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PTE Extras

EASA 2023 Highlights Motor, Pump and Machine Technology

The 2023 EASA Convention, June 25–27, at the Gaylord National Resort & Convention Center in National Harbor, MD. EASA showcased companies involved in the service and sale of electric motors, pumps, drives, controls, gearboxes and other rotating machinery. Highlights included synchronous motors, machine reliability, leadership, sustainability, EASA's 90th birthday bash, motor maintenance, pump repair, supply chain issues and more. Here's a recap of some of the technology on the show floor:



[powertransmission.com/blogs/1-revolutions/post/9312-easa-2023-preview](https://www.powertransmission.com/blogs/1-revolutions/post/9312-easa-2023-preview)

Low-Friction Bearings Reduce Energy Losses in Free-Stream Turbines

A hydro turbine company based in Portland, ME, has chosen Vesconite Bearings' lowest-friction material for the thrust bearings on its free-stream turbines. The material, Vesconite Superlube, has one of the lowest coefficients of friction of any plain bearing material available, with a coefficient of friction lower than virgin PTFE (polytetrafluoroethylene). "Thrust bearings made from this material were first ordered in June 2022 and installed in November 2022," states Petrus Fourie, renewable energy application developer.



[powertransmission.com/blogs/1-revolutions/post/9272-low-friction-bearings-reduce-energy-losses-in-free-stream-turbines](https://www.powertransmission.com/blogs/1-revolutions/post/9272-low-friction-bearings-reduce-energy-losses-in-free-stream-turbines)

Gates Publishes 2022 Sustainability Report

Gates recently published its annual Sustainability Report for 2022. The report highlights Gates progress on the four pillars of the company's sustainability strategy: Governance, Technology, Environment, and Stewardship.

[powertransmission.com/articles/9319-gates-publishes-sustainability-report](https://www.powertransmission.com/articles/9319-gates-publishes-sustainability-report)



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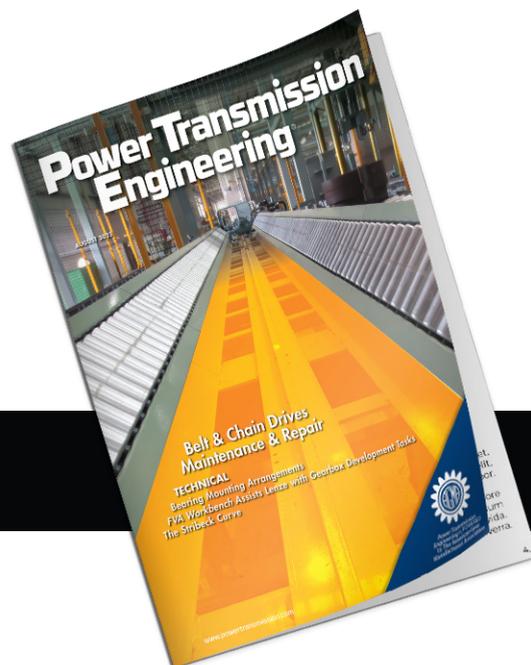
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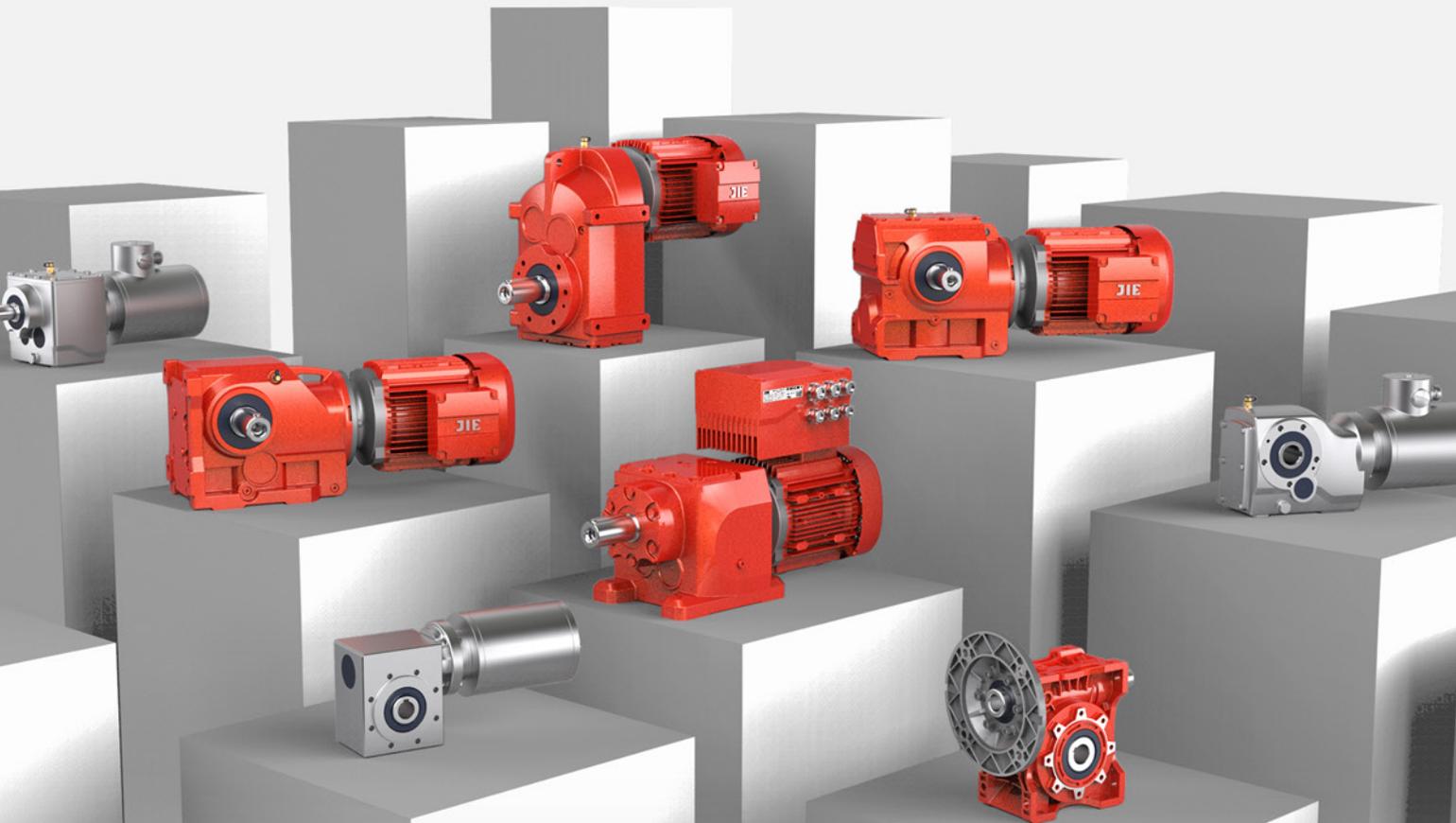
Michael Goldstein founded *Gear Technology* in 1984 and *Power Transmission Engineering* in 2007, and he served as Publisher and Editor-in-Chief from 1984 through 2019. Michael continues working with both magazines in a consulting role and can be reached via e-mail at michael@geartechnology.com.



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Smart Components are Getting Smarter

Are You Keeping Up?



After reading Senior Editor Matt Jaster's article this issue ("Advancing Technology for MRO," p. 18), I have visions of the maintenance engineer of tomorrow. He's not wearing a hard hat and steel-toe boots. No, he's wearing ripped jeans and a ball cap (backwards), and he's holding a game controller, because he's operating the drone system your company is using to do visual and thermal inspection of your equipment, saving you enormous time and effort in your predictive maintenance routine.

Okay, maybe he still needs the hard hat and boots, because eventually he'll have to go out in the field and fix something, but my point is that the skills required of this very old-school profession are definitely changing. It's critical that your organization changes, too—by investing in this type of technology, training people to understand and use it, and bringing on a new generation of employees who might already be comfortable with the technologies you need to implement.

And it's not just drones we're talking about. It's smart components with more and more sensors every year, hooked up to smarter and smarter systems with algorithms to spot problem areas and optimize processes and operations to speed production, reduce energy consumption and more. It's digital twins that can test and optimize solutions at a fraction of the cost. Artificial intelligence will have applications in every industry. MRO is no exception.

If you find yourself intimidated by all this change, I urge you to give it a chance. Don't be the guy who refuses to change because you've done your job just fine for the last 30 years. Don't resist it out of fear that the

powers-that-be are trying to replace you. Embrace the change and figure out how these new technologies can help you do your job better and more productively. Go out of your way to learn about these things.

One of the best ways you can do so is by seeing the technology and the people who develop it in person. It's trade show season, after all, and there are a few good shows coming up that will definitely have some of these cutting-edge components and systems on display. Here are some good choices:

- Pack Expo, September 11–13 in Las Vegas (packexpolasvegas.com).
- Turbomachinery & Pump Symposium, September 26–28 in Houston. See our show preview article on p. 14, or better yet, come visit us in person at Booth #1501.
- Motion+Power Technology Expo, October 17–19 in Detroit (motionpowerexpo.com). See the show advertisement on p. 23. This is AGMA's show, so we'll be there, in Booth #3132, with our popular live version of "Ask the Expert" in Booth #3136.



Technology is definitely not standing still, and you shouldn't either. It's time to up your game. So come out to one of these shows and talk to the suppliers and learn about what's new. Bonus points if you show up in ripped jeans and a reverse ball cap.

Randy Stott

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Faulhaber

DRIVE UNITS ADJUST SHUTTER AND FOCUS FOR CAMERA APPLICATION

Sports fans want to see every little detail, and the TV cameras deliver. Whether the goalie is clenching his jaw before the spot kick or the tennis ball clears the net by millimeters, everything is captured in detail. Images like these are only possible when the camera is up-close and doesn't interfere with the action. Many major tournaments and Olympic Games use miniature devices, which even fit in a corner flag, from the Wiesbaden-based specialist LMP Lux Media Plan. Drive units from Faulhaber are used to adjust the shutter and focus.

On October 14, 2012, Austrian extreme athlete Felix Baumgartner jumped out of a capsule that had previously travelled to an altitude of almost 39 kilometers by means of a helium balloon. In a free-fall from the stratosphere back to Earth, he reached a speed of 1,357.6 km/hour and was the first human being to break the sound barrier without the use of an aircraft. He opened his parachute 1,585 meters above ground and landed safe and intact.

TV stations around the world televised the preparations and the jump. The broadcaster of the main sponsor reported on the event live for more than 10 hours. Nine cameras delivered spectacular images—five inside the capsule, two showed the exterior of the capsule, and two more were attached to the performer's body.

The shutter and sharpness of the cameras were adjusted from the ground via remote control.

"The biggest challenge for the devices was heat," explains Friedel Lux, pointing out an unexpected obstacle, considering the freezing temperatures in the stratosphere. "The unfiltered sun radiation heated the housing enormously. And at that altitude there is no air to carry away the increasing heat. So, the cameras had to withstand quite a lot."

Industrial Camera on Ski Jump Tower

Originally, the founder and technical director of LMP developed it for "regular" professional sports. With his unique equipment designs for recording and image transmission, he had previously made a name for himself as a service provider for TV productions. In 2002 for the Olympic Winter Games, he received an

inquiry from an Italian TV station on whether it would be possible to mount an HDTV camera at the starting position of the ski jumpers at the top of the ski jump tower. "The space is very tight there, and the recorder wasn't to get in way, of course," Lux recounts. "So, we took a still rarely used camcorder and dismantled everything that wasn't critical to video recording."

The tiny device that remained enabled the TV station to literally look over the jumpers' shoulders. It didn't take long for other types of sports to discover the appeal of up-close footage. In 2004, LMP in cooperation with TV-Skyline for the first time mounted a camera on the net strut of a soccer goal, which showed every movement of the goalkeeper from behind and at the same time showed a view of the entire game situation from his perspective. The device could only protrude 3 cm into the area of the net.

The second generation was released in 2008: was completely further developed in-house under the commercial name "Cerberus" and it is still used today. You can find it in handball goals as well as on crossbars for pole vaulting and many other places where fans want a close-up view. The camera



head of the Cerberus is no bigger than three regular-size matchboxes stacked on top of each other.

Hellishly Efficient Drive for Cerberus

An even smaller version was developed for installation into the pole of a corner flag on the soccer pitch. It is currently being used in two top games of every match day in the Bundesliga. The cameras mounted on mobile cranes, which are part of everyday life in team sports in the top leagues, are also from LMP in many cases.

“In this case, it’s more about the weight than the size,” explains Lux. “The lighter the camera, the faster and more precisely the crane can perform the desired movements.”

The drive unit mounted on the camera plays a decisive role in the function of the Cerberus. It performs the mechanical work of adjusting the shutter and focus via a geartrain. To do this, LMP uses DC-motors from the 0816 ... S series and 08/1 gears with a diameter of eight millimeters from Faulhaber. The diameter of the corner flag camera is slightly larger, but the motors are shorter.

“For these types of applications, we need as much torque as possible with the smallest possible mass and volume,” Lux explains. “The gearhead is almost more important. It must withstand a lot and must be very robust. At the same time, it must ensure that the drive unit functions very precisely. Our top priority is that there are no sudden movements and everything works very smoothly, no fluttering, snagging, or start-up delays. Only then can you actually see whether the goalie is tense and by how many hair’s breadths the high jumper cleared the bar.”

But the drive units from LMP are not only used for sporting events. Lens controls for the aerospace industry, from Space-X through Boeing to Airbus, are also a part of the product range. Precision and robustness are of utmost priority here.

faulhaber.com/en/motion/camera-drive-unit/

Nidec Motor Corporation

EXPANDS MOTOR AND CONTROL CAPABILITIES



Nidec Motor Corporation’s “Super Premium” and above variable frequency drive (VFD) motors and all-in-one, integrated motors and controls provide efficiency ratings of IE 4 and IE 5 for remarkable energy savings compared to traditional single-speed motors.

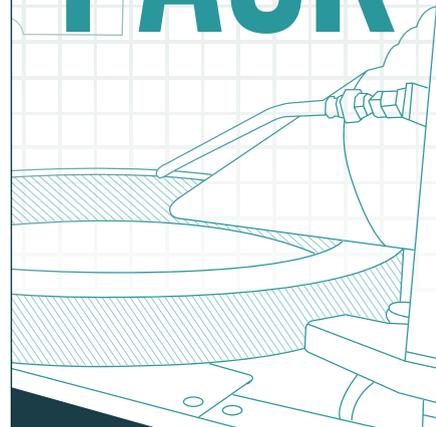
As energy costs climb, the need for the highest level of energy-efficient pumping equipment has never been more critical. Nidec continues to respond to that demand with its introduction of SynRA, an innovative, patent-pending, permanent magnet-free synchronous motor. Most ratings do not require additional permanent magnets to achieve excellent performance. When paired with the ID300 Perfectspeed integrated drive, the new motor offers one of the highest efficiencies available for today’s commercial pumping and HVAC equipment.

Nidec also offers the vertical HOLLOSHAFT motor which is backed by a century of ongoing innovation and is still the go-to product for agricultural, industrial, and municipal pumping needs.

The Rescue line of replacement motors for HVACR applications as well as the Nidec-Control Techniques brand of AC and DC variable speed drives, servos, and power conversion technologies for commercial and industrial applications were recently on display at EASA 2023.

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ADS Uptime

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ADS Uptime (Leine Linde) is an extremely useful condition monitoring system for encoders. Local wireless service check-up or system integration with ADS Link provides maximum flexibility to access data and diagnostics. With ADS Uptime, users can access live data and secure production uptime by making application health monitoring part of their proactive maintenance routine.

ADS Uptime is available with wireless connection for Leine Linde's 800 series. Users get remote access to the encoder's data and diagnostics with Bluetooth in the associated app on a mobile device. In the app, you can customize the alarm levels and then check the data live or look at detailed information for a specific time frame.

ADS Link is available for use together with Leine Linde's 800 and 2000 series encoders. With ADS Link you can integrate the ADS Uptime encoder into your company's existing maintenance systems.

Encoders with built-in ADS Uptime will enable monitoring the most relevant data from rotary installations and motors, as well as their surrounding environment. The system has pre-set alarm levels for working environment which are potentially harmful for the encoder, as well as a customer configurable warning system to adapt the diagnostic system to application specific parameters.

heidenhain.us

Kurt Hydraulics

INTRODUCES NEW STAINLESS STEEL COUPLINGS



Kurt Hydraulics has introduced a new lineup of stainless-steel couplings for applications ranging from marine hydraulics to food production and medical processes to fertilizer and chemical handling or other tough applications requiring washdowns.

Kurt Hydraulics stainless-steel couplings are manufactured from high carbon grade 316 SS with high nickel and chromium content, which provides resistance to chemical attack and corrosion, along with extreme durability compared to standard steel. Kurt stainless steel couplings meet or exceed SAE specifications and are U.S.C.G. accepted.

Available fitting styles include Female Straight Swivel, 37o JIC Female 90 o Bent Tube Swivel, 37o JIC Female 45o Swivel, Male Pipe NPTF Rigid, Male Pipe NPTF Swivel.

kurthydraulics.com

Iwis

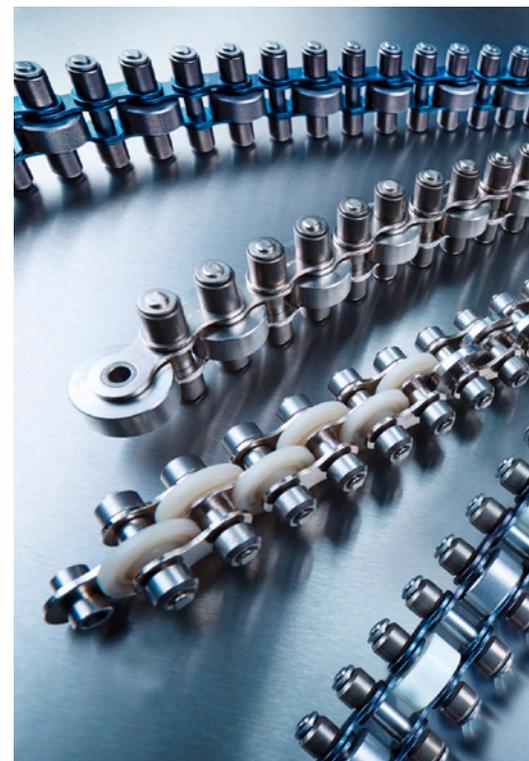
REDUCES DELIVERY TIMES FOR ACCUMULATION CHAINS

Shorter delivery times because of more efficient production was the explicit aim of the Iwis Czech plant. Iwis has invested massively in the automation of production in Strakonice in recent months to further reduce manual operations. New automatic machines for inner and outer

links were taken into operation to produce JWIS-branded accumulation chains, and chain assembly was also further automated.

Iwis accumulation chains guarantee problem-free positioning of conveyed goods via simple stopping points and prevent jolts when the belt starts and stops. The normal speed of the chains is 0.1 to 0.5 m/s. By fitting a simple acceleration rail, the transport speed at locations in which material is not accumulated can be doubled without changing the chain speed. Thanks to a special wax lubricant applied to the articulated points, the chains remain clean

and low maintenance. This lubricant is applied directly to the individual parts prior to chain assembly. As a result, the transport rollers on which materials are conveyed remain grease-free. A special-purpose initial lubrication can be used for specialized applications. Accumulation rollers are available in the following materials: hardened steel, stainless steel, nickel-plated or plastic (including antistatic).



- 1/2" accumulation chains of the types L85 SFK (with plastic accumulation rollers) and L85 SFS (with hardened steel accumulation rollers), construction: OS (standard version without washers)
- 3/4" accumulation chains of the types M127 SFK (with plastic accumulation rollers) and M127 SFS (with hardened steel accumulation rollers), construction: OS (standard version without washers)
- 1/2" accumulation chains of the types L88 SFK-SB (with plastic accumulation rollers) and L88 SFS-SB (with hardened steel accumulation rollers), construction: side bow accumulation chains
- 3/4" accumulation chains of the types M 120 SFK-SB (with plastic accumulation rollers) and M 120 SFS-SB (with hardened steel accumulation rollers), construction: side bow accumulation chains

The JWIS L88SF and M120SF accumulation chains offer optimized load distribution and the



offset arrangement of the accumulation rollers ensures better support and smoother running of the transported material. Offset accumulation rollers also reduce the load on the plastic guides by 50 percent: As a result, plastic guides can be used with up to twice the weight load.

In addition, Iwis has also invested in three new CNC lathes at the Strakonice plant in order to be able to produce 3/4-in. plastic or steel accumulation rollers more efficiently with immediate effect. And this also results in significantly shorter delivery times. The raw material for a wide variety of accumulation rollers is mostly kept in stock. This means that custom accumulation roller types can also be produced at short notice.

iwis.com

Ruland

OFFERS BEAM COUPLINGS FOR ROBOTIC APPLICATIONS

Ruland beam couplings are ideal for surgical, warehouse, and industrial robotics due to their increased torque and torsional stiffness and ability to accommodate all forms of misalignment. Ruland manufactures four-beam couplings for encoders and six-beam couplings for light-duty power transmission, such as connecting a stepper or servo motor to a lead screw. This allows robotic designers to design a standard beam coupling into most systems.

Ruland machines beam couplings from a single piece of aluminum or stainless steel for a zero-backlash design and maintenance-free service life. Multiple sets of spiral cuts enable Ruland beam couplings to handle all forms of misalignment—angular, parallel, axial motion, and complex—through frequent starts and stops. The multiple-beam design also allows for higher torque and torsional stiffness than commodity-style single-beam couplings. Ruland manufactures beam couplings in 7075 aluminum for low inertia and 303 stainless steel for increased torque capacity.

Ruland F-Series six-beam couplings have two sets of three beams allowing them to maintain accuracy,



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repeatability, and reliability in robotic systems. They have larger body sizes than comparable four-beam couplings for increased torque and torsional stiffness. F-series clamp-style beam couplings are supplied with Ruland's proprietary Nypatch anti-vibration hardware to prevent screws from loosening during operation.

Ruland P- and MW-Series four-beam couplings have two sets of two beams for increased flexibility and reduced bearing loads compared to the six-beam style. They also have shorter lengths, making them suitable for space-restricted applications commonly found in encoders. MW-Series couplings have nominal metric dimensions to better fit with systems with metric components.

Ruland offers beam couplings with a clamp or set screw hub attachment with

inch, metric, and inch-to-metric combinations ranging from 1/8 in. to 3/4 in. and 3 mm to 20 mm. They are manufactured in Ruland's Marlborough, MA, factory under strict controls using proprietary processes. Nonstandard designs such as anodizing, nonstandard bore sizes, and special tolerances are available upon request.

ruland.com

Timken's FOOD AND BEVERAGE PORTFOLIO CONTINUES TO SOLVE EQUIPMENT CHALLENGES

The Timken Company is experiencing strong demand for the broad range of application-proven products and services it offers the food and beverage industry. Timken has built a comprehensive food and beverage portfolio through both organic and inorganic growth, including its 2022 addition of GGB Bearings, and achieved a total sales compound annual growth rate of more than 30 percent in the market-sector over the last five years. The company expects an expanding global footprint, new product line launches and growing demand for food worldwide to drive additional growth in the coming years.

"Timken's growth in food and beverage is a great example of how we're combining the power of our core bearing business with our industrial motion capabilities to extend our value proposition and increase scale in growing markets," said Andreas Roellgen, executive vice president and president of Engineered Bearings. "Our engineers work hand-in-hand with manufacturers and end users to help solve food and beverage processing equipment challenges to improve food safety, hygiene, reliability and efficiency."

As part of Timken's growth strategy, the company is leveraging its decades-long relationships with manufacturers to design some of the safest, most durable and reliable products in the food and beverage industry. In the aftermarket, Timken's premium value proposition resonates in an industry where equipment failure and downtime can be catastrophic. Most industrial motion and bearing positions in a food-processing plant have short replacement cycles and can be converted to Timken products. In addition, the market for food and beverage processing equipment is estimated to increase from \$64.6 billion this year to \$84.9 billion by 2028.

timken.com





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Get Pumped for TPS 2023!

An essential annual industry event for rotating equipment engineers and technicians worldwide

Aaron Fagan, Senior Editor

The Houston Turbomachinery & Pump Symposia (TPS) began as a 200-person Turbomachinery Symposium on the campus of Texas A&M University in 1972. The Pump Symposium was founded in 1984 and joined forces with Turbo to become a combined event in 2011. TPS, still organized by the Turbomachinery Laboratory at Texas A&M University, will gather for the 52nd Turbomachinery and 39th Turbo annual event from September 26–28, at the George R. Brown Convention Center in Houston.

TPS is a vital industry event that offers a forum for the exchange of ideas between rotating equipment engineers and technicians worldwide. For over 50 years, TPS has been known for its impact on turbomachinery, pump, oil & gas, petrochemical, power, aerospace, chemical, and water industries through two pathways: the technical program and the exhibition.

The Technical Program

Two Advisory Committees (Turbomachinery and Pump) are comprised of dedicated industry experts who volunteer their time to oversee the success of the Turbomachinery & Pump Symposia. Advisors are respected leaders in their companies and fields who select the technical program for TPS each year. One of the greatest assets of the Turbomachinery & Pump Symposia is its professional continuing education program, relied upon by rotating equipment and pump engineers and technicians worldwide, spanning oil and gas, petrochemical, power, aerospace, chemical, and water industries. The program consists of short courses, case studies, discussion groups, lectures, and tutorials that are led by highly respected practitioners and pioneers in their fields. Topics include maintenance, reliability, troubleshooting, and instruction on emerging designs, technology, and best practices that include case studies with real-world relevance on problems solved and lessons learned. The Proceedings from each symposia become available to the public at no cost six months after the event through the Texas A&M library.

- Short Course—Full-day training sessions presented on the first day of the Symposia.
- Lecture—Presentation of a technical paper detailing emerging technology.
- Tutorial—A 90-minute mini-course/workshop.
- Discussion Group—A forum in which industry leaders and delegates participate together to share topical problems, solutions, and best practices.
- Case Study—A short presentation describing the successful implementation of established technology to solve a real-world problem.

The Exhibition

The TPS Exhibit Hall is a forum—gathering attendees from close to 50 countries—for exploring innovation and forging new relationships. Visit the booths of more than 350 leading turbomachinery and pump companies that will feature full-size equipment, new technology, and emerging industry trends.



The TPS peer-reviewed technical program is revered for its spirited debates among members of the turbomachinery, pump, oil and gas, petrochemical, power, aerospace, chemical, and water industries.

Overview

TPS is known for its spirited engagement with turbomachinery, pump, oil and gas, petrochemical, power, aerospace, chemical, and water industries through its peer-reviewed technical program and world-class exhibition, but there is also the Women of TPS Luncheon, Innovation Presents (formerly Turbo Stage), a tour of the Turbomachinery Lab at Texas A&M University in College Station, and more.

In 2022, the conference saw 3,815 attendees, hosted 94 technical sessions and had 274 exhibiting companies. From 2021 to 2022, TPS saw an increase in international delegates, with just 19 countries represented in 2021, to 44 countries represented in 2022. We will be sure to report back with what we discover this year and hope to meet you there!

tps.tamu.edu

PTE



The Women of TPS Luncheon became an annual tradition beginning in 2019.



Dr. Eric Petersen is the Director of the Turbomachinery Laboratory at Texas A&M University, which hosts the annual event.

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Advancing Technology for MRO

Sensors, drones and software highlight latest condition monitoring tools for PT components

Matthew Jaster, Senior Editor



The Maintenance, Repair and Operations (MRO) segment of mechanical power transmission has been one of the largest benefactors of smart technology. The prediction and prevention of catastrophic failures and unplanned downtime has vastly improved areas like mining, energy, off-highway, and other industrial segments. This data-driven analysis enables manufacturers to combat breakdowns, schedule component upgrades and enrich future design features. Clearly, this is an area where 24/7 surveillance is a good thing.



DriveRadar IoT for Gear Units with SEW-Eurodrive

SEW-Eurodrive displayed its DriveRadar IoT Suite condition monitoring and predictive maintenance system for recording and evaluating operating data from industrial gear units at Hannover earlier this year. The IoT Suite makes it possible to reliably predict the behavior of drives and system components and plan maintenance and repair measures in advance, thereby avoiding unplanned downtime.

The DriveRadar IoT Suite uses the operating data it records to determine the condition of industrial gear units and systems.

Data analysis processes can be applied to accurately predict imminent damage. This means that the DriveRadar IoT Suite can prevent unplanned downtime and disruption to operational procedures, identify wear, and minimize idling times.

When utilizing the DriveRadar IoT Suite for industrial gear units, all operationally relevant, mechanical parameters on the industrial gear unit are measured by high-precision sensor technology and then evaluated and interpreted with the aid of machine learning methods. As a result, the customer always has a transparent overview of how healthy the monitored gear units are.

Analysis algorithms can help allocate anomalies directly to a component, which makes troubleshooting much more straightforward. Besides being notified of any operational anomalies that are detected, customers are also given recommendations on what to do, told which services could help, and issued with predictions regarding the remaining service life of the gear unit, oil, and other components. This means maintenance interventions can be planned at an early stage and spare parts procured in good time, thereby ensuring the industrial gear unit can be operated on a sustainable basis with minimal risk of failure.

The DriveRadar IoT Suite for industrial gear units is available ex-works for new Generation X.e helical and bevel-helical gear units. However, retrofitting is also possible. Industrial gear

units that are already installed can be fitted out for monitoring with DriveRadar IoT as well.

sew-eurodrive.com

Continental Tracks Belts and Idlers with Drone Inspection System

Continental offers the Conti ConveyorInspect drone-based inspection system to allow operators to easily know the condition of their belts and idlers, quickly locate the exact position of failing idlers, and track changes in rotating components over time. With this real-time reporting, operators can better estimate their system's component life and plan their maintenance. This helps prevent costly damage of conveyor system components and minimizes downtime.

As a remote, drone-based system, the system can protect service technicians by avoiding time-consuming, manual inspections.

The Conti ConveyorInspect system can provide autonomous visual monitoring or can be guided by a drone pilot. During automated inspections, an infrared and RGB camera-equipped drone inspects both sides of the conveyor following a preprogrammed flight routine. Once the mission is completed, the drone returns to an autonomous charging station and uploads all the relevant visual data to the cloud. With the Drone Pilot inspection routine, a certified pilot controls the drone and collects data in dangerous or hard to reach places.

Once collected, visual data is uploaded to the cloud via the ConveyorInspect portal, and the data is processed and analyzed by an Artificial Intelligence (AI) based data pipeline. The data analysis and reports can be reviewed via the ConveyorInspect app available on desktop and mobile platforms.

Conti ConveyorInspect has been engineered and built for the demanding conditions found in mining and extraction. The drone can operate in temperatures of -4°F to 113°F while inspecting conveyors at an average speed of three feet per second. With up to 40 minutes of continuous flight and a charging time of only 40



minutes, ConveyorInspect can operate over a maximum range of three miles (5 km) and at a maximum altitude of 400 ft. (130 m). The drone is equipped with a 4K Daylight Camera and 640x512 thermal camera with a frame rate of 30FPS.

"Manual belt inspections are time consuming, costly and lack accuracy. Conti ConveyorInspect provides an 'eye in the sky' that scans the entire belt system. It saves time making predictive maintenance easier than ever," said Rob Schulz, Continental Marketing Communications Americas.

continental.com

SKF Extends Microlog Analyzer Family

SKF has extended its Microlog Analyzer family of data collection devices with a new model that offers faster measurement collection and greater diagnostic power.

"The new SKF Microlog Analyzer dBX that is part of our broad portfolio of condition monitoring solutions, built on state of art technologies, is a powerful tool for standalone troubleshooting as well as being part of a comprehensive predictive maintenance program" says Janne Westerlund, director services and technologies EMEA at SKF. "SKF Microlog Analyzer dBX together with our analytic software is providing best in class information and insights of customers' rotating asset health."

This unique portable solution coupled with analytic software significantly improves the way to schedule maintenance of rotating machines establishing the right and fast diagnostic thanks to its embedded features.

When used as part of a condition monitoring solution, the SKF Microlog

Analyzer dBX can detect issues with rotating machinery quickly and accurately.

“Our new SKF Microlog Analyzer dBX takes measurement with our MPA-in-a-flash method, which makes the device extremely powerful,” says Christophe Andre, project manager at SKF. “Multi-Point Acquisition (MPA) is our fastest vibration analysis method. It is typically three times faster than the previous Microlog series, saving you time taking measurements and helps to collect data more efficiently.”

The device allows the user to carry out a range of tasks including impact tests, digital recording, modal analysis, multi-plane balancing and cross channel phase. It can be applied in any type of industries including pulp & paper, food & beverage, renewable energy, mining, off-highway, metals, automation and marine.

The SKF Microlog Analyzer dBX is backwards compatible with SKF’s proven existing Microlog CMXA Series and adds new technology including a high-resolution, 10.1-inch screen that can display up to six measurement windows at the same time, and an embedded camera. Furthermore, it features a hybrid touch and keypad control as well as a simplified navigation, making it more comfortable and easier to use.



[skf.com](https://www.skf.com)

ONYX Insight Partners with Nearthlab on Drone Technology for Wind Systems

ONYX Insight and Nearthlab recently announced a formal partnership that delivers whole turbine predictive maintenance in one cohesive solution.

The industry is currently seeking to make operations more efficient, amidst



the backdrop of a labor, resource, and inflation-challenged environment. Together ONYX and Nearthlab will bring capabilities for large operators that address these challenges.

As part of this partnership, ONYX will utilize Nearthlab’s experience with mobile drone technology, reducing reliance on the availability of trained drone pilots and enabling self-performing operators to perform visual inspections of their turbines’ blades for substantially lower costs.

“After 2 years of collaboration with Nearthlab across large fleet of assets, we’ve identified strong benefits to turbine health management by combining our technologies into one unified offer. For major components in a fleet, the damage cases can be managed efficiently, end-to-end, from detection through to repair and QAQC,” said Ashley Crowther, chief commercial officer, ONYX Insight.

Additionally, they recently expanded the partnership beyond North America to Europe and APAC.

“The rapid evolution of our partnership is a result of growing market demand for an end-to-end maintenance solution,” said Jay Choi, co-founder and CEO, Nearthlab. “Our integrated suite of solutions

offers a unique ecosystem for maintaining turbines from blades to the drivetrain, empowering operators to streamline O&M workflows with fewer resources.”

The partnership brings together Nearthlab’s prowess in mobile drone technology and ONYX Insight’s depth of experience in turbine reliability engineering, drivetrain integration, blade health monitoring, and enterprise management systems.

“We’ve only scratched the surface as to how a holistic approach to turbine maintenance can reshape wind O&M,” added Crowther. “Together with Nearthlab, we’re working to put comprehensive maintenance capabilities in the hands of wind farms across the globe, and our continued expansion will serve as a big step forward in that very direction.”

[onyxinsight.com](https://www.onyxinsight.com)

Flender Offers a Smart Drivetrain

The digital enabler of all measurements and optimizations is Flender’s new gearbox intelligence AIQ. Its sensor technology and analysis functions continuously measure the torque and detect whether the gearbox and the plant are driven in over-

load or underload: the key to optimization and automation of the production processes and, moreover, to perfect design and dimensioning of the gearboxes for future plants. Thanks to AIQ, the gearbox becomes the central player in a constantly optimizing process that reduces CAPEX and OPEX and makes industrial production sustainable - thanks to raw material savings and more energy-efficient manufacturing processes.

The special feature of AIQ is the intelligence in the sensor. It not only records operating states, but also processes them directly, interprets them, and provides operators with recommendations for action - on site at the sensor, via app, or permanently in the customer's own system. This offers operators many opportunities to increase the profitability of their plants. The detailed condition monitoring of the individual components detects deviations from the optimum at an early stage and enables the prediction of possible failures. Operators are thus able not only to control the drive and processes, but to optimize them. Precisely scheduled maintenance and reduced downtimes are the result.

"Our goal is to make the world more sustainable together with our customers and partners. This is what our products stand for. With Flender One, our customers receive a completely new type of gear unit solution, precisely tailored to their application, exact to their requirements



and preventing waste while utilizing the smallest drive concept possible. If industrial gearboxes were cell phones, this drive would be the latest smartphone," says Andreas Evertz, CEO of the Flender Group.

www.flender.com

Force Technology, Hexagon and RoboDK Collaborate on Gear Repair

Force Technology recently partnered with Hexagon Manufacturing

Intelligence and RoboDK on making gear repair a more sustainable process for manufacturers.

The purpose of the project was to improve laser welding procedures and determine if sustainable gear repair was possible using robot tool-path programming, digital twin, simulation, and post-processing. Improving this practical application with robot simulation reveals a sustainable gear repair process that can guarantee high-quality results.




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Repairing the gear using industrial robots and robot simulation will help industries reduce waste, energy consumption, and the cost of replacing components. This application is designed for the MRO process and focuses on safely restoring repaired gears to service.

Using industry knowledge from Randers Gears and Villiam Petersen Tandhjulsfabriken Horsens, the project proceeded using Force's experience in laser welding.

The project used Direct Energy Deposition (DED) Technology, a process that follows a toolpath created directly from a CAD geometry and builds up parts in successive layers. In this case, the DED toolpath has been programmed using *ESPRIT* additive toolpath programming features, a CAM software from Hexagon Manufacturing Intelligence.

RoboDK's digital twin and post-processing features were used to generate the robot program. The RoboDK extension in *ESPRIT* simplified communication between systems and made it easier for end-users.

Force Technology used a 6-axis Kuka robot arm mounted on a rail (linear axis), a tilting table for rotary operation, and a spindle to produce the part.

Additionally, a GTV cladding head (powder and laser) enabled additive functions resulting in an overall cycle time of 5 minutes when reloading Steel 4140 parts.

"The project was a big step stone towards making gear repair more standard and achieving the required guarantee of quality and confidence to put repaired gears back into service from the gear manufacturers," Ivar Dale, additive manufacturing specialist at Force Technology.

RoboDK's simulation and offline programming tools can also reduce production downtime caused by shop floor programming. Companies can test a robot's abilities in a virtual environment with RoboDK.

"Using the path planner additive solution from *ESPRIT*/Hexagon, and the post-processor from RoboDK we saved a tremendous amount of time to program the path with a 1 mm positive offset as

the shape of the tooth was organic. This saves us time in printing, especially in larger repairs, but it also saves the gear manufacturer time as the material we add is very hard and every mm takes time to carefully CNC," Dale added.

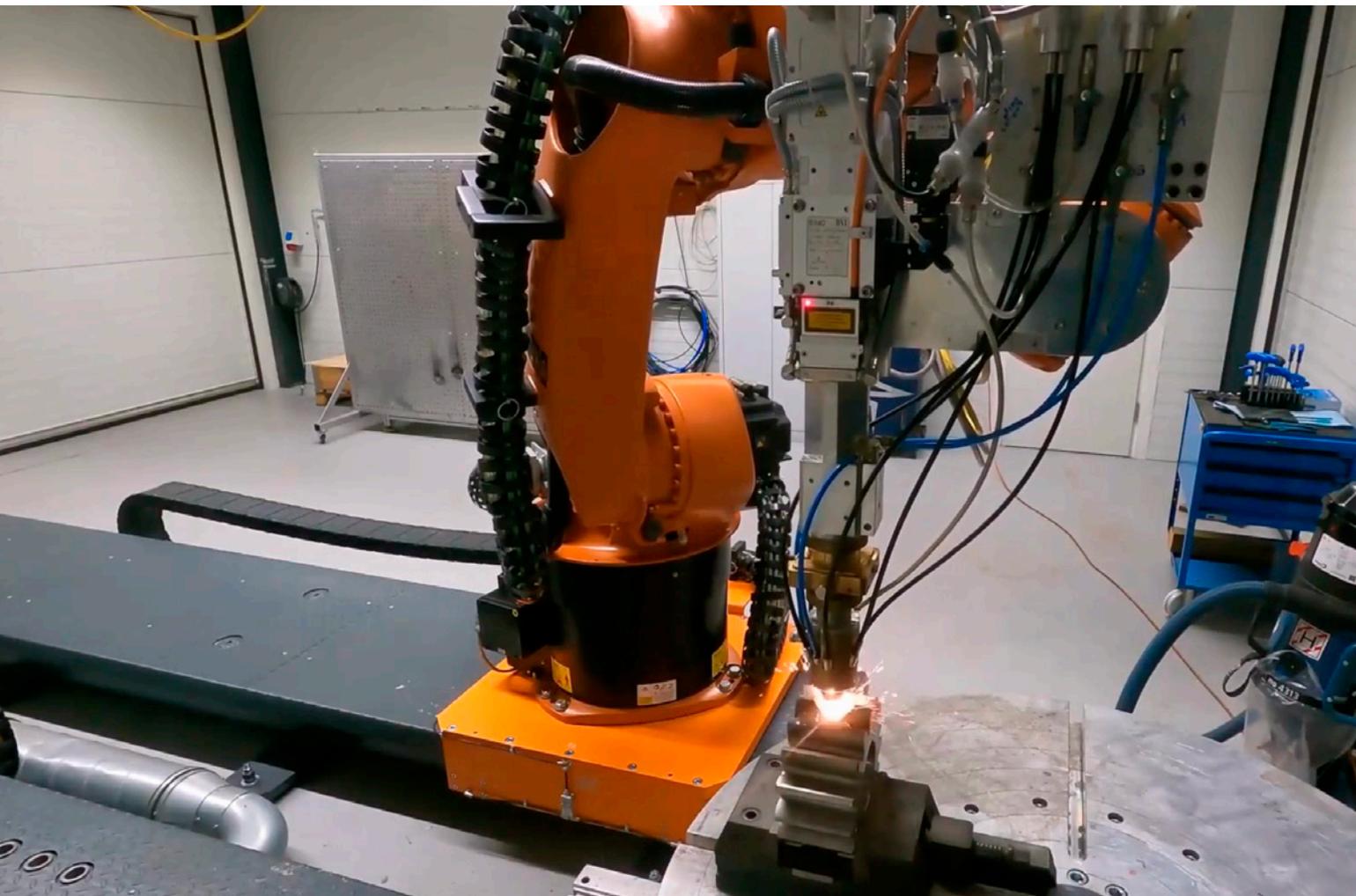
Overall, Force Technology employed *ESPRIT*, Hexagon's "Hybrid" CAM to program additive head path planning, and RoboDK to resolve kinematics and collisions while generating robot code to create the toolpath trajectories for additive manufacturing.

Ever mindful of their environmental responsibilities, the project enabled Force Technology to determine how to repair a gear instead of replacing it. In turn, they avoided throwing away a whole part and wasting materials and labor costs.

In addition, they kept downtime and costs low due to eliminating the need for replacement parts. The project is a successful example of how robot integration can improve MRO.

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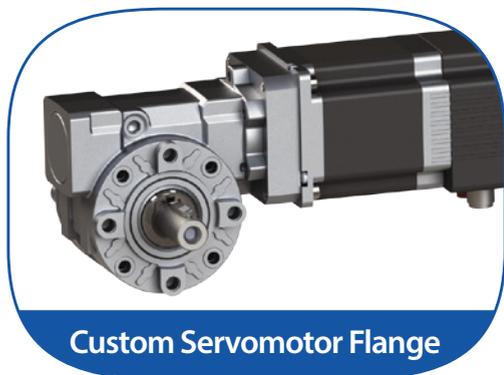


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Gates Design Power and Gates Design Power Mobile combine unique functionality to provide an end-to-end solution that can help from basic troubleshooting and site surveys to full site chain-to-belt replacement.

Desktop Belt Drive Services with Gates

Software platform provides end-to-end mobile troubleshooting and file management capabilities.

Amanda Williams, Gates Corporation

If you have ever installed a belt drive, you know the process can be time-consuming and frustrating, and installation is only half the battle. And if you have ever specked-out a belt drive on-site with a customer or supervisor watching, you know it can be worse than parallel parking a semi-truck on Main Street. Understanding our customers' challenges is what inspired us to develop our latest belt drive software solutions: *Gates Design Power* and *Gates Design Power Mobile*. These two platforms combine unique functionality to provide an end-to-end solution that can help from basic troubleshooting and site surveys to full site chain-to-belt replacement and create your most complex power transmission (PT) design applications.

What Is Design Power?

Design Power is a desktop application that combines the best of Gates PT design services into one easy-to-use software package to support the engineering and specification of belt-drive systems. Simply put, it helps you select the right belt-drive components to create the design quickly, easily, and properly. *Gates Design Power* features updated and upgraded versions of *Gates Design IQ* and *Design Flex Pro* applications. In addition to the user-friendly functionality of each specialized design module, *Design Power* leverages a state-of-the-art knowledge library with design guidance and sophisticated belt performance models. Automatic syncing with the Gates catalog streamlines and empowers the design process with direct access to the latest products, specifications, and ratings.

Design Power also adds new organizational features with digital collaboration tools, such as holding multiple designs in a single project file, tracking design derivatives, and iterations, and noting who made what changes along the way. Best of all, it is completely free and regularly updated.

Why a Mobile App?

In April 2023, combined the best of the desktop version with extra features to assist our users while in the field. Gone are the days of keeping track of paperwork after documenting the details of the drives that need to be converted. Simply download the *Design Power Mobile* app to use the Distance Measurement tool and the Flashlight RPM Meter to estimate the center distance and speed of your belt drive to identify the right specifications. Then, after installation of the new belt, measure the noise reduction percentage using the built-in Sound Meter and turn on the Sonic Tension Meter in the app to ensure proper belt tension on the spot. With *Design Power Mobile*, you can do all these tasks with increased safety since using internal mobile device functions eliminates the need to place your hands on the drive itself.

Finally, the details of each facility's drives can be stored in the most highly touted feature of the *Design Power Mobile* app: Facility Management. With the Facility Management tool, design reports are separated by facility and location, and users can set up replacement reminders and record service dates. The extended support tools of this mobile app allow for a full evaluation of each drive on-site to help ensure no additional follow-up work later in the process.

How Do the Mobile App Modules Work Together?

We created an end-to-end support solution for the people we serve. Putting ourselves in the shoes of inside sales, outside sales, customers, and field engineers, we considered the example of a Power Transmission (PT) site survey to demonstrate the efficiency and effectiveness of *Design Power* modules working in harmony.

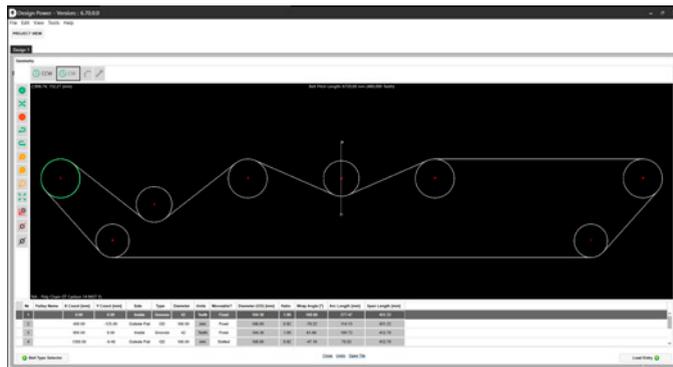
There are many factors to consider in a chain-to-belt (C2B) or belt-to-belt (B2B) conversion. Will belts work as well as chains? What kind of new technology is out there to support this conversion? How much money can I save over time? Who will help me understand the new products and assist with the actual installation of the new drive? Are V-belts still the best option, or would a synchronous belt be better for my application? In all these situations, adding *Design Power* to Gates user's tool kit makes the process even more efficient.

Imagine doing a full survey of the drives at a facility. Normally, you would walk through the full site with several sheets of paper, a pen, and several different measurement tools. All the drives would need to be shut off for safety, creating downtime in production or requiring the evaluator to begin working after hours. *Design Power* allows you to keep all drives running while completing the site survey during normal business hours - with minimal interruption to daily tasks and carrying only a tablet or phone.

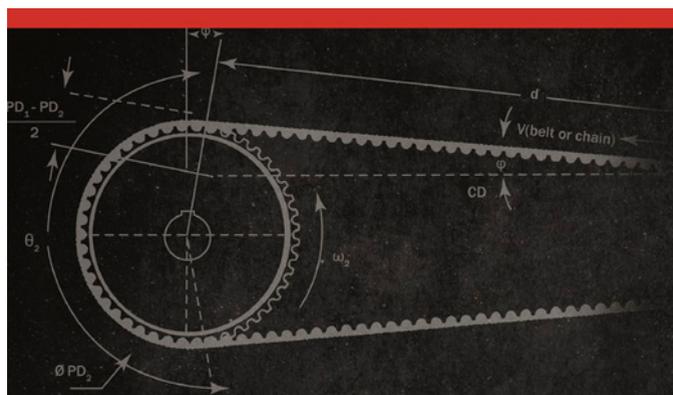
As an example of the simplicity of the *Design Power* application, one begins the site survey by creating a new entry for their facility, keying the details right into the Facility Management tool on their mobile device, and hitting save. From there, start the walk-around with the maintenance repair team or Gates representative. As belt-drive replacement or conversion opportunities are identified, enter the details into *Design Flex Pro*. This tool generates solutions meeting all predetermined requirements and prioritizing cost-effectiveness. Select the best option for the site and then click to add that option to the facility entry. All the inputs and possible solutions are reliably stored for future reference or changes. At any point in the process, one can add more people as facility managers, allowing them to view and collaborate on the project using the information gathered during the original survey. On installation day, users rely on the Facility Management tool to access key drive details like recommended tension specifications and part numbers and store details like install dates and tension for future reference. Using built-in app modules, such as the Sonic Tension Meter and the Sound Level Meter, directly from Facility Management allows the ability to streamline data collection and instantly store it within the specific drive entry. Through this process, all team members can take advantage of the maintenance and replacement reminders to avoid unplanned downtime and keep things organized.

So, Why Did Gates Create Design Power for Multiple Platforms?

Gates created *Design Power* to give users maximum flexibility - plain and simple. The mobile and desktop versions provide access to our valuable tools on your devices, and we even offer a web version with no software installation required, extending access to any user and any device with a web browser. Thanks to our modern software architecture, all three platforms utilize the same back-end data and calculations, ensuring consistent experiences and results. Data is stored in the cloud, so facilities, designs, and most settings link to your account



Gates Design Power features updated and upgraded versions of Gates Design IQ and Design Flex Pro applications.



Design Power offers new organizational features with digital collaboration tools, such as holding multiple designs in a single project file, tracking design derivatives, and iterations, and noting who made what changes along the way.

and are available across platforms. Not feeling ready for the challenge of replacing your drives by yourself? The Gates Power Transmission Product Application team is available for questions and support. Call 303-744-5800 or email PTPAsupport@gates.com today for personalized assistance from the Gates team.

Need some help answering a *Design Power* app or program-specific question? Email our Gates Design Software Support at GatesDesignSoftwareSupport@gates.com for further support with *Design Power* programs.

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Amanda Williams, content marketing manager for Global New Product Introductions at Gates Corporation, has five years of experience talking to customers about Gates products. Her constant collaboration with marketing, sales, and product application teams results in a well-rounded understanding of the ways Gates products and systems are used in the real world.

KISSsoft Supports Student Racing Team in Poland

AGH Racing—Innovating and Designing Formula Student Vehicles

Mikołaj Krawczyk, Deputy Project Manager, EV Powertrain, AGH Racing

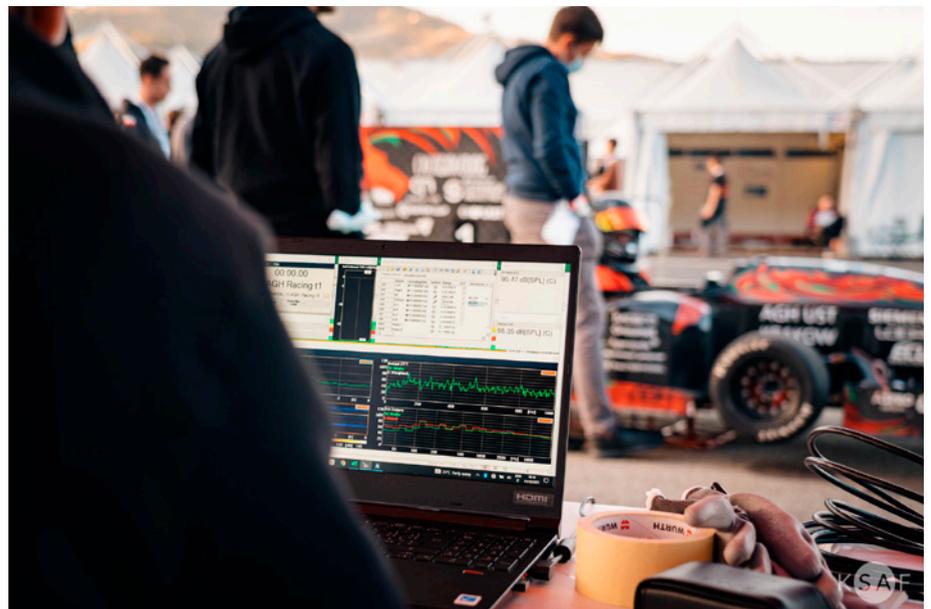
The idea of creating the Formula Student team representing the AGH University of Science and Technology in Cracow was born in 2012 and came to life soon after. That's how AGH Racing was established. The team didn't wait long and started building their first car—RTC1.0. It was equipped with a 68P S internal combustion engine. The vehicle itself weighed around 380 kg. It took part in its first competitions in 2013 in Hungary and then at the famous Silverstone Circuit. In the following years, the team presented RTC2.0 and RTE3.0, but the streak of success began with RTC5.0, which lasted from 2017 to 2019. It is the most successful car with five podiums, including two wins in the Acceleration competition. The measured 0-100 km/h time was 3.99 seconds. The car weighed less than 200 kg, which with the engine power of 98 PS explained its great performance.

While running RTC5.0, the team decided to try their hand with an electric powertrain, which is still gaining popularity. In 2018, the RTE1.0 was presented, which was mainly a testing ground for the successor. Thanks to RTE2.0 they became the first team in Poland to successfully pass the technical inspection for the Formula Student Electric Vehicle class. The second EV still holds the title of the lightest car in the team's history, with a curb weight of 190 kilograms, allowing it to accelerate from 0 to 100 km/h in 3.5 seconds, half a second faster compared to RTC5.0.

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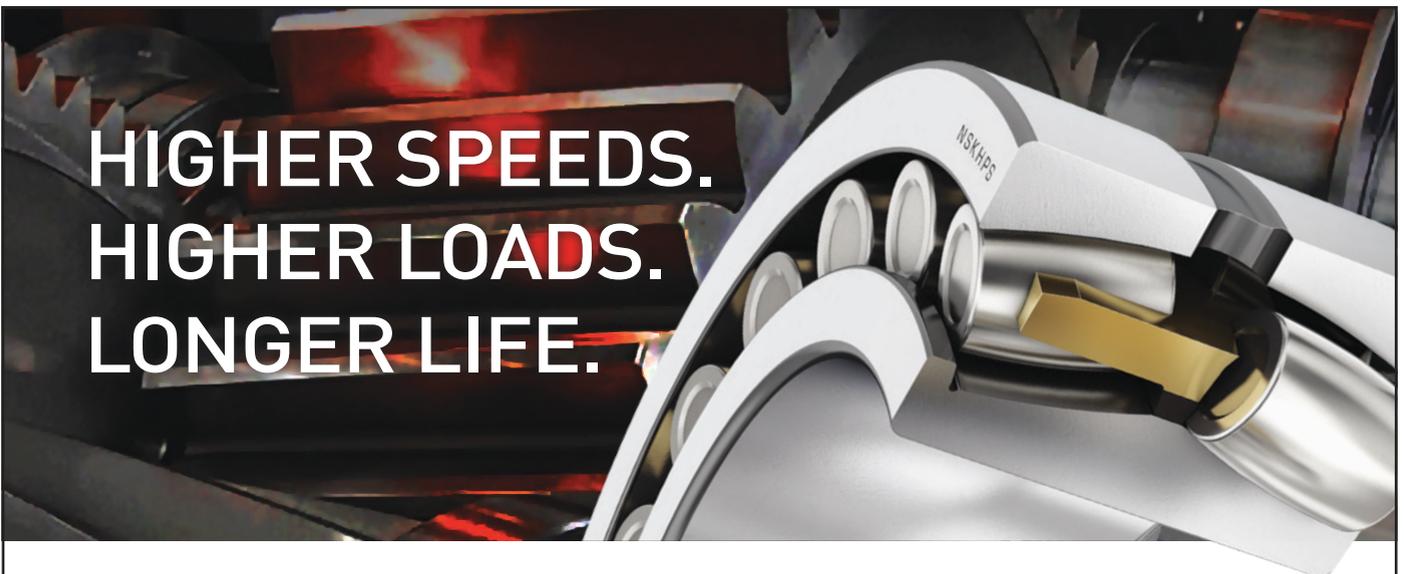
Breaking Down the Competition

Formula Student competitions test the preparation of the team and the capabilities of the car in various engineering aspects. The final result consists of points obtained in static competitions, as well as the most spectacular dynamic competitions. However, each team must first undergo a complicated technical inspection to check the compliance of the car with the regulations, as well as its safety and performance. Only after ensuring that the design meets all stringent standards can the team start driving.

The car must be made in the most economical way to manage resources. In this competition, the judges check the compliance of the previously sent "Cost Report" document with the facts. Team members must justify the use of the materials and the costs incurred in the production process.

Engineering design consists of presenting the car to the judges from the technical side. Innovation in the approach to design and implementation is checked. The use of materials, modern technologies and ingenious engineering solutions is also evaluated.

The business plan is aimed at testing the managerial skills and economic discernment of team members. It consists of giving a presentation of a business plan using a Formula Student car. Business awareness, market analysis and an extraordinary idea are required from the presenters.



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The outbreak of the pandemic, although it significantly changed the plans, did not stop the students from further work. In 2021, the RTC7.0 was presented—the last combustion car, which they still race today. For the first time in the team's history, they based the chassis on a composite half-monocoque. This provided an unprecedented level of stiffness and steering precision. The RTC7.0 power unit is based on the Honda CBR 600RR 0.6-liter inline-four engine. After some modifications, this engine can generate 100 PS. With a curb weight of 195 kilograms, it is their fastest car ever, and its sprint to 100 km/h takes just over three seconds. This resulted in third place in the Acceleration category in Formula Student Spain 2021.

The team started the latest season in 2022 with a great showcase—AGH Racing was the first team in Poland to present an autonomous car designed for the Formula Student competition. The RTD1.0 was created based on the RTE2.0, which was

modernized with an autonomous module. The premiere of the construction in March gave them a lot of time to demonstrate it to the world before the competition.

Last year's season can be considered a very successful one. During the Formula Student Czech Republic, the team won the static event—Business Plan Presentation. After four competitions, during which they fought with failures and bad luck, at the end of the season, during the Formula Student Spain competition, they successfully passed scrutineering for a Driverless Vehicle class car, and then they entered dynamic competitions with it. It was the first team in Poland to do so, which once again put this team in the position of national pioneers.

The team came back from the competition with a new dose of energy and motivation for the next season. They are already working on the new design and introducing innovative elements to it. Many of these solutions are created with the help of *KISSsoft*.

KISSsoft helped the students develop steering column gears in the RTC7.0 race car powered by an internal combustion engine. Then they used the software to develop a gearbox for their new electric AWD drivetrain in the upcoming RTE3.0 car. Most importantly, they could optimize the micro geometry of the gears and analyze the influence of different factors on the durability of the gear tooth. *KISSsoft* made it easier to apply quick changes in the project, as it adapts other tooth geometry to the ones they were working on. This helped speed up the process and avoid errors. It was a big step forward compared to the previous software.

From the beginning of 2012, AGH Racing has grown significantly. In the debut season, it had only 18 people, and currently, the team consists of 2 scientific clubs that associate well over 100 students.

kisssoft.com
racing.agh.edu.pl/en/home/

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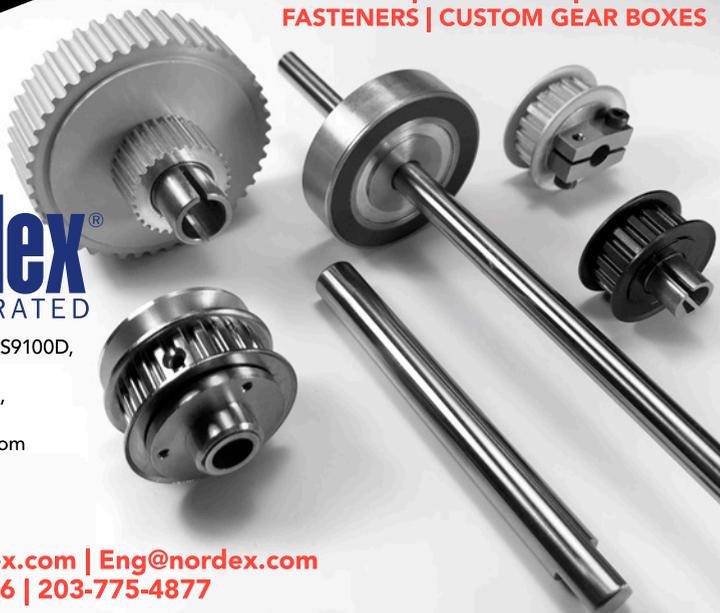
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Bearing Mounting Arrangements

Norm Parker, Stellantis

It seems like everyone is jumping into the electric gearbox market. Even Schaeffler is in the electric drive module (EDM) market now with their own 800v system. With all these new entries, some companies are satisfied with following traditional bearing arrangements while some want new and unique solutions or some combination of both. There is heavy debate over which styles are the best.

In this article, we will talk about the different types of two-bearing arrangements for each shaft with the pros and cons of each for a simple three shaft, single speed parallel axis gearbox (à la Tesla style).

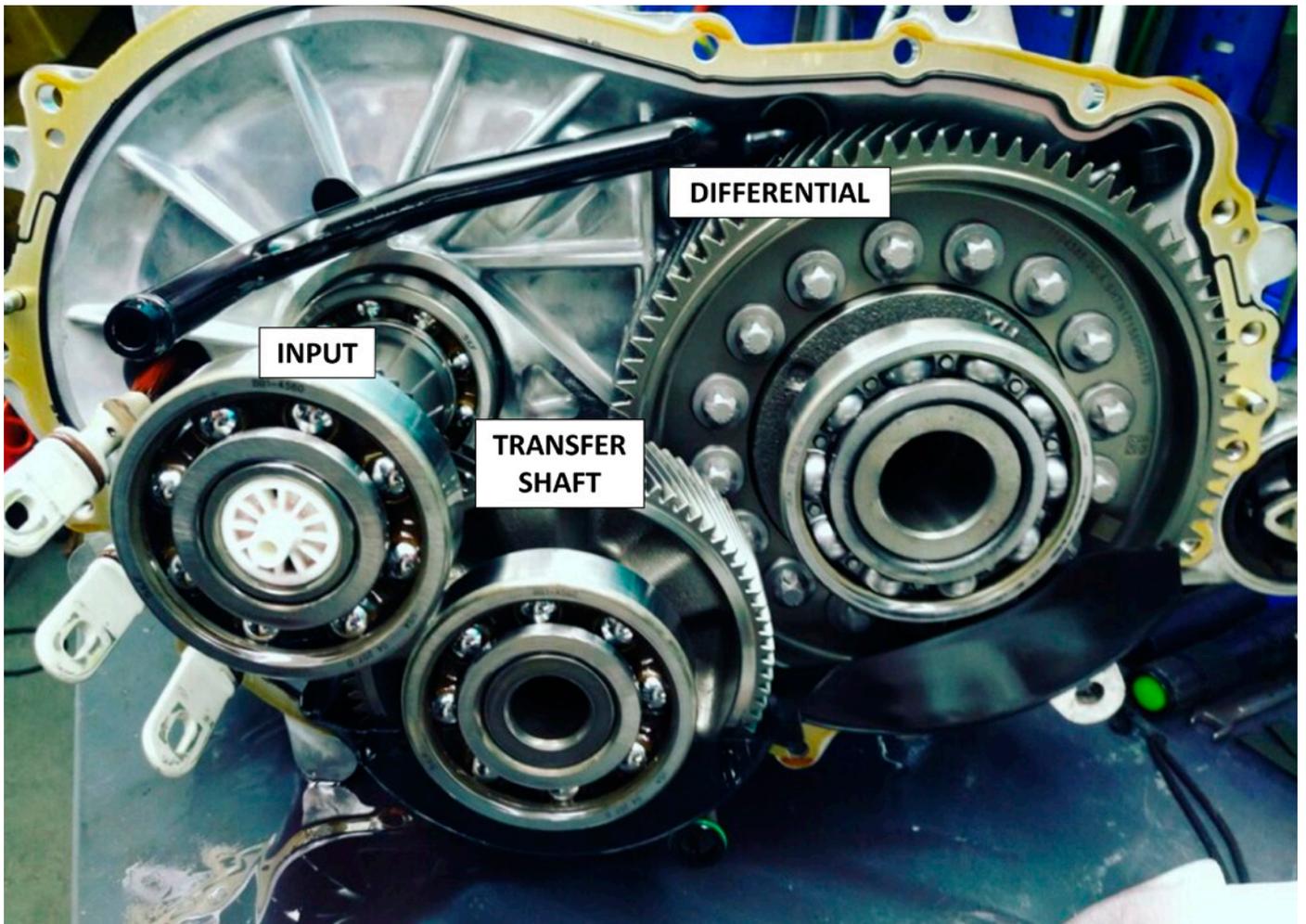


Figure 1 — wccftech.com/tesla-vehicle-delivery-increase-report

Let's start with the classic fixed-float ball bearing design. This is a great, simple, almost one-size fits all approach to fixing two bearings on a shaft. One bearing is going to be your designated fixed bearing, which means it is going to take 100 percent of the axial loads plus a proportional part of the radial loads, depending on where the loads are coming from. To force the fixed bearing to take all the axial loads, it must be constrained on all four corners by shoulders, snap rings, retaining plates, screws, whatever your flavor is. The other bearing obviously takes none of the axial load and this is done simply by leaving a loose fit on the housing with no constraints. In all of our textbook examples, we will have a tight fit on the shaft. There are a couple of drawbacks to this system. Usually, snap rings or a retaining plate is needed for the fixed bearing and there is no way to reduce endplay. The fixed bearing can have decent amount of axial play just due to the internal axial clearance of the bearing (a function of the installed radial clearance). If snap rings are used, those introduce additional axial endplay. A bearing plate eliminates snap ring tolerances though at a significant cost and added complexity. Some people like to try and press fit the outer ring of the fixed bearing as well. You will find that after

you increase the bearing internal clearance to compensate for the housing press fit, you are not any farther down the road in terms of reducing overall runout. In either case, we never rely on press fits as a retaining feature when taking direct axial loads. A snap ring is still needed in the loose or tight fit configurations. You can usually get away without a snap ring on the press fit side of the float side—though it is always recommended to package protect for it.

Another popular design is called a full float or straddle mount type of design. In this configuration, each bearing takes the axial load in one direction—the bearings share the axial load. This is done by constraining the outer rings in only one direction. This can be handled from the inside corners or the outsides. In the outer shoulder arrangement below (Figure 3), the right bearing will take all axial loads going to the right and the axial loads going to the left will be taken by the left bearing. A big benefit to this system is that endplay can be reduced with a selective shim, mounting screw or nut. As you shim one side, the reaction is taken by the opposite bearing through the shared loose fit housing and the outer rings are slightly pushed together. Unlike the fixed-float system, in a paired shim system, internal axial clearance be reduced or even eliminated.

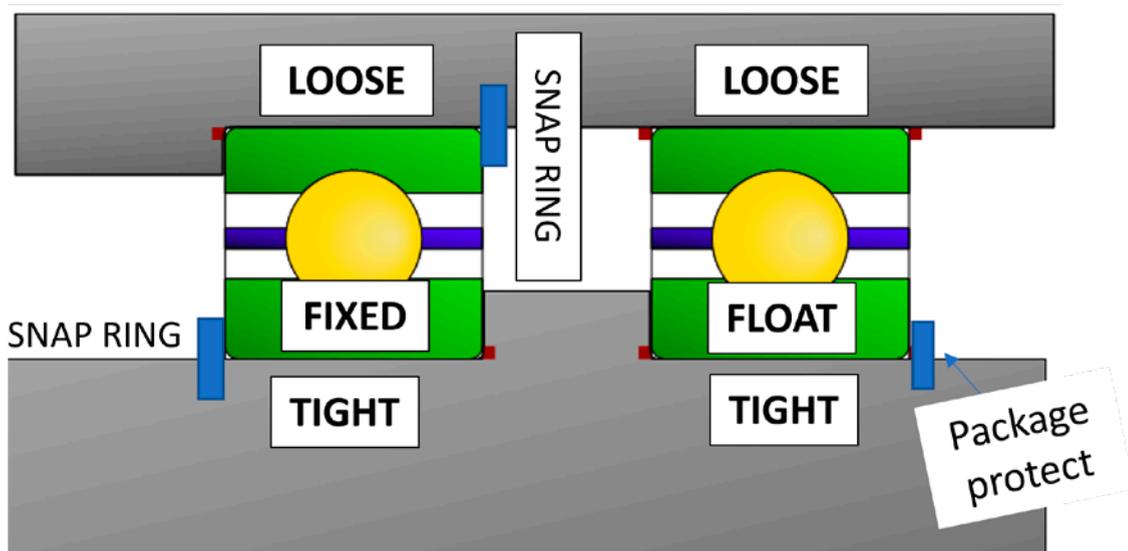


Figure 2—Fixed-Float Design.

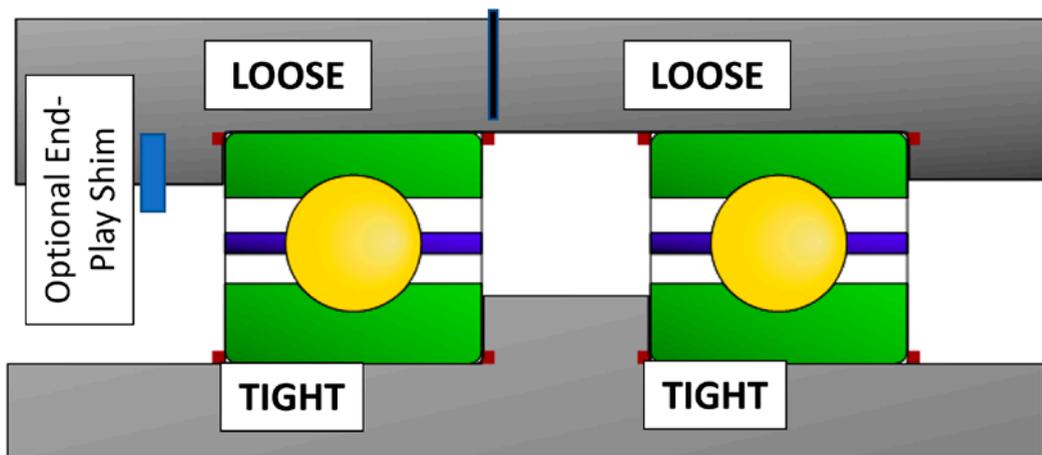


Figure 3—Straddle mount design.

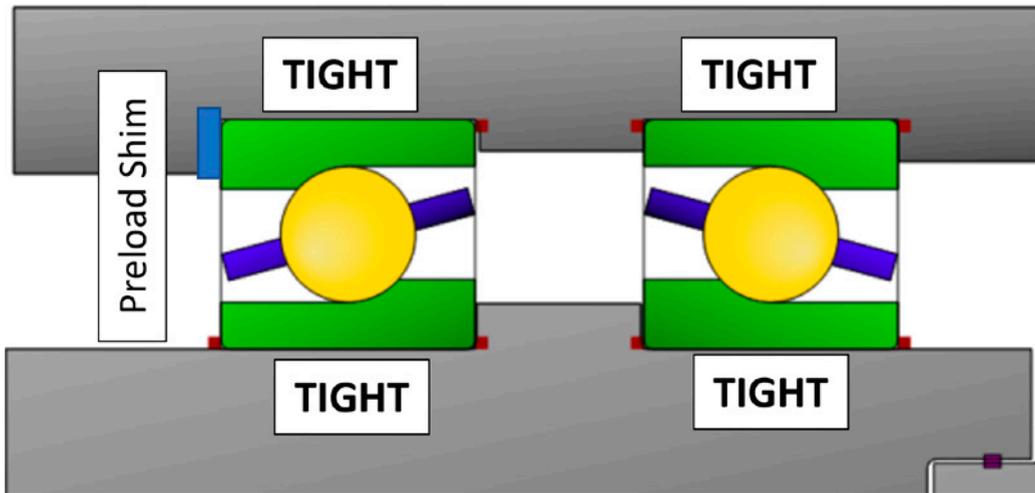


Figure 5— Angular contact ball bearings.

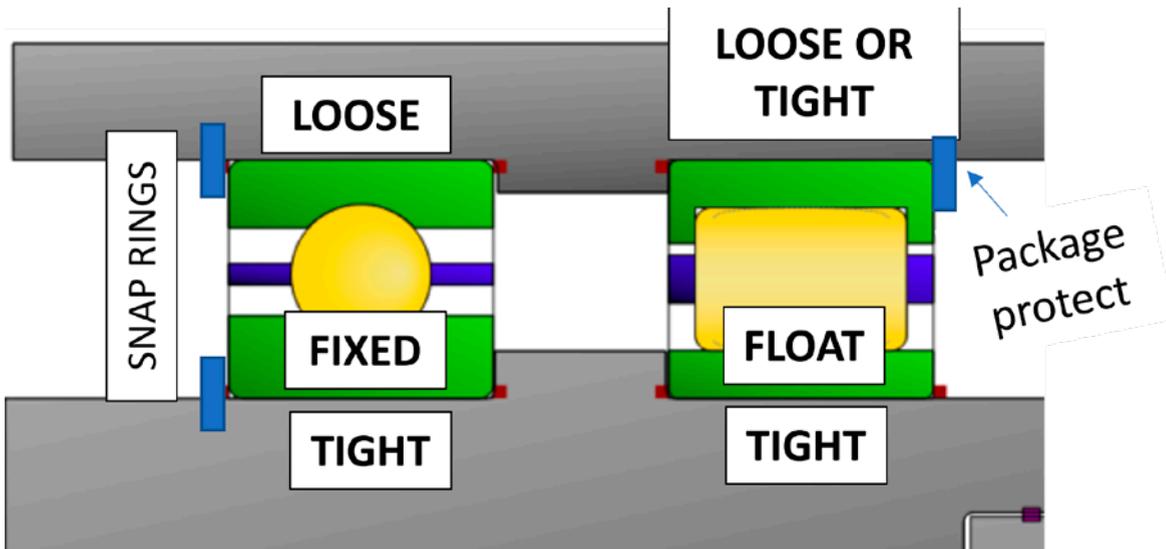


Figure 4— Fixed-float cylindrical design.

If you are looking at options outside of ball bearings, a ball-cylindrical combination is popular. This design is a different version of the fixed float system. In this case, the float bearing is the cylindrical since it does not take axial load anyway. You can order these with shoulder to take incidental axial loads, but they are not meant to take gear loads. In racing applications, for example, straight spur might be used with do not generate any axial loads. Those boxes will often run all cylindrical bearings with shoulders which just serve to hold the shaft in place. The drawbacks for cylindricals are the outer ring still needs to be retained even though it is the float bearing because it is not attached to the inner ring. It can walk and keep on walking. The sleeve side of the cylindrical (here shown on the inner ring in Figure 4) tends to be fairly robust against walking. While rolling losses in cylindricals are very low, oil churning losses can be high if too much oil is in the area due to the wide flat roller. Care must be taken in oil management if efficiency is a driver for using this arrangement.

The final example we will cover is a higher performance arrangement using preloaded angular contact ball bearings.

This arrangement is typically reserved for applications that require high precision, speed and efficiency. This is a great combination that is much more precise than the ball or cylindrical combinations but comes at a price. The angular contact bearings need to be preloaded just like tapered roller bearings. Even if the piece price is reasonable, the preloading operating can chase people away.

And the last example is, of course, the king of bearings—the tapered roller bearing combination. There is nothing else that can touch tapers in terms of stiffness, load carry capability and dynamic runout. Unfortunately, there is no free lunch. The high accuracy comes with the preload operation, light load efficiency loss and high-speed limitations. With the rollers having substantial sliding in both the rolling direction and the sliding rib, the losses can be measurably higher than ball bearings at low loads. However, when loads increase, hysteretic losses of a ball bearing increase significantly and eventually surpass the sliding losses of the taper roller bearing. Don't get into the habit of assuming that ball bearings are always more efficient, there are many factors to consider.

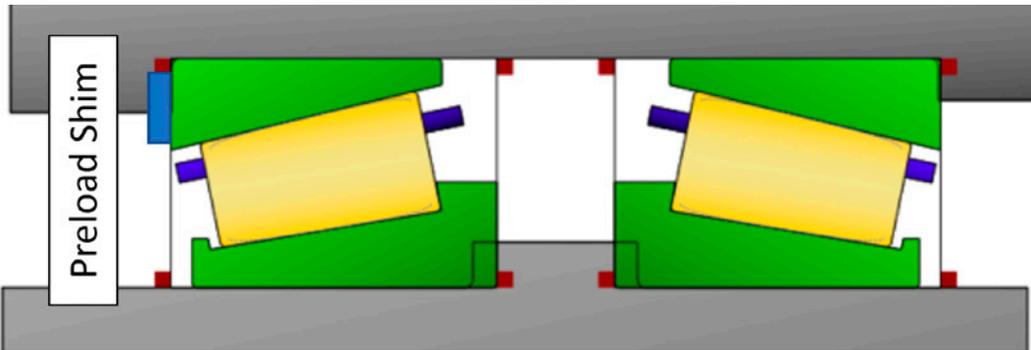


Figure 6—Tapered roller bearings.



1-Best, 5-Worst	Fixed Float	Fixed Float Straddle	Fixed Float Cylindrical	Angular Contacts	Tapers
Efficiency	1	1	2	3	4
High speed capability	1	1	1	1	3
Radial Load Capability	3	3	2	2	1
Axial Load Capability	4	3	4	2	1
Running Accuracy	4	3	4	2	1
Ease of assembly	3	2	3	5	5
Snap Rings	2	1	3	1	1
Spacers (endplay reduction)	N/A	5	N/A	N/A	N/A
Shims (preloading)	N/A	N/A	N/A	5	5
Bearing Cost	2	2	4	4	3
Overall cost	3	2	4	4	4

This chart is only intended to be a general guideline. Factors can vary greatly for numerous reasons

Figure 7—General guidelines for bearing mounting arrangements.

The truth is, there is no perfect answer. Every system has benefits and compromises. The type of vehicle you are designing will drive your gear design which will drive the bearing system. If you need a high performance quiet gearset, you may be looking at preloaded shafts. If cost and efficiency are your primary drivers and NVH is secondary, you can use bearings that have less running accuracy and stiffness.



Norm Parker is currently Technical Fellow at Stellantis. He has contributed articles for PTE since 2014.

Lenze relies on the *FVA-Workbench* for technical sales

FVA GmbH

With the expertise of a systems provider, Lenze works for and with customers to develop high-quality mechatronic products, powerful hardware and software automation systems, and digitalization services in fields such as big data management, cloud or mobile solutions, and design software for the Internet of Things (IoT). As challenges increase across the mechanical engineering sector, it is essential to be able to rely on capable partners where necessary and focus on core competencies.

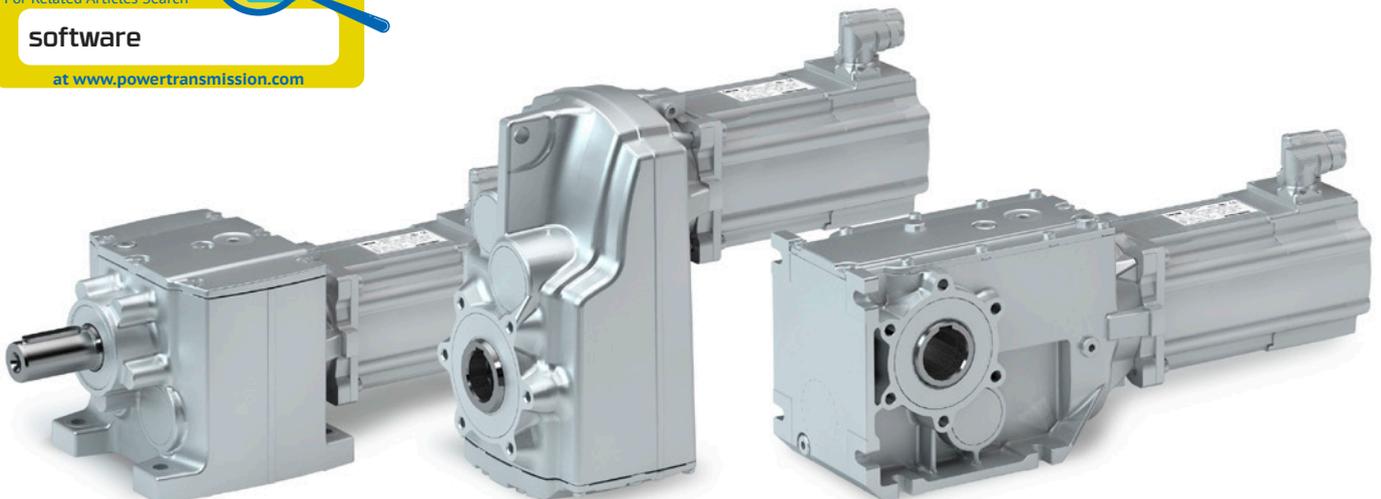
A Scalable Toolbox Forms the Basis for an Efficient Value Creation Chain

Modular systems are a popular solution for manufacturing industrial gear units, as they allow customers to choose from a wide range of options. Configuration tools enable sales personnel to assist customers with the selection of suitable components. This not only simplifies the sales process, but also leads to more efficient production. Development engineers have clear guidelines on which to base new products, which leads to better planning and faster implementation. The use of common parts

can reduce effort and save money, as components can be manufactured in large quantities and reused in different products.

These days, a catalog is much more than just a printed work or a configuration tool. Increasingly, it serves as a company's treasure chest. Thus, it is essential that everyone involved has appropriate access to data and is able to export it in a suitable format. Product development must be able to add and modify products, and modular designs must be exported so that they can be used as a basis for customizations.

Sales personnel access the product catalog via a configuration tool, working together with the customer to determine optimal solutions. Calculations which consider specific



operating loads can be used to help the customer identify variants which best meet their specific needs. The customer is provided with reliable figures which can be used to compare different drive variants with each other. The calculation models are automatically generated from the catalog database.

Shared Databases Are a Central Component for Efficient Work

At Lenze, the catalog is configured as a shared database for development and sales. Technical sales personnel use intelligent features to select suitable motor-gearbox combinations and run calculations based on customer-specific operating data. This provides obvious added value for the customer. Service lives, safeties, and expected loads can all be determined in a short time. Maintenance of the underlying database and the use of simulation tools make it possible to quickly and easily perform technical calculations without having to rely on a central calculation department. In less than a minute, the customer is provided with a data sheet which includes reliable statements about the gearbox based on these technical calculations.

Product development manages the database in the background, adding new products and creating models for automated calculations. A similar gearbox can be loaded from the database as a starting point and modified as needed. This is particularly important, as it ensures that customized products comply with the catalog standard, and that all calculations are uniformly configured. Automatic model generation also leads to enormous time savings for product development.

New products and variants are the result of careful optimizations, especially with regard to the microgeometry design, as this has a significant influence on the characteristics of the final gearbox. Care must be taken to ensure that all relevant loads are considered in order to obtain an efficient, low-noise gearbox with a suitable load capacity. The *FVA-Workbench's* reporting system helps users to clearly and easily interpret the results.



The FVA-Workbench Is Lenze's Tool for Electromechanics

The *FVA-Workbench's* extensive automation options can replicate simple tasks or complex processes. Data can be imported or exported, and calculations can be parameterized and started. The system is designed by engineers for engineers so that automation can be easily implemented without additional skills.

An intuitive user interface is also available for new product design. It can be used to design, modify, parameterize, and calculate new gearboxes. The parametric construction of the model makes it easy to make modifications.

In addition to a large number of standard load capacity calculations for a wide range of drive components, simulations are also available for noise behavior, loss behavior, and local loads. Even complex geometries such as casings can be considered in the calculation.

Lenze has been involved in FVA's research activities for over 50 years, and is active in the board of directors. Frank Maier, chief technology officer of Lenze Drives GmbH and a FVA board member, summarized this commitment as follows: "Lenze's customers value reliability. Using the *FVA-Workbench* for technical sales makes it possible to save time and money with automation in product development, while also ensuring calculation quality."

More Automated Calculations

Modular systems are revised at regular intervals, whether this is due to market or customer requirements, or new research results that

are available in the *FVA-Workbench*. An entire series, and potentially all installation positions, are often calculated during such a revision. This quickly results in a large number of variants, all of which must be calculated correctly.

In this case, all relevant models can be exported from the Lenze product database for mass calculation. This level of automation makes catalog revisions quick and easy, including evaluation of the calculations. Manual maintenance of tables is no longer required.

These days, Lenze rarely relies on manual gearbox optimizations. In many cases, expertly designed automated processes are used for variations. Defining modifications to the model in advance saves manual configuration time. Calculations can be processed and evaluated quickly. As a consequence, the number of calculations is constantly increasing. Companies are often faced with the challenge of how to reduce calculation times.

Conclusion

With the *FVA-Workbench*, Lenze has a powerful tool for quickly and easily performing all gearbox development tasks. The high level of automation is crucial for productivity and makes it possible to use calculations in sales discussions. Catalog databases are maintained which are directly linked to these calculations.

The Stribeck Curve

Robert Errichello

This review of Ref. 1 summarizes the conclusions of test data and numerical simulations showing that Stribeck curves for counterformal contact are different from Stribeck curves for conformal contact.

Stribeck Curve

Figure 1 shows the original curve of Stribeck (Refs. 2–4), which was further developed by Hersey (Ref. 5) who plotted the Stribeck curve versus the dimensionless Hersey number. The original Stribeck curve was developed for journal bearings, which have conformal contact characterized by the lubricant film’s relatively low pressure and low shear strain rate. Under these conditions, lubricants behave as a Newtonian fluid where fluid friction continuously increases with speed once the journal lifts off the bearing in the full-film hydrodynamic lubrication regime. Note that Figure 1 is shown with a logarithmic x-axis to expand the boundary regime.

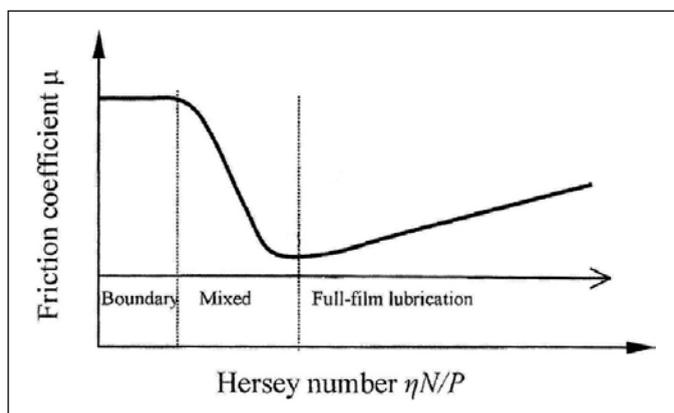


Figure 1 — The original Stribeck curve for conformal contact (Ref. 1).

Nomenclature

- η = Absolute viscosity, Pa·s
- N = Rotational speed, rps
- P = Average pressure, psi

Figure 2 shows an experimental traction curve from Ref. 1 for counterformal elastohydrodynamic lubrication (EHL) as a function of the slide-to-roll ratio (SRR). It shows that the friction coefficient initially increases linearly from zero due to Newtonian behavior of the lubricant under low shear conditions (low SRR). However, this happens only within a very narrow range of SRR near zero SRR. As the SRR increases beyond about ± 0.1 , the shear stress within the lubricant film reaches the limiting shear strength of the non-Newtonian film. Beyond $SRR = \pm 0.1$, the friction coefficient typically decreases due to reduction of the limiting shear strength caused by temperature increase of the lubricant film in the contact zone resulting from heat generation in the film when sliding velocity becomes high.

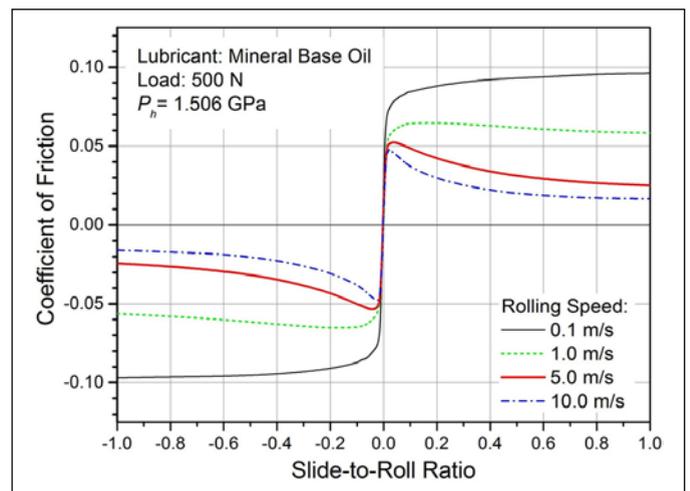


Figure 2 — Experimental traction curve for counterformal EHL contact (Ref. 1).

Figure 3 shows an experimental Stribeck curve from Ref. 1. Comparing Figures 1 and 3, it is evident that the friction behavior is similar in the boundary and mixed-film regimes, but very different in the full-film regime where the friction coefficient continuously decreases as the speed increases for counterformal contact (Figure 3), whereas the friction coefficient continuously increases for conformal contact

(Figure 1). According to Ref. 1, the lubrication regime division lines in Figure 3 are approximate, and there is never a clear boundary between neighboring regimes (Ref. 1).

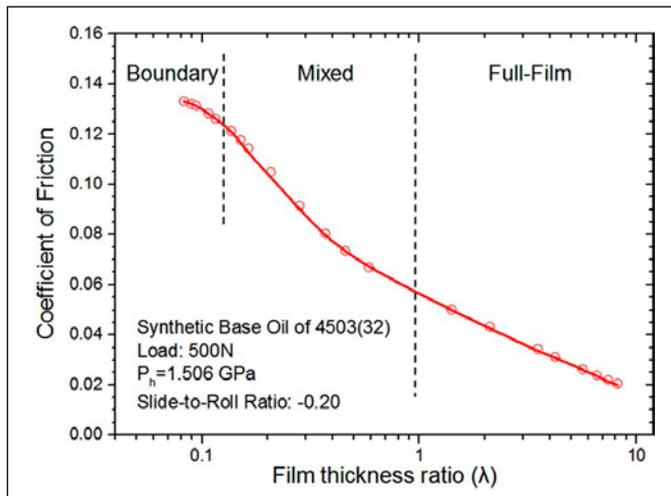


Figure 3—Experimental Stribeck curve for counterformal contact (Ref. 1).

Discussion

The Stribeck curve was developed for journal bearings, which have conformal contact where the shaft journal conforms closely to the bearing bore. Under conformal contact, the peak contact pressure in a journal bearing is low (typically 5 MPa), film thickness is relatively high (typically 50 μm), and elastic deformation of the journal and bearing are insignificant. Under these conditions, the lubricant obeys Newton's law of viscous flow.

In contrast, gears have counterformal contact, high contact pressure (typically 2,000 MPa, or 3 orders higher than a journal bearing), low film thickness (typically 0.5 μm , or 2 orders less than a journal bearing), and significant elastic deformations of the gear teeth. Under these conditions, the lubricant behaves as a pseudo-solid that exhibits non-Newtonian visco-elastic properties.

Consequently, to make the differences clear, it is best to refer to the operating regime of journal bearings as hydrodynamic lubrication (HL), and the operating regime of gears as elastohydrodynamic lubrication (EHL). Similarly, a Stribeck curve for journal bearings should show the regimes of boundary, mixed-film, and full-film HL, whereas a Stribeck curve for gears should show the regimes of boundary, mixed-film, and full-film EHL.

The Hersey number can be used for conformal journal bearings where the prevailing lubrication regime is hydrodynamic, but it is not appropriate for counterformal contacts of gears where the prevailing lubrication regime is elastohydrodynamic. Currently, other x-axis parameters are used to illustrate how friction varies with film thickness such as specific film thickness as shown in Figure 3.

Conclusions

1. Stribeck curves for counterformal contacts such as gears are different than Stribeck curves for conformal contacts such as journal bearings.
2. In gears with counterformal contact, both test data and numerical analyses (Ref. 1) show that the friction coefficient continuously decreases as the speed, shear rate, and film thickness increase in the mixed-film and full-film EHL regimes.
3. In journal bearings, with conformal contact, friction increases in the full-film hydrodynamic lubrication regime.
4. Stribeck curves for journal bearings show boundary, mixed-film, and full-film HL regimes, whereas Stribeck curves for gears show boundary, mixed-film, and full-film EHL regimes.

Recommendations

Add a Stribeck curve to AGMA 925, similar to Figure 3 with a friction coefficient that continuously decreases in the mixed-film and full-film EHL regimes.

PTE



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Robert Errichello heads a gear consultancy called GEARTECH, is a member of several AGMA Committees, and is a technical editor for Gear Technology. Errichello is a recipient of a variety of honors including the AGMA Lifetime Achievement Award, the STLE Wilbur Deuch Memorial Award, and the AWEA Technical Achievement Award.

Schaeffler

WIND POWER STANDARD
ENSURES MAXIMUM RELIABILITY IN
WIND TURBINES



Against the backdrop of ambitious climate goals and an ever-increasing awareness of sustainability issues in society, renewable energy generation – including wind power as a central component—is of growing importance. As market leader and strategic development partner, the global automotive and industrial supplier Schaeffler has been supplying reliable bearing solutions for onshore and offshore wind turbines for around 40 years. Rolling bearings from Schaeffler can be found in every second to third wind turbine worldwide.

Schaeffler introduced a Wind Power Standard for wind turbine bearings more than ten years ago, which considers the high demands on the reliability of turbines and associated components. This standard for products and processes ensures that wind turbine bearings are subject to the highest quality standards, as also implemented, for example, in the automotive industry, and in the aviation and aerospace sectors. The start of the year marked the manufacture and delivery of the millionth bearing by Schaeffler in accordance with the Wind Power Standard.

The progression to multimegawatt turbines is resulting in higher loads and torques, which place the components under even greater strain, while the costs associated with downtime and maintenance work in the event of a failure are becoming increasingly higher—especially where offshore systems are involved.

“Our customers require reliable components that allow the increasing power density in wind turbines to be used to its full potential. With the Schaeffler Wind Power Standard, we

have been ensuring the highest level of quality for more than ten years—and with more than a million bearings to date,” says Bernd Endres, head of the wind power business unit at Schaeffler.

To ensure these high standards, Schaeffler relies on coordinated and transparent processes, a defined change management system, strict quality control, and extensive documentation along the entire process chain—which is achieved in close cooperation with customers and suppliers. Targeted supplier development activities ensure that the highest quality standard is achieved from the outset.

Compliance with the strict quality standards that apply on a global scale to all development and design teams—as well as to all production facilities that design and manufacture bearings for wind turbines—is monitored via internal audits. In addition to the long-standing experience and comprehensive system expertise of the specialists at Schaeffler, the use of state-of-the-art calculation and simulation programs ensures that wind turbine bearings are designed to optimum effect. The calculations are supplemented and validated on powerful test rigs. Schaeffler offers extensive testing options, particularly for rotor bearings, in the form of its “Astraios” large-size bearing test rig.

schaeffler.com

Parvalux

HIRES KELLER INDUSTRIAL
PRODUCTS, INC.



In today’s marketplace it is important for suppliers to broaden their reach and expertise in multiple industries. Hiring the right sales representatives can not only increase a company’s capabilities but provide additional services as well.

Parvalux (by maxon), is the UK’s largest manufacturer of fractional

horsepower, geared, electric motors. The company provides components and systems to OEMs worldwide in markets such as industrial automation, materials handling, and building automation.

Parvalux has recently teamed with Keller Industrial Products, Inc., headquartered in Rochester, NY. The experienced team at Keller has specialized in mechatronic applications for OEMs and advanced manufacturing sites since 1937. As business development professionals who focus on motion control automation applications, components, and accessories, the company provides expert representation in the industry.

Keller represents Parvalux and several other synergistic world-class manufacturers by providing on-site technical product and applications expertise to OEMs throughout New York State, Pennsylvania, New Jersey, Maryland, Delaware, Northern Virginia, Washington DC, and West Virginia. The company representatives specialize in high-tech/high-touch products and services, providing local-to-the-customer technical sales and account management. Keller employs an experienced, turn-key sales force, allowing Parvalux to quickly reach a greater number of OEMs within a broad range of applications. “The Keller team is energized to assist our OEM customers in achieving greater value in their machine designs with Parvalux’s modular, customizable, high-quality product portfolio. We are in an era of automation not just of industrial processes, but commercial and consumer products, as well. Parvalux is a perfect fit for these markets,” adds Vincent Nolan, Keller’s VP of Sales and an electrical engineer.

Parvalux (by maxon) provides product design, software systems, prototyping, testing, and production of a wide variety of motion control products. The company provides standard, semi-custom, and fully customized products ready for manufacturing and long-term deployment. The Parvalux team includes highly experienced engineers working with project managers and product specialists to ensure that the company remains at the cutting edge of electric geared motor design and manufacturing.

parvalux.com

JKF Americas

LAUNCHES NEW WEBSITE FOR INDUSTRIAL AND AUTOMOTIVE MARKETS



JKF Americas Inc, a subsidiary of JK Fenner (India) Ltd., has redesigned their North American website, featuring the outstanding Top Drive line of belts, hoses and accessories for automotive and industrial markets. The website features dynamic design, informative videos, vehicle part lookup, literature downloads, company news and fast load times for efficient browsing.

“Customers can easily navigate our complete Top Drive product selection,” said Mohan Seshadri, business head—industrial and automotive products and exports. “We’ve listened to technicians, counter personnel, distributors, and manufacturer representatives to help provide an enhanced customer experience.”

“Having a dedicated site for North America reflects our commitment to this market,” said Panchapakesan R., manager—business development. “Our ‘customer first’ policy has and will be the key to our success.”

jkfamericas.com

Nord

DEVELOPS INTELLIGENT HEAT RECOVERY FROM MACHINE TOOLS

Nord Drivesystems continuously looks for opportunities to gain manufacturing efficiencies and implement practices that have less impact on the environment. In 2012, Fertigungstechnik Nord, a member of the Nord Drivesystems Group located in Gadebusch, Germany, developed a concept for heat recovery from machine tools in their production areas. To this day, the recovered energy has been used to heat the over 20,000 sq. ft. of the location’s production, assem-

bly, and office spaces. The recovered heat is also used to produce hot water within the facility, rather than using traditional water heating methods that are less environmentally friendly. Nord is constantly improving and expanding the system to become less dependent on fossil fuels.

Nord’s Gadebusch facility has been utilizing their heat recovery system since its initial installation in 2012. Many components for Nord drive solutions are produced in the Gadebusch facility, including housings, shafts, and gearing. Prior to 2012, the heat generated by the facility’s production machines had been dissipated directly into the surrounding environment via electrically powered cooling systems. In the summer months, this heat dissipation resulted in the five production halls becoming very hot, which lead to the development of the heat recovery concept, which has since operated year-round.

The Gadebusch heat recovery concept was implemented using plate-type heat exchangers coupled to the machines’ various cooling systems with matching consumption capacities. The internal machine circuits are connected to an external circuit, which—being a cooling water circuit—dissipates excess heat and feeds it into a central heat recovery system. Since implementing the system, Fertigungstechnik Nord has connected more than 80 machines, which are networked with the production department and the production hall ventilation. Within the recovery system, two heat pumps generate hot water for heating the facility and the heat is dissipated from the production areas via three cooling devices.

Fertigungstechnik Nord has been continually investing in heat recovery initiatives since the system was first put into place. Currently, the production halls’ temperatures are held at approximately 82 °F, even at the height of summer. The system operates without additional heating when outdoor temperatures are above of 32 °F. If temperatures drop below 32 degrees, the system can utilize natural gas for heating to ensure a baseline temperature of 66 °F in the production halls and offices. Currently, Fertigungstechnik



Nord saves approximately one third of its former consumption of 583,000 kWh of fossil fuel-based energy. This corresponds to a reduced CO² emission of approximately 117 metric tons. In 2023, the shower water in the facility will be converted over to the heat recovery system, which will further reduce excess heat dissipating to the environment during the summer.

The development, implementation, and further improvements to the Gadebusch heat recovery system is just one of many examples of the Nord Group taking responsibility for their impact on the environment. Resource conservation, cost reduction, and environmental performance are firmly established within the Nord Group and will continue to be expanded upon in the future.

nord.com

Universal Robots

WINS JOSEPH F. ENGELBERGER ROBOTICS AWARD

For the second time within five years, a key figure at Universal Robots (UR), the Danish manufacturer of collaborative robots (cobots), has been awarded the world’s most prestigious robotics prize, the Joseph F. Engelberger Robotics Award, often described as the Nobel Prize of robotics.

Following in the footsteps of UR’s co-founder Esben Østergaard, who was given the Engelberger Award in 2018 in the Technology category, Roberta Nelson Shea, UR’s global technical compliance officer received the award for Applications at a ceremony at the Automate Show in Detroit.

The Application category recognizes individuals or organizations that have made a significant contribution to the development of robotics technology and its practical application. Nelson Shea won the award for her

outstanding work related to robotics safety across the world.

"I am extremely honored to be receiving this award," she said. "I see it as an acknowledgement of not just my own work, but also of Universal Robots' and Teradyne's commitment to safety. This award is a recognition of all who have contributed to robot safety over the years. When I started in this field more than four decades ago, I felt I had a personal mission and that there was no one else who signed up for it with me. Now, especially after the emergence of collaborative robot applications, we are all aligned on the importance of safety."

In recent years, other women have received Engelberger Awards, and this is another indication of how robotics has evolved since UR's Global Technical Compliance Officer first started in the industry in 1982:

"Luckily, I am not the first woman to receive this award, but with women still being outnumbered in the robotics industry, I hope my career can also be an inspiration to younger women because they have an important role to play in the future development of both robotics and technology in general."

Kim Povlsen, president, Universal Robots, has also acknowledged Nelson Shea's achievements.

"This award is a testament to the great contribution Roberta has made to the robotics industry. In robotics, and especially when it comes to cobots, safety is always the top priority. Roberta's dedication to safety has helped create the standards for the interaction between people and robots. This has been a vital contribution to the collaborative relationship we see today between humans and cobots across thousands of workplaces," Povlsen said.



universal-robots.com

Fenner Precision Polymers

COMPLETES LAND PURCHASE TO CONSOLIDATE BUSINESS OPERATIONS UNDER ONE ROOF

Fenner Precision Polymers, a Michelin Group Company and world leader in reinforced polymer technology, announced the purchase of 41 acres of property zoned for light industrial development in Lancaster County's Penn Township. Fenner plans to develop the site, previously owned by Kreider Farms, as a 400,000-sq.-ft. world-class, environmentally responsible manufacturing facility. The project plans to consolidate the majority of Fenner's manufacturing plant sites in Pennsylvania into one location. The property is located at 426 Hostetter Road, Manheim.

"Manufacturing remains the top leading contributor to GDP in Lancaster County at 19 percent and it is the second leading employment sector at 16 percent," said Jack Krecek, divisional managing director, Fenner Precision Polymers. "Fenner's continued focus on growth and this exciting new development project is a testament to the strength of the manufacturing industry and we look forward to spurring it onward through the innovation and productivity that will be born here."

Reducing the number of Fenner's plants streamlines operations and improves staff collaboration and the sharing of skillsets. It also delivers greater annualized cost savings realized through operational efficiencies. In the end the new development will deliver a world-class manufacturing environment the company will be proud to showcase to its customers.

It was also important that the site's selection and operations take advantage of every opportunity to minimize environmental impact, in alignment with Michelin Group's net-zero emissions ambition by 2050. While utilizing an existing structure was preferable, the current market availability of commercial space remains extremely tight, and there were no truly suitable options that met Fenner Precision Polymers' requirements for



future growth. Developing a new site allows the company to design for sustainability including leveraging more energy efficient equipment, utilizing renewable energy sources, reducing water consumption, and reducing waste generation.

Zoned for light industrial development since 2011, the land purchase is located within the designated urban growth boundary for the region. The project team includes Scott Bradbury at US Commercial Realty, Barley Snyder, HF Lenz Engineering, and Warfel Construction, with consulting from Economic Development Company of Lancaster, PA. Fenner will conduct detailed building design and land development throughout the balance of 2023. Construction will be completed in multiple phases over the next five years. The first phase of construction is scheduled to begin in Q2 of 2024, with building occupancy expected early 2025.

As Fenner departs several of its existing facilities, the move will open new commercial real estate opportunities for other businesses at a time when market inventory is in low supply. While Fenner Precision Polymers enjoyed a mutually beneficial relationship with Manheim Township and Manheim Borough, the company's growth trajectory, need for accommodating that growth, and market availability for commercial development necessitated a change in location.

"The economic resilience and vitality of Central Pennsylvania are immensely stronger thanks to the contributions of manufacturing enterprises like Fenner Precision Polymers," said Lisa D. Riggs, former President, Lancaster County Economic Development Company. "Lancaster County's GDP grew 5 percent from 2020 to 2021 with manufacturing and professional business services responsible for 46 percent of that growth. Fenner's development project helps maintain the sector's momentum."

fennerdrives.com

August 8–10—ABMA Essential Concepts of Bearing Technology

This ABMA course will give you an overview of the bearing industry as well as basic bearing types and applications. Knowledge of the key players, bearing types and terminology will ensure that everyone has a basic knowledge of the industry upon arrival. This course is specially designed for engineers and others with technical backgrounds that have limited exposure to bearings and need to adapt their technical training to bearings or seek an upgrade to their technical knowledge. The Essentials Course focuses on understanding basic tribology, bearing attributes and applications and explores the basic concepts around manufacturing methods, loads, lubrication, and failure.

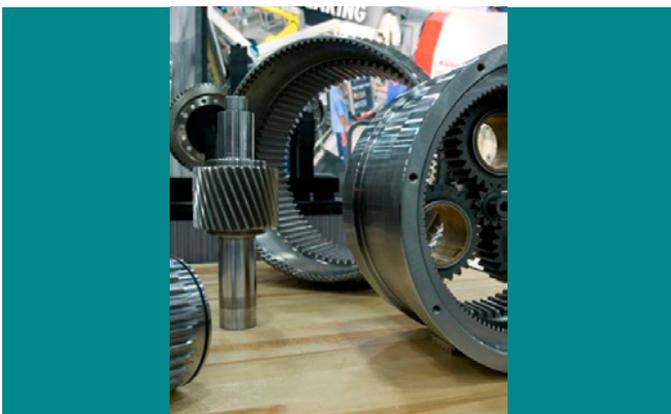
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September 13–15—International Conference on Gear Production 2023

As an accompanying event to the International Conference on Gears 2023, the 5th International Conference on Gear Production is one of the most important biannual meeting points for the gear manufacturing industry both for technical experts and for decision-makers. Current challenges and solutions are presented and discussed, strongly emphasizing new potentials in productivity and/or the flexibility of gear manufacturing processes. High-level expertise will be ensured by our conference presidents: Prof. Dr.-Ing. Christian Brecher and Prof. Dr.-Ing. Thomas Bergs MBA, WZL, RWTH Aachen as well as Prof. Dr.-Ing. Karsten Stahl, FZG, Technical University of Munich (TUM) in Garching. They will take you through the conference program and moderate the sessions in 2023. Do not miss an event outlining new trends for the gear producing industry of tomorrow.

powertransmission.com/events/952-international-conference-on-gear-production-2023

October 17–19—Motion + Power Technology Expo 2023



Produced by AGMA, Motion + Power Technology Expo (Detroit) is a three-day show that connects professionals looking for motion power solutions with manufacturers, suppliers, and buyers. Attendees will find new power transmission parts, materials, and manufacturing pro-

cesses. Buy, sell, and get business done with organizations in aerospace, automotive, agricultural, energy, construction and more. Hundreds of exhibitors and attendees means MPT Expo is a unique opportunity to find partners that can help fulfill your specific production needs. The show is collocated with Heat Treat 2023 and IMAT 2023.

powertransmission.com/events/948-motion-power-technology-expo-2023

November 12–15—2023 STLE TFC and E-Mobility Conferences

The 2023 STLE Tribology Frontiers Conference (TFC) will be held November 12–14. The event will allow attendees to engage with world-renowned industry, academic and government researchers to learn more about the technical, environmental, and social issues impacting tribology research in the 21st Century. The 2023 STLE Tribology & Lubrication for E-Mobility Conference will be held in conjunction with the TFC from November 14–15. The event will feature educational sessions and networking discussions with leading industry experts covering technical content, analysis, and best practices for addressing the challenges and opportunities associated with electric vehicle technologies and how they will impact the tribology and lubrication field.

powertransmission.com/events/944-2023-stle-tribology-frontiers-conference-and-tribology-and-lubrication-for-e-mobility-conference

November 14–16—SPS 2023



Numerous companies from all over the world have already registered for this year's automation highlight in autumn, SPS 2023. Among them are international key players such as Bosch Rexroth, SICK, Phoenix Contact, Beckhoff Automation, WAGO and Endress+Hauser, but also many small and medium-sized companies, start-ups and specialists who want to present their innovative automation solutions in Nuremberg. "After the successful restart last year, interest in the PLC has continued to grow and the feedback is already well above the previous year's level at the same time. In addition, we are currently in contact with many other companies, which makes us very positive and indicates that the SPS is developing again towards pre-corona levels," says Sylke Schulz-Metzner, vice president SPS at Mesago Messe Frankfurt.

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The Candy Man Can

How AI improves automation and motion control with reinforcement learning

Matthew Jaster, Senior Editor

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A sneak peek into the factory of the future has a sweet spot—so to speak. Several conveyor belts transport chocolate bars that are part of a demonstrator machine that shows how artificial intelligence can be used for motion control. What remains to be done in a real factory is to automatically pack the chocolate bars. In this Intelligent Infeed Demonstrator machine from Siemens Digital Industries, the chocolate bars must be placed in evenly spaced slots on the outfeed belt.

“The bars are placed on the inlet belt at random intervals,” says Martin Bischoff, expert in virtual mechatronics at technology, the research division at Siemens. “The system controller achieves this by altering the speeds of the conveyor belts. A line of three conveyor belts can be accelerated or slowed down to ensure the chocolate is positioned correctly on the outlet belt. The development of an optimized control algorithm for this application is a tricky programming task—if you don’t believe it: just try it yourself. Via Reinforcement Learning, we have trained an artificial Intelligence controller to realize this task.”

Reinforcement learning, according to Siemens Digital Industries, is an artificial intelligence method that works in much the same way as most people learn to ride a bicycle—by trial and error, without any knowledge of the basic physics: The novice cyclist experiences whether his or her own technique is good directly during the riding tests and thus gradually becomes better and better.

“This is exactly how reinforcement learning works,” explains Michel Tokic, a fellow expert at technology and a lecturer in applied reinforcement learning at Munich’s Ludwig Maximilian University. “The AI is given a target specification,

such as ‘the candy bars may only be placed in the target fields, and the system should work as quickly as possible in the process.’ The AI then makes—initially completely random—control attempts on the simulation model and receives feedback, triggered by light barrier signals, on how good each attempt was. With this feedback, a goal-directed control algorithm emerges after many automated training cycles.”

Errors in a plant control system can have expensive or dangerous consequences. For this reason, controls are developed and tested on digital twins of the plants without risk as standard (Siemens Virtual Commissioning). The digital twin of the plant can also be used to train the AI.

“After about 72 hours of training with the digital twin (on a standard computer; about 24 hours on computer clusters in the cloud), the AI is ready to control the real machine. That’s definitely much faster than humans developing these control algorithms,” Bischoff says.

Using reinforcement learning, the AI has developed a solution strategy in which all the chocolate bars on the front conveyor belts are transported as quickly as possible and the exact speed is only controlled on the last conveyor belt. This is interestingly quite different from that of a conventional control system.

The researchers led by Bischoff were able to make their approach even more practical by compressing and compiling the trained control models in such a way that they run cycle-synchronously on the Siemens Simatic controllers in real time.

There is great potential in the methodology of letting AI learn complex control tasks independently on the digital twin.

“Under the name AI Motion Trainer, this method is now helping several co-creation partners to develop application-specific optimized controls in a much shorter time. Production machines are now no longer limited to tasks for which a PLC control program has already been developed but can realize all tasks that can be learned by AI,” says Thomas Menzel, digital machines and innovation, production machines at Siemens.

sw.siemens.com

AI based Motion Control is the next big milestone



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Machines perform programable tasks

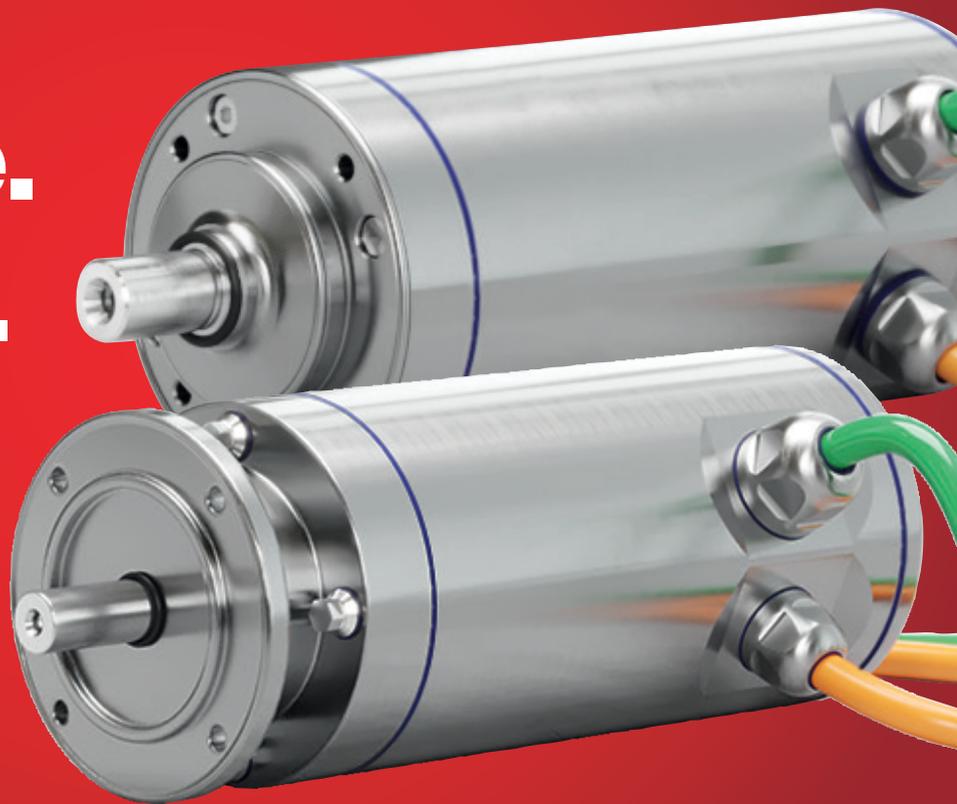
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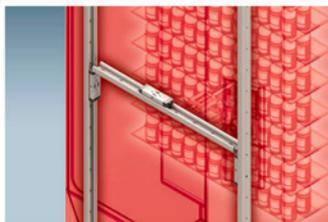
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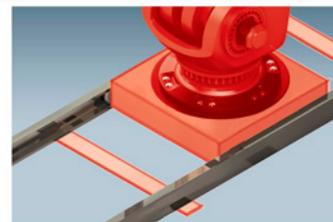
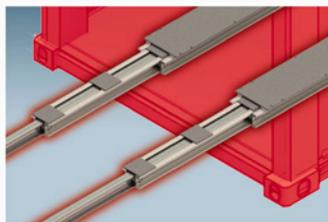
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