



Escondida improves safety and reduces worn liner removal time with RUSSELL Claw



Optimising mill relining for copper producers

The global shift to net zero is increasing copper demand, challenging mature mining operations with declining ore grades and higher processing volumes. Mill relining, an essential and routine maintenance process, consumes 2-5% of annual mill availability and poses residual safety risks, including confined spaces, manual handling, and proximity to suspended loads and mobile equipment. Optimising mill relining reduces shutdown duration and improves safety, delivering measurable economic benefits.

About this site

Minera Escondida (Escondida), the world's largest copper mine by production, is located in Chile's Atacama Desert. With a mine site life anticipated to exceed 65 years, Escondida focuses on continuous improvement to sustain performance and efficiency. This includes increasing processing tonnage while maintaining ore recovery through significant investments in concentrator strategy and management. Escondida has safety as a core value, continuously advancing practices to eliminate risks for reline crews and address fatigue from its high-altitude location over 3,000 meters above sea level.

Improving worn liner removal speed and safety

RME has long collaborated with Escondida to drive continuous improvements in mill relining. As part of the site's ongoing optimisation program, it recently introduced the RUSSELL Claw for worn liner removal at the Laguna Seca concentrator. This hydraulic jaw grapple attachment for their RUSSELL Mill Relining Machine (MRM) improves worn liner removal by safely grabbing liners from the mill charge or wall and transferring them to the liner cart for removal from the mill. It aims to eliminate hazardous practices such as liner slinging and manual handling, reduce the number of crew members required inside the mill during muck-out, and accelerate the process while significantly lowering risk exposure. Site implementation included operator training and a MILL RELINE DIRECTOR discrete event simulation (DES) study to quantify the safety and efficiency improvements.



The RUSSELL Claw eliminates risks for reline crew members working on the charge inside the mill, enabling safer and faster removal of worn liners.

RUSSELL Claw



SITE SUMMARY

- **Operation:** Escondida open pit copper mine
- **Location:** Atacama Desert, Chile
- **Grinding Equipment:** 26' x 43' Ball mill at the Laguna Seca concentrator plant
- **Site conditions:** High-altitude site



SOLUTION

- RUSSELL Claw (Engineered for use with the site's RUSSELL 7-Axis Mill Relining Machine)
- RME Commissioning and Maintenance Crew Training
- MILL RELINE DIRECTOR Study
- RME Optimisation Services



BENEFITS

- **Reduced risk exposure:** 72% fewer person-hours in hazardous conditions
- **Increased efficiency:** 27% faster worn liner removal
- **Enhanced safety:** Eliminates hazardous liner slinging and crew on the charge
- **Reduced fatigue risks:** Less manual activity, lowering fatigue
- **Quick productivity gains:** Easy to install, learn, and use
- **Cost-efficient:** Retrofits to existing RUSSELL MRMs without automation
- **Lower maintenance costs:** Frees crew for critical-path tasks, minimising downtime



Implementation results

Introduction of the RUSSELL Claw at Escondida improved worn liner removal efficiency and safety from the tool's first use. Liner removal time reduced by 27% due to improved gripping capabilities that led to faster liner detachment from the mill wall compared to traditional dislodging methods. The tool streamlined liner handling by minimising repositioning and eliminating the need to turn liners upside down on the charge in preparation for collection by the RUSSELL MRM. This time saving ensures a rapid return on investment within one to two reline events, at Escondida (and most mine sites), given the mill's contained metal value per hour.

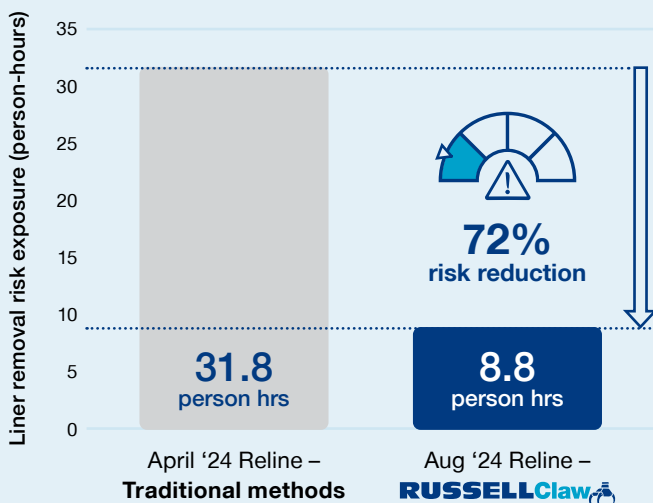
The most significant improvement was in safety, with the RUSSELL Claw reducing person-hour risk exposure by 72%. This was achieved by eliminating the need for personnel on the mill charge during liner removal. Traditional dislodgement and removal required multiple crew members inside the mill slinging out liners, exposing workers to risks such as crushing, confined space, ergonomic strain and musculoskeletal injuries from working on uneven surfaces and falling debris. At this high-altitude site, fatigue risks were also present during traditional worn liner removal, which the RUSSELL Claw effectively helps to mitigate.



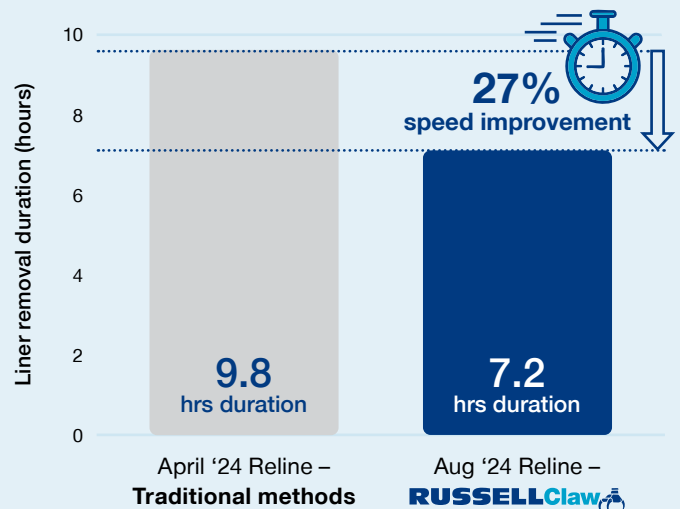
We are pleased to see the RUSSELL Claw's immediate safety impact and its contribution to faster worn liner removal so far. We look forward to continuing to work with our partners on optimising the entire mill relining process in support of our mill availability and production targets.

Escondida Mill Superintendent

SAFETY RESULTS Reduction in risk exposure during worn liner removal for a 26' ball mill.



PRODUCTIVITY RESULTS Reductions in worn liner removal time for a 26' ball mill.

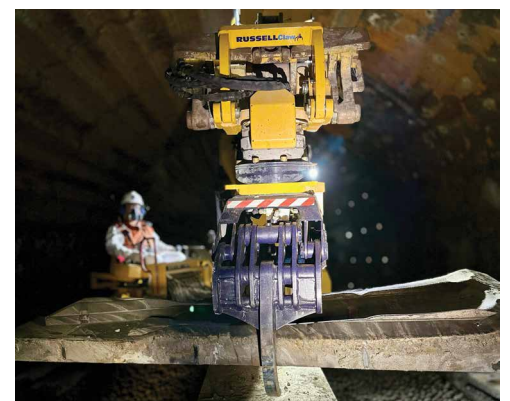


Implementation results are calculated using RME's discrete event simulation (DES) tool, MILL RELINE DIRECTOR (MRD). It utilises filmed reline studies and time-motion comparisons from previous events, as well data from similar sites, for performance benchmarking.

LEARN MORE ABOUT THE RUSSELL CLAW

The RUSSELL Claw can be retrofitted to most RUSSELL 7 and RUSSELL 8 Mill Relining Machines in the field. It is compatible with feed, shell, and discharge liners from leading liner manufacturers and certified to lift liners weighing up to 8 tonnes.

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RUSSELL
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RME's commitment to industry is to visibly, defensibly and sustainably improve our Customers' concentrator performance. We enable our Customers to remove fatal risk through innovative solutions.



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