

Belt Lifting & Roller Replacement Tool.

Kestrel Coal – Rio Tinto Coal Australia

The problem

After changing 30 rollers on the conveyor belt network on a maintenance day, two workers decided there must be a simpler and safer way to change out the often failing return rollers.

The environment in which these rollers are located is dark and often dusty or under 200mm of water. The ground is uneven and the workspace minimal, due to the confines of the mine wall (known as the rib) and conveyor belt.

At Kestrel Coal Mine there are in excess of 6000 return rollers in operation at any one time and at 18.4kg each roller, the task of changing them was one surrounded by many safety hazards. The process in lifting them out is difficult and was done by the use of cumbersome chain blocks and safety chains hung off the roof to support the belt off the roller. A co-worker has to get down on all fours or lie on their side in the mud or dust to replace the old roller with a new one.

It was with these issues in mind that Maehe Austin and Peter O'Brien set out to change the way in which the rollers were replaced. They sat down that day to formally discuss the need for change and decided to meet again in two weeks after formulating a design to make the task easier and safer.

The solution.

Peter and Maehe referred to the hierarchy of control and concluded that the most suitable way to address the issue was to engineer a tool specifically to change return rollers in an underground mine environment.

Throughout the next 18 months of trialling, testing and numerous prototypes, the original design evolved to include improvements that allowed the tool to be even more efficient, user friendly but most importantly, safer. Also during this period, documents were released to the workforce asking for feedback and suggestions. One of the improvements implemented was to add a set of rollers on the head, allowing the tool to slide in and out from under the belt far more easily. Much of the process has been conducted onsite. From the initial brainstorming, through the prototype stage and into the engineering

phase, Kestrel Coal Mine has had full control over the development of the tool. After having drawings engineered by Highlands Drafting Emerald and the tool manufactured by Integrated Metals Emerald for Kestrel, it is now used by infrastructure crews and outbye maintenance crews at Kestrel Mine.

The roller replacement tool has been designed to address one of the more common manual handling tasks within an underground mining environment.

With the addition of the rollers on the support bar, the operator only has to place and slide the roller into position without having to slide under the belt supporting the weight of the roller to locate. This part also swivels and locks at 90deg for Non walk side roller replacement.

As a result, the risk for injuries of a serious nature has been minimised, including but not limited to: line of fire, pinch points on hands and arms, working at heights, back strains and sprains and eliminates the chance of falling debris from hanging chain blocks from the roof.

Benefits / effects.

The benefits of this innovation are numerous but can be summarised into two categories.

- A) Personnel / time efficiency; and
- B) Safety Improvements / hazard minimisation.

Prior to this innovation, the task was a two man task. After isolating the belt, a worker would stand on top of the belt and screw two eye nuts onto roof bolts. He would then be passed two one tonne chain blocks from his co-worker. After lowering the hooks onto safety chains placed under the belt, both operators would lift the belt until it was off the roller sufficient enough to get the old roller out and a new one in. This process alone could take up to 15 minutes per location and it was not uncommon to repeat it many times per maintenance day.

By using the 7.5 kg roller replacement tool, the task can now be carried out by only one operator, which eases manning constraints. It is completed in less than two minutes per roller, which is a significant time saving in situations where production is waiting to have the belt back in operation to allow them to recommence coal output.

The safety benefits are numerous. There is no more carrying of chain blocks of lengthy distances on uneven ground. There is far less opportunity of pinch points to hands and arms as there is no longer

any need to be placing any part of the body where the eyes can't see. There is no longer a need for an operator to get in under the belt and physically lift the heavy roller into position whilst being forced to use very poor lifting techniques.

Transferability.

The design of this innovation incorporates a head attachment which can be adapted to suit different types of structure frames presently found at Kestrel Mine and indeed other mines throughout the Bowen Basin and beyond.

The structures supporting conveyor belts vary in design across the mining industry. The versatility of this tool allows very easy re-engineering to fit most structure frames at other mine sites, be it in coal or hard rock.

The innovation.

The innovative features of this tool are:

- Light weight at only 7.5kg
- One person operation.
- Lessens loss of production time.
- Less labour intensive.
- Two men @ 10 minutes replaced by one man @ 2 minutes.
- Easy to use operation requiring no training.
- Removes the need for cumbersome lifting equipment.
- Improves body posture when manual handling the heavy roller.
- Negates the need to work under conveyor belt.
- Easily adapted to be used on other belt structure and at other mines.
- Multifunctional design.
- No maintenance required.
- The cost of tool manufactured to specification and hot dipped galvanised is \$1860.00, a cost which could be recouped in less than 2 shifts.