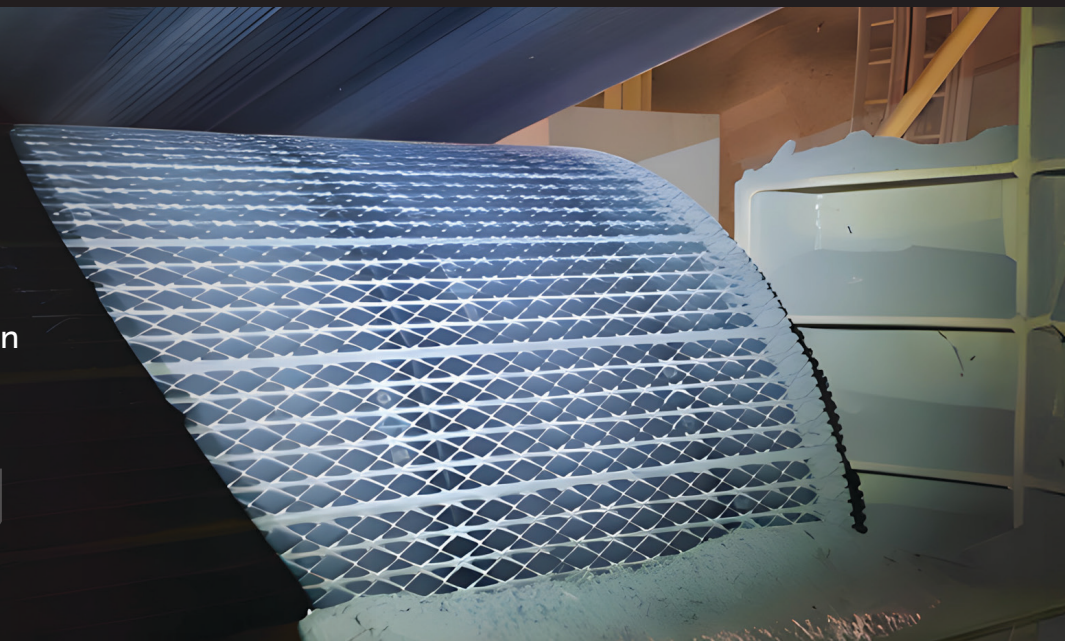


Lagging Select represents one of the most notable advancements in conveyor design in the past decade, providing a data-driven approach to lagging selection and improving reliability in pulley performance.

Ric Featherstone
Technical Director
ANZ NWA



CASE STUDY: HOW LAGGING SELECT CAN DE-RISK AN ENTIRE MINING OPERATION

In 2021, a major Australian gold mine upgraded its underground conveyor system to increase throughput from 4,600 to 5,150 tph, including a belt change from ST 5600 to ST 6300 - the heaviest duty belt in the country. The drift conveyors used dual-drive pulleys with 20mm rubber lagging (65 Shore A), which had performed reliably in the past.

During the upgrade, the same lagging was reused based on historical success, as no analysis tools were available to assess its suitability for the increased stresses introduced by the new operating conditions. What resulted, was a catastrophic lagging failure which cost the mine AUD \$21 M in lost production.



LOCATION: New South Wales
YEAR: 2021
APPLIC.: Lagging – rubber lagging 20mm thick
SOLUTION: Lagging Select

ISSUES ON SITE:

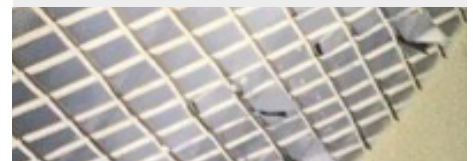
Just four weeks after commissioning, both drive pulleys suffered catastrophic lagging failure, resulting in three days of unplanned downtime and AUD \$21 Million in lost production. Despite the minimal cost of the lagging itself (<AUD \$10,000), no analysis was done to confirm its suitability for the upgraded load.

Lagging was selected based on previous specs - 20mm thick rubber at 65 Shore A - with two different application methods and grooving styles. Both failed under the new operating stresses, highlighting the critical need for engineering validation over historical assumptions.

Lagging failures on two drives after 4 weeks in operation post upgrade:



Failure of one of the drives with moulded small diamond rubber. Diamonds showed signs of melting,



Failure of other drive with calendared rubber in layers and hand grooved. Lagging showing signs of delamination.

LAGGING SELECT – AN INDUSTRY FIRST

To uncover the root cause of failure, Elastotec initiated an industry-first engineering investigation using its newly developed tool—Lagging Select. At the time, there was limited understanding in the industry of how stresses between the belt and lagging contribute to failure. To address this, Elastotec partnered with Conveyor Dynamics Inc. (CDI) to conduct in-depth analysis.



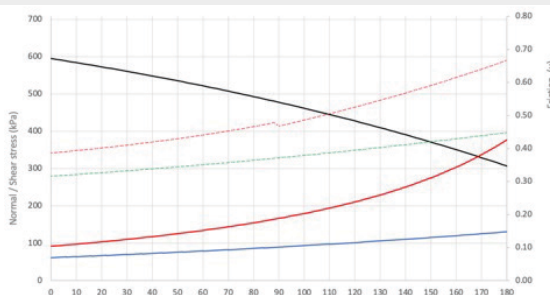
The initial focus was to eliminate slip between the belt and lagging as the cause. Tension analysis and friction modelling across the arc of contact revealed no signs of theoretical slip—consistent with the observed damage, which showed melting and delamination rather than typical wear.

To establish the friction limits between the belt and lagging, Elastotec partnered with TUNRA (Centre for Bulk Solids & Particulate Technologies) at the University of Newcastle in NSW, Australia for dedicated testing.

Using Lagging Select, supported by Finite Element Analysis (FEA), the team mapped how shear and compressive stresses transferred through the lagging. Testing with elastomer fatigue specialist Endurica validated that these stresses exceeded the fatigue limit of the rubber compound—particularly at the base of deep 90-degree diamond grooves, which only provided 43% contact area. This design allowed excessive deformation, accelerating fatigue.



In the below table, the analysis showed no signs of theoretical slip. The graph confirmed that the developed friction (red solid line) remained below both the green and red dotted lines, which represent friction limits under various operating conditions. This aligned with visual observations—the lagging wasn't worn, but showed signs of melting and delamination.



Slip analysis due to belt contracture for the case study. Graph showing no localised slip.

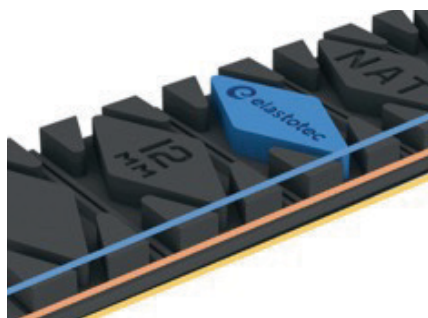
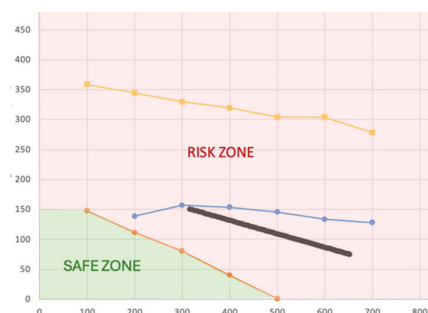
SOLUTION

With ceramic lagging not an option, Elastotec was tasked with engineering a rubber-only solution that could survive under the new, more demanding conditions. Using Lagging Select, the team evaluated multiple designs to find the most fatigue-resistant configuration.

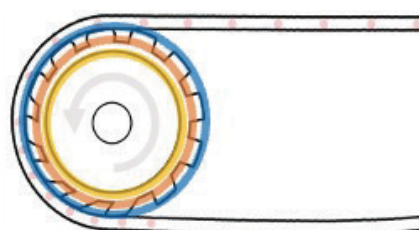
The outcome was a Chevron lagging design, featuring:

- **Shallow, rounded grooves to reduce stress concentration**
- **A full moulded rubber block, eliminating layer delamination risk**
- **95% contact area with the belt, reducing localised fatigue**

This solution marked a step-change in lagging design—replacing assumption-based selection with analytical precision. The redesigned lagging has now delivered over two years of reliable service, compared to just 4 weeks with the original design.



26%	Pulley shell shear stress util
31%	Contact face shear stress util
130%	Tread root shear stress util



Stresses in the application compared to the fatigue limit of every section of the lagging

RESULTS

The redesigned Chevron lagging was successfully implemented on both drive pulleys. Post installation, the new lagging operated reliably for over two years without failure, compared to just four weeks with the previous design. This dramatic improvement highlights the value of detailed engineering analysis and the role of **Lagging Select** in optimising lagging performance under increased operational loads.

While fatigue does still occur over time, it now develops on a predictable two-year timeline, allowing the site to plan maintenance in advance—avoiding unplanned shutdowns and costly production losses. This case not only prevented further catastrophic failure but also marked a shift toward more durable, engineered lagging solutions designed for real-world conditions.

Lagging life
extended from
**4 weeks to
2+ years**

Avoided a total of
AUD \$21M
in production loss

De-Risk
conveyor assets,
and production

Contact area
boosted from
43% to 95%

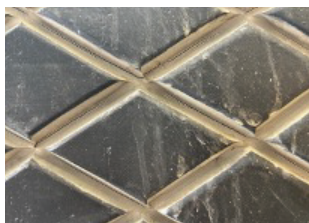
First-ever industry
use of **Lagging Select**
or fatigue-optimised
lagging design

 **laggingselect™**

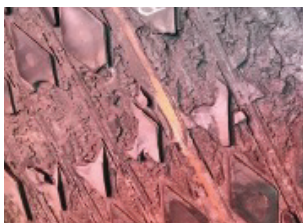
Other pulleys on other applications also showing signs of fatigue



6MW Drive NSW, Australia,
Melting of rubber



20MW, Copper, Chile.
Rubber cracks inside grooves



5MW, Coal, NSW, Australia.
Rubber melting



ONGOING DEVELOPMENT & INDUSTRY IMPACT

This case marked a true turning point for the entire conveyor industry, in more ways than one.

What began as a root cause investigation, has rapidly evolved into a game-changing predictive tool for lagging applications, but also overall conveyor design - with belt and pulley manufacturers, engineering firms, and design consultants.

Lagging Select is now a critical part of the decision process—supporting and validating the design of often longer, more efficient conveyors. Ric Featherson of ANZ NWA additionally remarked,

"While the industry has seen broader innovation across digital integration, energy efficiency, and materials, Lagging Select stands out as a targeted and practical tool addressing a longstanding design challenge."

The tool has since expanded to feature specialised modules — such as slip, fatigue, and drive analysis — making it uniquely capable of assessing risk and improving reliability across entire conveyor systems. While lagging represents a small fraction of total project costs, it is often a critical pinch point that can affect an entire mining operation. Mining companies using Lagging Select have been able to update forecasts, de-risk assets, and optimise performance.

Looking ahead, Elastotec has committed to continued investment in Lagging Select, focusing on real-world performance and end-user value. As the tool gains broader adoption, it's not just improving conveyor reliability—it's reshaping how the mining industry approaches asset design and long-term operational forecasting.