

ACCIDENT/INCIDENT ALERT

December 2004

TYRE EXPLOSIONS FROM LARGE STEEL WHEEL RIMS

Incident

A tyre fitter sustained serious arm injuries while removing a wheel from a 40 tonne container lifter. The container lifter, which looks like a large forklift, was fitted with dual load-bearing wheels, and single steering wheels.

The wheels had steel 1300 x 25 rims, marked “Made in India, batch 9809 WIL”. 18.00 x 25 industrial, smooth-treaded tyres were fitted to the rims, and the tyres were inflated to 138 psi (cold).

The wheels are centred onto the axle hubs by a “spade” or wedge. The wheels have a split rim with a locking ring that sits into a groove in the outer flange of the rim (see Figure 3). The whole assembly is attached to the wheel hub with a series of clamps and locking nuts. Tyres are regularly rotated so that they wear evenly.

Circumstances

The axle on the container lifter was chocked up and the tyre fitter had removed the retaining bolts and clamps. He had not deflated the tyre. Another worker was waiting on a 4 tonne forklift ready to lift the wheel off the axle hub. In order to break any rust cohesion between the rim and the spade and the hub, the tyre fitter delivered a blow to the assembly with a small hammer. The wheel assembly shattered under the pressure of the compressed air, striking the fitter’s arm before striking the mast on the 4 tonne forklift. The force of the assembly snapped the forklift mast and caused other damage.

Investigation

Wheels under pressure are always at risk of explosion during disassembly. All steel rims used in industrial applications will ultimately fail depending on the level of stressing. The “Wheels of India” in this incident, used in port operations, have an



Figure 1: Forklift has dual load-bearing wheels at the front; single steering wheels at the back.

estimated finite life span of about 6000 hours. These rims had been in service for 9500 hours. All of the rims were crack tested after the event and found to have cracks that were not visible to the eye.

Other brands of wheel used on large forklifts are also at risk of cracking. A combination of heavy loads and high tyre pressure means wheel cracks are inevitable. The likelihood of failure must be managed to minimise the hazard of sudden failure.

Recommendations

- Tyres must be deflated to no more than 35 kPa before wheels are removed from vehicles, or disassembled.



Figure 2: Assembly of wheel components. Rim base and flange on the ground; second flange being fitted; bead seat band between feet of fitter.

- Australian Standard 4457: *Earth moving machinery – Off highway rims and wheels – Maintenance and repair*, provides useful guidance.
- Titan Wheels Australia Pty Ltd, who supplied the “Wheels of India” rims, provide standard operating procedures for tyre and rim safety.
- Manufacturers and suppliers of equipment must supply safety information.
- All large rims should be registered in a scheduled maintenance programme.



Figure 3: Section through tyre and wheel assembly showing rim components.

- All wheel components should be subject to visual inspections for cracks, wear and corrosion.
- It is recommended that large rims be crack tested at 2 years of age and re-tested each time a tyre is replaced.
- All wheels must have external access to valves so that tyres can be deflated prior to any work.
- All tyre workers must be fully trained in safe working procedures with comprehensive, documented training procedures.