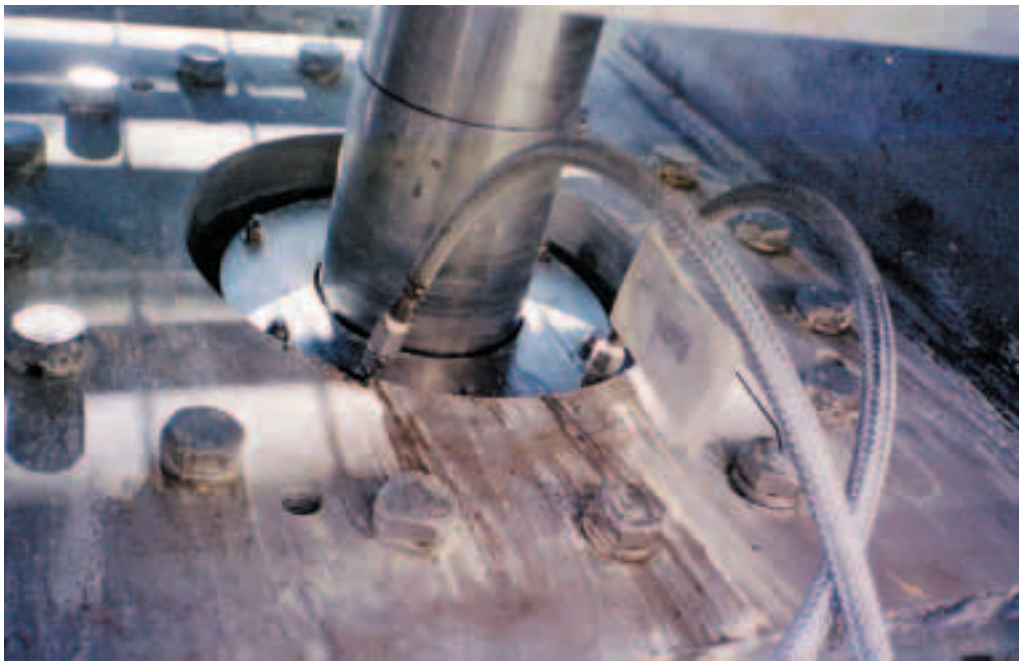
A supplement to *Processing* • March 2003
PROCESSING
PutmanMedia



SHAFT SEALS

reduce dryer downtime at DuPont

E.I. DuPont de Nemours Crop Protection Products' Mobile plant in Axis, Ala., a leader in the agricultural fine chemcials market, recently recognized a reliability engineering team led by Chris Marshall, who used a vacuum dryer to reduce downtime by ten-fold.

Marshall is the technical engineer for the unit of the plant where the dryer is in service. The particular process that created the opportunity for him and his team was one in which an inert solid carrier is coated with a crop protection product and mixed with an organic solvent. The mixture is then dried under vacuum until the solvent is evaporated, leaving only the carrier and product bonded together. The drying operation is performed at a modest temperature under vacuum. The dryer shaft diameter is 6" and it turns at less than 25 rpm.

The dryer was installed new in early 2000. The seals originally used on the machine were double-faced mechanical gas barrier seals, with carbon on silicon carbide faces. These seals, coupled with labyrinth ring seals, were specified to accommodate up to .005" of T.I.R. (diametric run-out). They worked fine until the shaft was accidentally damaged and began to run out by .020" diametrically. The lead-time for procuring a replacement shaft was too great to permit the company to idle the machine. So, they were forced to run it with the understanding that seals would fail on a more frequent basis, causing significant downtime.

This turned out to be an understatement, as the nightmare unfolded. The shaft run-out caused significant gas ingress, which in turn interfered with the operators' ability to control the degree of vacuum under which the machine was operated. With the machine unable to hold the desired vacuum, the drying process took longer and longer to complete.

They could run less than six batches through the dryer before the seals would fail and need to be rebuilt. This rebuild process involved shutting the manufacturing process down, removing the drive coupling, bearings and seals from both ends of the machine, rebuilding the

seals and replacing the bearings and drive coupling. Each end of the machine took between two and three days to rebuild in this manner, and the seal parts for each end cost $8,000. The specially molded carbide seal faces are manufactured by only one source in the United States and this company made only one production run of the faces per year. DuPont became their best customer, soon exhausting the nation's entire supply of the seal faces. They then resorted to reconditioning the used seal faces, further compromising their effectiveness.

The production cycle became one week at best of production, followed by three to four days of downtime. Occasionally, they had to rebuild seals three times a month. Meanwhile, the sales force did what they do best and demand for the product increased.

Marshall was familiar with another type of seal, which his predecessor, Joe Del Tosto, had used with success on screw conveyors and blenders in other parts of the plant. Del Tosto, a maintenance technology leader now working at a different DuPont plant, suggested that they apply it on the vacuum dryer. Marshall and Del Tosto discussed it with rotating equipment specialist David Day and made the decision to use the MECO seals. The MECO seal was chosen due to its high run-out capacity, fully-split design, and low cost of rebuild compared to the double mechanical seal currently used.

According to Marshall, "We saw this as a win-win situation. Even if we only gained a slight increase in MTBF with the MECO seals, we realized that the split seal design would greatly reduce repair times. The MECO seal could be repaired in place without removing the shaft bearings."

The patented EAS seal design is based on the use of a driving elastomer, which wraps around and grips the shaft. This both protects the shaft from abrasion damage and blocks product migration along the shaft, even if it is scored and pitted. The elastomer turns with the shaft and drives sacrificial rotors against stator plates, forming the seal interface. No relative movement takes place between rotors and stators. Because they have wide radius seal faces, the seals are able to accommodate 1/4" and more of diametric shaft run-out, as well as thermal growth of the shaft. The seals used at DuPont have a nitrogen purge connected to them. This purge serves both to maintain consistent seal face pressure and to keep product out of the seal cavity.

MECO's regional distributor, Jerry Chevalier of Mid South Mechanical Sealing, helped the team install the new seals in April of 2001. The installation took 2-1/2 days total, primarily due to the removal of the old seals which accounted for 90 percent of the total time.

Since that time, MECO seals have been running consistently for almost 100 batches between rebuilds. Rebuilds take two hours per end of the machine, and the maintenance team has not found it necessary to rebuild both ends every time. With the machine sealed effectively, operators are able to achieve the degree of absolute vacuum under which the machine was designed to function. Batch cycle times have been reduced by more than 25 percent.

Several months after the MECO seals were installed, the new shaft for the machine arrived. When the shaft was replaced, the seals were rebuilt as a matter of course. They continue to function as before, needing only infrequent and planned routine maintenance.

Meanwhile, Marshall and his team of mechanical reliability personnel can focus on the next big cause of downtime, knowing they have already improved their company's bottom line.

DuPont's mechanical engineer Chris Marshall improved the performance of this vacuum dryer by installing MECO shaft seals on it.

MECO SYSTEMS
1-800-526-8800

Woodex Bearing Company
216 Bay Point Road
Georgetown, ME 04548 USA
www.mecoseal.com
sales@mecoseal.com
800-526-8800 tel (US & Canada)
+1-207-371-2210 tel (worldwide)
+1-207-371-2169 fax