Preventing fires on mobile plant

The Resources Regulator has developed a discussion paper as a first step in consultation about the use and possible regulation of mitigation strategies for the prevention of fires on mobile plant. The Resources Regulator seeks your feedback on the existing and future use of fire-resistant fluid in mobile plant in NSW mines and other solutions, for example surface temperature control by water jacketing and other methods, to reduce the occurrence of fires on mobile plant.

You are invited to respond to some or all the questions posed in this discussion paper and provide any additional information on matters you think should be considered in relation to the use of fire-resistant fluids in mobile plant in mining applications.

→ Discussion paper: Preventing fires on mobile plant
→ Feedback form: Fires on mobile plant discussion questions

Please provide your submissions by 14 September 2018
Key observations

**Underground fires:** Several significant fires have occurred in the second quarter of 2018, including three 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. In one event, a 60 tonne underground mine dump truck caught fire, blocking a main decline and contaminating the ventilation in the mine. This resulted in an emergency evacuation and mines rescue response.

**Hot surface fires:** Fires related to escaping fluid onto hot surface (diesel exhaust/turbo) continue to dominate mobile plant fire statistics.

**Planned inspections**

In relation to fire risk assessments (FRA), the planned inspections have commonly found:

- FRAs are prepared by fire suppression system providers without consultation with key stakeholders involved in the lifecycle management of the plant as recommended by AS5062.
- FRAs typically focus on the suppression of fires after the event rather than preventative controls.
- Many controls and controls supports likely to come from the risk management process are present in the safety management system but are not necessarily driven from the FRA.
- FRAs have only listed exhaust lagging as a control over and above whatever the OEM has provided.
- The FRA only uses the collective corporate memory of attendees as the source of fire experience and knowledge rather than previous fire events.
- The FRA has not defined specific control measures for the prevention of fires.
- Exhaust lagging is not verified for effectiveness after installation by the use of thermography etc or routine inspection.
- Mines generally have systems for engineering change management and to review safety alerts and bulletins from regulators and OEMs however do not review FRAs themselves in response to updates to mining design guidelines (MDGs) and Australian Standards.

**On equipment:**

- Inspections play a vital role in keeping equipment safe. Three of the most common equipment fires reported are from the most common equipment used at open cut coal mines but also have areas of most difficult access for inspection.
- Lagging on turbo chargers and exhaust manifolds are commonly found to be in poor condition. Discussions with workers appears to recognise the need for lagging and its purpose but do not appear to report poor lagging. Sites do not have communicated acceptable standards well to workers for this purpose.
- Lagging manufacturers and suppliers may not consider fluid flow and gravity when designing the overlapping joints between sections of a multi-piece lagging kit often working in reverse to roof tiles. Lagging often does not fully wrap turbos in the area of the wastegate controller.
Mines have not used thermography or temperature measurement techniques to:

- measure surface temperatures for the identification of ignition sources
- measure the effectiveness of lagging installations
- measure areas of double walled exhaust determine if lagging is warranted, but have found to be lagged in some cases.

Hose segregation and rubbing particularly in dozer ‘hell hole’ appears to be challenging for mines to manage. Contributing to the difficult access has been the positioning of fire suppression system manifolds in the access hole of dozers.

Areas of attention for excavators include lagging standards and the firewall between the engine flywheel housing and the pump drive area.

**Fleet census:** A census of NSW mines and quarries mobile plant fleet was conducted in the second quarter of 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

<table>
<thead>
<tr>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td>49</td>
<td>67</td>
<td>112</td>
<td>47</td>
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Extrapolated 2018: 94

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<td>12</td>
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<td>6</td>
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<td>3</td>
<td>5</td>
<td></td>
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**Normal distribution**
Fires / month

<table>
<thead>
<tr>
<th>Mine Type</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground coal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Underground metex</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Open cut coal</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>3</td>
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<tr>
<td>Surface operation</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Quarry</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
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</table>

**Report details**

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

<table>
<thead>
<tr>
<th>Safety incident - ancillary (fire related to mobile plant)</th>
<th>Last 3 complete calendar months</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety incident - ancillary (fire related to mobile plant)</td>
<td>19</td>
<td>315</td>
</tr>
</tbody>
</table>

**Fires on mobile plant since Sept 2014 by year and month**

![Bar graph showing fires on mobile plant since Sept 2014 by year and month. Total: 315]
Fires on mobile plant since September 2014 by year

Fires on mobile plant since Sept 2014 by year
Total: 315

Fires on mobile plant since September 2014 by mine

Fires on mobile plant since Sept 2014 by mine
Total: 315
Fires on mobile plant last three calendar months by mine

Fires on mobile plant last 3 calendar months by mine  
Total: 24

- Baulkham Hills 2
- Broken Hill 1
- Coffs Harbour 3
- Cobar 2
- Dubbo 3
- Maitland 1
- Newcastle 2
- Port Kembla 2
- Singleton 3
- Tamworth 1
- Wagga Wagga 1
- Wollongong 1

Fires on mobile plant last three calendar months by machine type

Fires on mobile plant last 3 calendar months by machine type  
Total: 24

- Caterpillar 4
- Dozer 3
- Excavator 3
- Loader 4
- Motor vehicle 3
- Telescopic handler, telescope handler 3
- Tractor 2
- Track Dingo 1
- Water pump 1
- Wrecking trucks 2

...
Fires on mobile plant last three calendar months by machine manufacturer

Fires on mobile plant last 3 calendar months by machine manufacturer
Total: 19

Fires on mobile plant last three calendar months by heat sources

Fires on mobile plant last 3 calendar months by heat sources
Total:
Fires on mobile plant last three calendar months by fuel sources

Fires on mobile plant last 3 calendar months by fuel sources
Total:

- Hydraulic oil
- Electrical wiring
- Engine oil
- Diesel or petrol
- Rags, cartons or other debris
- Other

Report admin

Fires on mobile plant last three calendar months by failed component

Fires on mobile plant last 3 calendar months by failed component
Total: 19

- (None)
- Hose
- Seal
- Any part of the braking system
- Any electrical cable or wiring
- Other
<table>
<thead>
<tr>
<th>Date of incident</th>
<th>Event ID</th>
<th>Machine type</th>
<th>Machine manufacturer</th>
<th>Machine model</th>
<th>Causal factors comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/06/2018</td>
<td>SInAnc- 2018/00123</td>
<td>Excavator - backhoe etc; exclude hydraulic shovel</td>
<td>Leiherr</td>
<td>R9800</td>
<td>Loose turbo feed line fitting</td>
</tr>
<tr>
<td>22/06/2018</td>
<td>SInAnc- 2018/00137</td>
<td>Passenger motor vehicle - include ute, panel van, bus (manual), land cruiser/rover, etc</td>
<td>Ford</td>
<td>Ranger</td>
<td>On investigation it was identified that the positive cable running from the starter motor to the battery was rubbing with the oil line running from the engine block to the multhead sensor. The rubbing led to the cable to short circuit via the oil line thus resulting in arcing to occur. The arcing present combined with fuel sources such as oil residue from the oil line most likely would have initiated the fire</td>
</tr>
<tr>
<td>04/06/2018</td>
<td>SInAnc- 2018/00120</td>
<td>Dozer</td>
<td>Caterpillar (CAT)</td>
<td>D11T</td>
<td>Investigation still ongoing and will be provided</td>
</tr>
<tr>
<td>30/05/2018</td>
<td>SInAnc- 2018/00124</td>
<td>Dozer</td>
<td>Caterpillar (CAT)</td>
<td>D11T</td>
<td></td>
</tr>
<tr>
<td>29/05/2018</td>
<td>SInAnc- 2018/00116</td>
<td>Dozer</td>
<td>Caterpillar (CAT)</td>
<td>D11T</td>
<td></td>
</tr>
<tr>
<td>26/05/2018</td>
<td>SInAnc- 2018/00130</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Caterpillar (CAT)</td>
<td>795F</td>
<td>Please refer to attached Investigation Report</td>
</tr>
<tr>
<td>17/05/2018</td>
<td>SInAnc- 2018/00117</td>
<td>Watercart/tanker</td>
<td>Generic</td>
<td>3900G</td>
<td>Yet to be determined as investigation is not complete</td>
</tr>
<tr>
<td>16/05/2018</td>
<td>SInAnc- 2018/00102</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Caterpillar (CAT)</td>
<td>773G</td>
<td>Appears to be a faulty component. Equipment owner has been in touch with Cat regarding the problem</td>
</tr>
<tr>
<td>15/05/2018</td>
<td>SInAnc- 2018/00101</td>
<td>Concrete mixer</td>
<td>Normet</td>
<td>LF600 UTIMEC</td>
<td></td>
</tr>
<tr>
<td>10/05/2018</td>
<td>SInAnc- 2018/00097</td>
<td>Loader - surface mining</td>
<td>Caterpillar (CAT)</td>
<td>994-D</td>
<td>Preliminary investigations have found that the No: 9 Fuel Injector hold down bolt has broken allowing the injector to move out of the cylinder head bore and punch a hole in the valve cover mechanism.</td>
</tr>
<tr>
<td>07/05/2018</td>
<td>SInAnc- 2018/00093</td>
<td>Excavator - backhoe etc; exclude hydraulic shovel</td>
<td>Hitachi</td>
<td>EX5500-5</td>
<td>Electrical wiring and hose routing and support to be improved in the air conditioning room. This routing issue was caused due to a previous relocation of the air conditioning compressors on the machine.</td>
</tr>
<tr>
<td>05/05/2018</td>
<td>SInAnc- 2018/00110</td>
<td>Dozer</td>
<td>Caterpillar (CAT)</td>
<td>D11T</td>
<td>OEM Remanufactured Engine Assembly inclusive of engine oil filter housing has been delivered and installed with defect. Component was difficult to</td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Site Code</td>
<td>Equipment Description</td>
<td>Make</td>
<td>Model/Type</td>
</tr>
<tr>
<td>-----</td>
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<td>--------------------------------------------------------------------------------------</td>
<td>------------</td>
<td>-------------</td>
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<tr>
<td>13</td>
<td>02/05/2018</td>
<td>StnAnc-2018/00118</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Komatsu</td>
<td>Komatsu 830E</td>
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<tr>
<td>14</td>
<td>26/04/2018</td>
<td>StnAnc-2018/00088</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Caterpillar (CAT)</td>
<td>AD55B</td>
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<tr>
<td>15</td>
<td>26/04/2018</td>
<td>StnAnc-2018/00098</td>
<td>Excavator - backhoe etc; exclude hydraulic shovel</td>
<td>Hitachi</td>
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<td>16</td>
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<td>StnAnc-2018/00107</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Caterpillar (CAT)</td>
<td>777F</td>
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<td>17</td>
<td>18/04/2018</td>
<td>StnAnc-2018/00094</td>
<td>Water cart/tanker</td>
<td>Caterpillar (CAT)</td>
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<td>18</td>
<td>16/04/2018</td>
<td>StnAnc-2018/00082</td>
<td>Screening/washing equipment</td>
<td>Unlisted make</td>
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<td>19</td>
<td>01/04/2018</td>
<td>StnAnc-2018/00068</td>
<td>Truck dump - include off-highway rear dump truck and coal hauler dump truck</td>
<td>Euclid</td>
<td>EH4500</td>
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</table>

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (August 2018). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Planning and Environment or the user's independent advisor.

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