

SAFETY BULLETIN

APRIL 2021

Diesel engine shutdown failure

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

Issue

The NSW Resources Regulator has recently received two notifications of incidents involving explosion protected diesel engine systems (ExDES) failing to shut down upon initiation. In each case, the engines continued to run after the engine off switch was actuated. In response, the operators used various means to stop the engine, including isolating the main air supply, draining water from the exhaust conditioner, using the throttle pedal back-heel and activating the emergency stop strangler valve.

Investigation

One incident appears to have been caused by component failure due to contamination of the air safety circuit. The other incident was caused by damage to the throttle linkages and interference caused by incorrect fasteners being used.

The range of alternative methods attempted to stop the engine has raised concerns that operators may not be familiar with the correct emergency response. Using the wrong method to stop the engine may increase the safety risk or create a hazard by using the incorrect procedure.

Background information

A compression ignition diesel engine will keep running if it has fuel, air and compression. Diesel engines are normally stopped through the prevention of fuel being delivered to the injectors. Diesel engines have been known to continue to run on small amounts of diesel from a leaking injector, sump oil or methane gas in the atmosphere. This is known as uncontrolled combustion and is a known risk.

Although rare, engine overspeed from uncontrolled combustion due to a methane rich atmosphere may result in catastrophic failure. This is the highest risk for a diesel engine system in an underground coal mine. Diesel engines have an engine emergency stop system which is typically a strangler valve or inert gas ingestion system to stop the engine in this situation.

Methane detection systems may be integrated to automatically stop the engine in the presence of methane. However, some only operate the fuel shut-off function. Manual activation of the engine emergency stop function may be required, as methane in the air becomes the fuel.

Diesel engines with mechanical fuel systems typically use a single acting shutdown cylinder with return spring to shut off the fuel supply and stop the engine. Some manufacturers include diagnostic indicators which may be useful in assessing a defective fuel shutdown cylinder operation. If the fuel shutdown cylinder is faulty, triggering a safety circuit function will not cause the engine to shut down and may result in additional hazardous situations. For example, draining the water from an exhaust scrubber will potentially result in the ExDES operating in a non-explosion protected condition.

Recommendations

Persons who operate diesel powered vehicles must be provided with information and training which incorporates how to respond in foreseeable emergency situations, such as the engine failing to stop. In consideration of the above incidents, training should include the following requirements for each specific ExDES in use at the mine:

- How to recognise and what to do in an emergency situation.
- How to conduct the initial assessment of the situation.
- How to stop the engine when the engine fails to stop after it is turned off.
- What to do immediately after the engine is stopped.

More specifically, information to operators of ExDES powered equipment should address:

- If an ExDES is operating in an uncontrolled combustion scenario, the response plan must trigger operation of the engine emergency stop function (strangler valve or inert gas system).
- If the methane monitor will automatically operate the emergency stop system or fuel shut-off system, and circumstances when it is required to be operated manually.
- How to read and interpret diagnostic indicators such as lights, indicators or gauges and how to respond to those indicators.
- Alternative means to initiate engine shutdown, such as fuel shut off or use of the strangler valve.

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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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