NSW DEPARTMENT OF
PRIMARY INDUSTRIES

SAFETY ALERT

Catastrophic failure of auxiliary fan

INCIDENT

A 23 m^3/s (cubic metres per second) fan, operating at 2980 rpm, suffered a catastrophic failure. A failure at the drive end bearing of the flameproof motor resulted in the shaft severely overheating and deforming, causing extreme out-of-balance forces to be generated. This resulted in the fan impeller being shed and the motor junction box falling off, with resultant extreme damage to the explosion-protected properties of the motor.

Photographs of the damaged fan and associated flameproof motor

Figure 1

Fan housing impeller damage

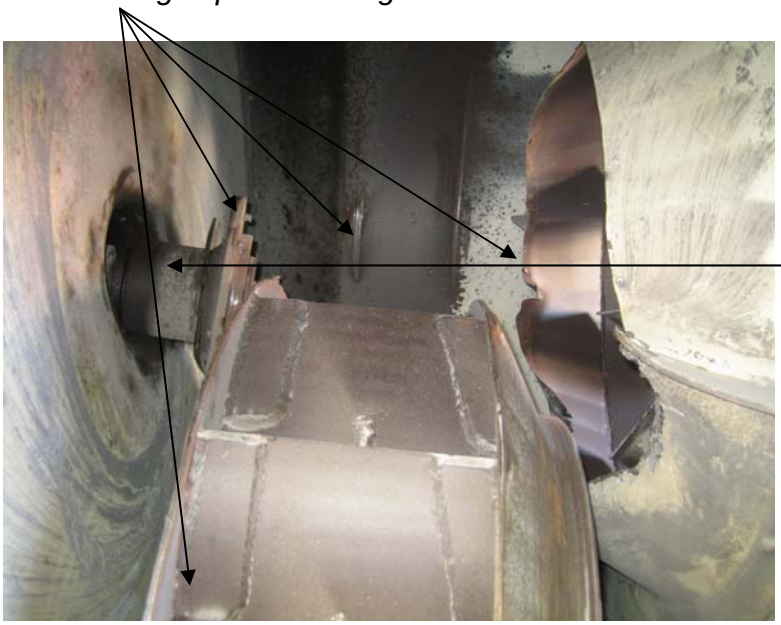

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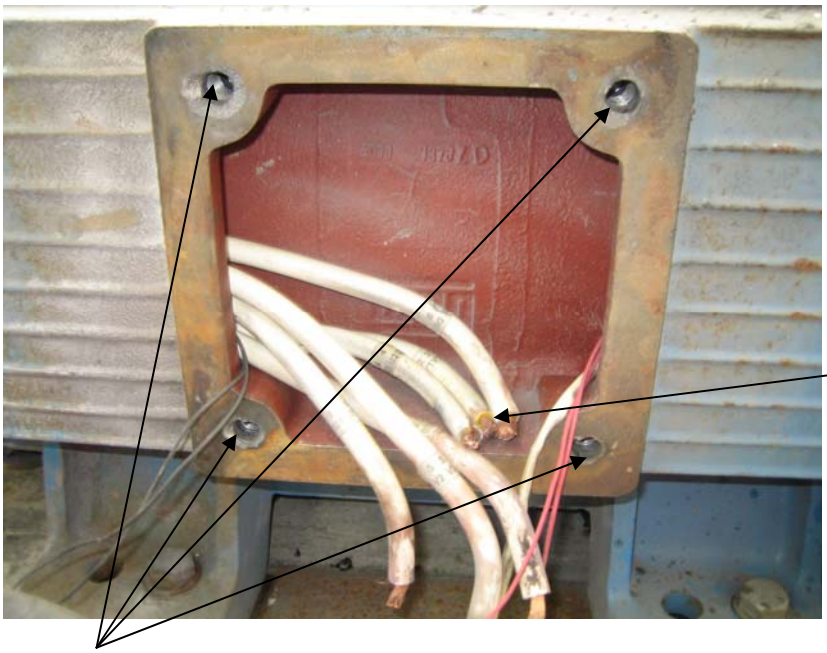
Figure 2



Four connection box holding bolts torn out of motor body

CIRCUMSTANCES

The fan was operating in a production section at an underground coal mine. The crew in a crib room heard a pitch change in the noise of the fan, and then the power tripped off.

INVESTIGATION

The fan failure has been subject to an extensive engineering investigation. It has been concluded that the incident was caused by excessive vibration, resulting in the failure of the drive end bearing carrier. This resulted in the motor shaft contacting the flameproof housing with the resultant heat and rotary energy causing the other damage. The manufacturers have informed their clients of this failure mode. Other issues were identified during the investigation. Salient points were:

1. Many failed fan motors were two-pole high speed (3000 rpm).
2. The impeller was installed directly on the motor shaft.
3. Many of the failures rendered the motor non-flameproof in service.
4. Fan maintenance practices were deficient.
5. Vibration monitoring practices were deficient.

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RECOMMENDATIONS

All users must review the suitability of their auxiliary fan design and application. In particular the following points must be addressed:

1. A design risk assessment for the life cycle of the fan that incorporates a fan and motor failure mode effects analysis.
2. Incorporate design features to prevent a reoccurrence of this type of event.
3. Ensure compliance with MDG 3.
4. Ensure that fan monitoring and interlocks are designed and operated to an appropriate safety integrity level.
5. Implement a suitable vibration monitoring program utilising:
    a. Correct type of sensors
    b. Correctly located sensors
    c. Calibrated sensors
    d. Correct alarm and trip settings
    e. Review by vibration analysts.
6. Implement a suitable auxiliary fan maintenance program that:
    a. Ensures correct greasing of bearings
    b. Regular cleaning of fan impellers
    c. Proof testing of alarms and trip systems.
7. Consider the use and availability of fan operational data via data-loggers.
8. Include an operational risk assessment, with consideration given to proper investigations of fan stoppages, restoration of fan power procedures and provision of alternative ventilation in the event of a failure.

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

Rob Regan
DIRECTOR
MINE SAFETY OPERATIONS BRANCH
NSW DEPARTMENT OF PRIMARY INDUSTRIES