



# SAFETY ALERT

## In-service failure of explosion-protected equipment

### INCIDENT

During a fault-finding exercise on an underground load haul dump (LHD) vehicle three plastic floats located inside the water-based exhaust system were found to be melted from excessive heat. This machine had been assigned to work in a hazardous zone (return airway) of an underground coal mine by contractors. The mine atmosphere is known to contain varying concentration levels of methane gas in the return airway.

### CIRCUMSTANCES

The LHD in question had been experiencing reliability issues with the low water shutdown protection system. During a period of a couple of weeks numerous persons had attempted to rectify the problems with limited success. This included the original equipment manufacturer's (OEM) service personnel and mine personnel.

### INVESTIGATION

The investigation focused on two areas, one being a mechanical component failure and the other being possible unauthorised adjustments by non-competent personnel.

The mine's inspection system showed the LHD had undergone daily inspection from the time of introduction. It also showed a number of days in succession where the low water protection system failed to operate, the LHD would be subsequently repaired and returned into service, with a failure being recorded at the following 24 hour inspection period.

Extensive testing on the circuit components found no failure. A number of components were removed for further investigation. However, investigation identified that by setting the operating pressures to above that recommended by the OEM, this would in fact defeat the protection systems and render the explosion-protection characteristic non-existent.

Investigations have also revealed the ease at which the safety system pressures can be adjusted to unknown values, thus rendering the protection system ineffective.

## RECOMMENDATIONS

1. Designers, manufacturers and owners of plant are reminded that if they become aware of or are notified of a design fault that has the potential to harm the health or safety of any person, they are required to review the risk assessment for the plant. Ref: ***Occupational Health and Safety Regulation 2001, Chapter 5, Division 1 “Design of Plant CL 88”***.
2. A person who has control of premises used by people as a place of work must ensure that the premises are safe and without risks to health and a person who has control of any plant used by people at work must ensure that the plant is safe and without risks to health when properly used. Ref: ***Occupational Health and Safety Act 2000, Section 10 “Duties of controllers of work premises, plant or substances”***.
3. A person must not, intentionally or recklessly, interfere with or misuse anything provided in the interests of health, safety and welfare under occupational health and safety legislation. Ref: ***Occupational Health and Safety Act 2000, Section 21 “Persons not to interfere with or misuse things provided for health, safety and welfare”***.
4. Designers, manufacturers and owners must ensure that engine shutdown systems comply with *AS 3584.2. Diesel engine systems for underground coal mines Part 2 Explosion-protected* which in clause 2.14 include the requirement that the engine shall be fitted with fail-to-safe automatically operated engine (fuel) shutdown.
5. Designers and manufacturers must ensure that safety shutdown systems are analysed to an appropriate risk-based method to establish if they are fit for purpose. The use of failure modes and effects analysis may be appropriate.
6. Designers must eliminate the use of single line components on safety critical systems or functions. The system must be designed to the required safety integrity level (SIL).

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

**Signed**



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