

Stober Drives' three-day turnaround on its gearboxes meets customers' need for speed, made possible—in part—by a close relationship with bearing supplier SKF.

By Bob Giuliano

At Stober Drives, customer orders are filled in the fast lane. The company turns around more than 93 percent of requests for its MGS™ (Modular Gear System) gearboxes in just three days, compared with industry averages that usually range from one to six weeks. And while that's quick, consider what happens with emergency orders. Customers who agree to pay airfreight costs can have a custom-built Stober gearbox on their doorstep within 24 hours.

Stober's build-and-deliver speed complements the gearbox maker's reputation for quality—one that is largely the result of a commitment to supplying products that are reliable, adaptable, and maintainable. There are no shortcuts in Stober's fast turnaround. Rather, the quick response is achieved through continuous improvement processes, training, and cohesive interaction with key suppliers. Consider Stober's relationship with SKF USA Inc., for example, which satisfies 98 percent of Stober's bearing requirements. Stober interacts with SKF in ways that make the supplier more of a business partner than a vendor. "SKF currently has a 99 percent delivery rate," says Stober Drives Product Manager Mike Mitchell, "and last year they were at 96 percent. This is phenomenal."

SKF's supply competency helps Stober ensure that it has the bearings it needs to quickly build and fill gearbox orders. The process starts with Stober providing a forecast to SKF of estimated bearing usage on every size. "That gives us an idea of what Stober will need over the next 45 days," according to Lonnie Helton, an SKF regional account manager. "We then hold forecast orders and inventory based on that expected usage at our national distribution center. When the inventory depletes to a certain level, we replenish it. Every SKF bearing shipped is individually boxed and contains a Stober part number, as well as a bar code that will be scanned when the component is eventu-

ally pulled from Stober's warehouse shelves."

SKF's state of the art 663,000 square-foot distribution center is located in Crossville, Tennessee, which is about 70 miles west of Knoxville. In addition to being the main point for SKF's product inventory, the center is the primary location for the company's quality assurance, product packaging, and safety and environmental departments.

Meeting Challenges

Stober places bearings orders weekly, and SKF usually ships within 24 hours. "We have contact with Stober purchasing personnel on an almost daily basis," says Helton. "We look at usage spikes and determine if order adjustments are needed. Because Stober is a custom builder, they never know exactly what they are going to make week-to-week or in what quantities. So it takes a lot of coordination to keep up with their bearings needs."

While firm processes are in place to keep forecastable supplies of bearings flowing, contingencies exist for special requirements. If Stober has an order that is well above normal quantities, for example, SKF will look for alternative products or search for the product at its different worldwide locations in Europe, Canada, or Mexico. SKF has the largest bearings selection of any manufacturer, so chances are good that supply specialists will locate the right bearings. Product is then shipped overnight, if necessary, to meet Stober's schedule requirements.

At times, SKF meets Stober's bearings requirements with personalized, hands-on service. Helton recalls occasions, for example, when he had readily available bearings shipped from the warehouse to his southwest Ohio offices, removed the bearings' shields, seals, or snap rings to make them conform to Stober's requirements, and then drove them 60

miles to Stober's Maysville, Kentucky, facilities. "We do whatever it takes," Helton says.

Tremendous Turnaround

According to Stober's Mitchell, the three-day turnaround is a powerful business advantage, both for his own company and its customers. "We've won new accounts based totally on our delivery," he explains. "Some instances were emergencies, where a company couldn't obtain the gearboxes they needed from existing sources. They were being quoted four to six weeks, but we could deliver almost immediately. Typically, once you bale somebody out of a huge jam and get their operation back up, you land the account, you win new business."

Most of Stober's business is for conveyors in the food and beverage industry, where applications often place special demands on gearbox performance (more on that later). First, it is worth noting that benefits accruing to Stober's original equipment and end-user customers can pertain to inventory, as well as equipment uptime.

"OEMs can wait longer to issue their purchase orders for gearboxes," Mitchell says. "They can wait until they're ready to mount them instead of ordering months in advance. End users benefit because fast turnaround reduces their need to inventory multiple spares. They can have just one on the shelf and know that Stober will quickly backfill if it's pulled from inventory. That is a huge savings for end users because they don't have to buy gearboxes in advance and keep them on a shelf."

Gearbox Design

Stober Drives' newest product offering is the MGS "KE" series. Like all MGS gearboxes, the KE series has a modular design, mounts in any horizontal position, employs SKF Explorer® ball

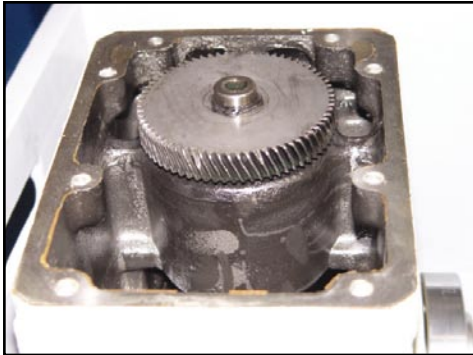
bearings and has its bearings positioned on either side of each gear mesh in the reducer.

With a simple clamping modification, the units can mount in a number of horizontal positions or on either side of a conveyor. This capability equips end users and OEMs with an adaptability advantage. "They can bypass conduits, cables, and other lines that might be coming in," Mitchell says. The horizontal mounting feature also delivers an inventory benefit since users do not need to keep right- versus left-mounting gearboxes in stock. One does the trick. Gearbox inventory collapses to one, where before a customer might have had to stock five or six.

Further adaptability is evident with the gearbox's shaft accommodation. "Each gearbox has a shaft size range that it can handle," he continues. "Let's say a customer has a KE Stober gearbox that can accommodate a shaft with a one- to two-inch diameter. It will not matter

whether the customer uses a 1 1/16 inch or a 1 1/2 inch shaft. With an inexpensive bushing kit, the customer can employ any shaft size within the range. That's adaptability."

A key feature available with certain Stober gearbox models is maintenance-free lubrication. On the new "KE," the oil port is inaccessible, making lubrication checks or changes impossible without dismounting the motor from the gearbox. "There is no need for oil changes or oil checks," explains Mitchell. "Lubricants will not break down until you add some type of catalyst. If you open the oil port in a food or beverage processing plant you introduce a catalyst—moisture—that will initiate lubrication breakdown. Our lubed-for-life gearbox is truly zero maintenance. That's a huge savings in maintenance costs compared with gearboxes that might require an oil change every six months."



FRACTURED GEAR TEETH CAN QUICKLY LEAD TO CATASTROPHIC GEAR BOX FAILURE. (PHOTOS COURTESY OF STOBBER DRIVES, INC.)



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Choice of Warranties

Stober Drives provides a standard three-year warranty with its gearboxes, a guarantee that is unique in the industry. The warranty includes coverage of natural wear items such as bearings and seals. "Several competitors provide a two-year warranty but will have a disclaimer on natural wear items," Mitchell notes, "so they are conditional warranties." Stober also offers an upgraded warranty option that extends the protection to a full five years.

An extraordinary degree of product quality is necessary to back up the gearbox industry's longest-term warranties. Materials, parts, and engineering are all in the quality mix. The recipe has proven so successful that Stober can boast of, and document, a miniscule 24/7 applications failure rate of just ¼ percent in three years, and a mean time to failure of over seven years.

"Stober uses only the very best components," Mitchell says. "Our engineering group works with selected suppliers, such as SKF, to develop high-end solutions. Keep in mind that the risk of allowing inferior materials into a product that has a three- to five-year warranty is staggering."

Stober Drives' design engineering takes place primarily at its parent company, Stober, which is located in Pforzheim, Germany. A pioneer in the gearing industry since 1934, the organization has 20 engineers on staff devoted to gearbox design. There, partnering takes place with SKF engineers to determine which bearings should be specified for the different gearbox models that Stober brings to market worldwide.

In Maysville, Stober partners with SKF engineers, but for different purposes. SKF provides training that ranges from materials handling to transport to installation. "SKF has trained our personnel to ensure that we have best practices at all times," Mitchell says, adding that the quality process starts with the first person who touches a component "That includes the person who receives it. If we receive a truckload of bearings from SKF and somebody mishandles them, then quality issues will appear later on. One key factor regarding handling is to leave bearings, gears, and seals in their box until you are ready to install them in the gearbox housing.

"The warehouse is another area for potential mishandling," he continues. "Let's say you are picking bearings and gears from shelves. You can't just drop them five feet into a cart from the ladder, because the resulting shock load will cause a problem. It might affect a

bearing's inner or outer race or its rolling elements. If you throw a bearing on top of a gear you can ding a gear tooth, which would cause the gearbox to have excessive noise or vibration. If you damage a seal, which is basically a steel cup with a plastic inner liner, then your gearbox will leak oil."

Mitchell says that the proper handling and installation of bearings is critical. "You can have all the quality in the world with

your gear grinding and processing, and the best seals in the industry. But the minute a bearing goes the shaft will have more run out, increasing the chance that your seal will fail and your gear teeth will no longer mesh properly. When this condition exists you will fracture gear teeth, and that will quickly lead to catastrophic failure. The bearings' rolling elements are critical to the gearbox's robustness and service life."



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Training Eliminates Returns

The critical nature of bearing handling and installation came prominently into play at Stober when the company noticed an increase in gearbox returns. The gearboxes, most of which were still under Stober's warranties, incurred expense and threatened to tarnish the company's reputation for quality. A preliminary gearbox inspection led Mitchell to suspect that the returns were in some way related to bearings. Stober had been sourcing from SKF for 15 years without a single bearings quality issue,

so quality was not a likely cause. Yet something bearings-related was almost certainly causing the gearboxes to fail.

Mitchell shipped a selection of returned gearboxes to SKF's Kulpville, Pennsylvania, headquarters for expert analysis. There, SKF engineers put their analytical expertise to work, backed by a century of accumulated company knowledge. They soon determined that the bearings were being damaged during Stober's installation process. Accordingly, SKF developed a customized training program that underscored the need to follow proper installa-

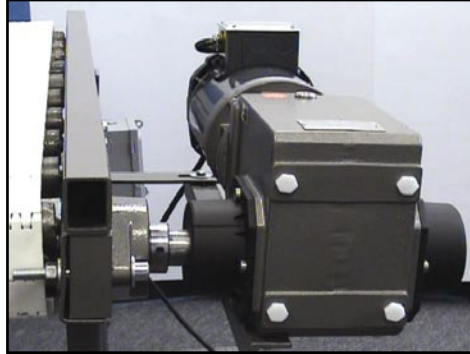
tion procedures. "Our objective was to have our assemblers learn best practices at every step," Mitchell says.

One key to proper installation has to do with the process of achieving an "interference fit," i.e. a fit that is tight enough to keep a bearing stationary on its rotating shaft. Impact or press tools are often used in conjunction with heat to install bearings.

Heating a bearing, which expands the inner race for fitting onto its assigned shaft, is best achieved with an induction heater or a hot plate. Because overheating can weaken the



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bearing materials, SKF recommends a maximum heating temperature of 250° F. Also, SKF advises assembly technicians to look for 120° F delta between the shaft and the bearing's inner ring. Delta marks the variation between ambient temperature and the intended temperature of the bearing being heated.

When driving the bearing onto the shaft, pressure or impact should only be applied to the bearing's inner race. Damage to the bearing's rolling elements and raceway will likely result if pressure is applied to the bearing's outer race. Stober's bearing assembly and seal insertion tools are critical components that contribute to its gearboxes' reliability and robustness. "A lot of these tools were developed with SKF's input," says Mitchell. "Partnering took place in both Kentucky and Germany."

SKF's training program yielded dramatic results. Stober has seen bearings returned under warranty drop by 42 percent, and scrap that was associated with faulty assembly procedures has fallen 48 percent.

"Our assembly line personnel now employ SKF's recommended procedures every time with heat and proper press tools," Mitchell reports. "Improper practices, such as tapping

an outer race with a ball peen hammer to seat a bearing, are a thing of the past. As a result, our product lifecycles are back where they should be for virtually every gearbox shipped."

The SKF training has evolved into an ongoing program at Stober. SKF engineers train new employees and periodically refresh the skills of veteran assembly workers. An added training benefit is that the program contributes to Stober's ISO quality system. "ISO mandates continuous improvement," Mitchell says. "The SKF bearing installation training improves an essential part of our gearbox assembly process. Plus it supports a key Stober business priority of maintaining high-quality standards."

Powerful Products

Stober markets its gearboxes to power transmission segments such as the general conveying, textiles, and chemical industries, but food and beverage conveyor applications are the company's primary source of business. "Each food and beverage market actually consists of multiple markets," says Mitchell. "You have general food processing, which is

then sub-categorized into specific products processed such as beef, pork, poultry, snack foods, spinach, and peanut butter. Each has specific gearbox requirements. Beverage is the same way since bottled water, fruit juice, beer, wine and spirits, and soda all call for different processing solutions."

Some of the requirements the gearboxes must satisfy include resisting chlorinated cleaners, sanitizers, wash-down sprays up to 1,500 psi, and conforming to a host of government regulations. Stober employs a variety of protective coatings, including an industrial epoxy that resists the rigorous sanitation regimens utilized throughout the food processing industry. The final coating layer for food duty applications has antimicrobial additives that prevent bacteria from propagating on the surface.

"For beef processing we have stainless steel leafing pigments and a clear coat epoxy that's very chemical resistant," Mitchell says, adding that the chemicals for sanitation are much more severe than elements in the food itself. "To control hazards like E. coli, salmonella, and listeria, the government has a very rigid requirement and volatile sanitation regimes. Stober gearboxes are specifically

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designed to meet these sanitation requirements.”

There are five gearbox series in Stober's MGS product line, giving design engineers a choice of types and technologies. The company's new KE series meets the rigorous guidelines of The American Meat Institute, which mandates that new equipment must be self-draining and completely free of harborage points where food or chemicals could collect. It comes in three frame sizes, can handle up to a five-horsepower motor, and has ratios ranging from 4:1 to 70:1. Others MGS models include:

- The C series with concentric helical gearing is a shafted unit that is recommended when a pulley or a chain sprocket is in use;
- The F series has offset helical gearing. Because it is offset, the motor operates on a plane that is different from that of the output shaft. This enables users to have the shaft up high on the reducer. The unit can mount easily in applications where there is an end joint and the conveyor line rolls around the head pulley;
- The K series—including the KE, with the “E” standing for “extreme”—has right angle helical/bevel gearing. The compact unit typically mounts right on the side of a conveyor;
- The S series, which has right angle helical worm gearing, is recommended for general power transmission applications.

Product Efficiency

Stober helical bevel gearboxes run at 97.5-percent efficiency, an operating characteristic that saves energy and helps justify premium pricing for Stober products. Efficiency is measured in terms of kilowatts in and kilowatts out. “With a Stober gearbox, when you put one horsepower in, then you get almost one horsepower out,” says Mitchell. “Conventional worm gearboxes typically yield about 60 percent efficiency, which consumes energy and incurs large energy costs.

“In today's business environment, professional purchasers are willing to pay more for a gearbox initially when we can demonstrate how much it can save over the life of a program. We do not offer a commodity product. Stober gearboxes are custom built, highly engineered, and shipped to order. We play in a high quality niche—food and beverage. And we are extremely successful there.”

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