



TIMKEN

TIMKEN IMPROVES DRAGLINE EFFICIENCY AT MOSAIC BY MORE THAN \$600,000

Draglines are some of the hardest working machines in the mining industry. Dragline operators expect their draglines to perform without problems 24 hours a day, seven days a week.

The Mosaic Company is the world's largest producer of finished phosphate products. When its draglines run longer, more efficiently and with fewer repairs, Mosaic experiences higher productivity and lower operating costs.

However, draglines at Mosaic's Four Corner mine in central Florida experienced reliability problems due to premature sheave bearing failures in the fairleads, which are critical components in the phosphate rock extraction process.

The lower vertical fairlead sheaves on draglines operate in a demanding environment as the bucket ropes drag across sand and dirt. The previous seal design on the fairlead sheaves allowed contamination to penetrate the bearing, degrading the lubrication and damaging the sheave bearing and rope.

In March 2009, Mosaic approached Timken to identify the problem with the current bearing's seal design, provide a favorable solution and track ongoing performance.



**Bearings after
6 months of operation**

CUSTOMER

The Mosaic Company

MARKET

Phosphate Mining

PRODUCT

Sealed Sheave Bearing

THE TIMKEN ADVANTAGE

The Timken solution provided enhanced performance for the Mosaic dragline:

- Timken trained the Mosaic repair machine team on best practices and to obtain Timken Bearing Certification
- The enhanced Timken seal keeps contamination out of the bearing system and allows effective grease purge.
- The solid lube keeps lubrication at the critical points in the bearing.
- Sheave bearing life increased up to four times longer



BEFORE

Bearings after 6 months of operation



AFTER

Inspection after 15 weeks



Inspection after eight months

Patrick Coveny, principal sales engineer, Brian Hare, service specialist, and Tim Murphy, principal application engineer, took the lead on the project.

They worked with personnel at the mine's machine shop where the sheaves were assembled to better understand the root cause for damage. "Our initial inspection showed evidence of heavy internal contamination and improper bearing setting," Patrick said. "Brian performed several bearing damage analysis inspections and trained Mosaic's machine shop technicians on best practices. The Mid-State Machine and Fabricating facility in Lakeland, Fla., is now Timken Bearing Certified."

After the Timken application engineering team reviewed the sheave design, they suggested installing a new seal, changing to a solid lube and placing the bearings into a mounted preload instead of the end play to reduce skidding due to an unloaded row. At that time, Mosaic was not in a position to change the seal and lube since several adjacent parts to the bearing would need to be changed.

Unfortunately, the problems continued. Mosaic was experiencing six months of life from the sheave and bearings on the dragline. The company estimated that annual cost of premature sheave failures for one dragline was more than \$600,000 in downtime and replacement costs.

After inspecting additional damaged and failed parts, Mosaic decided to implement the entire Timken set of suggestions. In August 2012, Mosaic began to use the Timken bearing with solid lube and enhanced contact seal.

An inspection 15 weeks later indicated that the bearings remained in good condition and the seals functioned properly.

After eight months, a second inspection indicated normal wear and the overall enhanced seal and solid lube were performing well. "Based on our inspections, we estimate Mosaic will get more than two times the service life compared to three to six months of service prior to the designed solution," Patrick said.

According to Malcolm Osenton, director of reliability for Mosaic's phosphate business unit, "The Timken Company's support has been outstanding in Mosaic's efforts to improve dragline sheave life. Timken engineers did a very good job at exploring several improvement options and developed a successful designed solution that exceeded our aspirations."

RELIABILITY. EFFICIENCY. TIMKEN.

Timken keeps the world turning, with innovative ways to make customers' products run smoother, faster and more efficiently. Our highly engineered bearings and related products and services turn up everywhere. To learn more about how Timken expertise in friction management and power transmission can maximize your performance, contact your Timken sales representative or visit us online at www.timken.com.

TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance mechanical components, including bearings, belts, chain, gears and related mechanical power transmission products and services.

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