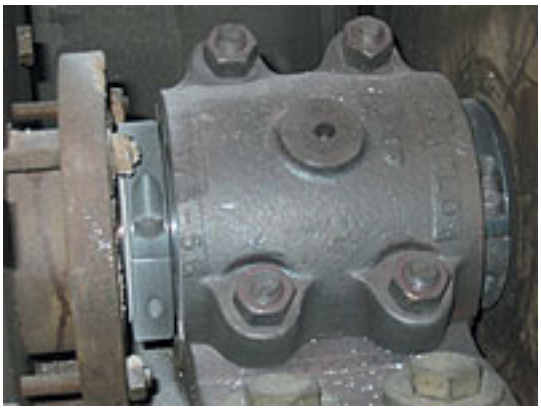
How To Avoid a Bearing Meltdown

Performance Roof Systems, Inc. (PRS) based in Kansas City, MO, has been manufacturing Derbigum modified bitumen industrial roll roofing systems for over 30 years. Derbigum provides membrane tensile strength up to 200 lbs./per in. Polyester and fiberglass scrims resist punctures and wear. Derbigum is produced by blending APP (Atactic Polypropylene) Modified Bitumen with other materials that provide flexibility, strength and stability, even at subzero temperatures. Derbigum is also available with unique mineral granule surfacing in a variety of colors.



Top-side bearing of auger opposite the drive end.

The location of the bearings made greasing and replacement very difficult.

Side view showing the heated screw, making these units difficult to change out.

The heated auger machine plays an important part in the production of industrial roll roofing. To maintain the high temperatures required at that stage in the production process, hot tracing oil is continually circulated through a tube that runs through the center of the bearings. The oil that is removed is heated back to a high temperature in a heater before being pumped back into the machine.

The bearings originally supplied with the machine provided continual maintenance problems. The machine has four pillow block bearings and each bearing cost $435 to replace. Temperatures of approximately 500 degrees Fahrenheit caused lubricants for the ball bearings used to quickly evaporate. From that point failure was only a matter of time.

"I replaced six bearings over a four year period," Stiverson said. "Actually, in most cases the bearings failed almost as soon as they were installed. It was not hard to tell when that happened because soon after the lubricant evaporated the bearings began to make a shrieking noise. If we had the time and were willing to spend the money on bearings we could have replaced them nearly every week. With the machine running at a relatively low rpm we were able to operate for quite a while even after the bearings failed. But eventually we had to replace them before they locked up completely. We tried to head off this problem by lubricating the bearings more frequently. But that didn't seem to make any difference. Whatever lubricant we applied quickly dried out and caked up." Tired of shutting down the machine to change bearings, Clayton Stiverson, Maintenance Supervisor, searched for alternatives and finally found a bearing material based on a self-lubricating graphite/metal alloy that provides a low coefficient of friction without any lubricant. Of course, the cost of the labor and machine downtime considerably added to the total cost of replacing the bearings.

Stiverson researched various lubricants to find one that would stand up to the demands of the application. "I tried a number of different oils and greases, including some that were rated up to 1000 degrees," Stiverson said. "But they rarely lasted longer than 24 hours. The oils would typically evaporate and the greases would cake up and get hard as a brick. Interestingly, the lubricant that worked the best was 30-weight automobile engine oil. But even this lubricant failed fairly quickly. It just couldn't withstand the exposure to dirt and sediment that is produced in the roofing process. After a while the oil would assume the consistency of molasses and from that point the bearings would fail pretty quickly."

Next, Stiverson started looking at other bearing materials. Traditional nonlubricated bearing materials, which are made of polymers, have no chance of standing up to the high temperatures involved in the application. But he continued to search directories and trade journals for a material that could tolerate the combination of heat and dirt encountered in this application. He was not making much progress until he talked to an application engineer from Graphite Metallizing, based in Yonkers, NY, and was told about GRAPHALLOY, graphite filled with a metal impregnant to enhance the chemical, mechanical and tribological properties of the material. The graphite structure can be compared to a deck of cards with individual layers that are able to easily slide off the deck. This phenomenon gives the material a self-lubricating ability that is matched by no other material. External lubricants

are simply not necessary.

Properties of Graphalloy

Self-lubricating
Requires no grease or oil
Survives run-dry conditions
Will not soften under high temperatures
Will not extrude under load

GRAPHALLOY requires no grease or oil, survives run-dry conditions, and eliminates galling and seizing in hot and dry conditions. The bushing material is suited to applications where temperatures are too high to permit the use of oil or other lubricants because there are no lubricants to congeal or solidify. GRAPHALLOY will not soften at high temperatures or extrude under load. Many grades are suitable for temperatures to 750 degrees F, where oil-based lubricants burn off or oxidize and plastics fail. Special grades give good service up to 1000 degrees F and higher in non-oxidizing atmospheres.

The material provides other properties that are beneficial in other applications. It maintains its integrity even when submerged in hostile liquids such as acids, alkalies, hydrocarbons, black liquor, and liquid gases. The material provides a constant, low coefficient of friction rather than just a surface layer, helping to protect against catastrophic failure. Lubrication is maintained even during linear motion; lubricant is not drawn out and dust is not pulled in. GRAPHALLOY wear components also improve reliability under conditions such as low speed operation, frequent starts and stops, and switch-overs from standby to continuous running. GRAPHALLOY bushings are available in over 100 grades of material in any desired size or geometry, including cylindrical with or without grooves, flange or double flange, split and metal-backed. Grades and design are engineered to best serve the application.

Stiverson spoke to the manufacturer and ordered four bearings to evaluate the performance of the material. The ball bearings originally used in the application had an 80 mm inside diameter, 3-7/16 outside diameter, and were 5.5 in. long to fit the

split pillow block in the auger machine. “We put them in and hoped for the best. The bearings kept running and running and running without any problems. After a year we inspected the bearings and could not see any visible signs of wear. Since installation, we’ve never removed the new bearings.”

“The new bearings have already lasted 18 months and show no signs of any wear,” Stiverson said. “By eliminating the need to lubricate and replace the bearings, we are saving a considerable amount of money in maintenance downtime, labor, and replacement part costs.” Stiverson says that the new material can now be considered a complete success in this application. “By eliminating the need for regular maintenance, the new bearing material has greatly simplified the job of maintaining the auger,” Stiverson said. “This lets the maintenance staff focus on other issues. The production workers are extremely happy with the new bearings because they run so much more quietly than the ones that we used in the past. We always keep them in mind for other high-temperature applications as the need arises.”

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