

Safety Bulletin

Date: July 2024

Wheel assemblies detaching from mobile plant

This safety bulletin provides safety advice for the NSW mining industry.

Issue

In the past 4 months, there have been 4 significant incidents involving failed wheel assemblies where the assembly has detached from the mobile plant. In one incident, a wheel came to rest beside an articulated dump truck. In another incident, the wheel and axle assembly detached from a front-end loader and rolled about 110 metres into a crushing plant and stockpile area. The other 2 incidents occurred in the main declines of underground metalliferous mines, where the wheel assemblies were caught between the vehicle and wall.

In all of these incidents, the earthmoving equipment wheel assembly did roll or had the potential to roll into areas where people regularly work.

Figure 1: Failed position 1 wheel assembly on a haul truck, resulting in a loss of steering



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Incident 1 – 11 April 2024

A worker was driving an articulated dump truck at low speed on flat ground when the position 2 tyre and rim disengaged from the wheel hub. This caused the front right underside of the truck to make contact with the ground. The wheel assembly remained beside the truck, and the driver was not injured.

Figures 2 and 3: Articulated truck with a disengaged wheel assembly, broken wheel studs and elongated holes



An initial investigation suggested the wheel nuts became loose, allowing the rim to move relative to the hub. This resulted in elongated holes in the rim and broken wheel studs. Prestart inspections did not identify the issue. All similar equipment on site was parked up until they were inspected by maintenance personnel.

Incident 2 – 2 June 2024

An underground load haul dump (LHD) was transporting waste up a decline in an underground metalliferous mine. The operator was tramping in first gear at low speed up the decline when it was thought a rock hit the heel of the bucket. The operator stopped and reversed a metre to assess the issue when the position 2 wheel came off the LHD. The wheel lodged between the wall and the position 2 guard, preventing it from rolling down the decline.

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Figure 4 and 5: Loader wheel against wall, and intact wheel studs on hub



There was a lack of machine history due to the LHD being second-hand plant. Prestart inspections indicated the wheel/rim condition was inspected, and loss of wheel integrity was not identified by operators in previous prestart inspections. The wheel nut torque was checked on all other loaders.

Preliminary findings showed all but 2 wheel studs were undamaged, which would suggest the wheel nuts had worked loose. The preliminary cause for the loss of wheel nuts was determined to be incorrect torque setting on workshop rattle guns.

Incident 3 – 24 June 2024

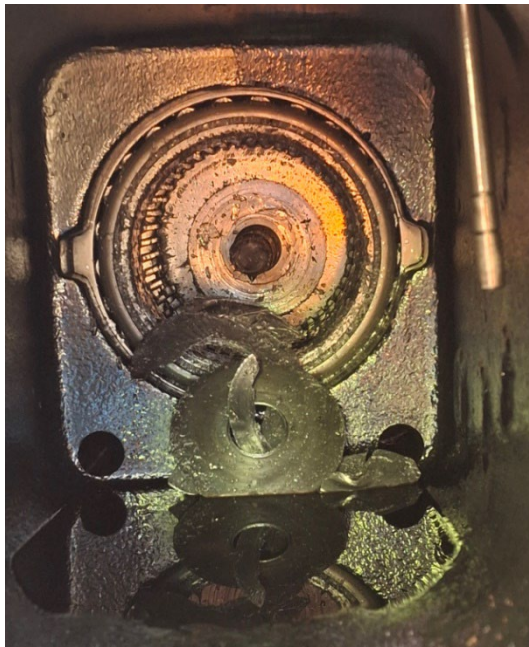
A front-end loader was loading a hopper bin with surge material when the front left wheel assembly detached from the front differential. The wheel rolled about 110 metres down a roadway and came to rest adjacent to a stockpile near the crushing plant. Visual inspections at the time of the incident suggested the differential had failed.

Figure 6: Loader with recovered wheel assembly



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Figures 7 and 8: Loader drive shaft splines, and differential drive shaft retaining bolt and shims



The mine supplied a non-original equipment manufacturer (OEM) differential to the loader, which was installed 3 months before the incident. The remanufactured differential was sourced from a local third-party supplier from an overseas refurbisher and appears to have no quality assurance paperwork to identify the drive shaft retaining bolts were correctly shimmed and torqued.

Both the supplier of the differential and the OEM were made aware of the incident. The OEM considered the bolt retaining the axle in the axle tube was either not torqued up or worked loose.

Incident 4 – 14 July 2024

A loaded haul truck was ascending the decline when the position 1 wheel assembly detached, resulting in a loss of steering. The wheel assembly became jammed between the machine and the wall. The truck driver was uninjured and shut down the truck. All workers safely evacuated the underground mine.

The remaining truck fleet was inspected by maintenance personnel before returning the fleet to operation. An investigation was carried out by the mine and the truck OEM and determined the root cause to be failure of the wheel end assembly.

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Figures 9 and 10: Haul truck in decline with detached wheel assembly against wall, and showing failed hub and bearings



Analysis of incidents

All incidents involved compromised stability, steering and/or braking capacity. Brakes and steering are safety critical systems for mobile plant.

Investigation of each incident identified a variety of issues that contributed to the wheel assembly failures, including:

- poor routine testing and inspection of wheel nut integrity
- poor standard of pre use inspection
- poor maintenance, inspections, and testing standards
- poor assembly standards of wheel assemblies and differentials
- lack of quality assurance documentation
- lack of change management.

Recommendations

Mine operators should:

- ensure plant and equipment are fit-for-purpose and designed for the required tasks
- ensure workers are trained and competent to undertake required tasks in terms of both operation and maintenance
- ensure mine workers follow any reasonable requirement set by the mine operator to ensure the health and safety of themselves and their colleagues. This may include undertaking a diligent pre-start inspection of any plant that they will be operating.
- ensure stringent monitoring and quality control of maintenance and repair activities

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- ensure that equipment is maintained as per the original equipment manufacturer's instructions
- OEM recommendations on torque settings must be followed when tightening wheel nuts
- that when changing to a different component supplier, or to a different model component, complete a comprehensive change management process. This must include checks to confirm compatibility with the equipment that it is being fitted to, and suitability for the task or duty.
- identify suitable controls and verifications required to mitigate risks to as low as reasonably practical.

Note: Please ensure all relevant people in your organisation receive a copy of this safety bulletin and are informed of its content and recommendations. This safety bulletin should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's common area, such as your notice board where appropriate.

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