

By GRAEME RODDEN, Editor

Eliminating refiner failure

Inpro/Seal's modified design of its bearing isolator solved an ongoing problem that no other sealing methods could address at Buckeye Technologies' Memphis mill

Headquartered in Memphis, TN, with plants in the US, Canada, Germany and Brazil, Buckeye Technologies is a global, bulk producer of cellulose-based specialty products.

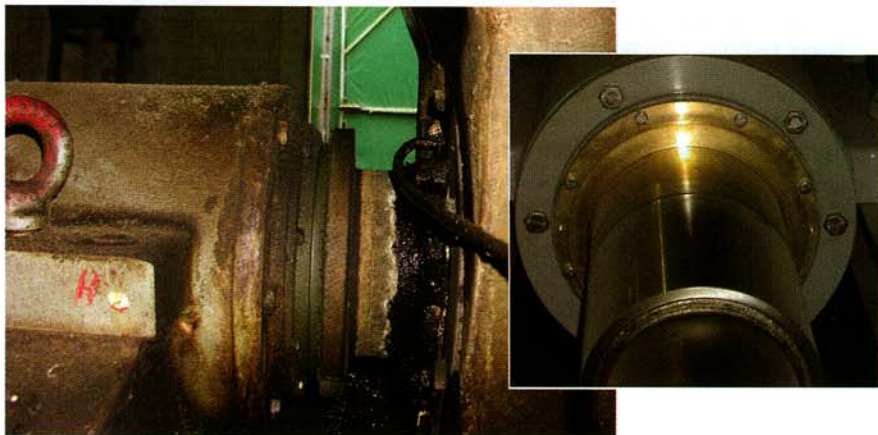
According to its current annual report, its expertise in polymer chemistry serves as the foundation for innovative and proprietary products. Utilizing wetlaid and airlaid technologies, Buckeye is the only manufacturer in the world that offers cellulose-based specialty products made from both wood and cotton. Its products are based on long-term relationships and are custom manufactured to meet individual customer needs.

The company divides its product lines into four categories, which are then divided into two reporting segments: specialty fibers and nonwoven materials:

- **Chemical Cellulose:** Derived from wood and cotton cellulose materials using wetlaid technologies. End uses include the likes of: food casings for hot dogs; rayon cord to reinforce tires and hose; personal care products; low fat dairy products, pharmaceuticals; construction materials; computer screens; high purity cottons; liquid crystal displays.
- **Customized fibers:** Derived from wood and cotton cellulose materials using wetlaid technologies. End uses include the likes of: fine writing papers; automotive, laboratory and industrial filters; cotton balls and swabs; concrete.
- **Fluff pulp:** Also uses wetlaid technologies where fibers are deposited using water. End uses include disposable diapers and hygiene products.
- **Nonwoven materials:** Airlaid nonwoven materials are derived from wood pulps, synthetic fibers and other materials using airlaid technology. End uses includes hygiene products; wipes; mops; napkins; placemats and pads.

The company has been in business for

Before (left) and after photos showing how the installation of a bearing isolator eliminated the problem of oil contamination in the bearing housing assembly in a mill refiner.



more than 80 years and is well known for its ability to develop new uses for cellulose-based products. Initially, the company was part of Procter & Gamble, but became an independent company in 1993 and then went public in 1995. As a bulk supplier, the company's products may not be household names, but end users would readily recognize the names these products are marketed under.

Speaking as part of the CEO panel at the TAPPI Papermakers' conference in Florida earlier this year, Buckeye Technologies CEO John Crowe said the company's objective is to develop proprietary product innovations. Buckeye wants to produce "superior" products, he added, and bring them to market. Another key to success is long-term alliances with its customers.

The company has enjoyed good success with this philosophy. Sales revenue in 2006 (fiscal year July 1-June 30) was \$728.5 million and 2007 appears headed towards a new record. Sales have gone up every year since 2002. As noted, the company operates worldwide: 74% of Buckeye's products are made in the US; 68% of sales are external.

Approximately one-third of its production is non wovens. The remaining is classified as specialty fibers and includes fluff pulp, chemical cellulose and customized fibers.

For the next year, Crowe said that Buckeye's priorities would be three-fold: develop new products; bring the new facility in Brazil to full capacity; be a "lean" enterprise. Being lean, according to Crowe, means driving the waste out of the system. The company was able to decrease its working capital by \$12 million in 2006 and another \$12 million in the first half of 2007. This was helped by eliminating non-value added activities while targeting a gross margin increase of 1%.

Memphis focuses on cotton

The Memphis facility manufactures chemical cellulose for a variety of cotton-based fibers; they do not contain any wood fibers. This plant does not manufacture any end products but is a bulk supplier. It can produce 100,000 tonnes/yr. Current production is about 80,000 tonnes/yr.

In the manufacturing process, multiple refining technologies are used to mechanically modify the fibers.

Given the specialized nature of the products produced at the Memphis plant, the site is very sensitive to refiner reliability problems. Refiner bearing issues had become a recurring issue to the point where Eddie Kelly, crew leader, Maintenance Technology

Group, said they considered it a "routine failure." In fact, he states that prior to the installation of a bearing isolator, staff could count on the refiner failing.

The problem was ongoing for 4-5 years before Kelly became involved. The downtime was quite expensive in that it not only shut down the refiner, but also production as it could take as long as eight hours to change the assembly. According to Kelly, the main reason for the failure was contamination of oil in the bearing housing assembly. Worse was the fact that, they knew it was going to break down, but just did not know when. The equipment problem was caused by the continuing failure of the lip seal. Water would travel from the refiner down the entire rotating assembly. This is where the lip seal failed, allowing water to enter the bearing housing.

They also had to contend with the fact that the refiner was designed to operate under a significant load and in doing so, the entire rotating assembly had to move. That is, when pulp stock is fed into the refiner, there is movement that affects the hydraulic balance of the refiner. This was fixed with the installation of the bearing isolator as now it has been converted from a moving assembly to a stationary rotating assembly.

Lip seals did not work

When Buckeye first received the refiner, it came equipped from the OEM with labyrinth seals, which were installed next to the packing gland. When the refiner kept failing, other sealing methods were tried.

Double lip seals with a grease barrier did not provide a lasting solution. Other sealing methods also proved inadequate. Unfortunately, usually they also failed within a short time.

First introduced in the 1930s, lip seals were the only sealing devices conveniently available for general use. They are inexpensive and, in sheer numbers, commanded 99+ % of the industrial rotating equipment sealing market.

Most process plants have an extensive

inventory of lip seals, stacked next to the spare bearings in the stock room. The problem is that even the best lip seals have a mean life to failure of only 1,844 hours or 77 days of operation.

Contact vs non-contact

Contact seals are subject to excess wear on the seal faces as they make contact with each other and have been known to wear out in as little as 3,000 hours. Adjustments, such as tightening, may renew the seal, but only for a relatively short period of time. Fibrous packing, flingers, lip seals, simple labyrinth seals and other devices do not eliminate the root cause of the equipment failure: contamination entering the bearing environment and the loss of lubricant.

While a lip seal or contact seal operates with contact, the bearing isolator makes no contact, never wears out and can be used over and over for many years. Bearing isolators are used to protect motor and pump bearings, machine tool spindles, turbines, fans, gearboxes, paper machine rolls and many other types of rotating equipment.

A bearing isolator is a non-contact, non-wearing, permanent bearing protection device. It has a rotor and a stator, and the two are unitized, so that they don't separate from one another while in use. Typically, the rotor turns with a rotating shaft, while the stator is pressed into a bearing housing. The two components

interact to keep contamination out of the bearing enclosure and the lubricant in.

Kelly had known about Inpro/Seal through the plant's E&I Department. As E&I had been specifying and using IEEE-841 motors, Eddie knew what bearing isolators were and what they did for the motors.

The IEEE 841 motor, upgrades the EPA mandated IEEE motor, by improving reliability, efficiency and performance through establishing simple design guidelines that require the use of bearing isolators. The end result has proven to be reliability and longer, useable motor life.

He also knew that whenever a Goulds' ANSI 3196 or Goulds' 3175 paper stock pump was ordered, bearing isolators were also standard. He knew what bearing isolators did for their motors.

Precision Maintenance Program

The use of premium motors, pumps, bearing isolators and other upgrades are part of Buckeye's Precision Maintenance Program approach to maintenance. (Precision Maintenance is trademarked by Reliability Solutions LLC, with whom Buckeye's Memphis plant has been working to improve its maintenance systems.) Kelly says that the extra dollars invested has proven to pay big dividends in the future.

To solve Buckeye's problem, Inpro/Seal

Almost Three Million in Service

Inpro/Seal Company is the originator and world's largest manufacturer of bearing isolators. Its site includes: engineering, research, development, testing and manufacturing that operate on a continuous basis. David C. Orłowski, inventor of the bearing isolator (patent # 4,022,479) is also the founder of the company.

Almost three million Inpro/Seal branded bearing isolator designs are in operation in process plants around the globe, where end users continue to report significantly reduced operating costs with increased productivity and reliability. Protected bearings have proven to run 150,000 hours (17+ years), eliminating the need for continual maintenance and repair. Documented cases show that a plant can easily double the mean-time-between failure (MTBF) and reduce maintenance costs by at least half, with users reporting an extremely high return on investment.

took its paper machine roll (PMR) bearing isolator and modified it to fit Buckeye's exact needs and specifications. Engineered specifically for the size, speed, alignment and operating conditions of machine rolls, the PMR bearing isolator had proven to be highly successful on the wet and dry ends of paper rolls.

On the wet end rolls (breast, table, press, wire return), water, pulp and paper stock are prevented from entering and contaminating the bearing housing. On the dry end rolls (calender, coating, queen, suction, starch, drum, end), leakage from oil-lubricated bearings is eliminated.

Before its availability, end users had to contend with sealing methods that allowed roll bearings to fail. The leading cause of failure was contamination from heat, humidity, paper stock, water and oil leakage that would enter the bearing housing.

Inpro/Seal engineers developed a solution that not only solved the problem, but also changed the way the refiner worked. They modified the existing design by adding a flange that provides for a tight fit, by registering it directly to the bearing housing, where it now bolts on, without the need for an O-ring.

With this modification, the refiner's rotat-

ing assembly was converted from a moving design where the refiner plate loaded up and moved to a stationary design with no movement. Actual installation took but 15 minutes. Generally, replacing other types of seals would take a full day.

Since installing the flanged PMR bearing isolator 14 months ago, Buckeye has not had a shutdown on this refiner. Buckeye does have a spare rotating assembly equipped with a bearing isolator just in case. Under Buckeye's Precision Maintenance Program and rebuild policy, as breakdowns happen, additional bearing isolators will be installed. **P&P**