A PPI SPECIAL REPORT

An Air Mizer™ shaft seal helped Port Townsend Paper solve a long-term bearing contamination problem

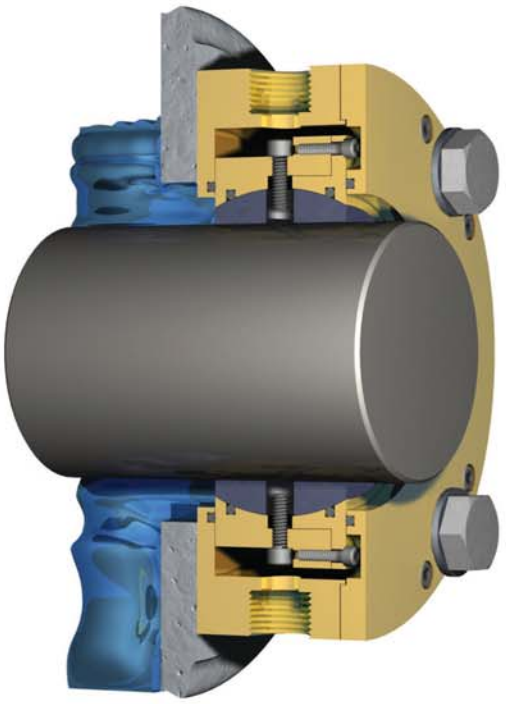
DOING AWAY WITH FAILURE

With readily available timber and a location near Puget Bay, Crown Zellerbach realized the potential of the area and built a new kraft paper mill, which began operations as the Zellerbach kraft paper mill (National Paper Products Company) on October 6, 1928. The mill has been in continuous production since then. In the same year, Zellerbach acquired Crown Willamette Pulp and Paper Company in Camas, WA, and the mill became known as the Port Townsend Mill Division of the Crown Zellerbach Corporation.

It went through various owners over the years, until 2001, when it became part of the privately-held Port Townsend Paper family of companies. This "family" also includes Crown Packaging and Boxmaster, well known for their high-quality corrugated and paperboard. Plant locations are in Port Townsend, WA, Burnaby, Kelowna and Richmond, BC.

The Port Townsend Paper Company (PTPC) is the largest employer in the area, manufacturing 325,000 tons/yr of unbleached paper and cardboard. The firm manufactures a wide range of high quality pulp and kraft paper grades including: lightweight linerboard; corrugating medium; unbleached converting grades; and specialty grades, such as gumming and laminating kraft. Its Discovery Kraft is a high converting grade blended from recycled material and virgin fibers.

Equipment at PTPC includes digesters, paper machines, recovery boilers, steam turbines, chip screeners, screens, pumps, motors, gearboxes, washers, filters, pressure washers and related equipment that runs 24 hours a day, seven days a week. It also operates a state-of-the-art old corrugated containers (OCC) recycling plant. To keep this equipment operating, a full-time maintenance department of 72 people works around the clock; personnel includes 27 millwrights, eight pipefitters, two oilers, five yard crew, four machinists, 10 electricians, seven instrument techs and nine supervisors.



Inpro/Seal Air Mizer™ Shaft Seal

The nature of the kraft pulping process requires that strict local environmental laws must be followed. To that end, Port Townsend Paper maintains a full-time environmental team which interacts with local, state and federal agencies to monitor and report compliances to regulatory agencies. The team works out of a modern and well equipped laboratory that participates in EPA and industry quality control audits

several times each year. Likewise, the company supports and participates in a number of organizations, which monitor constantly changing regulations and compliances, and which also participate in EPA and industry quality control audits throughout each year.

THE PROBLEM

When lime leaves the recovery boiler, it is in a sludge-like state. This lime "mud" is sent to a lime kiln where, in a complicated chemical reaction process, quick-moving combustion gases provide heat as high as 1200° F to remove moisture. The dried lime is returned into the papermaking process. As with other kraft mills, induced draft (I.D.) fans suck air through the kiln and into the scrubbers. In the case of Port Townsend, a 10-ft diameter fan is used.

According to Terry Rohring, maintenance planner at Port Townsend, "With lime dust in the air and high operating temperatures, lime kilns need to be taken care of. These issues can lead to problems that can get out of hand if not watched. This is especially important as lime kilns are such an integral part of the kraft papermaking process that when a lime kiln is down for repairs, the entire mill may have to be shut down. And the biggest problem we had was bearing failure from contamination. This is a problem we had for years."

The bearing contamination problem tied into the lime dust and the need for a long-lasting means to protect the fan shaft bearing. The bearing assembly for the fan shaft is a hydrodynamic bearing type to accommodate the high heat. Due to the close proximity of the bearing to the fan housing seal and the lack of an effective, long-lasting shaft seal, lime dust would leak through the seal and enter the bearing housing over a relatively short period of time, eventually burying the pillow block in lime dust. Worse, the lime dust was allowed to migrate around to additional equipment (electric motors). In other words, Port Townsend was dealing with an unpredictable 100% failure rate. What they needed was an effective, long-lasting shaft seal that could hold up under their harsh operating conditions.

With lime dust in the air and high operating temperatures, lime kilns need to be taken care of

INEFFECTIVE SEALING METHODS

"Over the years we tried all types of sealing methods," Rohring continues. "Until we installed Inpro/Seal's Air Mizer™, nothing worked. The original OEM seal that came with the lime kiln failed many years ago. Over the years, I know my predecessors tried many types of seals. In a search for a solution, we developed our own sealing system consisting of a box, an air nozzle, an aluminum impeller and a sealing device.

"Though better than what we had, it still was not the solution. Even with our own design, we still needed a means to keep lime out of the fan housing. We tried a number of sealing methods, but our high operating temperatures and axial shaft movement made them ineffective and only temporary. Packing did not last, as they would compress and create a leak path. Plus, it would soften to the point where it could leak. Adjustments to the packing were only temporary. Any type of seals that used elastomers would not last either, due to the high temperatures. Contact seals were subject to wear and so were also temporary solutions."

COSTLY AND TIME CONSUMING

When lime kilns need maintenance, it is not a simple on-and-off process. Because they work at such high temperatures, they need to be cooled down for at least 24 hours before any maintenance can be performed. Then, to return to operation, another 24 hours are required to heat back up again. Add in the time needed to replace the bearings and one can see

that downtime is at a minimum of 2.5-3 days. When they tried to work with a planned shutdown schedule, the shaft seal would fail before the shutdown.

Simply put, no matter what they tried would not work, and they faced an ongoing, costly, time-consuming solution to a decades old problem until they installed the Inpro/Seal Air Mizer shaft sealing system.

Inpro/Seal's bearing isolator is a non-contact, no-wearing labyrinth seal that provides users of rotating equipment with permanent bearing protection. Its two parts – a rotor and a stator – interact with each other to keep contaminants out of a bearing enclosure while keeping lubricant in.

The maintenance staff at Port Townsend knew about Inpro/Seal, as they had been using their bearing isolators on select pumps and screens and had been working with Boyd Evenson (regional manager) and Lena Hunt (local representative).

According to Boyd, "In 2005, during a routine visit, Lena and I told them about a shaft sealing system — the Air Mizer - that had come into its own. Frankly, I never really knew about their lime kiln problem, but they did. As soon as I showed this system to Terry, Greg Knowles and their maintenance people, they immediately recognized its potential to solve their problem. It was like a light bulb got turned on."

For about 10 years, Inpro/Seal had been receiving a large number of end user requests for a long lasting shaft seal that could be used on equipment where wet or dry particulates, powders and slurries were handled, processed, packaged and stored.

In 1999, following extensive R&D, field testing and laboratory trials, Inpro/Seal unveiled its first shaft seal, the Air Mizer-PS, a modification of its bearing isolator. A compound labyrinth, it was adapted to incorporate an air purge containment system. Its unique design uses a solid wall of air, which functions as a barrier for contamination to retain product where it should be: in the equipment, not outside of it.

End users widely accepted the initial Air Mizer-PS for its ability to boost overall reliability, reduce costs, extend sealing efficiencies and increase bottom line results without equipment modification, and they wanted more. By 2004, an entire product line began to evolve with the addition of Articulating Air Mizer and Smooth Bore designs.

Fan housing covered in lime dust that was leaking out of the fan housing

THE BOTTOM LINE

In summing up, Rohring says, "Before we met with Boyd and Lena, we tried a number of different methods to seal the fan bearing housing. No matter what we tried, nothing worked. For years, we just accepted the fact that lime dust was going to contaminate the fan bearing housing. We also had to acknowledge the fact that there was no way to plan this. Sooner or later, we knew we would face 15-24 hours of lost time due to lime kiln maintenance. Adding to the problem was that we did not know when. As a maintenance professional, it was hard to accept having to deal with a 100% chance of failure.

"In the old days, if the fan failed completely, we would have had to shut down the lime kiln and possibly even the entire mill to replace the fan bearing," Rohring concludes. "But that was then. This is now. We installed the first Air Mizer in the fall of 2005. Due to the high operating temperatures, we had to do some tweaking, including the addition of a special design adapter plate to compensate for the poor condition of the fan housing. We also had to make adjustments to compensate for axial shaft movement. Since that time, we have not had to shut down a single time to replace the fan bearings in our lime kiln. It appears that this problem has become a thing of the past." **PPI**

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