

Fires on mobile plant

January - March 2018



Introduction

The NSW Resources Regulator reviews in-service fires on mobile plant at NSW mines. The intent of this quarterly report is to present data collected from ancillary reports to facilitate industry understanding.

It is hoped the reader will gain an insight to the broader understanding of fires on mobile plant across the NSW mining industry and prompt a review of the effectiveness of current preventative measures. The report also provides an initiative for the industry to consider a shift of focus towards elimination of ignition and heat sources to drive a step change in the occurrence of fires.

The data for the analysis in this report has been obtained from incident notifications reported as required by the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Key observations

Underground fires: Significant fires have occurred in the first quarter of 2018, including four fires in underground metalliferous mines. Fires on mobile plant in underground mines represent a risk to all workers who may be exposed to the products of combustion and the loss of safe egress from the

underground parts of a mine during a fire. One of the underground fires involved an explosive-charging vehicle where the automatic fire suppression system was also found to be faulty. The vehicle fires occurred on the declines causing, in some cases, obstruction to egress.

Human and organisational factors: A review of ancillary report comments established a significant correlation of fires with recent mobile plant maintenance or overhaul work. NSW Resources Regulator inspectors have begun planned inspections targeting human and organisational factors and maintenance practices that contribute to fires on mobile plant. The aim of the planned inspections is to identify factors that may have degraded the performance of the plant, the maintenance team and the operator.

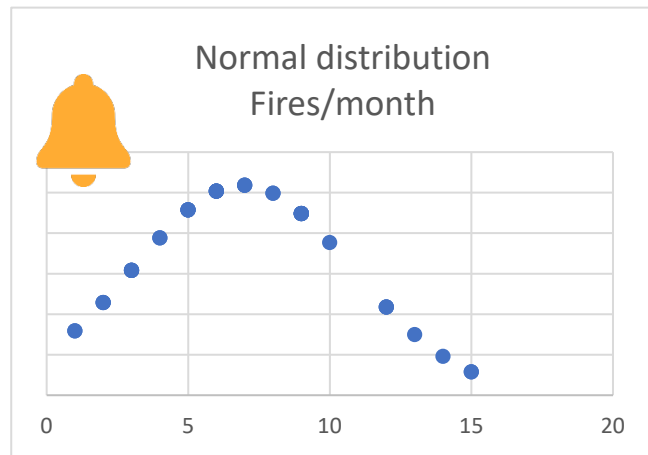
Fire suppression failures: Twenty-seven (27) fires occurred in the first quarter of 2018. Of these fires, the fire suppression system failed on four occasions. This is a significant number of failures in this small sample, representing 15% of all fires.

Hot surface fires: Fires related to an escape of fluid onto a hot surface (diesel exhaust/turbo) continue to dominate mobile plant fire statistics.

Fleet census: A census of NSW mines and quarries mobile plant fleet was initiated in April and **closes in May 2018**. The census information will be used to normalise fire event data allowing the regulator to develop objective and targeted strategies to help reduce the incidence of fires on mobile plant.

Data summary

2015	2016	2017	2018
49	67	112	27
Extrapolated 2018			108



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12	8	7									

Mine type	January	February	March
Underground coal	0	0	0
Underground metex	3	0	1
Open cut coal	7	7	4
Surface operation	0	1	0
Quarry	2	0	2

Human and Organisational Factors (HOF) assessment



The regulator will be exploring **human and organisational factors** that may influence the events leading to fires on mobile plant. Factors to be considered include worker behaviour, critical controls including maintenance supervision and task assessment and planning. Performance shaping factors that contribute to or degrade the behaviour of maintenance workers and operators will be of evaluated during the regulator’s inspections. These include:

Table 1:

Personal factors	Job factors	Work environment	Team factors	Organisational factors
Individual technical competence	Task demands	Environmental conditions	Team dynamics	Maintenance inspection and testing (plant and equipment)
Individual non-technical factors	Communication factors		Work practices	Training and competence systems
Individual wellbeing	Procedures		Planning and co-ordination practices	Safety management
	Ergonomics		Supervision support/assistance and communication quality	Organisational culture
	Tool use/equipment use			Contractor management
				Checking inspection and monitoring

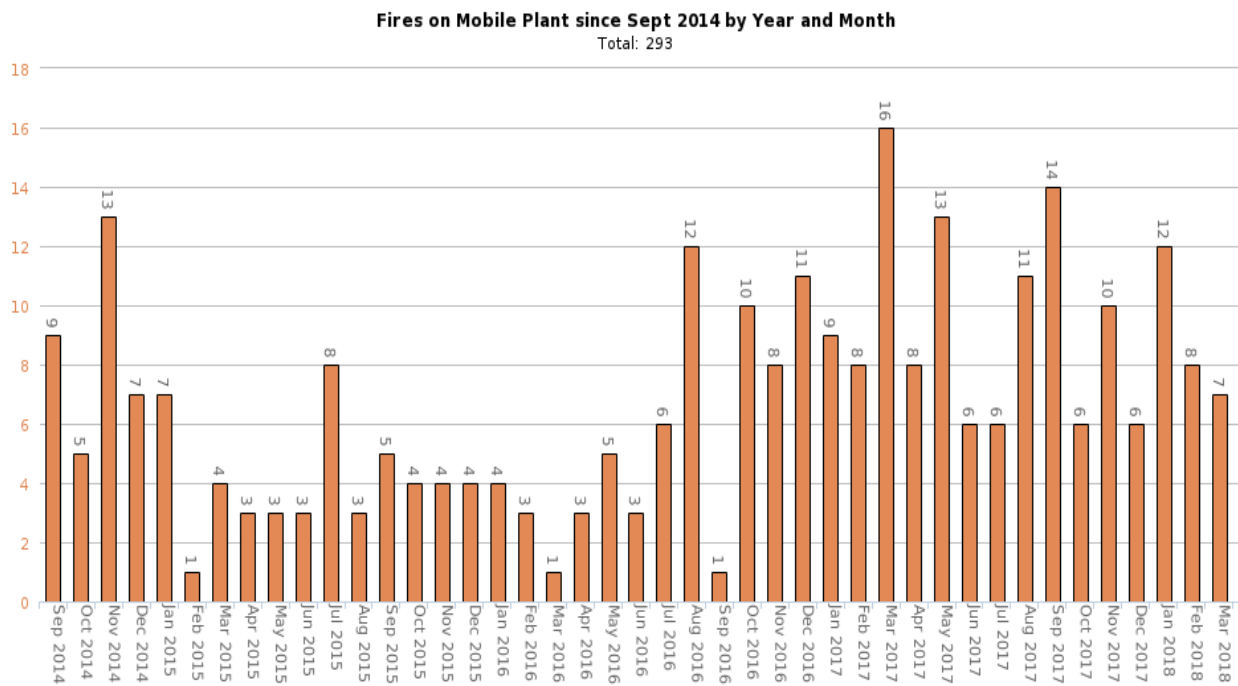
Title Safety ancillary reports - fires on mobile plant **Report date**

Report details

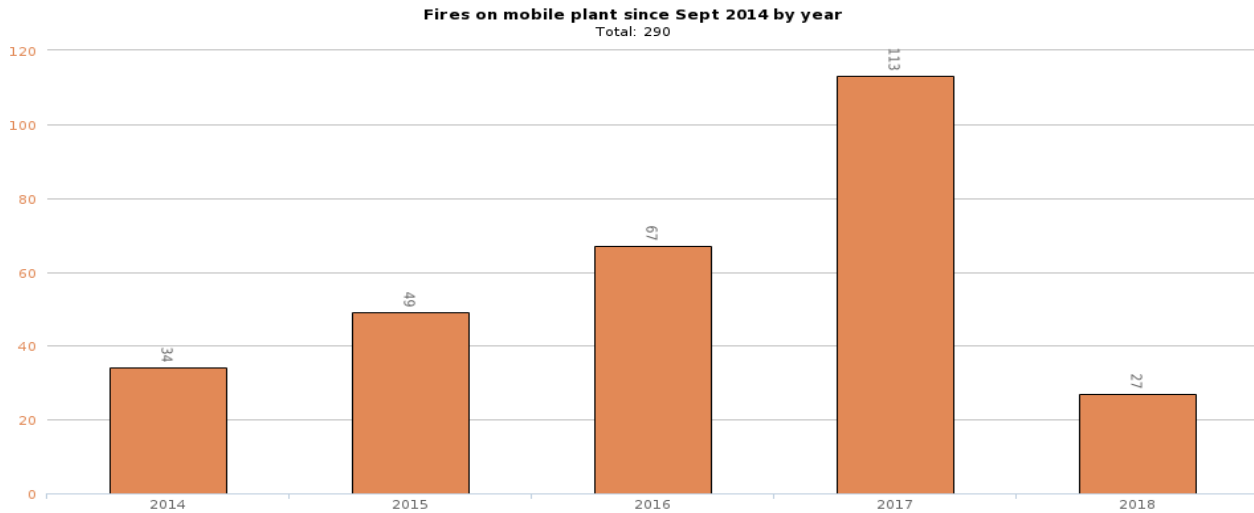
Fires on mobile plant since Sept 2014 - Last three complete calendar months and total

	Last 3 complete calendar months	Total
Safety incident - ancillary (fire related to mobile plant)	27	291

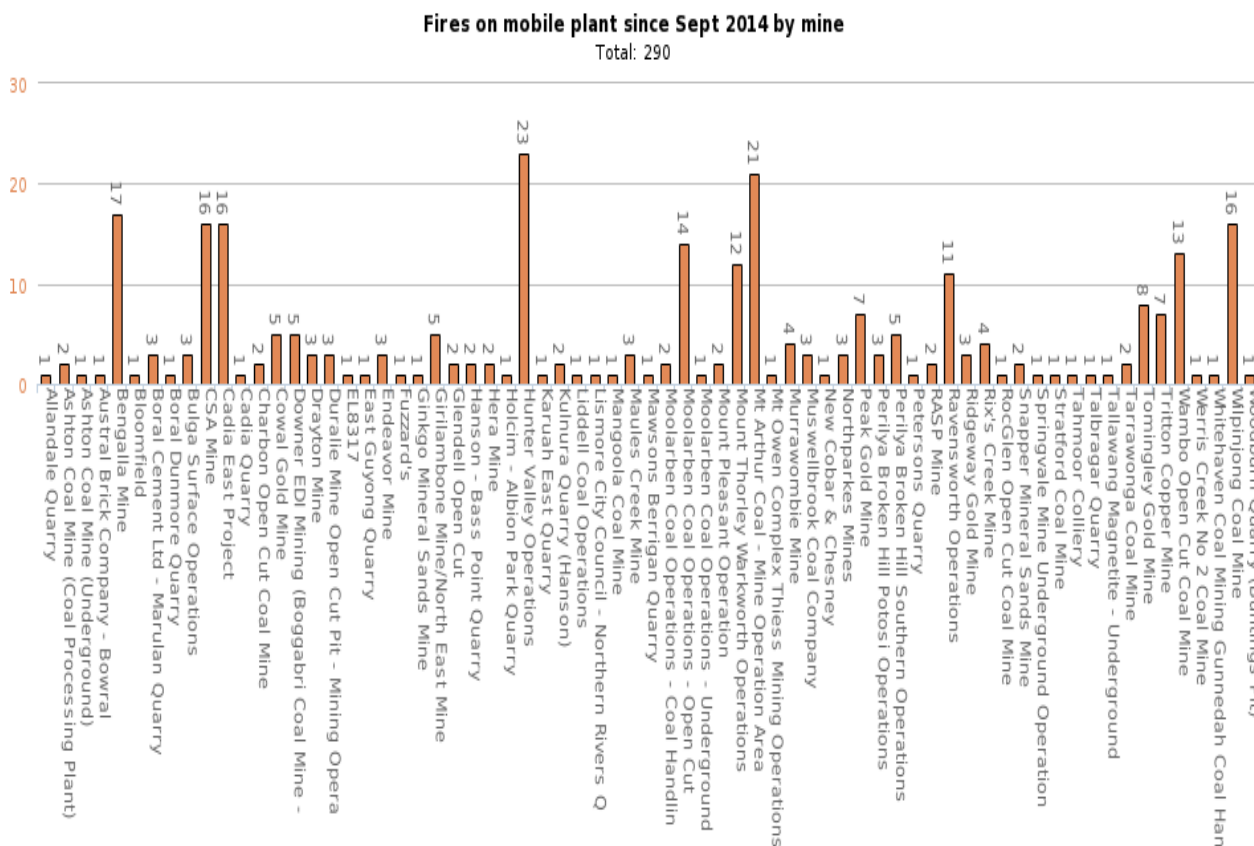
Fires on mobile plant since Sept 2014 by year and month



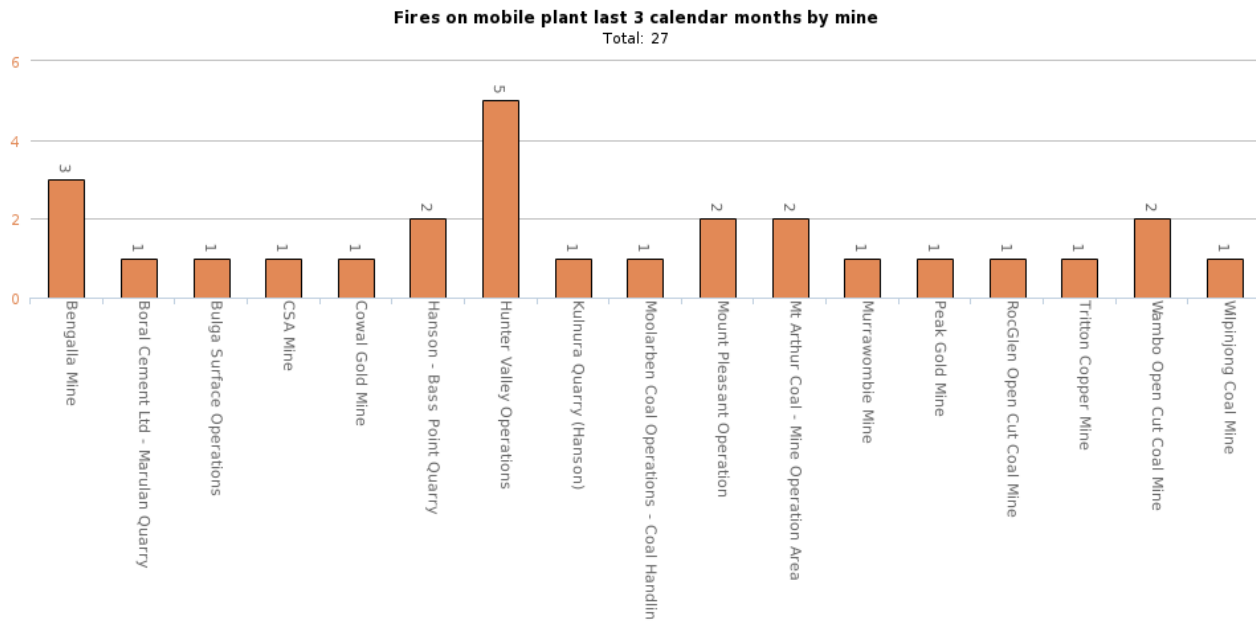
Fires on mobile plant since Sept 2014 by year



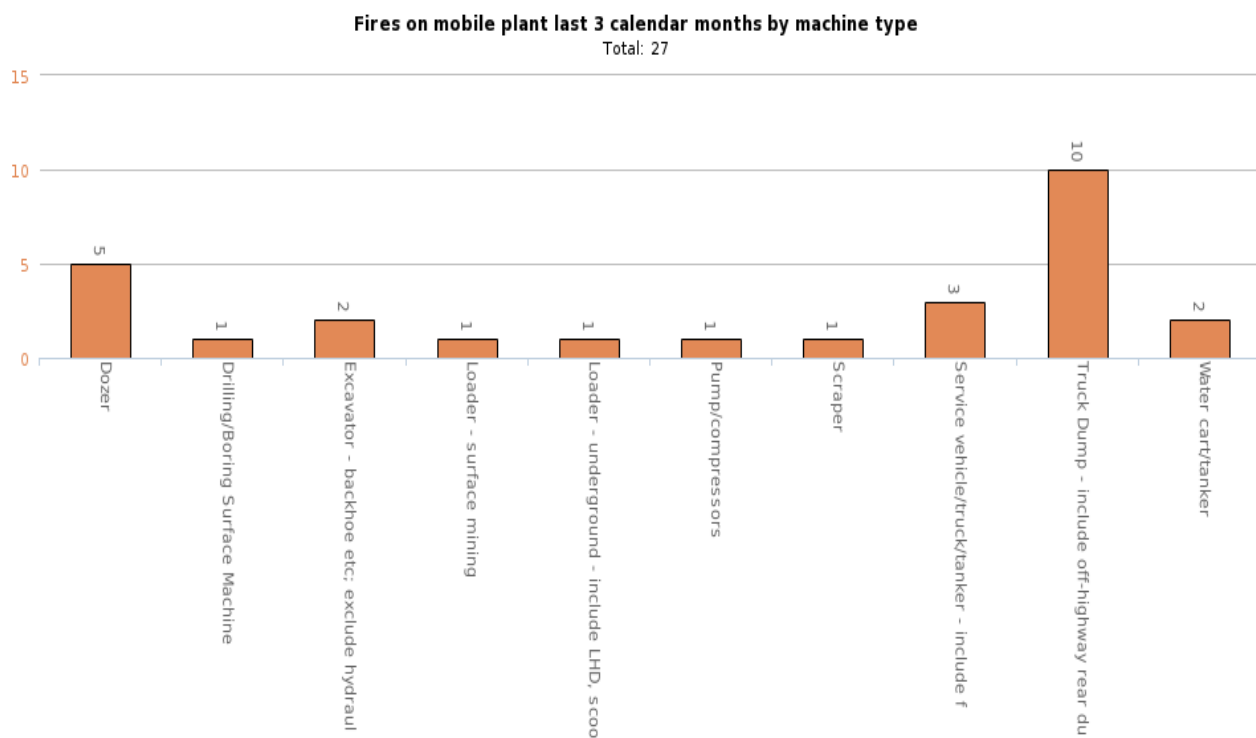
Fires on mobile plant since Sept 2014 by mine



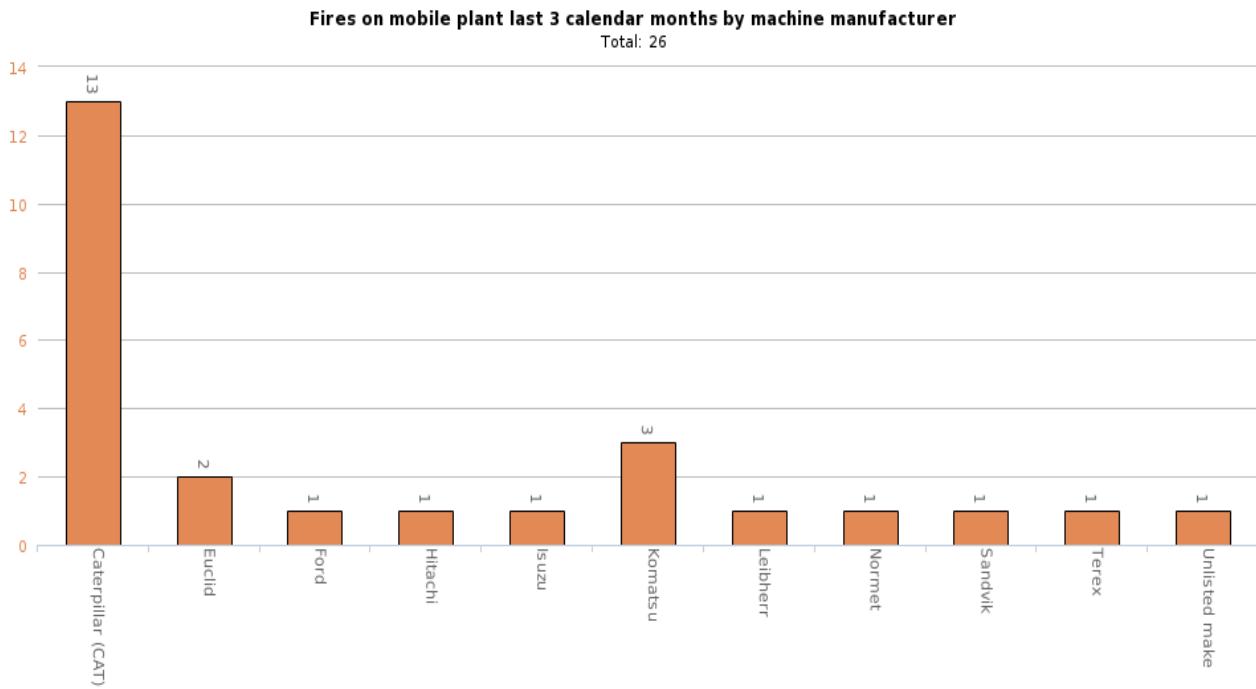
Fires on mobile plant last three calendar months by mine



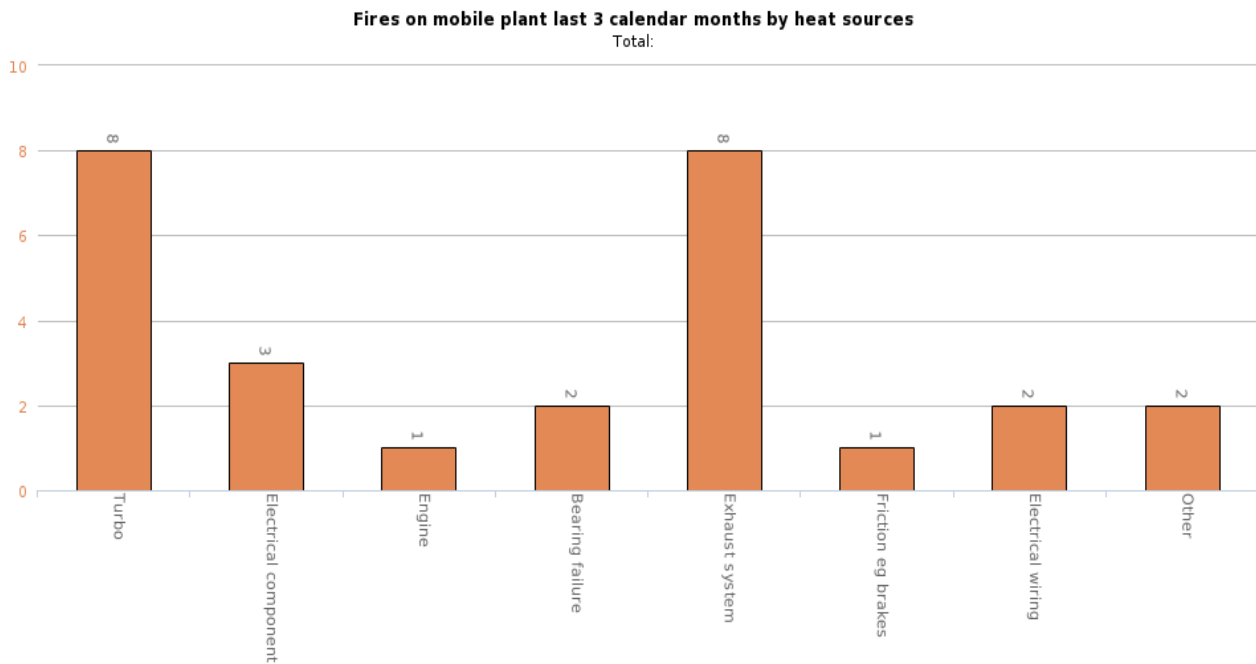
Fires on mobile plant last three calendar months by machine type



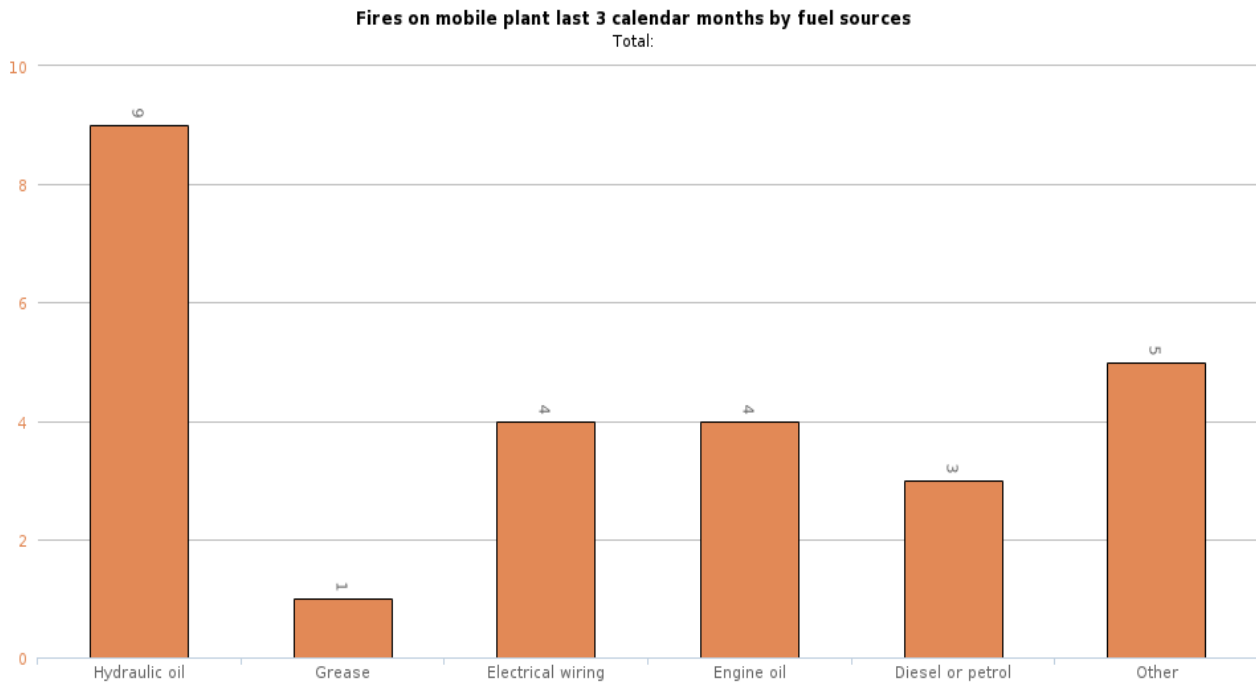
Fires on mobile plant last three calendar months by machine manufacturer



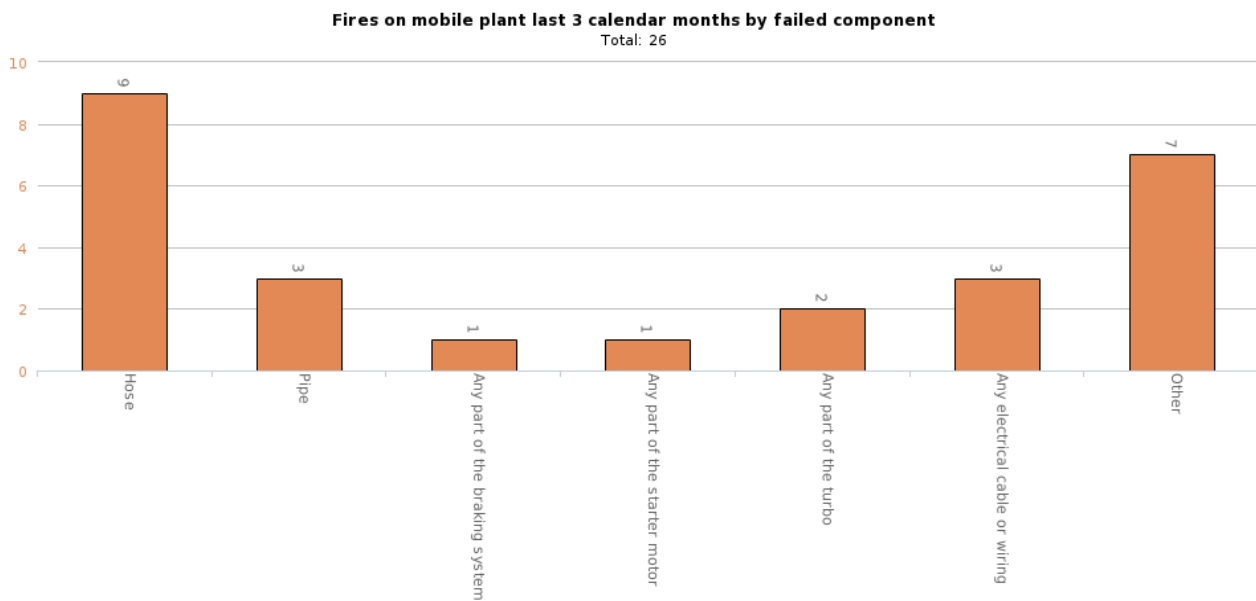
Fires on mobile plant last 3 calendar months by heat sources



Fires on mobile plant last 3 calendar months by fuel sources



Fires on mobile plant last three calendar months by failed component



	Date of Incident	Event ID	Machine type	Machine Manufacturer	Machine Model	Causal factors comments
1	30/03/2018	SInAnc-2018/00074	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Sandvik	663	The worn support bearing was identified during the 250 and 500 hour services. Parts were ordered and were scheduled to be installed the week following the incident. Parts were ordered that were in stock due to recent changes in the part numbers for the component.
2	27/03/2018	SInAnc-2018/00067	Service vehicle/truck/tanker - include fuel/lube/pump truck, oil tanker, shotfirer's truck, concrete truck, etc	Ford	Sterling LT7500	
3	23/03/2018	SInAnc-2018/00071	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	777D	Haul truck operators may have various ideas about how the retarder works under local conditions across a range of truck models. This may have resulted in the incorrect use of the retarder and therefore the front disc brakes were over-used while driving down a decline, loaded, in wet conditions. Speed may also be a factor.
4	17/03/2018	SInAnc-2018/00070	Dozer	Caterpillar (CAT)	D11T	<p>Actions have been developed to prevent reoccurrence:</p> <ol style="list-style-type: none"> 1. Audit the 12 machines that have had this hose upgrade completed focusing on correct clamping, routing and segregation. 2. Complete the OEM hose clamping and routing upgrade on the remaining eight machines in the fleet. 3. Update service sheets to include inspections of hoses in this area every 500 hours. 4. Communication of the incident and importance of thorough inspections and on correct clamping, routing and segregation during installation. 5. Fire service provider to conduct investigation into the fire system failure to operate.
5	17/3/2018	SinAnc-2018/00077	Truck dump	Komatsu	830E	Continuous vibration in the grid box and subsequent movement of the resistive grid element with heat inside the grid frame assembly, is the most likely cause of the internal failure of grid 2 in the rear grid package of RD712.
6	02/03/2018	SInAnc-2018/00064	Service vehicle/truck/tanker - include fuel/lube/pump truck, oil tanker, shotfirer's truck, concrete truck, etc	Unlisted make	ACCO 2350G Septic Vac Truck	No protection fitted to solenoid terminals.
7	01/03/2018	SInAnc-2018/00057	Drilling/boring surface machine	Terex	SK50	Review of the cable tray position and design to rectify snagging/rubbing of the hose.
8	26/02/2018	SInAnc-2018/00049	Dozer	Caterpillar (CAT)	D10T	Correcting routing and support of hose
9	20/02/2018	SInAnc-2018/00058	Scraper	Caterpillar (CAT)	637G	It was identified that the shaft of the turbo failed in two areas. One area was at the threaded section of the shaft that secures the intake turbine and the other section of the shaft that failed was at the step of the shaft. The failures were due

						to the stresses being exerted on the shaft at the thread and the step resulting in these areas to be overloaded. The shaft failure enabled oil to escape through the system and up to the muffler where it leaked onto the engine, causing the fire. The failure of the shaft was thought to be either a workmanship issue or a manufacturing issue. The workmanship issue may be a result of the nut that secures the turbine becoming loose and enabling the impeller to come into contact with the housing, causing the overloads on the shaft. This was a possibility due to the symmetrical markings at the front on the impeller where the nut was positioned. It may be a manufacturing issue however as there are cracks evident on the back of the impeller. These cracks will have caused flexing in the shaft resulting in overloading leading to the failures on the shaft.
10	15/02/2018	SInAnc-2018/00039	Water cart/tanker	Euclid	R90	Bearing failure due to age.
11	14/02/2018	SInAnc-2018/00041	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	789C	Loose seal falling onto exhaust system.
12	14/02/2018	SInAnc-2018/00050	Dozer	Caterpillar (CAT)	D11T	
13	03/02/2018	SInAnc-2018/00035	Dozer	Caterpillar (CAT)	D10T	Maintenance management - hose and clamp condition not identified before failure. Equipment integrity - hose become worn behind p clamp and ruptured.
14	02/02/2018	SInAnc-2018/00044	Loader - surface mining	Caterpillar (CAT)	992D	This is a recognised issue from the OEM with upgrades and service bulletins published to highlight the problem. This is also reflected in the routine service sheets with inspections of injection line specifically listed to inspect. The OEM has also release upgraded bracket kit Caterpillar SEPD0293-00 to reduce this issue.
15	01/02/2018	SInAnc-2018/00023	Pump/compressors	Isuzu	Note pump is HONDA, no option above (water truck is Isuzu, road registered)	Inadequate maintenance and refuelling activities – allowing build-up of flammable material on hot exhaust surfaces.
16	29/01/2018	SInAnc-2018/00040	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Komatsu	830E AC	*Deck cracking under grid box, allowing for movement of the grid box and subsequent grid frame/elements.
17	23/01/2018	SInAnc-2018/00026	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Komatsu	830E	
18	22/01/2018	SInAnc-2018/00017	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	775G	

19	21/01/2018	SInAnc-2018/00053	Water cart/tanker	Euclid	R90	<p>As per final report sent to the regulator:</p> <ul style="list-style-type: none"> • Hoses to rear pump module are designed to run close to exhaust. • Design of water tank and interaction with the OEM truck results in these pump module hoses running close to the exhaust system. • Hose clamps were not present to segregate hose from exhaust. • Segregation should be controlled through correct routing and clamping. • BMC does not stock a large variety of P clamps making correct segregation difficult at times. • BMC does not stock Stauff clamps at all. • Previously welding additional hose clamp supports onto the tank was banned due to inner rubber liner of tank. • Access to hose is difficult due to design of machine and route of hose. • Hose was in contact with exhaust lagging/system. • Hose length may have contributed to the rubbing issue. • Hydraulic oil contacted an ignition source. • External surface exhaust temperature exceeded the flash point of oil leading to fire.
20	17/01/2018	SInAnc-2018/00037	Dozer	Komatsu	D475A-5C0	The exact cause of the fire based on the available physical evidence and physical restrictions to components, cannot be determined. Refer to the forensic examination and cause report GKA1801070.
21	13/01/2018	SInAnc-2018/00043	Excavator - backhoe etc; exclude hydraulic shovel	Leibherr	996	Bolt has been incorrectly tensioned causing premature failure of component.
22	10/01/2018	SInAnc-2018/00025	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	793D	The JIC fitting that supplies engine oil to the turbo had a slight weep which absorbed into the exhaust blanket until there was sufficient fuel to ignite.
23	08/01/2018	SInAnc-2018/00014	Loader - underground - include LHD, scoop, scraper loader, bobcat	Caterpillar (CAT)	R2900G	Wiring configuration in the replacement operator cabin did not match the original operator cabin wiring.
24	08/01/2018	SInAnc-2018/00045	Excavator - backhoe etc; exclude hydraulic shovel	Hitachi	87T - 2X870LCR-3	A change out of this tube at a recommended age or hours of operation may prevent this type of incident. The machine had 7000hrs on it.
25	06/01/2018	SInAnc-2018/00031	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	AD55B	
26	04/01/2018	SInAnc-2018/00055	Service vehicle/truck/tanker - include fuel/lube/pump truck, oil tanker, shotfirer's truck, concrete truck, etc	Normet	1610B Charmec	Hose joiner in articulation area rubbing causing hose to burst.

27	02/01/2018	SInAnc-2018/00024	Truck dump - include off-highway rear dump truck and coal hauler dump truck	Caterpillar (CAT)	793D	A blockage in the steering system hydraulic tank breather has caused over pressurization of the steering pump suction line causing the hose to disengage from the pipe.
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CM9 reference: DOC18/279024