Mines Safety Bulletin No. 122

Subject: Use of tyre inflation cages

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Background

Some mining operators rely on tyre inflation cages to control the risk of a tyre burst when inflating (and testing) newly assembled light vehicle tyres and on-highway type truck tyres (up to 24 inch rim diameter). Many of these cages are of unproven or uncertified design, and lack comprehensive instructions.

There is no Australian or international standard for the design, manufacture or testing of tyre inflation cages for any size of tyre. However, tyre inflation cages are commercially available in Australia, for tyres with rim diameters less than 24 inches, that are engineer-designed, third-party tested and certified to manufacturer's standards.

Summary of hazard

The sudden depressurisation of a tyre can release a large amount of energy as a percussive shock wave. For tyre assemblies that have split wheels or multi-piece rims these components can become projectiles following a sudden depressurisation.

The risk of a tyre burst is particularly high during the first inflation of a tyre after assembly or mounting i.e. components (e.g. the bead) fail to engage properly, or the wheel or rim is not correctly assembled. This initial inflation is often undertaken in a workshop or maintenance area. The percussive shock wave and projectiles generated can damage equipment and be potentially lethal to personnel in the "line of fire".

Contributory factors

Many tyre inflation cages are purchased or manufactured without comprehensive designer or manufacturer instructions for their installation, operation, inspection and maintenance.

During installation, this can lead to mining operators:

- bolting tyre inflation cages to concrete floors or other structures. The bolts and nuts used, the concrete floor or support structure are usually not designed to withstand the forces generated during a tyre burst, and therefore may generate projectiles.
- over-restraining the cage structure which reduces the capacity of the tyre inflation cage to deflect or deform and adsorb the energy of the tyre burst . Most tyre inflation cages are more effective if they are free-standing and should not be bolted down without consulting the manufacturer.

During use, this can lead to mining operators assuming that tyre inflation cages provide some degree of protection and will restrain projectiles if a tyre assembly fails catastrophically. This belief may:

- mislead personnel into having a false sense of security
- affect the perception of risk, which can lead to decisions that increase exposure to harm (e.g. reduce the size of exclusion zones, pneumatic pressure testing of tyres).

Actions required

Use of tyre inflation cages

Mine operators and maintenance supervisors who rely on tyre inflation cages as part of their safe system of work should consider their duty of care obligation. Recommendations include:

- use only fit-for-purpose and engineer-certified tyre inflation cages
- ensuring competent persons install, operate, inspect, and maintain tyre inflation cages in accordance with the designer's or manufacturer's instructions, as well as mining operation procedures
- consulting with the designers or manufacturers before bolting tyre inflation cages to concrete floors, footings or other restraining or supporting structures.

Example of engineer-certified tyre inflation cage after testing with a 22.5 inch tyre at 140 PSI. Image courtesy RLM Distributing.

Recommendations for safe inflation or deflation of tyres

- The size of the exclusion zone should be established by competent persons using an appropriate risk assessment, including tyre and wheel (or rim) manufacturer's recommendations for the size and type of tyre assembly.
- Information from the risk assessment (e.g. exclusion zone, tyre size limits) should be included in safe work procedures (SWPs) and training.
- Before commencing any inflation, establish an adequate marked exclusion zone (e.g. signage, barricading, floor marking) as necessary.
- Never exceed the recommended cold inflation pressure without consulting the tyre manufacturer.

Note: The practice of pneumatic pressure testing (inflating to beyond the manufacturer's recommended cold inflation pressure) should not be undertaken unless approved by the tyre manufacturer.

- Respond to any popping or cracking sounds detected during inflation by stopping inflation and evacuating the area until the tyre can be deflated in a safe manner.

  Note: After inflation, tyres should be allowed to stand for a short period (typically 5 minutes) before approaching the tyre to disconnect the inflation line.

- After storage, subsequent re-inflation should be undertaken in a tyre inflation cage, where practicable.
- Supervisors and service personnel are reminded to:
  - position themselves out of the "line of fire"
  - use remote inflation systems or an inflation system with sufficient hose length and clip-on style chuck fittings to ensure that service personnel can stand at a safe distance
  - keep working areas free of loose objects and debris (the percussive shock from a tyre burst can generate lethal projectiles from any loose rocks or objects nearby).

Further information

Visit www.dmp.wa.gov.au/ResourcesSafety for information on occupational safety and health in the resources sector.

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