Equipment Safety Bulletin

Technical Support Department

Reference Number	Bulletin 02 - 2019
Affected Product	All diesel engines
Risks Identified	Injury or death may be caused by the ejection of pressurized fluid from a cylinder.
Release Date	March 4 2019

Risk Overview

Fluid injection from hydraulic systems and high-pressure fuel systems has caused many serious injuries and several deaths. These incidents can occur due to equipment and part failures or during maintenance and repair work. An example of a fatal incident that occurred during a maintenance activity can be found in MSHA report CAI-2008-03 *

Some maintenance practices can unwittingly create pressure in a component that has previously been verified as safe and free of residual pressure. Two examples are:

- The mechanical movement of a hydraulic cylinder by the application of external force e.g. crane, jacking, gravity.
- During engine repairs or fault finding on a diesel engine, with fuel injectors removed, under certain circumstances fluid can be ejected under pressure from an engine cylinder via the fuel injector orifice in the cylinder head. Hastings Deering is aware of one fatality as a result of these circumstances (refer MSHA incident referenced above) and has anecdotal evidence of more than one 'near miss'.

In certain situations, similar risks could exist on a petrol or gas engine, or a reciprocating piston compressor.

This bulletin deals with one of the potential risks associated with working on a diesel engine with injectors removed and provides general guidance to minimize the risk of injury or death due to fluid ejection from a cylinder.

Background

Fluid can enter an engine cylinder from a number of sources:

- Water entry via inlet or exhaust systems during severe weather events, component failures, or poor storage procedures.
- Fuel entry due to the design characteristics of certain engines when injector/s are removed.
- On occasions, maintainers have added a fluid to an engine cylinder to prevent corrosion or for other purposes.

Cranking or 'bumping' the engine with the starter motor with fluid present in an engine cylinder, with an injector removed, can cause a high pressure ejection of fluid from the cylinder via the fuel injector orifice in the cylinder head.

Best Practices

- Provide training on the potential hazard of high-pressure fluid ejection from an engine cylinder to all maintainers who are likely to be involved in engine repairs.
- Emphasize the requirement to read, understand, and follow the OEM's relevant maintenance procedures and warnings before undertaking a task.
- Always confirm that no fluid is present in engine cylinders before turning the engine. In addition to the risk of an incident, with fluid present in a cylinder, engine damage can occur – even with injectors removed. Fluid can be removed with a suitable suction gun, vacuum pump and tubing. NB. for D10R the service procedure provides tooling part numbers.
- Never attempt to remove fluid from cylinders by cranking the engine with the starter motor.
- If the engine needs to be rotated during maintenance activities, in addition to these recommendations, follow the OEM procedure. For Caterpillar engines, use the specified engine turning tool.
- If it is necessary to crank an engine via the starter motor with injectors removed conduct risk assessment and clear personnel/tooling from 'line of fire'.
- Stay alert and keep all personnel out of 'the line of fire', even if all fluids and contaminants have been removed from a cylinder.
- Always wear suitable PPE for the task being undertaken.

* United States Department of Labour Mine Safety and Health Administration

If you have any questions regarding this bulletin, please contact your Product Support Representative.