

A photograph of an underground coal mine. A long conveyor belt runs through a tunnel, carrying coal. The tunnel walls are rocky and supported by metal beams. A red fire extinguisher is mounted on the wall to the right. The scene is dimly lit with overhead lights.

Flexco XP Fastener Outlasts Competitors by 14 Weeks in Underground Coal Mine

NSW UNDERGROUND COAL MINE LONGING FOR FASTENER DURABILITY

Mechanical belt fasteners play a crucial role in underground coal mining operations as the belt length is constantly changing. Underground conveyor belts need to be extended as operations progress further into a mine and shortened as operations retract. In total, mechanical fasteners allow the on-site crew to quickly respond to these changes and repair and join conveyor belts efficiently.

Conveyor output and overall operational productivity can be significantly impacted by mechanical belt fastener durability. Mechanical fasteners used for splicing should have excellent tensile strength, abrasion resistance, and durability. They should also be able to withstand the heavy loads and constant wear and tear that occur during the transportation of coal. If they are unable to withstand the harsh conditions of underground coal mines, premature splice failure will occur, leading to frequent belt repairs and disruptions to the operation.

Located in one of Australia's coal basins, an underground coal mine was experiencing premature mechanical belt fastener wear on their underground trunk conveyors.

Consequently, the mine would need to halt production frequently to replace damaged or worn-out fasteners. As a leading Australian producer of coal, minimising conveyor downtime and maximising output is crucial to the success of their operation.

With concerns about frequent fastener replacements, the site approached their contracted Conveyor Maintenance Site Representative (CMSR) and Flexco distributor to discuss their splicing challenges. With knowledge of the new-to-market Flexco XP™ Staple Belt Fastening System, the Flexco distributor proposed a trial to compare the existing competitor staple fasteners with XP to determine which would last the longest. The Flexco distributor and Flexco NSW Territory Manager, Khy McLennan worked closely together to provide the support and training for the crew managing the trial.

"One of the biggest issues for underground conveyors is the longevity of components. Shutting down a conveyor to repair a damaged clip is extremely disruptive. This stops the belts and the longwall operations, so fastener durability is critical," McLennan expressed.



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THE XP STAPLE BELT FASTENING SYSTEM

Fastener longevity was at the forefront of the Flexco® XP™ Staple Belt Fastening System design. “The use of cold-rolled steel provides uniform mechanical properties and increased tensile strength of up to 50%,” Franklin Moore, Product Manager at Flexco, explained. “Along with increased strength, the finished splice also has a smooth, low-profile, which minimises damage to belt cleaners and other conveyor components” In addition, the staples are preset in the fastener and the larger loop area accepts bigger pins for easier insertion and extended splice life.

Application of the staple fasteners is possible with manual, pneumatic, and hydraulic tools that are easy to set up and maintain. The frame and applicators are built for durability, while still being easy to transport. The integrated guide plate on the frame helps load heavy belts, making splice preparation faster and easier. A built-in belt-thickness gauge confirms proper fastener size and setting selection for an optimal splice with both tools.

THE TRIAL

With the goal of improving the service life of their fastening system, the trial’s sole objective was to determine which staple fastener would last the longest. Both staple fasteners were installed on the same conveyor, same position, and same conditions one after the other, beginning with the existing fastener followed by Flexco.

Trial specifications

Conveyor Type	Underground Trunk Conveyor	
Belt Type	PN2000/4 1800 4+3 S Grade	
Belt Speed	6 m/s	
Belt Length	5.34 km	
Belt Width	1800 mm	
Max. Tonnages	5000 TPH	
No. of Belt Cleaners	6	
Type of Belt Cleaners	2 x Polyurethane Primary and 4 x Tool Steel Secondary	
	Flexco	Competitor
Fastener Type	XP7CC	—
Fastener Belt Strength	Up to 3500 kN/m	Up to 3500 kN/m

THE RESULTS: DURABILITY UNLEASHED

	Flexco	Competitor
Product Lifetime	17 weeks	3 weeks

The competitor fastener was removed at three weeks as its condition fell outside the acceptable range for the competitor’s Triggered Action Response Plan (TARP). The fasteners were primarily missing combs and broken loops in both trough lines and the hinge pin was also visibly worn.

After installing the XP, there was no reported wear during the first six weeks. At week six, it was found that the top cover of the fastener had experienced minimal wear and a few pins on either edge were missing. Despite this, the overall performance of the splice was not impacted. At week eight, one broken comb was reported missing. By week 15, the CMSR reported that three combs were missing likely due to tracking. However, this had no cause for concern about the condition of the fasteners and the site suggested scheduling to change out the fasteners within the next two to three weeks as the trial objective was met; the XP fastener lasted the longest. At week 17, the XP fasteners were replaced due to a scheduled belt replacement.

“Both the client and my team were extremely impressed with the performance of the XP fastener. This will significantly reduce downtime, enabling us to focus on other critical maintenance tasks around the site,” the CMSR reported.



Week 4

Week 8

Week 10



XP Fastener after 17-week trial

“It is important to highlight that the XP7 fastener was installed in a heavily worn belt with exposed ply in the trough lines of the belt top cover. Surprisingly, this did not impact the performance or longevity of the XP fastener,” noted the CMSR.

MORE ERGONOMIC TOOLING

After the trial was complete, the service crew at the coal mine also provided great feedback on the ease of the use of the XP pneumatic installation tool. The XP power applicator tools were ergonomically designed for worker safety, and the crew acknowledged that the tool was less taxing on the body and safe to use for long periods at a time. The single-lever pneumatic and hydraulic applicator tools mount quickly to the frame and are easily positioned for splicing. The tools compress the plate before driving and folding the staples in one smooth motion, producing a consistent, quality staple set and finished splice every time. They also have the ability to intentionally skip over misdrives without starting over, making tool jams infrequent.

“The integrated guide plate made it a lot easier to load the belt and position it correctly for splicing. The pneumatic tool was also more ergonomic for the underground team in comparison to other tools on the market,” the CMSR claimed.

After seeing the exceptional results from the trial, the site has now begun to replace its existing fasteners with XP.

OPERATIONAL BENEFITS FOR EXTENDED FASTENER LIFE

The XP fastener durability has allowed the site to focus on more pressing maintenance issues each week, rather than replacing worn-out fasteners. In turn, this has translated into significant cost savings for the mine. During the trial period of 17 weeks, the existing fastener would have needed to be replaced six times. That is six times more in labour and downtime costs required to repair one set of fasteners on one conveyor.

“Our main goal with the XP was to engineer something that lasts a lot longer in a harsh environment than anything else on the market, and this trial has substantiated this,” Moore said.

The benefits of switching over to XP have resulted in decreased downtime and increased productivity. The XP allows the coal mine to keep running their conveyors for an additional 14 weeks with no stoppage, significantly improving production rates, reducing maintenance windows, and elevating their overall operational efficiency.

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