We Can Solve This

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Energy giant Kinder Morgan is reversing the direction of flow in a 2,897 kilometer long (1,800 mile) pipeline that runs between Kankakee, Illinois, United States, and Ft. Saskatchewan, Alberta, Canada. The pipeline was used previously to transport propane and ethane eastbound. When the project is finished in mid-2014, it will carry light condensate westward to help process bitumen from the Alberta oil sands into petroleum.

There are 25 pumping stations along the way. The pumps, Flowserve Model HSLB of Byron Jackson heritage, were installed when the pipeline was built in the mid-1970s and rerated in 1997, changing the speed of operation and certain lubricating properties. More recently, issues with a downed station required an inboard and outboard seal change-out as well as special knowledge and attention to detail. Flowserve helped with that task, and its field personnel built relationships with Kinder Morgan technicians.

The request-for-bid (RFB) for the new project specified new seals for each pump, a leak detection and remediation plan, and field service for an initial four seal installations — the locations unspecified except that two would be in the United States and two in Canada. The winning bidder therefore had to be able to provide field installation and maintenance teams at any of the 25 locations and be prepared to deliver not just the new seals, but also stellar field service.

When Kinder Morgan experienced an emergency catastrophic seal failure on its pipeline, its team installed the Flowserve UHTW/GSL model, a tandem cartridge dual seal in which the second chamber is classified as unpressurized, making maintenance easier and less costly.
Flowserve was awarded the contract for installation and field service at all 25 locations. What sales engineer Greg Yezak believes gave Flowserve an edge in winning the contract was another example of the field service the company demonstrated to Kinder Morgan. “Simultaneous to the RFB going out, Kinder Morgan had a catastrophic failure on one seal on the line,” Yezak explains. “They asked us to take it back in for repairs, which could result in a longer turnaround. Our field crew went out, assessed the situation, and told them we could fix the problem on-site. In addition, we trained their technicians on seal installation best practices.”

Kinder Morgan expressed its appreciation in a letter from senior project engineer Jamie Chapman confirming that Flowserve won the bid. The letter said, in part, “We selected your team for a couple of reasons, but know that service was at the top of the list. Our recent experience with your team in the field has generated some positive feedback that got back to the selection committee.”

New Seals for a New Fluid
The seals to be installed are the Flowserve UHTW/GSL model, a tandem cartridge dual seal in which the second chamber is classified as unpressurized, making maintenance easier and less costly, Yezak says. Widely used for heavy-duty applications such as pipelines, this seal can function with either light condensate or propane. All aspects of its design, from seal faces to drive mechanisms to adaptive hardware, are designed to maintain a stable fluid film at the seal faces for long-term, reliable operation.

The inboard seal is the UHTW, custom-designed for high pressures with laser-etched waves on the seal faces tailored to the type of fluid being transported. It is configured with a large stationary element and a large rotating block face, both also designed for high-pressure tasks.

The stationary element locates the seal’s coil springs within the gland and away from any product flush. An inner flush follows API Plan 11 for bypass flush from discharge and uses a multiport distributed flush to create an even coating on the seal faces, even with a fluid of low specific gravity.

The GSL seal, used outboard, is a lift-off dry running gas back-up seal. Its faces, too, are laser-machined in wave patterns specific to the fluid being pumped. When combined in the tandem arrangement with the UHTW seal deployed in this application, it provides secondary containment that helps meet emission and leakage standards without the auxiliary equipment that would be needed with traditional liquid seals.

Leak Detection is Key
Kinder Morgan needed a different seal from those already installed because the specific gravities and typical states of propane and light condensate are different, Yezak says. With propane, which has a lower specific gravity, any leakage goes into a flare stack that burns it or turns it to vapor for dispersal into the atmosphere. Light condensate remains a liquid, so it needs a different treatment.

The seal leak detection plan proposed by Flowserve is an API Plan 75. When this plan is used in conjunction with a dual seal that incorporates a GSL seal for containment, any leakage is drained from the containment seal cavity to a liquid collector and vapor recovery system. “If the condensate leaks, this plan contains it,” Yezak notes.

“From the vessel where it collects, it goes into a drain that takes it to a sump-pump system that removes it for handling or from which it is removed by qualified personnel for disposal.” It’s important, he adds, that any leakage is caught early in its passage through the seal.

To provide for a catastrophic failure, the Plan 75 apparatus also has a high-pressure switch that can shut down the pump.

Reversing the flow of the pipeline involves changing the piping to and from the pump, Yezak explains, rather than changing the pump’s rotation. “This is becoming more common as we see natural gas and other petroleum products being produced from nontraditional sources such as the Alberta oil sands and the shale fields in North Dakota and the Northeast.”

Flowserve, which is now manufacturing the UHTW/GSL seals for the project, is demonstrating how to switch course successfully.

For more information, visit www.flowserve.com.
On Saturday, June 1, 2013, Flowserve received a call from Lawter, Inc. in Baxley, Georgia, United States, because a seal had failed and the company needed a replacement, fast. The seal was mounted on the shaft of an agitator mixing pine resins; the agitator shutdown was causing significant financial losses.

The seal was a Flowserve BRT, and manufacturing a new one usually takes four to five weeks. A Flowserve team of customer service representatives and sales engineers scrambled during that weekend and, together with Lawter personnel, worked out a significantly shortened schedule in which Flowserve would deliver a new seal by June 11.

Carrying through on the commitment involved Tim Hope, a Flowserve sales engineer; the Flowserve customer service, inventory, repair, engineering, and shipping and receiving departments in Bridgeport, New Jersey; and a sturdy pick-up truck.

“We promised Lawter a six-day turnaround from the day we received the seal and agitator parts,” Hope says. The clock started when the parts arrived at the Flowserve facility in Bridgeport on June 5.

The seal failed primarily because of old age, Hope adds. “It had been in service for about 10 years and working reliably, so it dropped under the radar — until it failed.” Sitting on top of the agitator around a 4.6 meter long, 88.9 millimeter diameter (15 feet, 3-1/2 inch) shaft, it prevented resin and vapor in the 3.1 meter diameter (10 feet) agitator vessel from escaping. The agitator also needed repairs.

“The seal failure leaked, so we shut it down immediately and diverted the product to other mixing vessels,” explains George Gaskill, senior process engineer at Lawter. “The other vessels were not as satisfactory, and we were losing a significant amount of money each day.”

Upgrading the Seal

With the schedule set up for a short turnaround, Lawter personnel shipped the seal and agitator parts to Flowserve’s Bridgeport facility. The agitator was built by another company.

After examining the area on the agitator shaft where the seal made contact with it and cleaning all the parts, Flowserve shipped them back to Lawter on Thursday, June 6, with delivery scheduled for Monday, June 10.
The Flowserve BRT model is a dual pusher mechanical seal with a pressurized barrier fluid between the inboard and outboard seal faces. This level of protection was necessary because of the heat of the resin in the agitator vessel and the presence of a vapor space at the top of the vessel.

“We noticed heavy scoring and grooving on the shaft where it came in contact with the seal,” Hope says. “The secondary seals were made of PTFE, which, because of its hardness, had been fretting the metal shaft over time. We told Lawter what we found and recommended upgrading to a model that used an O-ring made of a perfluoroelastomer instead. They agreed, and we upgraded the seal to a BRO model.”

Once the design of the new seal was determined, its component parts went into fast-tracked production. The stationary faces are made of Durachrome in Flowserve’s plant in Kalamazoo, Michigan, and they alone normally take three weeks to manufacture. In this case, the Flowserve team made them within days and shipped them to the Flowserve Bridgeport facility, which received them on June 10.

The Bridgeport team had already manufactured, constructed, and assembled the remaining parts of the new seal, and they were ready to go. So on June 10, all of the components were ready for overnight shipment to the Lawter plant to meet the June 11 deadline.

Exceptional Efforts for Delivery

Building the seal components seemed relatively simple compared with getting the agitator parts back to Lawter. On Thursday, June 6, Hope checked the tracking number with the delivery company and found out the agitator parts, which had been scheduled for delivery on Monday, June 10, had been held back because of Baxley’s relatively remote location and because of their weight — 86 kilograms (190 pounds). Now they were rescheduled to arrive on Wednesday, June 12 — the day after the seal installation was to be complete and the agitator put back in service.

The Flowserve inventory control supervisor in Bridgeport explained to the shipper the urgency of getting the agitator parts delivered by June 11 and negotiated a new arrangement: The shipper pulled the packages from its delivery system and set them aside at its distribution center in Jacksonville, Florida, for private pick-up. The upgraded Flowserve BRO mechanical seal also needed to arrive in Lawter by June 11.

Time was so short that it looked as if a Lawter employee would have to make a special trip from Baxley, Georgia, to Blackshear, Georgia, where the seal was pulled off its shipping company’s delivery system and held for pick-up. Luckily, the driving distances from Jacksonville, Florida, to the Georgia towns of Brunswick to Blackshear and then to Baxley were reasonable for a single driver. So Hope, who is based in Jacksonville, offered to pick up the salvaged agitator parts from the shipper’s distribution facility in Jacksonville, some fittings and adaptive hardware from Brunswick and the Flowserve mechanical seal from Blackshear, and then deliver everything to Lawter in Baxley.

“It was about a 4-1/2 hour drive,” Hope says. “For a Lawter driver to make the trip to Brunswick would have taken about two hours each way.”

With help from the shipping company, he loaded the 86 kilograms of agitator parts into his pick-up truck. After making the other stops along the way, he had all necessary components in Baxley by 11:00 a.m. on June 11. He supervised technicians from Lawter as they assembled the seal on the agitator, and the work was finished — as promised — by the end of the day on June 11.

Gaskill modestly calls this “fairly unusual service.” And the new seal is performing just as expected, with the exceptional reliability for which Flowserve is known.

For more information, visit www.flowserve.com.
Seals are a vital part of any mining operation. One company that knows this is Teck, a diversified mining and mineral development company based in Vancouver, British Columbia, Canada. The firm pumps a lot of zinc slurry in a large metallurgical complex at its Trail complex in the southern part of the province. The slurry goes through a number of chemical reactions as the zinc is purified progressively before being sent to an electrolytic facility for plating as pure zinc.

Not surprisingly, the slurry posed a problem for the expeller seals Teck used at the hot residue transfer stage. The pumps failed regularly and leaked, even sometimes expelling gallons of slurry. In the summer, the slurry oozed out to dry and flake; in the winter, it froze. In addition, there was always the possibility of emitting hydrogen gas.

The expeller seals on the pumps take solids captured by the hot stage filters through a re-pulping process and then transfer them to another part of the plant for re-leaching. The expeller seals employed packing in a stuffing box.

Howard McMeekin, reliability specialist for sulphide leaching at Teck, investigated the seal failures and subsequent leakages and found that because the slurry came in batches, the pumps would sit idle for significant periods during the day. With each of these shutdowns, a little more of the corrosive, abrasive slurry would be deposited.

This accumulation would plug the expellers and breach the packing, and slurry remaining in the pump would leak. In just one year, 10 pumps experienced 21 seal failures.

Idle Time Caused Problems
Dennis Teasdale, a senior technical sales representative with Flowserve, suggested trying a mechanical seal instead, the Flowserve SLC model. The SLC seal, designed specifically for work with slurries, is made of corrosion-resistant materials and is designed to handle the high temperatures and pressures found in metallurgical applications. The SLC seal is also designed to be easy to install and maintain, which is important in a production environment.

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Mining Company Solves Slurry Pumping Problem
An SLC mechanical seal stopped leakage from metallurgical slurry pumps for a zinc refiner in British Columbia with fast return on investment.
and abrasion-resistant metal parts and silicon carbide faces to function in the harsh environments characteristic of many metallurgical slurries.

Its robust construction can handle slurry concentrations of up to 60% particles by weight and particles with an MOH hardness of 9. In addition, as Teasdale points out, the gap between faces is only 0.0000508 millimeter (0.000002 inch), making it just about impossible for solids to come between the faces and abrade them.

In addition, very important to Teck, the seal operates without flush water. Since these are centrifugal pumps, the seals can draw liquid from the slurry to lubricate the faces. Water does not dilute the slurry. And because the pumps are outside, no water is in them to freeze and perhaps breach the seals.

Exceptional Performance

Teck tried one mechanical seal, which remained in service longer than the expeller seals. This one ultimately failed because of problems with the pump, but the company was encouraged to install more mechanical seals.

The company then installed the SLC mechanical seal, along with a sleeve newly designed by Flowserve for the pump shaft. This sleeve protects the shaft from wear and tear potentially caused by the seal. The new one is simpler in design than the one used with the expeller seal, making construction and maintenance easier.

The first SLC seal has lasted more than two years in service, and Teck has equipped additional pumps in sulphide leaching operations with the same model seal.

“The SLC seals are continuing to perform exceptionally well,” says McMeekin. “No leaks, no mess of slurry leakage. Our slurry pumping problem has been solved.”

There’s also a more concrete measure of success: The return on investment has been less than six months.

For more information, visit www.flowserve.com.
SLC Series
Heavy duty slurry seals

Proven performance in mineral and ore processing applications

SLC Series seals are heavy duty single cartridge seals built for the harshest slurry pump services found in mining, mineral and ore processing, and flue gas desulfurization.

The SLC Series is designed with a unique non-clogging cone spring that increases seal reliability and enables flushless operation for lower operating costs.

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