Horsburgh & Scott: Heavy Duty Gear Expert

Big gears. They drive the machinery that rolls steel, grinds limestone, pulverizes coal, pumps mud, mixes rubber, raises bridges and does many other heavy-duty industrial jobs. For 117 years, big gears have also driven the business of Horsburgh & Scott of Cleveland, OH.

The company specializes in the design, manufacture, service, rebuilding and repairing of large industrial gears and gear drives. It serves industries including cement, chemical, mining, sugar cane, petroleum, steel, utilities and others.

Horsburgh & Scott built its reputation on manufacturing quality gears and gear drives for those industries, says president Dave Kraninger, and it's a reputation that they continue to foster. For example, Horsburgh & Scott offers a four-year warranty on their new gears and drives.

But over the past several years, the company has struggled to redefine itself in the face of a number of challenges, including corporate buyout, bankruptcy, overseas competition, manufacturing recession and a vastly shrunken steel industry, to which Horsburgh & Scott has long been closely tied.

The biggest change in Horsburgh & Scott's business, though, has been a shift from manufacturing original equipment toward serving the aftermarket.

Horsburgh & Scott takes pride in its ability to manufacture quality gears and drives for heavy industry. "We're going to keep our manufacturing base," Kraninger says proudly, indicating that much of the company's credibility stems from its reputation as a quality manufacturer. But Horsburgh & Scott spends much more of its time than previously in servicing, rebuilding, repairing and replacing drives already in the field.

Kraninger estimates that about 30% of the company's business is manufacturing original equipment, versus 20 years ago, when manufacturing new gears and drives made up 70% of the business.

This shift in philosophy isn't original to Horsburgh & Scott, Kraninger says. Many of the gear companies serving the same industries are moving toward the aftermarket and service activities. One of the reasons is that many of the OEM companies that had built facilities for steel mills and other large plants are out of business. Also, as long as their specifications can be met, the remaining OEMs are most interested in buying gear drives at the lowest prices. Often, this means an overseas gear manufacturer will get the job. "The OEM business is diminishing for USA-based manufacturers," Kraninger says.

The change in focus means Horsburgh & Scott spends more time talking with

Horsburgh & Scott Co.
Subsidiary of P&H Mining Equipment, a subsidiary of Joy Global Inc.
Established: 1886
No. of Employees: 190
Main Facility: 270,000 square feet
Heat Treat Facility: 30,000 square feet
Industries Served: Steel, Aluminum, Rubber, Plastics, Utilities, Movable Bridges, Petroleum, Mining, Paper, Sugar, Food Processing, Environmental Control and other industries where large gears and drives are used.
Major Products: Large industrial gears and drives, including spur, helical, internal, double helical, worms, Maag hard-cut, precision ground and herringbone gearing from 3 inches to 30 feet in diameter.
Specialty: Upgrade of existing gearing and gear units to provide increased horsepower in the same envelope.
Industry Affiliations: ASME, ASTM, ASM International, founding member of AGMA.
www.horsburgh-scott.com

Maag hard cutting is a specialty at Horsburgh & Scott. Using a CBN tool, the company cuts hardened gears "as accurate and smooth as a ground gear," says president Dave Kraninger.

Horsburgh & Scott: The Aftermarket

One of Horsburgh & Scott's specialties has been the manufacture, service, rebuilding and repair of gears and gear drives for heavy industrial plants, such as steel mills, cane sugar processing, power plants and strip processing lines. Those facilities often use a variety of large, critical service gear drives. In many cases, the service lives of those drives are measured in decades, and keeping them running requires expertise.

A double-helical ring gear for an iron ore ball mill.

A cold mill combination speed increaser/pinion stand.

A double helical gear set for the main drive of a hot strip mill, undergoing final mesh test at Horsburgh & Scott.

Case 1

Recently, a Horsburgh & Scott customer in the steel industry needed help with some gear drives that had been upgraded about 20 years earlier. Gears in those drives were beginning to show signs of cracking.

"They really take a beating," says an engineer who works with the gear drives at the company.

In fact, the drives were being used to carry higher loads than they were originally designed for, so the company couldn't just buy new gears like the old ones. They needed engineering analysis of the parts. Also, manufacturing new parts isn't always the optimal choice, because of the expense and the amount of time needed for manufacture.

According to Dave Kraninger, president of Horsburgh & Scott, his company will be working on the project over the next couple of years, repairing gears where possible, replacing them and supplying spares when necessary.

Repairing cracks in large gears involves taking the gears back to Horsburgh & Scott's Cleveland manufacturing facility, where they undergo magnetic and ultrasonic inspection to completely map each gear and look for problems in the teeth, rim, hub and—in the case of fabricated gears—welds.

After inspection, cracks may be ground out or machined out using a large, horizontal boring mill with end mills. Parts are normally inspected a second time to be sure all the cracks have been removed. New material is welded in place, and the parts are thermally stress relieved in Horsburgh & Scott's in-house heat treat facility. Then the parts are "trued up," including recutting the teeth if necessary.

The whole process requires an integrated knowledge of gear design, manufacturing and heat treating, as well as expertise working with large gears, Kraninger says.

And his customer agrees. "There are a lot of companies that have the manufacturing capability," the customer says. "But they don't have the engineering or the heat treating. When you get into the highly technical, highly loaded gearing that we have, you need the expertise. These guys have it."

Case 2

Horsburgh & Scott recently completed a project for a cement company. The manufacturer had gear failure in a large enclosed drive, which is used to drive equipment for grinding limestone. One helix broke on the 10-foot-diameter, 40-inch-face, double-helical, composite-designed gear.

The original gear drive manufacturer, a Horsburgh & Scott competitor, recommended that the cement manufacturer purchase a new gear for this drive, but that would have taken months, Kraninger says. Instead, his company repaired the gear, replacing the broken helix in just under six weeks. The project involved buying a new forged rolled ring, turning, facing and mounting the ring, and finally, cutting the teeth.

The repaired gear is only intended to be a temporary replacement, though it may last several years. In the meantime, the cement manufacturer will have time to determine the best course of action regarding the long-term high-reliability requirement for the mill drive, while limiting its downtime.

end user customers, Kraninger says. The company needs to understand how customers are using their gear drives in order to provide solutions that best take advantage of Horsburgh & Scott's engineering, manufacturing, inspection, heat treating and rebuilding expertise. "We are really focused on improving the end user's gear reliability," Kraninger says.

Another significant challenge for Horsburgh & Scott has been the decline of the American steel industry.

According to Kraninger, the company has lost 34 steel industry customers to bankruptcy over the last five years, forcing management to face issues such as bad debt and where to find new business.

Despite that decline, the steel industry still makes up about 50% of Horsburgh & Scott's business, Kraninger says. But the company is working to expand in other markets, including cement, sugar, petroleum, mining and utilities. "We've had to work hard to establish ourselves in these industries," Kraninger says. But he adds: "We see ourselves having successes and being recognized by our customers."

Another challenge for the company has been the conversion from a family-owned business to a corporate-owned business. From 1886 until the mid-1990s, Horsburgh & Scott was owned and managed by members of the Horsburgh family. In 1998, Horsburgh & Scott was acquired by P&H Mining Equipment Co., a subsidiary of Harnischfeger Industries, Inc.

Shortly thereafter, in June 1999, Harnischfeger filed for Chapter 11 bankruptcy protection. Today, Horsburgh & Scott is still a subsidiary of P&H, now a subsidiary of Joy Global, Inc., the company that emerged from Harnischfeger's bankruptcy proceedings in 2001.

According to Kraninger, who took over as president in 2000, the bankruptcy of the parent company didn't affect Horsburgh & Scott terribly. As evidence, Kraninger points to the fact that after emerging from bankrupcy, both P&H and Horsburgh & Scott were able to repay all of their creditors 100% plus interest.

Horsburgh & Scott's carburizing furnaces can handle parts up to 75" in diameter and 180" long.

"Some peripheral customers may have looked at us with a jaundiced eye, and it probably cost us some business," Kraninger says.

Far worse than the effects of the bankruptcy has been the current manufacturing recession, which Kraninger likens more to a depression. "It's impacted us very dramatically," he says.

In the past few years, Horsburgh & Scott has had to undergo wage freezes, wage reductions and job force cuts. The company had about 230 employees when it was acquired by P&H in 1998. Today, it has about 190 employees. In 2002, the company closed its facility in Mentor, OH. That facility was a 70,000 square foot building used for Horsburgh & Scott's enclosed gear drive rebuild and service activities. Those activities have been moved to the company's main facility in Cleveland.

But today, although the market is still tough, Horsburgh & Scott is well positioned for the future, Kraninger says. "We're doing better, we're making money, we're weathering the storm."

He attributes the company's success to its unique blend of capabilities and its continued focus on the needs of its customers.

One of the capabilities that Kraninger feels sets his company apart is its experience with Maag hard gear cutting. "We're the missionaries on coarse-pitch hard gear tooth machining," he says. Maag hard cutting allows Horsburgh & Scott to cut carburized or high-through-hardened coarse pitch gears with a CBN cutting tool. The results are "as accurate and smooth as a ground gear," Kraninger says. The process also allows them to cut narrow-gap double-helical gears, which are common in many of the industries they serve.

In addition, Horsburgh & Scott boasts a large selection of both imperial and metric tooling, including hobs, shaper cutters, Maag tooling and generating tooth grinding tooling. All of that provides a lot of flexibility, Kraninger says.

Another aspect of their operation that sets the company apart is its engineering staff. "We have a few very unique engineers," Kraninger says, explaining that they allow the company to help solve customers' problems, instead of just manufacturing parts.

Also, Horsburgh & Scott has its own full-service heat treating facility and metallurgical lab. It has carburizing furnaces capable of handling parts up to 75" in diameter, 180" long and 60,000 lbs.

All of these capabilities add up to an ability to meet the needs of customers with big gears.

"Wherever there are big gears—low speed, high torque—and people have questions, we want to be the people they think of first," Kraninger says.

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