

Polymer Bearings in Dryer Section Reduce Failures at Graphic Packaging

by HAROLD CODY

The average consumer sees folding cartons everyday, whether it is a cereal or frozen food box at the grocery store or packaging for small electronics or hardware at a discount outlet. This wide array of end uses is one reason the market is highly competitive. Another reason is that this wide customer base is served by three major substrates—recycled, bleached kraft, and unbleached kraft—that provide the package designer a variety of quality and cost options.

Key to competing in this market is the ability to maximize uptime while keeping maintenance and operating costs down. One step taken by Graphic Packaging Corp. to reduce equipment-related downtime has been the replacement of old journal bearings with new, nonmetallic bearings on one of its two boxboard machines. The switch has resulted in a reduction in the number and frequency of bearing failures. Use of the new product is just one example of the results from an extensive preventive maintenance program that has been underway for some time.

TWO MACHINES PRODUCE RECYCLED BOXBOARD. The Kalamazoo, Mich., mill operates two paper machines producing coated recycled boxboard grades. Graphic Packaging's downtown site also includes one of the company's folding carton operations, which is located just across the street from the paperboard mill. The 146-in.-trim K1 boxboard machine is one of the industry's largest and most complex, operating a huge multi-fourdrinier forming section that was installed during a major rebuild in 1992.



Using polymer bearings on dryer can journals and an aggressive preventive maintenance program help recycled boxboard mill compete by reducing downtime

The smaller 120-in.-trim K3 line operates at about 500 fpm and produces 270 to 280 tpd of coated-one-side recycled boxboard grades, typically in the 16- to 28-point caliper range. The wet end consists of seven pressure-former cylinders—five for the filler plies and one each for the top liner and back liner. Coated grades are produced using a combination of bar and air-knife coating.

NEW BEARINGS REDUCE FAILURES. To maximize uptime and operating efficiency, maintenance on an older, smaller paper machine is probably even more important than on newer equipment. As part of its ongoing maintenance work, the mill, like most others, had to deal with dryer can bearing failures. A shutdown to replace a “blown” bearing takes several hours, and thus a lot of valuable production time is lost.

The K3 board machine is now using polymer-based bearings in the dryer section. The original units were old-style bronze bearings. The material for the new bearings was developed in conjunction with Accro-Seal of Vicksburg, Mich., to address problems such as the burning up of old bearings. The mill ran initial trials in the 1992 to 1993 period using an earlier version of the bearings. The mill and Accro-Seal worked together to develop the current product following this initial trial work. In 1994, the remainder of the bearings on the dryer cans was replaced with

Accrolon 9039 bearings, which are a proprietary blend made by Accro-Seal. The base-polymer is Victrex Corp.'s PEEK polyaryletherketone.

Before converting to the new bearings, the mill was losing a bearing—i.e., it was failing—about every eight to ten days. Such a failure would require a three- to four-hour shutdown for bearing replacement.

“Now it’s unusual to lose a bearing at all,” says K-3’s maintenance manager, Manuel “Manny” Garza. “In fact, from 1994 to September 2001, no dryer bearings failed on the run. So, they’ve run for seven years without major disruptions.”

The polymer bearings cost more than the old bearings they replaced. However, the increased uptime and reliability the new material provides offsets the added cost. An hour of downtime costs thousands of dollars in terms of lost production and maintenance costs. One aspect of the new bearing material is that if it fails for some reason, getting it off the dryer can be a problem because it can “melt” onto the journal. However, the mill is very pleased overall with the results.

While the polymer bearings at the Kalamazoo mill run under lubrication, at other mills they are run with minimum lubrication or without lubrication at all in similar applications, according to Accro-Seal’s Thomas Moerman.

STEP-BY-STEP MAINTENANCE. Dryer can journal bearing maintenance is something that should be part of any good preventive maintenance program. Such a program is key to keeping the machine running at a high efficiency by minimizing downtime due to equipment or mechanical failures.

“Lubrication and alignment are two keys to any successful maintenance program,” according to Garza. In his view, the role of the maintenance supervisor is to provide the operators with a paper machine that goes on and off and stays up and running as asked by the production manager.

The maintenance staff has developed a detailed checklist of maintenance items to be performed at every maintenance shutdown. The staff adheres closely to the plan. While it may appear that cutting back or eliminating some of the steps or postponing them to the next maintenance outage can reduce costs, it really does not, according to Garza. In his experience, over the long run, a systematic program that includes well-documented steps at every maintenance shutdown will result in improved reliability. On a particular shutdown, it is possible to cut costs by eliminating some steps, but the penalty you pay down the road due to unplanned downtime exceeds the short-term cost savings.



Lubrication and vibration analyses are important components of a preventive maintenance program, according to Manuel Garza (right), maintenance manager on the K3 paper machine. Tom Moerman is with Accro-Seal.

The maintenance shutdown list incorporates several different types of activities. For example, it includes a list of things the mill does for every shutdown, a key one of which is to examine every single dryer bearing on the paper machine. Others include inspecting all pumps, pulleys, and belts. The shutdown list also includes items the mill plans to do, such as dealing with problems that operators have observed or that were found during maintenance inspections and, of course, things they could not anticipate.

Shutdowns, which start at 7 a.m., last a minimum of 10 hours, but the duration varies. For example, if one large roll has to be changed out, this might extend the shutdown by 15 to 16 hours. At present, maintenance shutdowns on the

K3 board machine are scheduled every five to six weeks. One tool that has proven invaluable for the mill's preventive maintenance program is vibration monitoring and analysis, which is used as a predictive tool. For example, vibration monitoring is used to "listen" to gear meshing frequency on the dryer can drive gears. If the amplitude of the frequency starts to increase, it can indicate that a bearing is going bad. The staff can then write a work order to replace it. The mill brings in a local Kalamazoo company, Integrated Maintenance Technologies, to provide vibration analysis services. Typically on the K3 paper machine, about 800 to 900 data points are analyzed per month. Analyses are run twice per month.

Another check for unusual or problematic bearing wear is to examine the gear clearances. If the bearing is wearing down, the clearance narrows between the teeth on the drive gears on the backside. Maintenance staff uses a welding rod as a simple gauge to check gear clearance.

The nonmetallic, self-lubricating bearings are chemically inert, require less lubrication, and have reduced downtime due to equipment failures.