Brake Disc and Hub Removal Tool

Rio Tinto Coal Australia-Hail Creek Mine

The Problem

Rio Tinto's Hail Creek Mine operates a fleet of Bucyrus MT4400 Electrical trucks, which play an important role in the pre-strip operations throughout the mine.

Regular maintenance to the trucks includes the rebuild of the rear brakes and replacement of wheel motor. These tasks often involve the removal and installation of the brake disc and hub. At approximately 100kg the brake disc and hub could not safely be manually removed by a single person. Due to its awkward positioning and weight, manual removal by two people also created a heightened safety risk.

A safety assessment was conducted during the removal of the brake disc and hub and it identified that the:

- the method was unsafe and a risk to finger, hand, back and wrist injury.
- the location of the brake disc and hub did not allow the attachment of conventional lifting equipment (Crane).
- a tool would have to be designed and developed specifically for this purpose.

Location of disc and hub

Coal Tray width did not allow using the lifting crane.

The Solution

An expert team was formed to brainstorm possible design ideas that would lead to the development of the most suitable tool for the effective and safe removal of the brake disc and hub with minimal manual handling.

The team of experts were:

- Richard Espinoza - Maintenance Engineer
- Lionel Kennedy - Maintainer
- Bucyrus (Hastings Deering) representative

After several discussions and taking into account previous work experiences, we established the specific requirements and specifications for this tool which are:

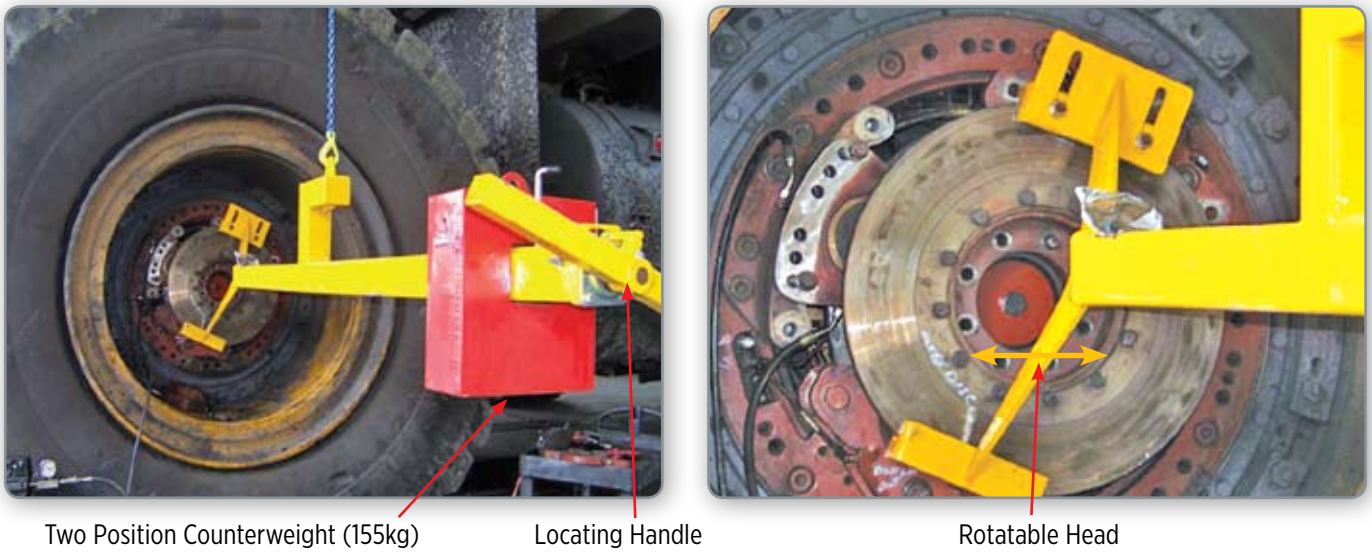
- Safe
- Single person use
- Rotatable head
- Sufficient reach

Firstly, and most importantly, the tool must be safe to use and by a single person if possible. The tool should have a rotatable head to facilitate ease of use and the alignment of the bolts via the rear handle. It should be long enough to avoid any contact between the lifting equipment and the tray of the truck.

Finally, the tool should have a movable counterweight to compensate for the weight of the disc during the removal or installation process. This will provide balance and aid in the safe use of the tool. All of these details were taken into consideration during the brainstorming session and eventual fabrication of the tool, which was entrusted and supervised by our OEM (Original Equipment Manufacturer) representative who was also very involved in this project.

The first trial identified that the tool did not function efficiently because it was too long thus creating an imbalance. We subsequently rectified the design by reducing the tool length from 4500mm to 3075mm and repositioning the lifting point. The lifting point was key to the design as it allowed perfect balance once the brake disc and hub and compensation weight were in place.

Finally, an Information Bulletin was developed to inform to Supervisors and maintenance staff that this new tool was available and where and how it is to be used. Moreover, the JHA (Job Hazard Analysis) to remove and install the brake disc was also modified in order to reflect the use of this tool.:



Benefits / Effects / Outcomes

The implementation of this tool eliminates the need to remove or install the 100kg brake disc and hub manually therefore extensively reducing the risk of finger, hand and wrist injuries. Additionally, this tool decreases significantly the risks associated with working in awkward postures, e.g. Back injuries.

Since its creation, a job that took two people now only takes one and has provided the secondary benefit of freeing up man hours on site. The tool will now be considered for deployment across other Rio Tinto Coal operations.

Transferability

The basic concept of this tool could be replicated to other mining trucks equipped with brake discs at the rear.

Innovation

This tool fulfils the basic innovation concepts because most of its components such as the rotatable head and counterweight were designed considering our specific needs and requirements.

However, the design of some parts involved some failed attempts which were overcome through the trial process and the feedback from the members of the team.

Approximate Cost

The cost was approximately AU$8,000 including tool certification.