

Solving High Risk Mining MRO Challenges

John Crane retrofit helps copper mine save around 288,000 liters of sealing water per day on critical tailings pump

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John Crane took its sealing knowledge from general industry and oil and gas and applied this expertise to the mining industry.

John Crane, a business unit of Smiths Group plc, has retrofitted a mechanical seal on a large underflow thickener slurry pump at a major copper mining operation, cutting the clean water needed for sealing by around 288,000 liters per day and supporting a move away from frequent, high-risk maintenance interventions on a production-critical asset. With a shaft diameter of approximately 270 mm, the installation represents the largest slurry seal sold by John Crane to date.

"Underflow thickener pumps are among the most critical assets in a mine's tailings circuit, so customers are understandably cautious about change," said Warren Smith, global mining market director, John Crane. "This project is a practical example of how improved sealing can reduce maintenance exposure and cut the clean water required for sealing, while supporting more predictable planned maintenance."

Mining Pump Maintenance

Smith has been involved in the mining industry for 26-plus years in a variety of positions including product development, sales, and even working on pumps in the field. He has been involved in fluid dynamics and sealing in mining as well as general industrial applications.



Regarding slurry pump maintenance, Smith said the stuffing box is the chamber through which the rotating shaft passes and which the packing is installed. The packing is designed to control leakage around the shaft, while clean gland water helps cool and lubricate the packing and limit the entry of abrasive slurry. Correct selection, installation and adjustment of the packing are important to keep pumps running longer and more efficiently.

Underflow thickener pumps are a key link in tailings handling, moving high-density slurry from the thickener into the tailings transport system. In this application, the Warman 550 pump operates at approximately 65 percent solids, where reliability is essential and any unplanned interruption can have an immediate impact on production.

Sealing components in slurry pumps can be exposed to significant wear. Abrasive particles can accelerate wear in packing arrangements and, if allowed to enter the seal chamber, can affect mechanical seal performance.

"The lifespan of packing and other wear components in slurry pumps can vary from days to weeks to months," Smith said. "It all depends on the quality of the materials selected and how their maintenance practices are implemented. Ideally, you want to keep the pump running as long as possible."

Historically, packing selection can sometimes be driven by initial purchase cost or immediate availability rather than total lifecycle performance. Smith said selecting a material that is not suited to the operating conditions, combined with ineffective maintenance practices, can lead to premature failure.

Prior to the retrofit, the pump in this mining application used a traditional packed stuffing- box arrangement. In abrasive service, that approach led to accelerated wear on the shaft sleeve, with replacement required around every four months. Although the impeller and rubber liners were typically replaced annually, sleeve changeouts were major events involving a full mechanical crew working across two shifts (around 36 hours), a 100-metric-ton crane, and extended exposure to safety and downtime risk.

"This specific mine was experiencing problems with packing and ideally wanted a continuous maintenance run of one year instead of four months. The biggest driver in this shorter maintenance interval was the gland service water had not been dependable," Smith stated.

In heavy-duty centrifugal slurry pumps, fitted with packing, gland service water (or gland seal water) is a pressurized, clean fluid injected directly into the pump's stuffing box. It helps prevent abrasive slurry from entering the stuffing box area while colling and lubricating the packing and shaft sleeve.

From a maintenance point of view, Smith said gland packing can require intervention on a daily, sometimes weekly basis just to adjust the gland and keep gland leakage at a manageable rate. The end goal is to eliminate the safety risks involved in making frequent gland adjustments.

"By designing a mechanical seal package, you're also going to reduce both water consumption and support more predictable maintenance over the long term," Smith added.

Reliability at a Premium

John Crane designed a mechanical seal package at the rear of the pump, replacing the original stuffing box (packing) arrangement and enabling a retrofit without modifications to the pump. The scope also included an adapter sleeve to suit the shaft. To support performance in mining service, the seal uses a controlled seal-flush arrangement to maintain a clean fluid environment at the seal faces and is specified with diamond-faced materials for robustness in the event seal-flush pressure drops and solids enter the seal chamber.

With this simple upgrade, John Crane was able to give the customer a mechanical seal using John Crane Diamond face technology allowing the company to regulate the gland service water. Actual operating flow is approximately 7.5–8 cubic meters per hour, compared with around 20 cubic meters per hour on a parallel pump operating with packing.

"Internally, we were now able to build the seal for whatever Warman pump ranges we had not built one for. These seals are built and designed specifically for mining applications and extend the life of rotating equipment. Our standard Type 5860 slurry seal platform was enhanced simply by adding diamond face technology. We have provided similar seals in other mining operations where we regulate the gland service water or even eliminate the water entirely," Smith said.



John Crane offers seals built specifically for mining applications that extend the life of rotating equipment.

John Crane designs its seal packages around widely used slurry pump platforms, according to Smith. This gives the organization a leg up on the competition as the engineers involved know the platform very well and understand how the pumps respond to field operations. Every new case study provides an opportunity to discover ways to enhance the product portfolio and develop better sealing solutions in the future. "We'll design our own options and use different materials to enhance longevity and increase safety throughout each application," he added.

While this application boasted the largest slurry seal John Crane has sold to date, Smith said there will be designs for even larger seals in the future. The company is working on additional applications where the seal is about as large or slightly larger than the one utilized in this copper mine application. The real work is subjecting these seals to rigorous testing prior to installation. "We're not putting anything in the field that doesn't meet the requirements of our customers as well as meeting our own expectations," he added.

Retrofit Rewards

Following installation and commissioning, the sealed pump is operating well. The seal-flush system was designed around approximately 11 cubic meters per hour at 75 psi, with actual operating flow running at approximately 7.5–8 cubic meters per hour. By comparison, a parallel pump operating with packing has been consuming around 20 cubic meters per hour of water. This indicates a reduction of roughly 12 cubic meters per hour, equivalent to approximately 288 cubic meters (288,000 liters) per day, subject to site operating conditions.

The retrofit is designed to align maintenance with the site's planned annual major service interval, when the impeller and liners are replaced, reducing the need for additional intrusive interventions during the year.

"John Crane broke into the mining industry with our successful product portfolio designed for general industry as well as oil and gas applications years ago," Smith said. "We took a step back and started designing products specifically for mining. Everything we have designed since has been evaluated at mines across the globe, specifically in Australia, South Africa, and Canada. These are the playgrounds are engineers play in."

John Crane is a specialist in flow control technologies and an innovator in solutions for rotating equipment in the energy and process industries. The company also provides mechanical seals, seal support systems, couplings and filtration systems, supported by advanced service solutions and digital diagnostics.

John Crane supplied highly specialized filtration sieves for the Artemis II program, specifically for the spacecraft's Propellant Management Devices (PMDs). Read about this application in the *PTE* August 2026 issue here:

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