Bypassed Methane Detector on Explosion Protected Diesel Engines

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Background

The purpose of this safety bulletin is to provide information on reports and subsequent investigations by the Mines Inspectorate into incidents where methane detectors fitted to underground coal mine explosion protected diesel engine systems have been found to have been bypassed. It is generally not known how long the machines had operated underground at the mines with the methane detector bypassed.

It is expected that the implementation of recommendations will reduce the risk of machines operating without methane detectors interlocked to engine safety shutdown systems.

Incident Summaries

Incident 1

On the 14th November 2020 weekly methane detector gas calibration checks were being carried out on a personnel transporter fitted with an explosion protected diesel engine. The methane detector safety circuit bypass valve was found in the bypass position.

The methane detector had been recently changed and the initial investigation has identified that the vehicle has been driven underground for three days with the methane detector bypassed.

Incident 2

On the 11th July 2020 scheduled maintenance tasks were being undertaken on an underground coal mine LHD fitted with an explosion protected diesel engine system.

During routine methane detector gas calibration tests the explosion protected diesel engine did not shut down as expected. Investigations by the mine identified that a methane detector bypass switch was positioned in the bypass position.

The incident investigation identified that the design of the lockable switch cover was not tamper proof and additionally the cover could be locked with the switch in the bypass position.

Incident 3

On the 16th April 2020 during scheduled gas calibrations on a hired LHD it was found that a bypass valve on the methane detection circuit was locked in the bypass position. In this instance this was a secondary mechanical bypass not located in a typical position on the machine.

The investigation identified that the bypass valve was not identified during site introduction procedures and was not of a tamper proof design.

Comments

Similar incidents have been historically reported to the Mines Inspectorate. Incident investigations have identified:

- Bypass valves/switches not fitted with tamper proof covers or of tamper proof design.
- Designs that enable bypass valves to be locked in either the normal or bypass position. The unlabelled bypass valve shown in Figure 1 can be locked in both the normal position and the bypass position potentially confusing workers of the methane detector status.
- Poor or inadequate labelling of valves. The bypass valve shown in Figure 2 can only be locked in the normal position, however, the use of non-permanent labels subject to fading, wear and degradation may lead to workers not understanding the status of the methane detector.
- Mismatched lock shank diameter and lockable bypass valve plate holes enabled the valve to remain partially shut preventing machine shutdown.
- Cable ties used to hold a bypass valve in a position that prevented engine shutdown systems from operating as required when methane was detected.
- Ineffective control and management of bypass locks and keys resulting in unauthorised operation of the bypass valves.
- Ineffective methane detector bypass switch/valve inspections during:
    - Introduction to site of equipment
    - Periodical operation checks
    - During maintenance and prior to re-introduction of machines to service.
- Reliance on administrative controls which have proven to be ineffective.

The Coal Mines Safety and Health Regulation 2017 specifies requirements for methane detectors to be fitted to explosion protected diesel engine systems and actions to be taken if methane is detected or a methane detector is non-operational.

Recommendations

All underground coal mines should:

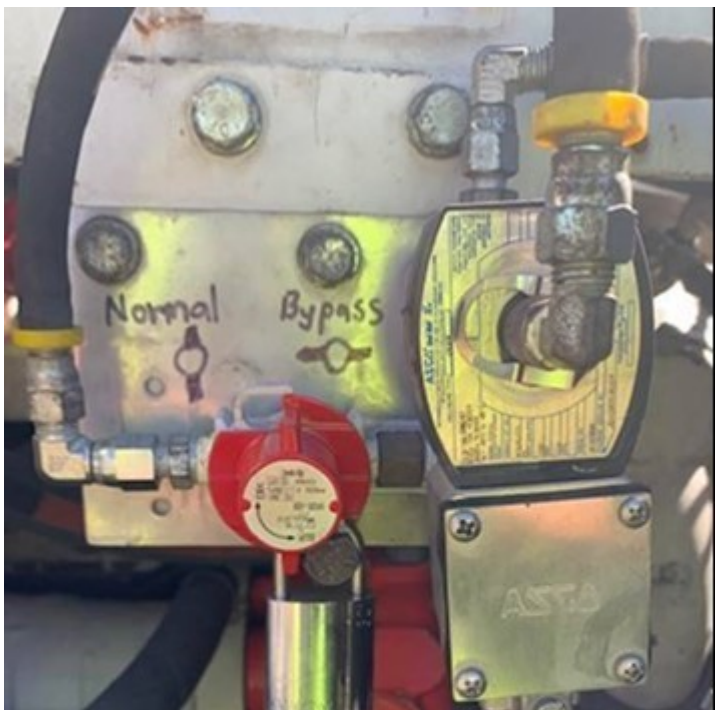
1. Audit all explosion protected diesel engine systems fitted with methane detectors to confirm regulatory and site Safety and Health Management System requirements are met.
    - of a robust engineering design,
    - clearly identified,
    - tamper proof,
    - provide adequate security,
    - comply with AS3584 test report documentation.
2. Review introduction to site procedures and confirm bypass switches/valves are:
3. Review procedures for the use of locks/bypass controls. Ensure procedures are clearly documented and communicated to relevant coal mine workers.
4. Consider use of permit procedures when methane detectors are to be bypassed for maintenance activities or recovery purposes.
    - processes for bypassing in the event of a methane detector activating,
    - processes for bypassing in the event of a methane detector being non-operational,
    - processes for maintenance testing and repairs; including recommissioning.
5. Ensure that gas monitor bypassing processes are sufficiently robust to cover all likely scenarios. These could include but not be limited to the following:
6. Regular inspections of methane detector bypass switches/valves are in place to maintain system integrity.

7. Consult with OEMs or service providers to identify and implement appropriately engineered and tamper proof solutions.

References and further information

1. Control of ERZ controller (deputy) keys. Mines Safety Alert No.350, issued 04/4/2018
2. Management of UG coal mine contractors – Alarm bells are ringing! Mines Safety Alert No.270, issued 08/7/2011.

(https://www.dnrme.qld.gov.au/__data/assets/image/0005/1522868/SA383-figure-1.jpg)



(https://www.dnrme.qld.gov.au/__data/assets/image/0006/1522869/SA383-figure-2.jpg)

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