent fires on mobile plant.

## Underground coal mine fire

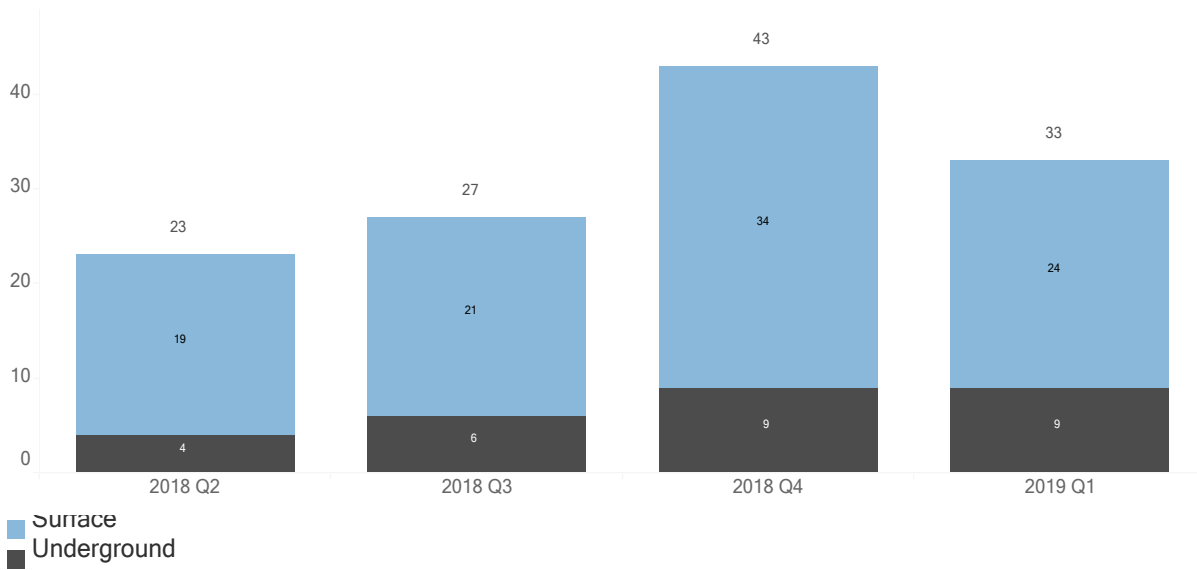
A catastrophic engine failure occurred in an underground coal mine that resulted in a fire. In this event, a hole was punched in the engine block by hot reciprocating components. This failure was attributed to engine oil lubrication failure. Fortunately, this event occurred in an inert atmosphere and the vehicle had a fire suppression system installed.

A diesel engine in a high methane atmosphere can run on unmetered methane fuel to overspeed the engine. In this state of overspeed, a catastrophic failure of the engine becomes more likely and presents a high risk of fire and explosion in the methane rich atmosphere. For this reason, engine systems designed for use in underground coal mines require fundamental protection from uncontrolled combustion (methane ingestion). Typically, onboard vehicle methane monitors and strangler valves are controls for such a rare but critical condition.

## Statistical data

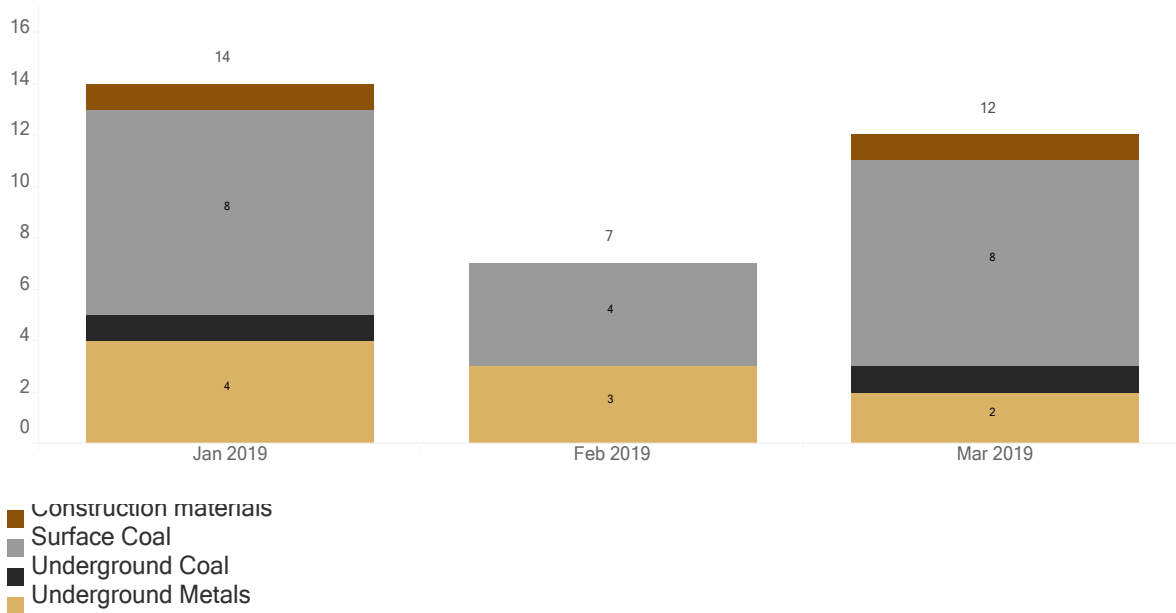
### Incident notifications by primary location – April 2018 to March 2019

Figure 2 Fires on mobile plant by surface or underground location



### Incident notifications by mine type - operation type and Month – January 2019 to March 2019

Figure 3 Fires on mobile plant for quarter 3, 2019 sorted by depth layers



Note: The January event for coal-underground (black) occurred on the surface of the underground mine.

Figure 4 Triage classification and the NSW Resources Regulator’s direction

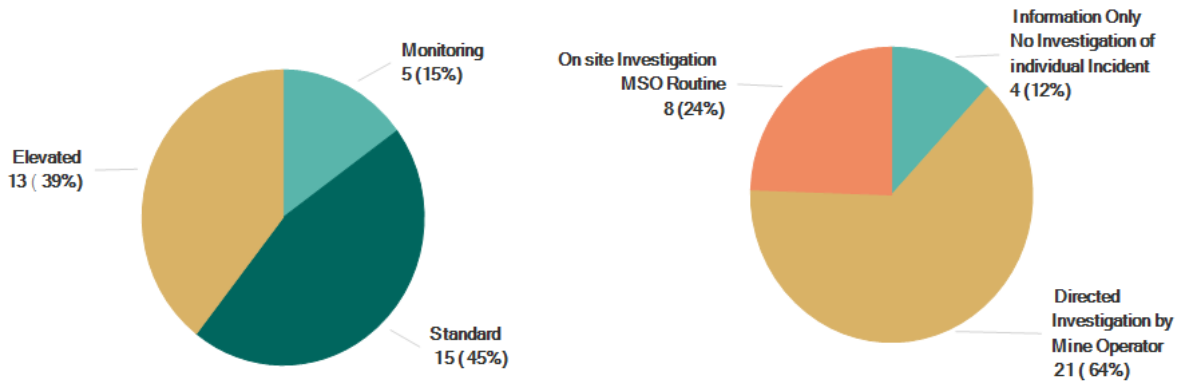
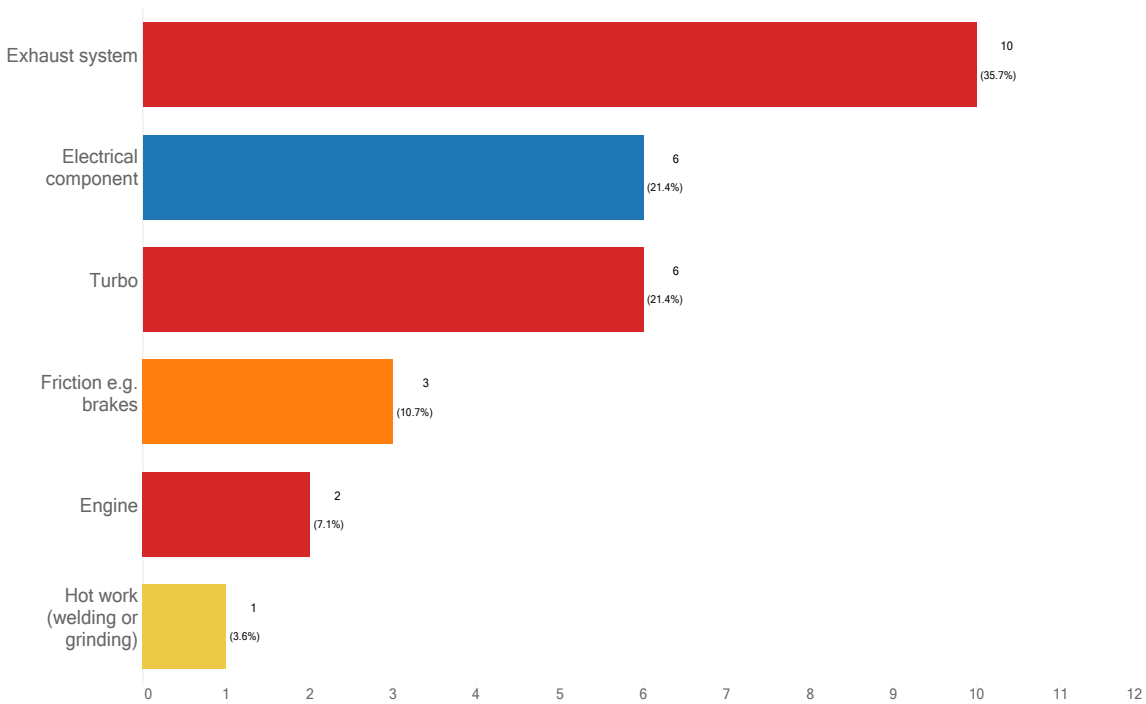


Figure 5 Heat sources as identified on ancillary reports



Mine operators and equipment manufacturers are required to implement engineering solutions to control surface temperatures, so far as is reasonably practicable.

Surface temperature control has been demonstrated to eliminate the risk of engine exhaust fires on mobile plant in underground coal mines. Reduction of surface temperatures may eliminate or reduce the ignition and heat source, when a combustible fluid escapes containment.

Figure 6 Fuel sources

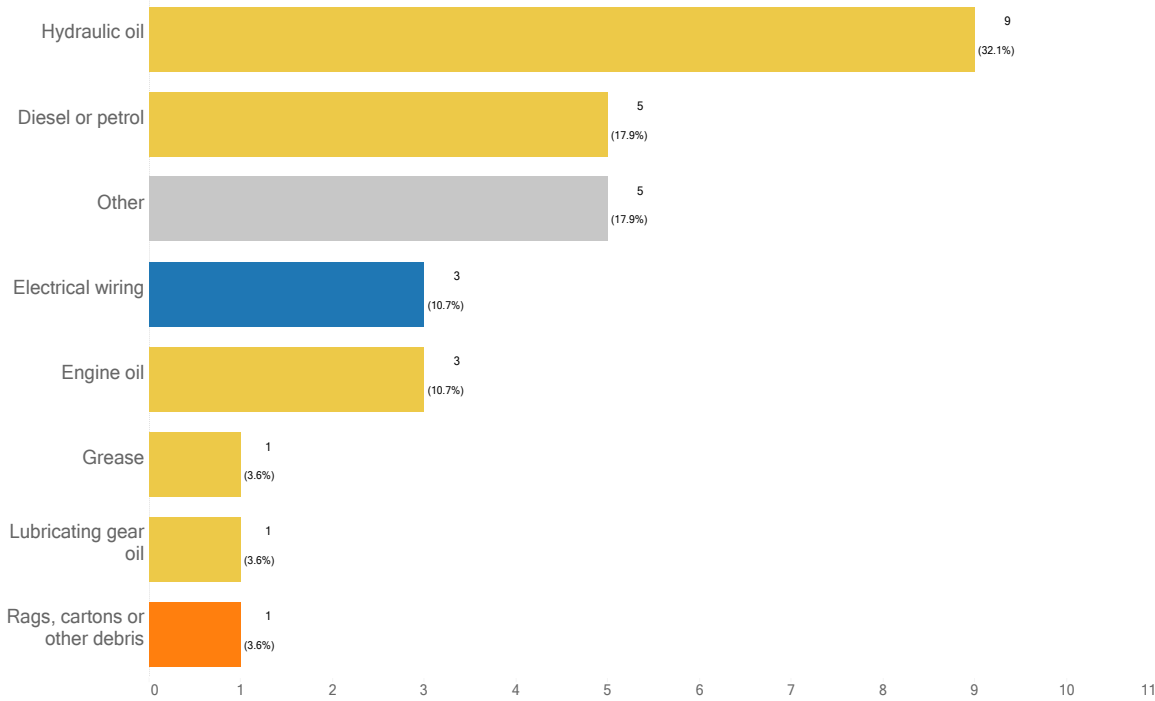
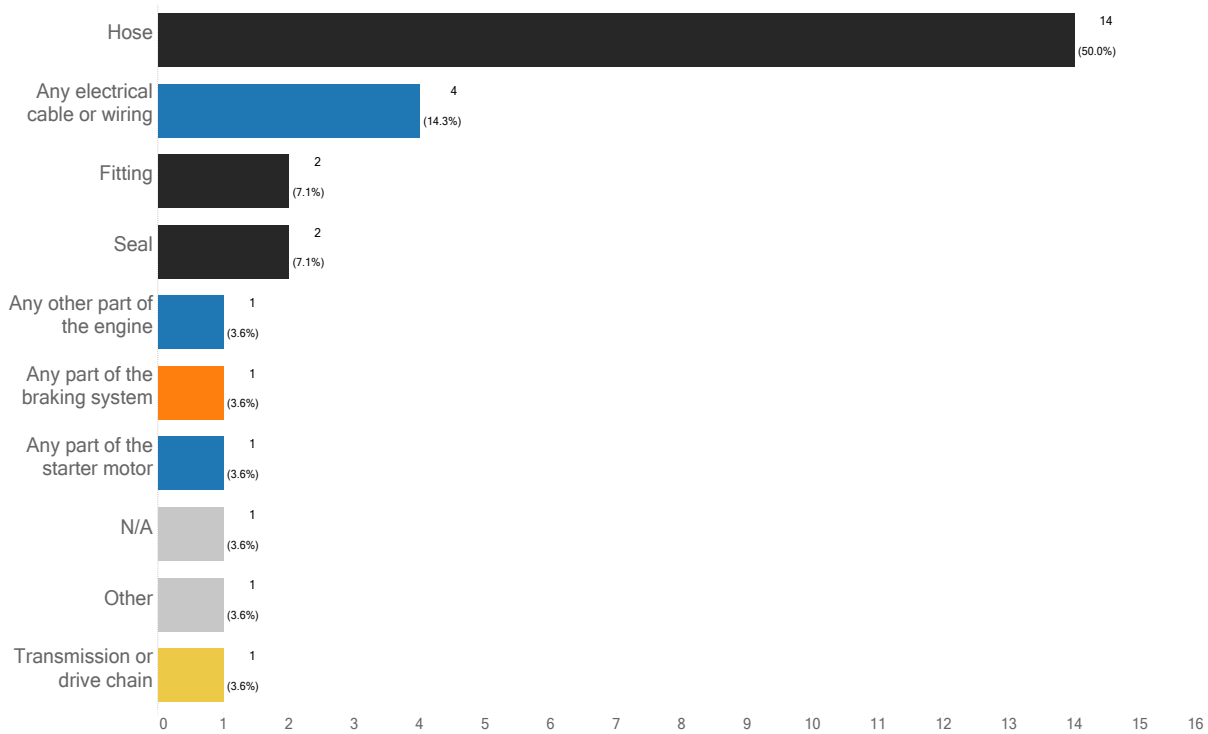


Figure 7 Failed components identified by ancillary reports



Original equipment manufacturers (OEMs), designers and suppliers should develop solutions to address the persistence of fires on mobile plant, to ensure they are meeting their obligations under the work health and safety legislation.

## Safety incident log (January to March 2019)

### January 2019 - Murrawombie Copper mine IncNot 0033495

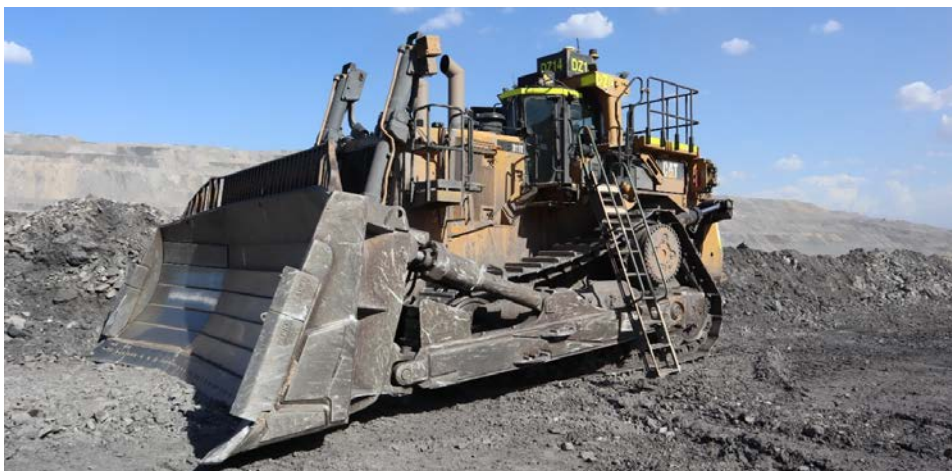
A solenoid failure on a Normet charge rig allowed a build-up of enough heat to ignite the plastic coating of the solenoid. The automatic fire suppression system was activated however did not extinguish the fire. It is believed this was due the area not being covered by any nozzles.

*Figure 8 Murrawombie Copper mine incident*



**January 2019 - Bengalla IncNot0033522-** An investigation into the incident at Bengalla found that the ladder valve supply hose, from the transmission filter to the ladder valve, rubbed through an adjacent hose and sprayed oil into the hell hole area. The engine fan drew oil into the engine bay. The oil made contact with hot surfaces of exhaust/turbo components and ignited.

*Figure 98 Bengalla incident*



## January 2019 - Hunter Valley Operations IncNot0033564

An operator was made aware by another operator of a fire coming from a resistor grid box on a haul truck, while descending the ramp.

*Figure 10 Hunter Valley Operations incident*



## January 2019 - Moolarben IncNot0033553

On a Komatsu WA1200 loader, a hydraulic pilot control circuit hose failed at the point where it connected to the hydraulic pilot control solenoid, releasing hydraulic oil. This ignited on hot engine components.

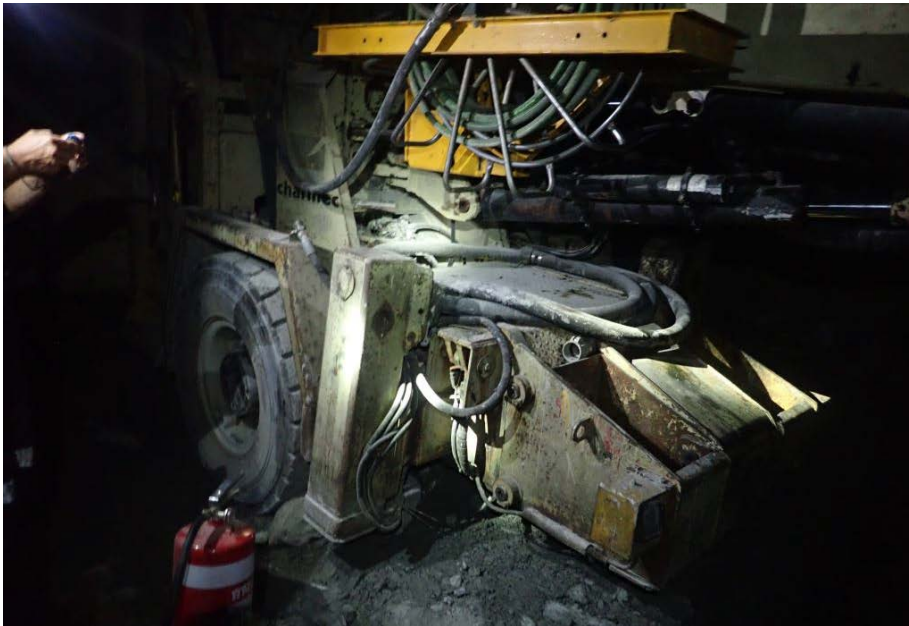
*Figure 11 Moolarben incident*



## January 2019 - Murrawombie Copper mine IncNot0033599

A Normet, on the bottom of the decline, was stationary and being derigged when the boom solenoid caught fire.

*Figure 12 Murrawombie incident*



## January 2019 - Hanson Bass Point Quarry IncNot0033615

The battery cable rubbed through on an engine oil supply hose.

*Figure 13 Hanson Bass Point Quarry incident*





## January 2019 - Bloomfield IncNot0033624

While operating a sk75 drill at SCK09, the operator saw flames coming from the engine. The source of the fire was from a small hole in the cooler fan motor hose which was spraying over the engine.

## January 2019 - Bengalla IncNot0033626

Failure of turbo oil feed line.

*Figure 9 Bengalla incident*



## January 2019 - Hunter Valley Operations IncNot0033652

The cause of a fire on a water cart was found to be a hoist/water pump system hydraulic hose failure, between the chassis rails under the water tank, which sprayed hydraulic oil into the engine bay. This hose was identified as leaking on 29 December 2018 and marked as a 'high' priority. However, it was only scheduled to be replaced on 9 February 2019.

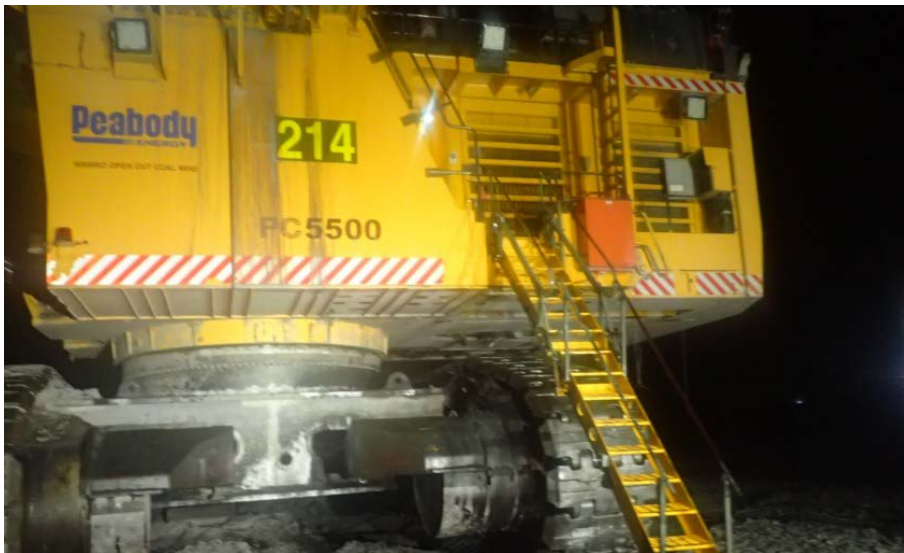
*Figure 15 Hunter Valley Operations incident*



## January 2019 - Wambo Open Cut IncNot0033641

On an excavator, the main hydraulic supply hose from the high-pressure screen to control valve #3, suffered from a rupture. Flames were seen around the turbo of engine #2.

*Figure 16 and 1710 Wambo incident*



## January 2019 - Bengalla IncNot0033643

There was a fire on a Hitachi EH4500 truck which came from the engine bay. The driver could see flames outside the passenger door coming from the engine bay. A burst hose was rubbing on the deck structure. The investigation identified that the hydraulic hose failed and a mist burst from beside the cab, outside the passenger door. Within a few seconds, flames appeared behind the cab at the height of the cab itself.

*Figure 11 Bengalla fire incident*



### January 2019 - Newstan IncNot0033664

The failure of a pilot fuel line to an after-treatment regeneration device (ARD) head resulted in atomised fuel being sprayed into the engine compartment. The fire was ignited by a heat source, most likely the exhaust system.

*Figure 12 Newstan incident*



### January 2019 - Rasp Mine IncNot0033742

Wiring from an alternator shorted on the engine sump, which eventually burned a hole through the sump, caused a fire to start.

*Figure 13 Rasp mine incident*



### February 2019 - Tomingley Gold Mine IncNot0033802

Oil sprayed over hot engine components caused by a failed hydraulic hose O-ring for the ripper system.

*Figure 14 Tomingly incident*



## February 2019 - Moolarben open cut IncNot0033791

A dozer had a failed a left-hand rear idler bearing, which caused heating on the outside of the idler. The heat caused a small amount of grease on the outside of the idler to catch fire.

*Figure 15 Moolarben incident*



## February 2019 - Mt Arthur North IncNot0033822

A fuel hose rubbed through a rocker cover due to incorrect installation of the hose. Inspection of the condition of the fuel lines during the last service did not identify potential failure of the hose.

*Figure 16 Mt Arthur North incident*



## February 2019 - CSA Mine IncNot0033915

Park brake pads in contact with a brake disc on a heavy-duty park brake system. The park brake was left partially on while driving.

*Figure 17 CSA mine incident*



## February 2019 - Cadia East IncNot0033951

Failure of the high current stud on the crane engine starter motor allowed a broken conductor to short to ground.

*Figure 18 Cadia East incident*



**February 2019 - Cadia East IncNot0033953**

The bearing support block contact area deformed during fabrication, causing the bearing to become 'oval' when tightened down onto the support. This increased the bearing rolling torque and bearing operating temperature, to the point where the grease ignited.

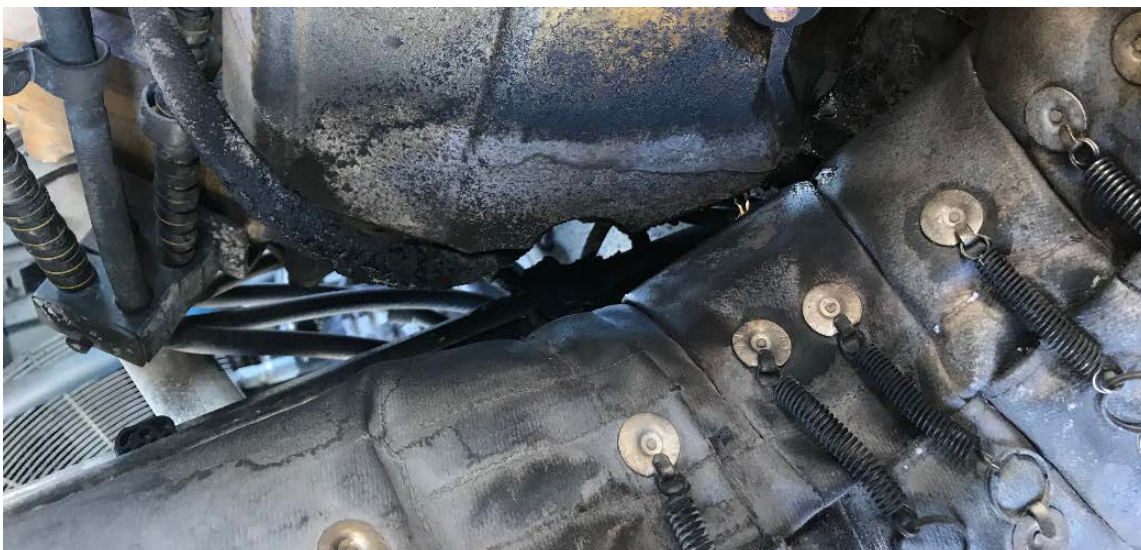
*Figure 19 Cadia East ignition incident*



**February 2019 - Mt Arthur North IncNot0033998**

A fuel return line on a Sandvik drill rubbed through, allowing diesel fuel to spray onto hot engine surfaces in the vicinity of the turbocharger. The return fuel line was inadequately supported or segregated and rubbed through on the engine rocker cover from normal machine vibration.

*Figure 20 Mt Arthur North incident*



**February 2019 - Wambo Open Cut IncNot00034127**

The engine had recently been replaced on this machine. The turbo oil supply line had been incorrectly routed on the inside of the heat shielding blanket, directly against the turbo snail. This caused the hose to fail and engine oil to come into contact with the turbo.

*Figure 21 Wambo Open Cut incident*



**March 2019 – Ravensworth IncNot0034078**

There was a fire on a 6040 Caterpillar excavator in the right-hand side engine bay.

*Figure 22 Ravensworth incident*





## March 2019 - Wilpinjong IncNot0034097

A dozer cab filled with smoke and the operator picked up a self-rescuer. Another worker appeared on the right side of the cab and said there was no fire on that side. The cause was attributed to rubbing the air conditioning guard on the starter isolator cabling, resulting in a short circuit. The operator was sent for medical treatment regarding a hand injury that occurred while striking the fire suppression actuator.

Figure 23 & 31 Wilpinjong incident



## March 2019 - Wilpinjong IncNot0034114

A shotfirer's Toyota land cruiser 12-volt wiring loom rubbed through to the wiring above the battery box and caught fire while the workers were outside the explosives magazine. At the time of the incident, there were unused detonators remaining on board the vehicle.

Figure 24 Wilpinjong vehicle incident



## March 2019 - Mt Arthur North IncNot0034122

A major oil fire occurred on a Liebherr 996 excavator. The machine had been back in service for one hour after maintenance. When the fire erupted, the suppression system was activated and four water carts were used to control the fire. Insufficient retention of a hydraulic fan motor hose caused a release of high pressure hydraulic oil. This oil sprayed under the scoop of the engine guard, igniting on the exhaust manifold.

*Figure 25 Mt Arthur excavator incident*



## March 2019 - Rix's Creek IncNot0034140

A manual fuel primer failed and came apart, spilling diesel on the motor of the service cart while it was operating, resulting in a fire.

*Figure 3426 Rix's Creek fire*



## March 2019 - Wilpinjong IncNot0034210

A dozer related incident where a water/corrosion presence in an electrical connector was not identified during inspections.

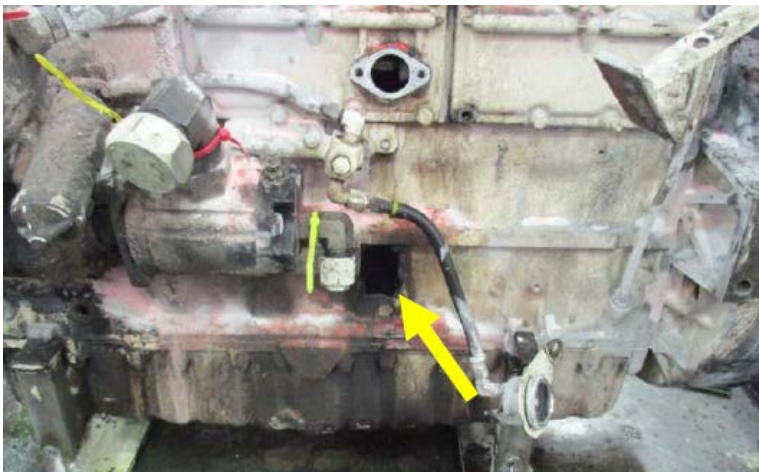
*Figure 35 Wilpinjong incident*



## March 2019 - North Wambo IncNot0034184

There was a catastrophic engine failure, resulting in an oil fire at this underground coal mine.

*Figure 36 & 37 North Wambo incident*



## March 2019 – Perilya Southern Operations IncNot0034221

Hydraulic oil leaked from the pump return hose onto a rotating driveshaft and sprayed onto hot engine components.

**March 2019 - Wilpinjong IncNot0034233**

Sparks from grinding work caused a damaged aerosol paint can to ignite. Flammable items had not been removed from the work area before undertaking the hot work.

*Figure 38 Wilpinjong incident*



**March 2019 - Bengalla IncNot0034268**

An exhaust stack fire was caused by a bleed down manifold hose end failure. The hose was subject to mechanical strain and fatigue caused failure of fitting.

*Figure 39 Bengalla incident*



## March 2019 - Central Coast Sands Quarry IncNot0034272

A hydraulic fan pump hose rubbed through on the firewall of a dozer, causing hydraulic fluid to spray over the exhaust and turbo manifold.

*Figure 40 Central Coal Sands Quarry incident*



© State of New South Wales through Department of Planning, Industry and Environment 2019. You may copy, distribute, display, download and otherwise freely deal with this publication for any purpose, provided that you attribute the Department of Planning, Industry and Environment as the owner. However, you must obtain permission if you wish to charge others for access to the publication (other than at cost); include the publication in advertising or a product for sale; modify the publication; or republish the publication on a website. You may freely link to the publication on a departmental website.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (December 2019) and may not be accurate, current or complete. The State of New South Wales (including the NSW Department of Planning, Industry and Environment), the author and the publisher take no responsibility, and will accept no liability, for the accuracy, currency, reliability or correctness of any information included in the document (including material provided by third parties). Readers should make their own inquiries and rely on their own advice when making decisions related to material contained in this publication.

DOC19/1075304