NSW GOVERNMENT

NSW Resources Regulator

SAFETY BULLETIN

SEPTEMBER 2022

Fires occurring on mobile manufacturing unit trucks

This safety bulletin provides safety advice for the NSW mining industry.

Issue

The NSW Resources Regulator recently identified 2 incidents involving fires on mobile plant that have occurred on explosives mobile manufacturing unit (MMU) trucks.

While the fires were very small and quickly extinguished, explosives and oxidising agents such as ammonium nitrate present a high risk with potentially severe consequences in the event of being involved in a fire. The MMU fires were both at bulk explosives storage and reload facilities.

Figure 1 MMU truck moved away from bulk storage after a fire was detected

Circumstances

The 2 fires were related to hot surface temperature ignition, one due to a hot catalytic converter and one due to an electrical cable hot joint. The circumstances of both fires present an opportunity to improve the design of the specialised explosives MMU trucks and reinforce the requirement to maintain high standards of housekeeping on this type of equipment.

Incident 1

An explosives MMU truck returned from the pit empty after about half-an-hour travelling from the shot to the reload point. The operator got out of the truck and smelled something hot. The operator was checking the machine and saw a flame coming from above the catalytic converter behind the rear of the cab. He drove the truck forward, clear of the reload point, and extinguished the flame with a hand-held extinguisher. Flames were seen about 10 cm high at the top of the catalytic converter cover.

Figure 2 Product spillage above the exhaust

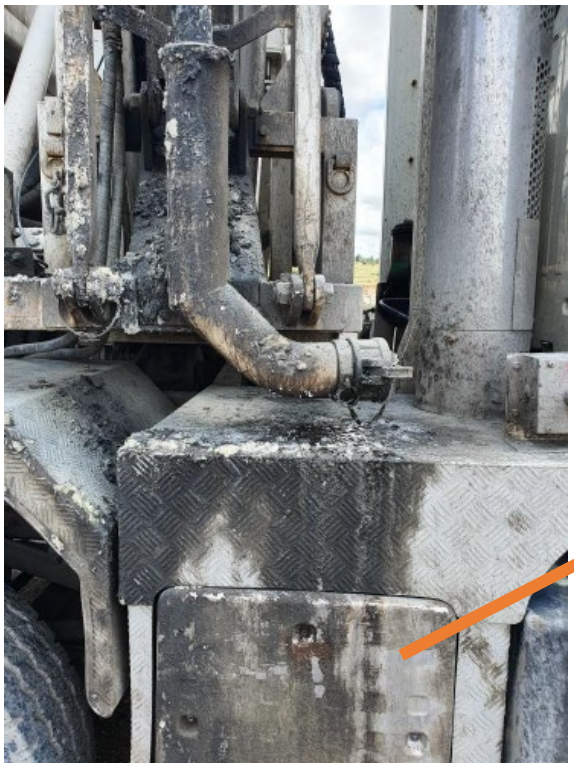
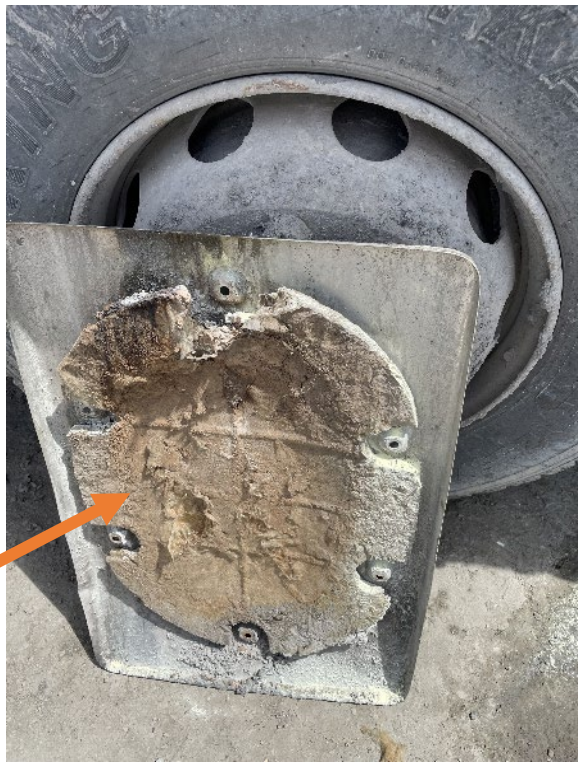


Figure 3 Cover insulation showing fire damage



Investigation

An amount of Ammonium Nitrate Emulsion (ANE) with a combination of combustible material such as oil and other matter had dripped off the delivery hose diffuser over time, which has built up on top of

the aluminium cover on top of the catalytic converter. The contaminated ANE product accumulated in the insulation behind the catalytic converter cover and on top of the catalytic converter. The heat from the catalytic components ignited the combustible material within the ANE product.

Analysis

The surface temperature of a catalytic converter or a diesel particulate filter (DPF) component will be the hottest part of the exhaust system when a catalytic converter regeneration cycle is initiated, and a likely hot surface ignition point for spilt contaminated ANE product.

Insulation materials can absorb combustible materials to build a fuel source for a fire. MMU product spillage must be segregated from any hot surfaces.

Incident 2

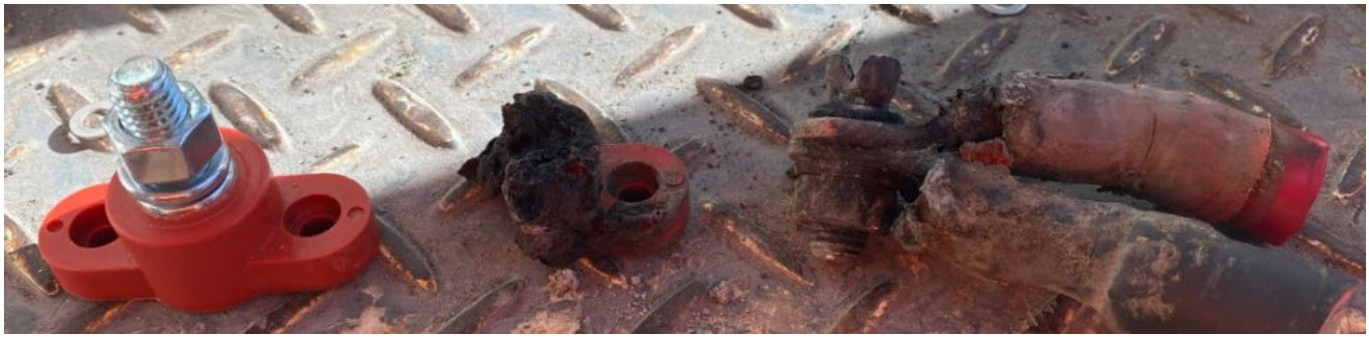
While washing an MMU in a reload facility, the operator noticed a burning smell and saw a small flame behind the battery box.

Investigation

The flame was seen to come from a positive terminal post that provided connection to a starter motor isolator. The terminal post was connected from the battery isolator by a cable.

The truck batteries were protected by a PVC cover, however the location of the positive terminal post that caught fire sat outside the protection provided by this cover. There was some evidence of corrosion at the joint but this was not the cause of the fire in this case.

Figure 4 New terminal adjacent to a failed hot joint terminal and cable connections.



The fire was caused by a broken terminal connection that provided an electrical path to the chassis. Arching caused the cable rubber boot to catch on fire.

Analysis

The joint in the cable was an unnecessary additional joint made to insert a starter motor isolation switch. The cable for the starter motor isolator could run directly from the battery isolator switch without the additional joint. Terminal joins must be engineered and installed to maintain a reliable and robust connection.

Recommendations

As prescribed in the NSW *Explosives Regulation 2013*, designers must ensure that MMUs are designed in accordance with the requirements of AS 2187.2-2006. The requirements of the *AEISG Code of Practice: Mobile Processing Units*, should also be considered when designing these units.

Designers, manufacturers and operators of MMU's must also consider that AS 2187.2-2006 specifically acknowledges that not all hazards are identified within the standard and that additional precautions and risk control measures may need to be implemented beyond those specified in the standard.

The designer must assess risks associated with transporting explosives and make any special precautions that may not be prescribed directly in codes or standards to ensure, so far as reasonably practicable, that the plant is fit-for-purpose.

The designer and manufacturer of a MMU must be satisfied that the design of any sub-system that is sub-contracted or provided by a third party has been undertaken in accordance with the applicable provisions required by Part 2 Division 3 of the *Work Health and Safety Act 2011.*

Duty holders who design, manufacture and supply MMU plant (including sub-systems) must retain records to demonstrate how they have met their duties. This should include:

- the method used to determine the control measures for the plant and the control measures that result from that determination, and
- a copy of the information provided to the manufacturer under section 22 of the WHS Act in relation to the MMU, and
- a copy of the information provided to the manufacturer under WHSR clause 187 in relation to the MMU, and
- if applicable, a copy of information provided to the manufacturer to address hazards identified by the manufacturer.

Further recommendations relating to the recent events include:

- The design of electrical wiring relating to wiring of MMU should be detailed by the designer to include cable runs and connections to eliminate any unnecessary joints that may increase the risk of hot joints forming.
- Terminal joins must be engineered and installed to maintain a reliable and robust connection.
- Assessment of the risk of fire should consider all engine hot surfaces and potential hot electrical joints during operation that may come into contact with ammonium nitrate and emulsion-based product spills in operation.
- Ensure that any part of the diesel engine or exhaust system that may be exposed to product spills must be shielded. (ref. AS 2187.2, AS 2809.2)
- Review shielding of other ignition sources such as engine exhaust systems, including catalytic converters or DPF systems for shielding from product delivery hose reels and hoses.

For persons that manage and control plant:

- Review segregation of explosives product from hot surface ignition sources including exhaust DPF components and potential electrical hot joints.
- Review engine exhaust systems shielding, including catalytic converters or DPF systems for shielding from product delivery hose reels and hoses.
- Review product delivery hose spill areas where accumulation can occur on the truck including absorbent materials such as exhaust blanket cladding.
- Ensure that all mitigating controls (for example fire extinguishers and fire suppression systems) are inspected and maintained in accordance with the relevant Standards, and installed in locations where they are readily available when required.

The practice of isolating vehicle batteries when the vehicle is unattended is an administrative control that must be managed. Battery isolation will remove power from compromised joints when unattended, in the time that a small fire may escalate to engulf the explosives truck with a risk of explosion.

NOTE: Please ensure all relevant people in your organisation receive a copy of this safety bulletin and are informed of its content and recommendations. This safety bulletin should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's common area, such as your notice board where appropriate.

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DOCUMENT CONTROL	
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