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THORDON BEARINGS INC.

Biosolids Screw Conveyor Roller Bearing Retrofit

Industry: Sewage & Wastewater
End User: Wastewater Treatment Facility, Ontario, Canada
Application: Biosolids Screw Conveyor – Roller Bearing Retrofit
Thordon Grade: ThorPlas-Blue
Date of Original Installation: Mid-2023

About:

This wastewater treatment plant was originally built in the 1960s and collects wastewater from a large Canadian city, handling around 400 million litres (1.06 million gallons) per day. After processing, one of the useful outputs from the treatment plant is about 40 tonnes (88,185 lbs) of "biosolid" material per day that is a nutrient-rich, soil-like material that is used as agricultural fertilizer.

Challenge:

The conveyors used for moving this biosolid material to the large storage hoppers are long screw-type conveyors, with a slowly rotating helical screw driven from one end by an electric motor and gearbox. In the design of this particular screw conveyor, the screw is supported at multiple points by greased metallic roller bearing assemblies, with integrated mechanical face seals to prevent entry of solid material into the bearing space.

These bearings are primarily carrying a radial load, with low rotating speeds, and are running 24 hours/day, 7 days/week. Unfortunately, the gritty and abrasive solid materials in the conveyor would easily work past the bearing seals and contaminate the grease, leading to the failure of the roller bearing assembly. As with most roller bearings, contamination with solids like this quickly leads to seizing of the bearing assembly, preventing the screw from rotating and necessitating an immediate intervention to repair and replace the damaged roller bearing.

The roller bearing assemblies at this facility would typically need to be replaced pro-actively every 6 to 9 months to prevent unexpected downtime resulting from a bearing failure. The replacement roller bearing, and seal assemblies were quite costly, both in terms of cost of the replacement assemblies, and cost of downtime associated with the frequent replacements. Each new roller bearing & seal assembly was nearly CAD$15,000, and each of the 4 screw conveyors at the site has 8 bearings, making it very costly to replace them frequently. Replacing all 36 roller bearings annually would cost CAD$540,000 per year, not including the labour required to remove and replace them! The customer was often able to clean up and rebuild the roller bearing assemblies to save a little bit, but this was very labour intensive and still costing about CAD$7,000 per assembly to rebuild.

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Solution:

This customer was looking for a solution to their ongoing reliability challenges with the original roller bearings, and when searching for Ontario-based companies with a background in bearing & sealing expertise, they found Thordon's local distributor, Millstream Engineering. Thordon SXL elastomer bearing inserts were used for the initial trial, but with warmer temperatures around 45°C in the conveyor, the elastomer was found to be softening and deforming under load. The bearing inserts were changed to ThorPlas-Blue, a thermoplastic material that has excellent wear resistance, higher mechanical strength, and better dimensional stability in this warm environment.

The existing roller bearing housings were slightly modified to fit them with a self-lubricating ThorPlas-Blue bushing and two wiper seals. The wiper seals help keep the sand and grit out of the bearing area to prolong the wear life of the bushing. The shaft was fitted with a new stainless-steel sleeve to provide a smooth finish for the bushing to slide on.

The new assembly will never seize as the self-lubricated bushing is designed to support the shaft with a slight running clearance, unlike the typical zero-clearance roller bearing assemblies. The other big advantage of this solution is the ability for the customer to easily rebuild the bearing assemblies as they wear by simply replacing the ThorPlas-Blue inserts and wipers.

Result:

The first installation of the ThorPlas-Blue replacement bearings is nearing 1-year of service and will be inspected for wear at the next opportunity. It can either be returned to service, or easily renewed with replacement of the ThorPlas-Blue inserts and wiper seals. Early indications show that a 2+ year wear life is quite possible which would be a 100% improvement over the previous roller bearing solution!

The cost of initially retrofitting the roller bearing assemblies with new ThorPlas-Blue inserts, wiper seals, stainless steel thrust washers, and stainless-steel shaft sleeves was approximately CAD$2,500 per assembly. For future rebuilds in service, the cost of just replacing the ThorPlas-Blue inserts and wipers in the existing assemblies will be about CAD$500 per insert, compared with a rebuild cost of approximately CAD$7,000 for the roller bearings.