

SAFETY BULLETIN

Fires ignite while refuelling mobile plant with quick-fill fuel systems

BACKGROUND

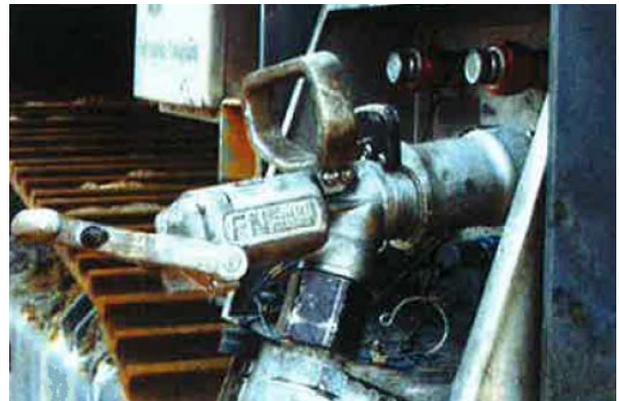
There have been several related incidents of diesel fuel fires occurring on mobile plant while they were being refuelled.

The fires initiated from escaping diesel fuel coming into contact with hot engine components including turbo chargers. In each case the operator filling the mobile plant was in close proximity to the fire and a 'quick-fill – dry break' type refuelling system was being used.

Figure 1: After a fire on a drilling rig.



Figure 2: Refuelling a drill rig.



INCIDENTS

Refuelling fires have occurred on graders, excavators, drill rigs, pump sleds and a water cart. They included:

- a) diesel fuel escaping from the manufacturer's normal manual fill point (regular 'splash' fill cap) after the fuel tank became pressurised during the refilling process, igniting the fuel on a hot engine, turbo or exhaust pipe.
 - On one occasion the regular splash fuel cap was not latched closed by the operator on the previous occasion the plant was refuelled.
 - On another occasion a faulty O-ring was found to prevent the splash fill cap from sealing when pressurised.
- b) diesel spraying on to a hot turbo charger after the fuel fill system did not stop when the tank was full.

- c) diesel spraying onto a hot exhaust from the fuel tank vent and igniting during refuelling. The fuel tank vent was incorrectly matched to the fuel fill rate.
- d) diesel discharging from the vent pipe towards a hot engine and igniting. The vent float valve was found to be faulty and the vent was directed towards the engine.

Figure 3: Dry break refuelling components.



COMMON FACTORS

All the incidents had the following factors in common;

- The refuelling systems were all quick-fill – dry break type.
- The refuelling system relied on a pressure build-up in the tank to trigger the refuelling system to stop.
- The fuel filling system, tank, or associated fittings or alternate fill points failed to contain the pressurised fuel.
- The close proximity of the fill points to exposed hot engine components facilitated the ignition of the fuel when it escaped the pressurised system.
- People were in the vicinity during refuelling.
- Most installations were user-specified, site specific alterations to the plant.

RECOMMENDATIONS

When altering plant to fit quick fill refuelling systems consideration should be given to:

- a) identifying all risk scenarios that may give rise to fuel spillage and/or fire during the refuelling process and the provision of reliable control measures in accordance with the hierarchy of risk controls
- b) carrying out a failure modes effects analysis (FMEA), or similar analysis, on the final design to identify lifecycle inspection and maintenance requirements
- c) using refuelling systems that do not rely on fuel tank pressurisation to stop fuel flow when the tanks are full
- d) locating fuel fill points and air vents away from hot engine components as far as possible
- e) ensuring fuel dispensing flow rate and air vent capacity of fuel tanks is correctly matched
- f) ensuring refuelling nozzles and fuel tank receivers are a matched set
- g) checking the designs of fuel tanks to ensure they are capable of accepting the high delivery flows and pressure of the refuelling system on a cyclic basis without deformation of the fuel tank

- h) installing decals on or near the fill points with max designed flow rates nominated for the mobile plant
- i) verifying the quick fill system design is compatible with the refuelling farm or tanker delivery capacities
- j) an engineering means or alternative cap to prevent regular “splash” fill points from being left open and preventing pressurisation of the fuel tank during refuelling
- k) using hose(s) compatible with diesel fuel and capable of withstanding the maximum refuelling pressure, even if used as a drain line.

Mines that use quick fuel systems should:

- a) review refuelling procedures with consideration to:
 - the potential for the regular fuel cap to be inadvertently left open during quick refuelling
 - the need to leave the refuelling vehicle running, the position and the distance between the vehicle being refuelled and the refuelling vehicle so it can be moved away quickly in the event of an emergency
 - ensuring an attendant remains at the fuel quick fill point during refuelling and does not leave the mobile plant unattended
 - no people being on the refuelled plant during the refuelling process.
- b) ensure inspection and maintenance activities consider lifecycle degradation of the refuelling system, the mine environment and the manufacturer’s recommendations.
- c) provide refresher training to workers who refuel mobile plant.
- d) check an engineered “break link” is fitted to the fuel filling line at the fuel supply end to stop flow of fuel in an emergency and for a quick exit away from a potential fire.

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 notice board.

Signed



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MINE SAFETY OPERATIONS BRANCH
NSW TRADE & INVESTMENT

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