



Mines Safety Bulletin No. 164

Subject: Wheels detaching from graders

Date: 17 April 2019

Background

The Department has received reports of potentially serious incidents involving graders when either a front steering wheel or a driving wheel experienced catastrophic failure of its stub axle, resulting in the wheel suddenly detaching during operation. Recent incidents include:

- seven steering wheels detaching
- a driving wheel detaching.

These incidents were injury free. In all cases there was temporary loss of control of the machine and the detached wheel rolled away in an uncontrolled manner. The modes of failure, the physical root causes and contributory factors in all these incidents were found to be similar.



Example of a steering wheel failure and a driving wheel failure.

Summary of hazard

1. The mass of a detached uncontrolled wheel assembly can typically range from 500 kg to 1,600 kg.
2. Loss of grader steering control and rapid deceleration.
3. Interference to operations from the disabled grader, detached wheel and recovery operation/s.

Contributory factors

- Non-genuine parts fitted to shaft group assemblies.

- Inadequate management of fatigue limited components by poor tracking of operating hours. When parts are swapped between different machines or used stub axles are installed, information about operating hours should be transferred.
- Failure of programmed maintenance practices to adequately inspect stub axles at appropriate periodic intervals as defined in original equipment manufacturer (OEM) manuals.
- Inspection and crack testing of stub axles is not always undertaken by suitably trained and competent personnel using OEM approved methods.
- Support from the OEM dealership is not always obtained when expert technical guidance is required.
- Poor hazard awareness and reporting - some sites fail to report such incidents to the Department.
- Poor operating practices that cause excessive loading of the stub axles can also contribute to their premature failure. These include:
 - mounting one front tyre on a dump pile and the other on the ground
 - running the front end directly into the pile
 - grading road verges and windrows - tyres mounting on windrows
 - operating on sharp turns and tight switch-backs
 - exceeding the oscillation stop limits of axles in rough terrain (total range of 32 degrees)
 - imposing excessive speed and shock loads to the grader front end (e.g. from excessive or sudden braking, or impacts with rocks and depressions in the road).

Actions required

- Ensure stub axles are periodically inspected for surface cracks and other defects using OEM approved Non Destructive Testing (NDT) methods, at the OEM recommended intervals and by competent inspection personnel. When defects are observed, apply OEM recommended discard criteria.
- Use only genuine (OEM approved) or other fit-for-purpose replacement parts for shaft group assemblies.
- Ensure maintenance management systems adequately track and manage fatigue limited components such as stub axles.
- Ensure maintenance management systems always capture, communicate and apply the latest guidance from OEM information bulletins.
- Ensure up-to-date OEM manuals are readily available to maintenance personnel.
- Ensure maintenance personnel have access to OEM dealership support whenever additional technical information, guidance or advice is required.
- Ensure grader operators are adequately trained/assessed and fully aware of the performance limitations of their equipment and the types of operating practices that may contribute to premature failures.

To comply with the reporting requirements of the *Mines Safety and Inspection Act 1994*, any injury free incidents involving wheels breaking off a grader must be reported as a loss of control event under section 78(3)(j) of the Act or a potentially serious occurrence under section 79 of the Act.



Progressive fatigue failure on a steering stub axle and a steering stub axle failure due to suspected shock load.

Further information

Visit original manufacturer websites for service information and alerts.

Dash cam video of driving wheel failure: www.youtube.com/watch?v=212RrhDBmdw

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