Safety bulletin

SB17-05 September 2017

Reuse of removable exhaust filters on explosion-protected diesel engines

This safety bulletin provides information on serious incidents and safety advice for the NSW mining industry.

The issue

The NSW Resources Regulator has become aware that services to clean, check and reuse removable diesel particulate exhaust filters (removable exhaust filters) on explosion-protected diesel engine systems (ExDES) that hold a registered design for use in underground coal mines are available.

There are risks and legislative compliance issues associated with cleaning and reusing removable exhaust filters on ExDES.

Although not prohibited, cleaning and reusing removable exhaust filters must not produce additional hazards or affect engine safety performance of the ExDES. That is, the cleaned removable exhaust filter must not:

- increase the fire or explosion risk
- reduce filter efficiency in diesel particulate capture
- release hazardous vapours or particles that may result in an increased risk to worker health.

Background

Using removable exhaust filters is part of the recognised process for controlling diesel particulate matter in the underground coal mining industry.

Removable exhaust filters have been used on ExDES for many years to prevent exhaust particulates entering the mine environment. They are one of several options designers may use to capture and minimise exhaust particulate emitted from an ExDES. They are used on most ExDES, however technology advances in emissions treatments are producing alternatives.

Removable exhaust filters may have high particulate filtration rates (efficiencies), however their lifespan is often short. Replacement can be expensive, they are high maintenance and there are potential health risks to workers who handle the captured diesel particulate.

Removable exhaust filters are typically downstream in the exhaust cooling system and may be subject to continuous operating temperatures of 150 degrees Celsius on some ExDES. Where an engine cooling system fails, removable exhaust filters can be exposed to the hot engine combustion exhaust gases for the duration of time for the ExDES to shut down, giving a higher temperature exposure to the filter.

For every type of ExDES design, removable exhaust filters are assessed for fire-resistant properties and particulate filtration efficiency.

Incidents of removable exhaust filters catching fire on ExDES have been reported to the regulator.

Legislation and standards

Section 42 of the *Work Health and Safety Act 2011* prohibits the use of authorised plant that is not design registered, where the regulation requires the design to be authorised.

Clause 177 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2011 requires diesel engine systems used in underground coal mines to be authorised plant that must be design registered.

The Resources Regulator registers the design of ExDES. Design registration is granted to applicants who have demonstrated that design requirements, testing requirements and performance standards have been achieved.

The design registration conditions placed on the registration holder include there being no alteration to the materials, design or construction of the diesel engine system from those detailed in the notice of registration of plant design.

An alteration or change to the removable exhaust filters design is considered a design change, which requires that the change must be registered if the user of plant is to comply with WHS legislation.

The design and design performance requirements (for the purpose of registration of the ExDES design) are set out in the design order (see www.resourcesandenergy.nsw.gov.au/miners-and-explorers/safety-and-health/applications/registration-and-licensing).

The design order gives effect to *MDG 43 Technical standard for the design of diesel engine systems for use in underground coal mines* as the mandatory design standard. Removable exhaust filters are considered part of the ExDES and their design requirements are captured within MDG 43.

In relation to removable exhaust filters, MDG 43 sets performance criteria for:

- the continuous operating temperature of the removable exhaust filter assembly
- the auto ignition temperature of the removable exhaust filters assembly
- the exhaust emissions performance of the ExDES.

Testing and reusing removable filters

In relation to performance testing of cleaned removable exhaust filters, there should be sufficient testing (to the relevant tests in MDG 43) to verify that the cleaning process of the filter assembly (including media, glues, resins and framing material) does not increase the risk to the health or safety of workers. This testing should verify that following the maximum number of times the removable exhaust filters is cleaned and reused:

- there is no increase in fire or explosion risk by a decrease in either
    - continuous operating temperature, or
    - auto ignition temperature
- there is no decrease in filter efficiency for the removal of diesel particulate
- there is no decrease in durability or intended operating life (refer to clause 3.7 of MDG 43)
- the effectiveness of any housing sealing arrangements remain unchanged
- there is no release of hazardous vapours or particles from the filter, such as glass fibres.

Recommendations

The following recommendations should be considered as part of the overall management of risks associated with the potential hazards created when reusing removable exhaust filters. Risk controls must always involve a consultation with workers who may be exposed to health and safety risks arising from their work.

Suppliers

Suppliers that provide a cleaning and reuse service to underground coal mines in NSW should carry out sufficient analysis, testing or examination of the used removable exhaust filters to ensure there is no increase in the risk to health or safety when the reused removable exhaust filters are used for the purpose they were designed.

Consideration should be given to:

- ensuring cleaned removable exhaust filters perform within their original design specifications and in compliance with the ExDES design registration
- analysing the number of times a removable exhaust filter can be reused without affecting its performance
- the system that will be used to identify and track how many times a removable exhaust filters has been cleaned and reused
- carrying out relevant testing to MDG 43 on a sufficient number of cleaned and reused filters to statistical validate there is no increase in risk to health or safety from filter degradation following the cleaning process
- analysing the potential failure modes of the removable exhaust filters, and implementing systems to test and or examine filters for onset of failures
- establish and implement relevant individual filter tests and batch tests
- carrying out the cleaning process in a quality system consistent with AS/NZS ISO 9001 *Quality management systems – Requirements*
- carrying out periodic testing of cleaned filters to the tests in MDG 43 to validate the ongoing performance of the cleaning process
- have the cleaning and checking process independently audited by a competent person
- verifying the original supplier's label remains on the filter
- verifying the effectiveness of the removable exhaust filters' housing sealing arrangement
- ensuring workers are trained and competent in the process and the risks associated with handling used reusable removable filters.

Mine operators

Mine operators who reuse (or are considering reusing) removable exhaust filters should:

- check that the supplier who provides the cleaning and checking service has taken consideration to the issues raised in this safety bulletin
- only reuse removable filters on ExDES that have the correct label that is compliant to the ExDES design registration documentation
- have systems in place for the safe handling and transport of used filters
- implement systems to check the number of times a used filter is reused
- report any issues to the supplier.

Other matters to consider include:

- the handling of hazardous by-products resulting that may produce risks to health and safety of workers when transporting, handling or cleaning filters
- implementing handling systems consistent with the code of practice for handling hazardous materials
- implement systems to minimise the risk to health of workers who work on used removable exhaust filters and who may be exposed to diesel exhaust particulate and conduct health monitoring.

The NSW Resources Regulator issues compliance alerts to help the mining and extractives industries improve compliance practices and to understand their legal responsibilities. This alert provides mine operators and service providers with information to help them meet their obligations. Failing to meet obligations may result in enforcement actions.

NOTE: Please ensure all relevant people in your organisation receive a copy of this compliance alert, and are informed of its content and recommendations. This compliance alert 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.

Go to resourcesandenergy.nsw.gov.au/safety to

- find more safety alerts and bulletins
- use our searchable safety database
- sign-up to receive mine safety news.

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of NSW Department of Planning and Environment or the user's independent advisor.

Office use only	
RM8 reference	PUB17/568
Date published	8 September 2017
Authorised by	Dave McLean, Chief Inspector of Mines