

Carbon Fibre Shuttle Car Collars

Xstrata Coal Queensland – Newlands Northern Underground

The Problem or Initiative

a) Identified problem

- Shuttle car maintenance occurs on a daily basis, and the current process and tools (steel collar) make this task hazardous for the operator.
- It is deemed to be hazardous due to the weight of the steel collar, the difficulty associated with manual handling this item, and the excessive time it requires operators to be in a hazardous zone (ie – underneath the shuttle car).
- The manual handling issues include awkward postures, excessive reaching and lifting excessive weight. 14kg held at arms length, whilst stooping, exposed the operator to sprain and injury.

b) How the improvement opportunity was identified

- In terms of the current process, fitters reach under the shuttle car and apply a mechanical stop (the current steel collar) to the hydraulic lifting cylinders. If the shuttle car was to lower inadvertently, the shuttle car would come to rest on these collars.
- As part of an overall process improvement and safety review, this particular improvement opportunity was identified through consultation with personnel doing the task and the Engineering department at Newlands Northern Underground.
- It was determined that the risk of injury while conducting this task was unacceptable.

c) What health and safety consequences were to be addressed

- Manual handling injuries (sprain and strain injuries) as a result of awkward postures, excessive reaching and excessive weight.
- The original collars are difficult to apply and place the fitters into a hazardous zone underneath the shuttle car, potentially resulting in crush injury if the hydraulics fail.

The Solution

a) Strategies and initiatives developed to identify and address the problem

- As the weight of the collar was the primary issue, the team commenced investigation of composite material alternatives.
- The project team identified carbon fibre as the best likely alternative, and the team was tasked with investigating the overall viability of carbon fibre as a high strength substitute for steel, relative to this specific application.
- A range of trials carried out by the project team confirmed carbon fibre as a suitable substitute – explained in more detail in section c) below.

b) Internal and external resources used

- The project team comprised of personnel performing the task and the Engineering Department at Newlands Northern Underground.
- An external manufacturing company was employed to manufacture the newly designed collar.
- There was regular consultation during the development stage of manufacture with the Development Mining Department.
- Communication to employees on the progress and implementation of the project was through Tour Starts and Health, Safety, Environment and Community (HSEC) Meetings.

c) Methods used to trial and test

- Extensive trials were conducted on the collars, which involved destructive testing.
- In the initial trials, the collars didn't fail, however the layers began to separate (and this has since been rectified).
- The collars are rated to 12.5 tonnes, however the destructive testing was taken to 75.0 tonnes without complete failure.

d) Implementation process

- The project team had a carbon fibre version designed and manufactured.
- The new collar weighs approximately 3kg and is rated to 12.5 tonnes as per the current steel collar.
- This rating is in accordance with half the weight of the shuttle car.
- End users of the innovation were consulted in the design and testing of the collar, with positive feedback received throughout the design and implementation process.

e) Demonstrate how hierarchy of control has been applied

- The task of applying a mechanical stop to the hydraulic lifting cylinder is a necessary safety precaution, therefore it is not possible to eliminate this task.
- This is a substitution level control, whereby we have substituted the material for a much lighter one..

Benefits / Effects / Outcomes

a) Describe the safety and/or occupational health benefits

- The carbon fibre collars are approximately 3kg (an 11kg reduction from the original version) and greatly reduce manual handling issues.
- As a result, the risk of strain and sprain injuries is minimised.
- The carbon fibre collars are easier and more efficient to apply and reduce the time that fitters will be in a hazardous zone underneath the shuttle car.
- This reduces the risk of a crush injury.

b) Supporting data

- Risk Rating (according to the Xstrata Coal Risk Management Standard) :
Before implementation
12M After implementation - 5L
- Physicality of Tasks Rating (according to a modified PERforM risk tool):
Before implementation
10M After implementation - 5L

c) Extent of deployment across the site

- The collars have been installed on all shuttle cars across the site and are currently being utilized for maintenance tasks.

Transferability

a) Potential for innovation to be used, modified, transferred across the industry

- The use of this material is already being trialed on other applications, eg development conveyor structure and underground ventilation tubes.
- All shuttle cars have mechanical stops for the hydraulic lifting cylinders, therefore this innovation is application for all operations where shuttle car maintenance is required.

Innovation

a) Originality of the innovation

- The innovation is unique to Newlands Northern Underground, and is the first design of its type across the industry (to our knowledge).

Approximate Cost

a) Statement of approximate cost, if known

- \$1,900

