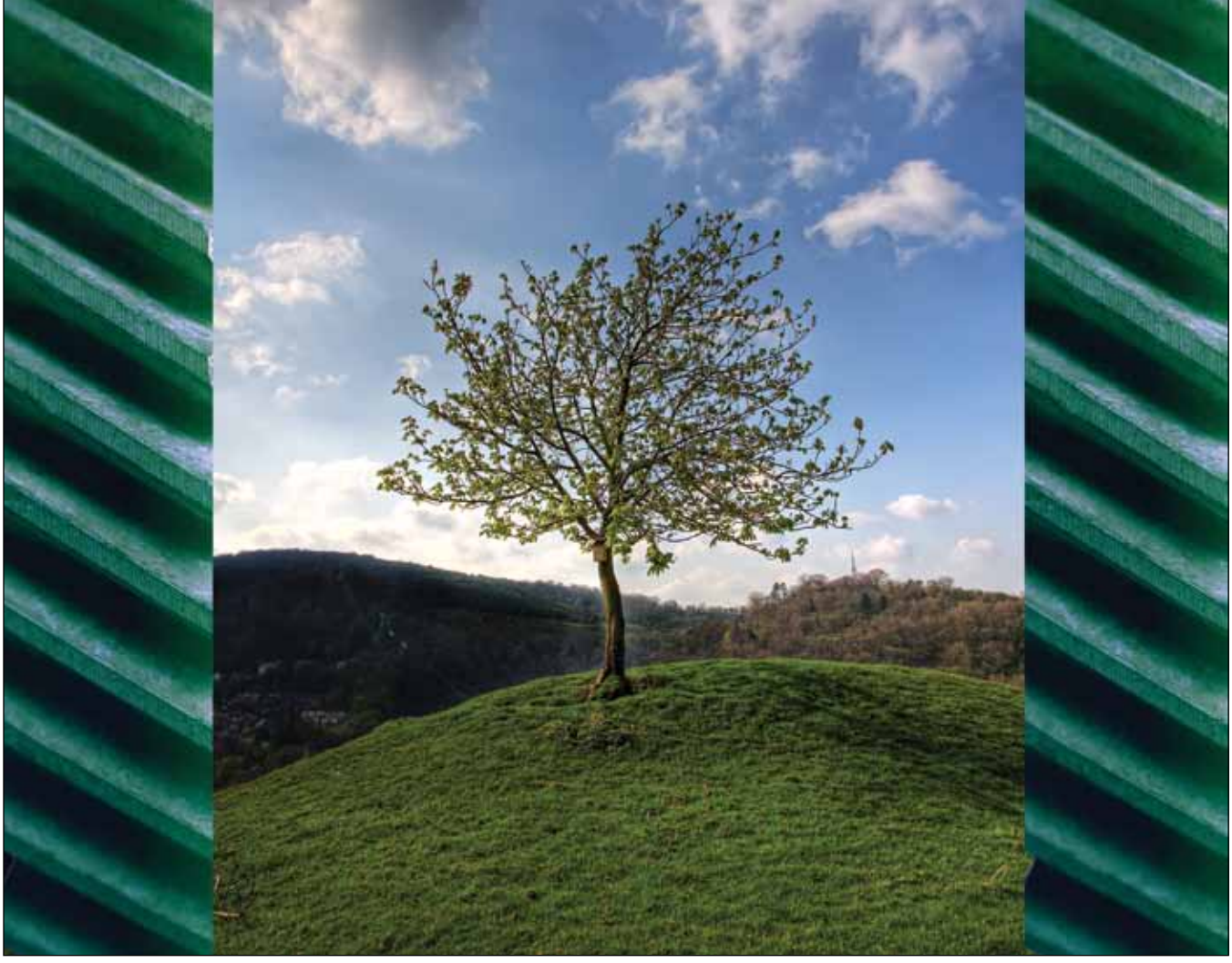


Helical Gearing Offers Green Alternative

UPGRADING TO GEARBOXES WITH HELICAL GEARING CAN SAVE ON ENERGY, MAINTENANCE AND LANDFILL SPACE

Stober Drives

The goals of any factory operation are to achieve profits—through cost savings and efficiency.

A long life for equipment results in lower equipment costs; reduced downtime and maintenance means lower operating costs; and low energy consumption equates to lower operating costs.

U.S. manufacturers need to modernize assembly lines in order to revive manufacturing here and compete in the global economy, says Peter Feil, vice president at Stober Drives, Inc. in Maysville, Kentucky. Yet today, Stober estimates that half of U.S. manufacturers still use outdated gearing technology that is low-cost, but inefficient and wears quickly, which wastes energy and causes premature failures.

Feil says helical gearing helps manufacturing go green by preventing breakdowns, saving energy and landfill space—and greatly improving the bottom line in U.S. factories.

"As we rebuild U.S. manufacturing and create jobs, productivity is the key to competing against low-wage labor markets. Highly productive and efficient equipment saves money, energy, materials and time," says Feil. "Going green in manufacturing is no longer an optional, feel-good choice; it is sound business and our opportunity to regain our competitive edge in the global economy."

As for the need to modernize assembly lines, there are endless miles of conveyors and tons of equipment that are being driven by inefficient motors and even more inefficient gear drives. "More efficient motors are now required by law, but gear reducers have been virtually ignored by our legislators," says Feil. "Many of these inefficient gear reducers use outdated worm and spur gearing, not helical gearing. We've done energy audits and find that many factories and processing plants are operating equipment at 60 to 70 percent efficiency, which is like driving your car with the parking brakes on."

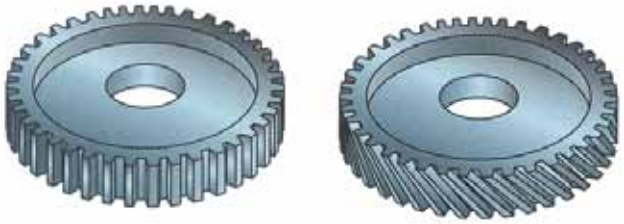
According to Feil, there are two common quality indicators in gearing that all engineers understand intuitively: high noise and vibration, and high heat generation.

High noise + vibration = low precision and limited life. Rotating machines that generate high noise and high vibration can have any number of quality issues: rotating components may not be balanced properly, which causes vibration; mating components may be machined to tolerances that are not precise enough regarding perpendicularity, concentricity and true position; or components may not be rigid enough, flexing under load, which can result in misalignment.

High- heat generation = low efficiency and wasted energy. High-heat generation is always the result of low efficiency in rotating machines, which can also have many causes, including inefficient design, misalignment, incorrect fits and large seal diameters creating drag.

Unfortunately, says Feil, low-quality gear reducers are a major contributor to industry downtime, maintenance problems and excessive energy consumption. For example, many American factories still have maintenance personnel named "oilers," whose job it is to check the oil levels in gear boxes and refill them if they are low. These gear boxes often have drip pans underneath them to catch oil as it leaks out. These gear boxes are typically so hot you cannot keep your hand on them for more than a second or two.

The angled teeth of helical gears result in smoother transmission and less noise and vibration.



Spur Helical

"Why do so many machine manufacturers use inferior gear reducers on machines that they sell to valued customers?" Feil asks. "Is it the American 'throw-away' mentality? Buy at the lowest possible cost and replace it whenever it fails? Of course, the initial cost of a machine is very important, but it is not the only factor that is important to the customer who hopes to run the machine for 10 to 15 years of high productivity, with few or no repairs. Manufacturers should go green just like every other industry has over the past few years. And when they do, they'll find that as efficiency rises, so do profits."

One example of green gearing is the evolution of gears from the use of inexpensive-yet-inefficient spur and worm gears to high-efficient helical gears over the last decade. Worm gears operate mainly by sliding contact, resulting in high friction. Spur gears operate mainly by rolling contact,

continued

Stober helical gearing is at least 95% efficient.

Recipe for a Green Gearbox

All Stober helical gearing is at least 95 percent efficient, according to company literature.

Stober helical gearing is machined with angled teeth, then hardened and ground, which is a complex but necessary process to achieve the high-efficiency gear mesh. "The teeth are cut across each gear at an angle, such that the gears gradually mesh," says owner Bernd Stober. "Because of the angled teeth, two or three teeth of each gear are always in contact with other gears. This alleviates the load on each tooth and creates a smooth transition of forces from one tooth to the next. The result: less vibration, wear, noise and a longer life."

Quieter gears mean good news for employee hearing, human resources departments and Occupational Safety and Health Administration (OSHA) officers, too.

Stober gears are designed to be nearly maintenance-free; the tooth profiles are designed to minimize gear wear; and since units are packaged in sealed, oil-filled housings, there are no oil changes required, which is another boon for the environment, says Peter Feil, VP of Stober Drives Inc.

Stober helical gear reducers come in many shapes, sizes and configurations, allowing machine designers to eliminate parts with high wear and high maintenance such as belts, pulleys, chains and sprockets. Factories can then assign highly-skilled maintenance staff to modernize equipment rather than repair outdated machines.

Other critical components of helical gearing include housings, lubrication, seals and bearings.

Housings

Many gear reducers are designed for ease of assembly or for highly-automated assembly, Feil says. "This does lower the overall cost slightly, but it can greatly compromise the integrity of the housing of the gear reducer and adversely affect the quality. These compromised designs have additional plates and gaskets that are then bolted together to form the housing. The result is that these housing assemblies flex, causing gear misalignment, noise, vibration and limited life."

Rigid, one-piece housings may make gear reducer assembly more difficult and a bit more expensive, but resultant housing stiffness and rigidity keeps shafts and gears precisely aligned, even at high loads. "Additionally, housings must be machined to very tight tolerances to ensure the optimal radial meshing of the gears, as well as the optimal perpendicularity of gears to each other," Feil adds.

Lubrication

Inefficient gearing generates high heat losses that in turn elevate pressures inside the gear reducers that require venting to the outside environment. Venting lets air out, but it also lets air in. Incoming air contains contaminants and adds moisture, which breaks down the oil inside the gear reducers.

"Stober helical gearing, because it is very efficient and does not generate much heat, allows gear reducers to be completely sealed, preventing moisture and contaminants from entering the oil chamber and breaking down the oil," says Feil. "Oil, under normal operation, should not break down and should not need to be changed for the life of a Stober helical gear reducer. Mineral oils are perfectly adequate for many applications."

Synthetic oils, for some very demanding applications such as continuous operations or high-ambient temperature environments, may be required to achieve the Stober "lubed for life" performance over many years.

Seals

Seal surfaces run at high speed against metal surfaces, thus making them the wear items that typically determine the life of a gear reducer. The highest-quality designs, materials and handling and assembly practices are required to ensure that oil seals perform to the level required for long-life gear reducers. "Stober uses the highest-quality seals available from the industry-leading supplier, without compromise," says Feil. "Preparation of the metal running surfaces that mate with seal lips is also of utmost importance. Machining and grinding of these surfaces to ensure proper seal run-in and operation are just as important as the seal choice."

Bearings

Bearings, whether roller, taper or cylindrical, are the other wear items within gear reducers with high-speed metal-to-metal rolling contact under various load conditions. Proper selection and sizing, correct handling and assembly are all critical in ensuring long life in gear reducers.

"The temptation to cut corners to lower initial cost is always present," says Feil. "Price competition in the market is fierce. Many companies attempt to lower costs in areas that result in a compromise of quality, although that was surely never part of the intent. Stober believes that cost control has to be in other areas like efficiency, waste reduction and continuous improvement, but the quality and durability of the gear reducers should never be compromised."

The initial cost of Stober helical gearing is somewhat higher than the cost of worm and spur gearing, Feil admits, but that investment is returned many times over during the life of the machine. Stober helical gear reducers are built to order and serviced in the United States. Stober credits its friendly customer service and hardworking Kentucky work force as a leading reason it has experienced continued strong growth since setting up shop there in 1991.

which is more efficient, but the teeth are cut straight across on a face; one or two teeth at a time are in contact with the mating gear, which creates lower load capacity and higher noise compared with a comparably sized helical gear set, says Bernd Stober, owner and former helical gearing designer at Stober.

"The right solution is to utilize high-quality gear reducers utilizing the best technology available, at a competitive price," says Stober. "Then you will have gear reducers that run cool and quiet for many years versus ones that need to be replaced after the warranty period expires in one to two years."

As with most complex products in manufacturing, there is not one single thing to point to that passes the litmus test of green manufacturing. Rather, it is an accumulation of careful attention to many details, with uncompromising commitment to quality that makes the difference between functional-yet- inefficient versus high-quality, sustainable gearing.

"Leadership in gearing technology requires the best people in the industry—with years of experience and a spirit of innovation and continuous improvement," says Feil. "Next, you must utilize only the best materials, processes, tools and the highest-precision equipment available."

"Helical gearing is 20 to 35 percent more efficient than worm gearing, depending on the ratios and the loading," Feil says. "Even for a one-HP motor running in a 24/7 operation, that can mean hundreds of dollars per year in energy savings. Since energy costs vary from region to region, and every application is different, we like to demonstrate to customers the actual savings on the customer's own equipment—in side-by-side comparisons—to competitor gear reducers."

"Helical gearing lasts 10-plus years under normal operating conditions," Feil adds. "Many Stober helical gear reducers have been running for over 20 years."

For more information:

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