GET Removal From Gyratory Crusher

Innovation Award Submission

GET Removal from Gyratory Crusher

Xstrata Copper Ernest Henry Mine

Problem

The Ernest Henry Mine gyratory crusher is designed to crush rocks from approximately 1500mm down to 160mm at a feed rate of 4,000 tonnes per hour. It achieves this by means of a 71-tonne mantle, powered by a 470kW motor, which crushes rocks against the body of the crusher (see figure 1 below).

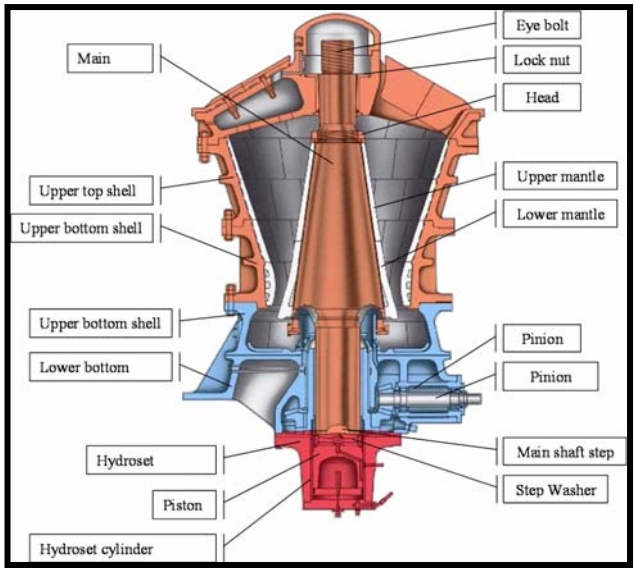

Figure 1- Crusher Internal Layout

Occasionally a piece of steel, such as a bucket tooth, may inadvertently enter the crusher body. The crusher does not have the ability to crush steel, instead jamming the steel in between the mantle and crusher body. Each piece of ground engaging tools (GET) can weigh in excess of 50kg, and when jammed inside the crusher can contain an enormous amount of potential energy.

Figure 2- Typical Piece of GET Removed From Crusher

Removal of the piece of GET requires it to be cut into pieces with a lance in order to free it up and lift it out. This can cause a sudden release of the potential energy stored in the GET, causing it to eject from the crusher at a high velocity.

During a crew safety meeting, members of the concentrator mechanical maintenance team viewed a short video clip in which a technician at another mine site was struck in the head by a piece of GET ejected from a crusher, suffering critical injuries.

Solution

The maintenance crew reviewed their risk assessment for performing this task and assessed this newly-identified hazard as posing an unacceptable level of risk. In combination with the concentrator draftsman, the team designed and constructed an engineering control in the form of a tool for protecting the technician whilst GET is removed.

Figure 3- GET Removal Tool

The tool is designed to slip over the moil of the mobile rockbreaker, which remains permanently around the crusher area. It is secured to the rockbreaker moil by means of two chains. Should a piece of GET become jammed in the crusher, then the tool is lowered into place over the GET as shown in figure 4.

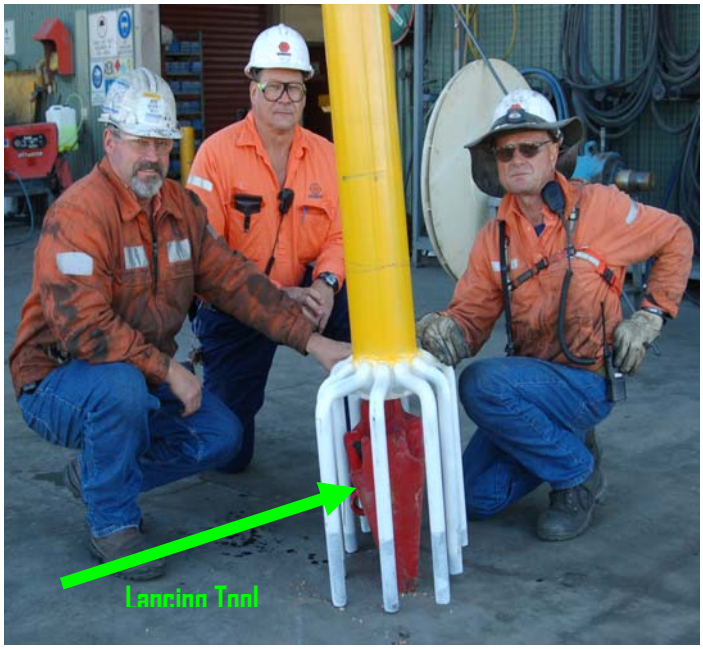

Figure 4- Use of GET Removal Tool

The technician is protected by a series of protective rods that are welded into place on the end of the tool. Each rod is constructed from a mill liner bolt and is designed to be sacrificial so that it can be shortened or removed completely in order to provide the most secure fit around the GET. The technician is able to slide their lancing tool in between the rods to cut the GET. Should the steel eject from the crusher, then the energy is absorbed by the tool, preventing it from becoming an airborne missile.

The cost of to implement this innovation was approximately $2,000. The steel, chains and protective rods were all taken from surplus or redundant materials already on site. The strength of the chains and rods was checked and certified by an engineer to ensure they were capable of withstanding the energies and forces involved.

Benefits and Effects

As a result of this innovation, a high-level hazard has been managed by means of an engineering control.

The manufacture and use of the GET removal tool has achieved the following:

- Provides a physical barrier between the mechanical technician and the GET
- Provides a positive means of withstanding any ejection by means of the rockbreaker
- Allows the technician to modify the shape of the tool by cutting the protective rods to ensure it fits properly.

Transferability

This innovation can be used on any mine site (or in a related industry) where gyratory crushers are used. The tool is easily adapted to suit whatever equipment is available on that site, and the flexible arrangement at the end of the tool means that it can quickly be adapted to manage any potential scenario.

Innovation

The innovative features of this are…

- Provides a physical barrier
- Easily adapted
- Surplus material was used to construct the tool
- Transferable to other gyratory crushers
- The cost of the tool is $2000
- The components are easily maintained

.