Investigation information release

Planning & Environment Resources Regulator

CAUSAL INVESTIGATION PRELIMINARY REPORT:

Catastrophic engine failure in underground coal mine

- **Incident date**: 4 July 2017
- **Event**: Catastrophic failure of diesel engine system
- **Location**: Wongawilli Colliery, Wollongong, NSW

Overview

- The NSW Resources Regulator has commenced a causal investigation into a catastrophic engine failure at Wongawilli Colliery, to determine the cause of the failure and whether there is an ongoing risk to worker health and safety.
- While operating in an underground coal mine, a catastrophic failure of a diesel engine system occurred, resulting in hot internal reciprocating components being ejected through the engine block and exposing them to the mine atmosphere. This created an ignition source which has the potential to cause an explosion of methane gas.
- Preliminary investigation has identified a damaged oil supply pipe, which may have been a result of the engine failure or it may have been a precursor to the engine block failure. Subsequent testing of the automatic shutdown system shows that it appears to have been functioning correctly.
- Further detailed investigation is being undertaken to determine the exact causes of the failure. This preliminary report is being issued at this early stage of the investigation in accordance with the regulator's causal investigation policy.

The incident

The incident occurred on 4 July 2017, and involved the failure of a Caterpillar 3126 DITA engine in a Bucyrus FBL10 (FBL10), operating in the main intake airway. The failure caused internal engine components, such as the conrod cap, to be ejected from the engine block, exposing the mine atmosphere to the high-temperature engine components and possibly these combustion chambers. No person was injured as a result of the incident.

Diesel engine systems used at underground coal mines are explosion-protected to ensure they do not create an ignition source in methane-rich atmospheres. The catastrophic failure of a diesel engine system, where the products of internal combustion are potentially exposed to a methane-rich environment, presents a significant risk of initiating an explosion.

The investigation

Engine failure: The FBL10 involved in the incident (left), and internal engine components (right). Photos: Resources Regulator.

A scene preservation notice was issued and the machine was seized. It was removed off-site for inspection by an independent assessor. Visual inspections indicated a damaged oil supply pipe. This may have been a result of the engine failure or it may have been a precursor to the engine block failure. The causal investigation will seek to identify the exact causes of the failure.

The causal investigation team has been established by the regulator. The causal investigation team includes representatives of Wongawilli Colliery, the regulator and Westrac.

Members of the causal investigation team have undertaken two inspections of the FBL10 as well as reviewing a number of documents relating to the FBL10. At the second inspection, the causal investigation team tested the SEMSII electronic shutdown system of the FBL10. The emergency shutdown system is a manually activated strangler valve that was not activated at the time of the incident. The testing included:

- the engine oil shut down system
- the engine exhaust temperature shutdown system
- the engine coolant level and temperature shutdown system
- the engine scrubber water level
- the vehicle hydraulic oil shutdown system.

The causal investigation team then conducted an on-site analysis of what these tests indicated. It is a complex matter and further testing, examination and analysis is required including the disassembly of the 3126 diesel engine. However, at this early stage in the investigation, the automatic shutdown system appears to be functioning correctly when the vehicle is tested in a workshop on a horizontal plane.

The causal investigation is ongoing.

Recommendations

As it is a complex matter and further investigation is required, the Resources Regulator recommends:

- mine operators ensure maintenance of diesel engine systems and inspection and testing of the safety-related components and systems be carried out in accordance with recommendations of the vehicle original equipment manufacturer, the engine manufacturer and the ExDES registration holder.
- when designing explosion-protected diesel engine systems, it is essential that rare malfunctions causing ignition hazards are considered during the design risk assessment process. Refer to MDG 43 Technical Standard for the design of diesel engine systems for use in underground coal mines.

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RM8 reference	PUB17/558
Mine safety reference	2017/01045
Date published	25 August 2017
Authorised by	Director Mine Safety Operations