Floor Clip Installation Tool

Rio Tinto - Kestrel Coal Mine

The Problem

The construction of the Kestrel Coal Processing Plant and many similar plants includes many hundreds of square meters of steel tread or walkway mesh. These mesh walkways are retained by fit-for-purpose retaining clips or clamps.

The corrosive nature of the operating environment requires that these retainers require periodic inspection, maintenance and, or, replacement. The vast size of the coal handling and processing system means there are literally thousands of these retaining clips. This was one of the tasks allocated to me shortly after joining the Coal Processing team.

The task essentially involves crouching down on grating with fingers passed through the gap to support a nut on the bottom *(see picture below).*

Old method

A retaining bolt is passed through the clamp, threaded through the nut being held in position and tightened.

This job was carried out using rudimentary hand tools; was time consuming, labour intensive and hazardous, with many hours spent in a crouched position.

The general hazards included poor ergonomic design, potential for interaction between pedestrian traffic and dropped objects, as well as finger and soft tissue injuries.

Upon realising the limitations, hazards and inefficiencies of the task to be performed, I decided to look for a safer and more efficient way to complete the task.

Solution

The solution to the problem involved mainly the opportunity to reduce the risk profile by:

- Speeding up the task;

- Eliminating the potential for finger injuries;
- Eliminating the potential for sprains; and
- Reducing the potential for dropped objects.

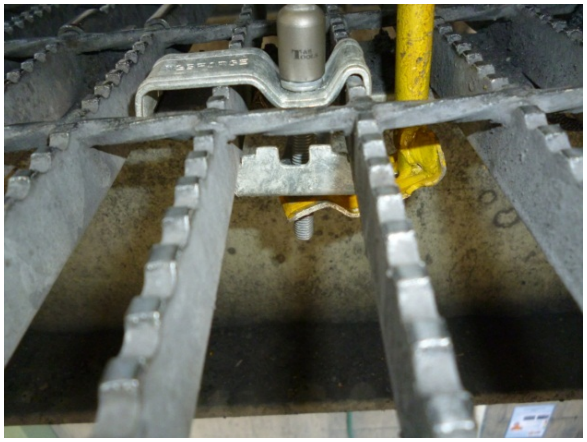
Internal stakeholders:

- Manual Handling sub-committee: While this improvement has been identified and worked on mainly by myself, the opportunity was discussed with and supported by the Site Manual Handling Sub Committee.
- Site Ergonomist/Physiotherapist and Health Advisor: The sites Ergonomist/Physiotherapist and Health Advisor were consulted during and after the improvement, to assess the potential risk reduction and benefits in relation to reducing the potential for injuries and strains.

To speed up the tightening of the retaining bolts I selected a cordless driver drill fitted with a socket attachment, to drive the retaining bolt. In order for this to work the nut on the underside of the clip would need to be held up into the bottom half of the clip to stop free rotation and facilitate tightening.

With the old method the nut used to be held in position using fingers stuck through the grating. The potential for finger injuries existed if the nut locked on the thread and the torque of the driver drill spun the lower half of the clip during installation.

In order to eliminate need to expose the fingers, I designed and constructed a tool that can be placed through the mesh using just one hand. The tool is angled through the gap in the grating to get it into position. With this I can support the underside of the clip and raise the nut on the retaining bolt up into its locking mechanism. This then allows me to screw the retaining bolt down with the driver drill.



New set-up

As this tool is designed to fit through the mesh to access the underside of the mesh there is a danger of the tool falling through, to the level below. This hazard has been eliminated by the use of a retaining lanyard.

To address the hazard of other smaller objects falling e.g. nuts, bolts and clip parts, a mat is deployed at the work area in conjunction with a parts hopper to eliminate the danger to persons working or walking below.

To address the ergonomic and related posture problems it is recommended that the operator utilize a seated posture via a step stool or the use of knee guards.

The solution has been designed internally, with no external support required. I worked through the solution on my own, assessing the hazards, identifying the need to eliminate them and speed up the process, and utilising my experience to look for alternatives.

Following the development of the tools and process, this was communicated to the workgroups and leaders at the Coal Processing Plant and steps taken to develop a Safe Work Procedure which is now part of the sites Safety and Health Management System.

The tool kit and the proposed method of operation has been trialled by the other members of the maintenance team with confidence and approval.

In applying the hierarchy of control to the proposed solution, the focus has been mainly on ***eliminating*** the exposure for finger injuries and dropped objects. The potential for strains and sprains has been reduced by reducing the overall time spent on the task and reducing the need for continuous crouching ***(substitution).*** The design of a tool to hold the clamp and nut fits into the category of an ***engineering*** solution.

Benefits/Effects

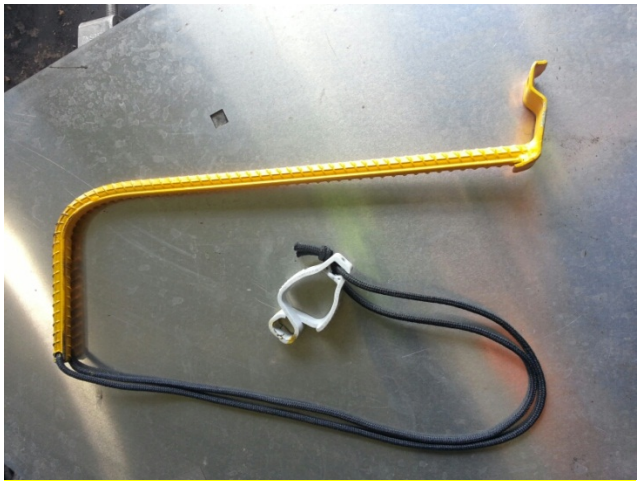
Safety and occupational benefits:

- Ergonomic improvement to the posture position for the operator.
- Elimination of falling objects hazard (tools and clip components).
- Elimination of fingers in line of fire (crushes, cuts from burrs and rotating parts).

1. With the extended handle on the tool this allows improved back posture. The use of the driver drill reduces the time in a crouched position. Utilizing a seated posture via a step stool seat also reduces the ergonomic hazard and strain on the knees. If the seated position is not possible it is recommended that knee guards be used.

2. To eliminate the potential of tools falling from one level to another, a wrist secured lanyard is attached to the operator. To control the hazard of falling clip components a work area parts hopper and mat are deployed close to the work area for the assembly of the clip. The use of the mat allows the user to relocate

by sliding all components to the next location. The clip is assembled from the parts hopper on the mat prior to installation.



3. The use of this tool eliminates the potential for fingers to be in contact with the rotating part of the clip and or possible sharp or burred edges.

This improvement fitted in well with a campaign being run across the site, to reduce the potential for hand and finger related injuries. In 2011, across the site, we had reported approximately around 54 finger/hand/forearm/shoulder related injuries (First Aid cases and greater). In 2012, through the hand injury campaign, of which this improvement was one initiative, the reported number of injuries was reduced by approximately 50%.

Transferability

The tool itself is of a relatively simple design, composing of a lanyard, with a handle welded to a shortened upper half of a retaining clip. It is light weight, does not require significant engineering approval and is easily constructed by a qualified boilermaker in any workshop.

Innovation

The overall objective of the improvement has resulted in a safe method to install and maintain the floor mesh retaining clips in a multi-story Coal Processing Plant and associated conveyer belt walkway systems.

The traditional method is one which has been used for years where we had accepted the time consuming task along with the potential hazards it presented.

The innovation, through its simplicity of design, demonstrates the initiative and desire to continually challenge the status quo in looking for safer and more efficient ways to perform work.