

Power Transmission Engineering®

MARCH 2022

OFF-HIGHWAY

- HYDRAULIC SYSTEM ENERGY EFFICIENCY
- UPGRADING AN UNDERGROUND MINE
- TRANSFORMING THE DRIVETRAIN



www.powertransmission.com

Power Transmission Engineering is
now published by The American
Gear Manufacturers Association



The best protection you may never need



Brother Gearmotor makes such an outstanding product that they offer a 5-year limited warranty...we've never had to use the warranty.

RYAN MILLER,

Owner and Engineer Manager
Southeastern Technology Automation



Brother leads the way, by shielding its entire line of standard gearmotors with the industry's best warranty. No matter how far the journey or how rough the path, rest assured you've got the protection you need right "at your side."



Call us today for a sample gearmotor to try out.

brother
at your side

866.523.6283
BrotherGearmotors.com

Power Transmission Engineering®

MARCH 2022



A Publication of
The American Gear
Manufacturers Association

[22]



FEATURE ARTICLES

- [22] **How to Improve the Energy Efficiency of Your Hydraulic Systems**
Using the proper hydraulic fluid can lower the total cost of ownership.
- [24] **An Underground Conversion in Mining**
Pumps, motors, brakes and even battery technology are changing how engineers approach mining applications in 2022.
- [28] **Electric Integration**
Swiss company relies on electric drives for postal delivery and electric sports cars.
- [34] **Transforming the Drivetrain**
How the mobile machine market is adapting to the latest technology.

TECHNICAL ARTICLES

- [38] **How to Optimize Round Rail Performance and Cost with Informed Linear Bearing Selection**
Round rail offers distinct cost and reliability advantages for certain applications, but maximizing those advantages depends on specifying the right bearing to minimize friction in each application.

Stay Connected



Follow us on Twitter
twitter.com/PowerTransMag



Connect with us on LinkedIn
www.linkedin.com/groups/Power-Transmission-Engineering-PTE-2950055



Subscribe Online
www.powertransmission.com/subscribe.htm

Vol. 16, No. 2. POWER TRANSMISSION ENGINEERING (ISSN 2331-2483) is published monthly except in January, May, July and November by The American Gear Manufacturers Association, 1840 Jarvis Ave., Elk Grove Village, IL 60007, (847) 437-6604. Cover price \$7.00. U.S. Periodicals Postage Paid at Elk Grove Village IL and at additional mailing offices. Send address changes to POWER TRANSMISSION ENGINEERING, 1840 Jarvis Ave., Elk Grove Village, IL 60007.

The American Gear Manufacturers Association makes every effort to ensure that the processes described in POWER TRANSMISSION ENGINEERING conform to sound engineering practice. Neither the authors nor the publisher can be held responsible for injuries sustained while following the procedures described. Postmaster: Send address changes to POWER TRANSMISSION ENGINEERING, 1840 Jarvis Avenue, Elk Grove Village, IL, 60007. ©2022 Contents copyrighted by THE AMERICAN GEAR MANUFACTURERS ASSOCIATION. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the publisher. Contents of ads are subject to Publisher's approval.

Power Transmission Engineering

VOL. 16, NO. 2

QuickSilver Controls SilverMax™

Integrated Hybrid Servos

Motor + Encoder + Controller + Driver

High Efficiency Over Wide Speed Range
Highly Programmable
Handles Large Inertia Mismatch
NEMA 23 and 34

Bringing Our 23 years of
Hybrid Servo Expertise
to Your Project!



+1 909 599 6291

www.QuickSilverControls.com



[04] PTEExtras

Revolutions: Gearmotors: the art of precision and reliability; Custom Clutch Application with **Mach III**. **PTE Videos:** **ABB Drivetrain Solutions for Mining Vehicles.** ABB's modular platform of onboard equipment can be optimized to fit powertrain needs of electric mining vehicles.

[06] Publisher's Page

Cool Kids in Tractors.

[08] Product News

Eaton Cummins releases XD series for on-highway; **Moog** partners with Doosan Bobcat on electric track loader; **GWJ** adds online calculator for Hirth couplings; **Dana** introduces planetary drives for mobile and industrial; **SKF** develops dual-piston grease gun, and more.

[32] Engineering Showcase

Leading suppliers and their latest technology.

[36] Engineering sMART

Products and services marketplace.

[40] Industry News

Obituary: Wendy Young (1952–2022); **Voith** acquires remainder of Elin Motoren; **Hy-Tech** acquires Jackson Gear; **Ringfeder** acquires **Carlyle Johnson machine**; and more.

[46] Advertiser Index

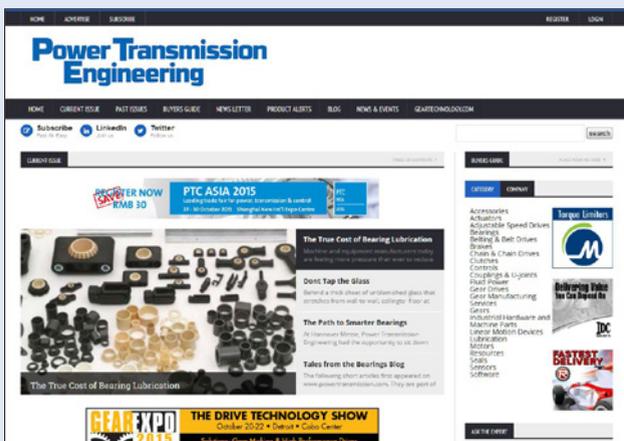
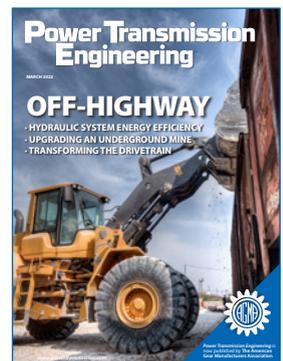
Contact information for every advertiser in this issue.

[47] Subscriptions

Renew your free subscription today.

[48] Power Play

Fade In: Int.
Factory—Day.



Power Transmission Engineering

- Technical content free for everyone
- Comprehensive Buyers Guide
- The latest news

www.powertransmission.com

Designed for power.

Refined for performance.



Introducing RPM AC Generation 3

BALDOR • RELIANCE

The ultimate in power density just got better. The Baldor-Reliance RPM AC motor packs maximum torque into a small space. Available in multiple enclosures, RPM AC can be as much as three frame sizes smaller than a traditional NEMA or IEC motor and is more power dense and efficient than similarly sized DC motors.

abb.com/motors-generators



Revolutions

Gearmotors: The Art of Precision and Reliability

High performance, high precision and component compatibility top the list of gearmotor trends in our product-roundup for 2022. These products can be found in everything from AGV and mobile robotics to solar power, aerospace and large optical systems. Learn more here:

www.powertransmission.com/blog/gearmotors-the-art-of-precision-and-reliability/



Custom Clutch Application with Mach III

Torque Inc., a Mach III distributor, had to supply a clutch for a customer's testing assembly that connected to an automotive gearbox housed within a climate-controlled chamber. The objective was to model a vehicle's inclination using gearing at different operating temperatures under both high speed/low torque and low speed/high torque conditions. Learn more here:

www.powertransmission.com/blog/mach-iii-custom-clutch-solves-stick-slip-issue-in-vehicle-research-system/

ABB Drivetrain Solutions for Mining Vehicles

ABB's modular platform of onboard equipment can be optimized to fit powertrain needs of electric mining vehicles. The system is designed for reliability and energy efficiency, reducing total cost of ownership while supporting productivity. Learn more here:

www.powertransmission.com/videos/ABB-Drivetrain-Solutions-for-Mining-Vehicles-/



Power Transmission Engineering



AGMA MEDIA
1840 Jarvis Avenue
Elk Grove Village, IL 60007
Phone: (847) 437-6604
Fax: (847) 437-6618

EDITORIAL

Publisher & Editor-in-Chief
Randy Stott
stott@agma.org

Senior Editor
Matthew Jaster
jaster@agma.org

Senior Editor
Aaron Fagan
fagan@agma.org

ART

Art Director
David Ropinski
ropinski@agma.org

ADVERTISING

Advertising Sales Manager & Associate Publisher
Dave Friedman
friedman@agma.org

Materials Coordinator
Dorothy Fiandaca
fiandaca@agma.org

CIRCULATION

Circulation Manager
Carol Tratar
tratar@agma.org

ACCOUNTING

Luann Harrold
harrold@agma.org

MANAGEMENT

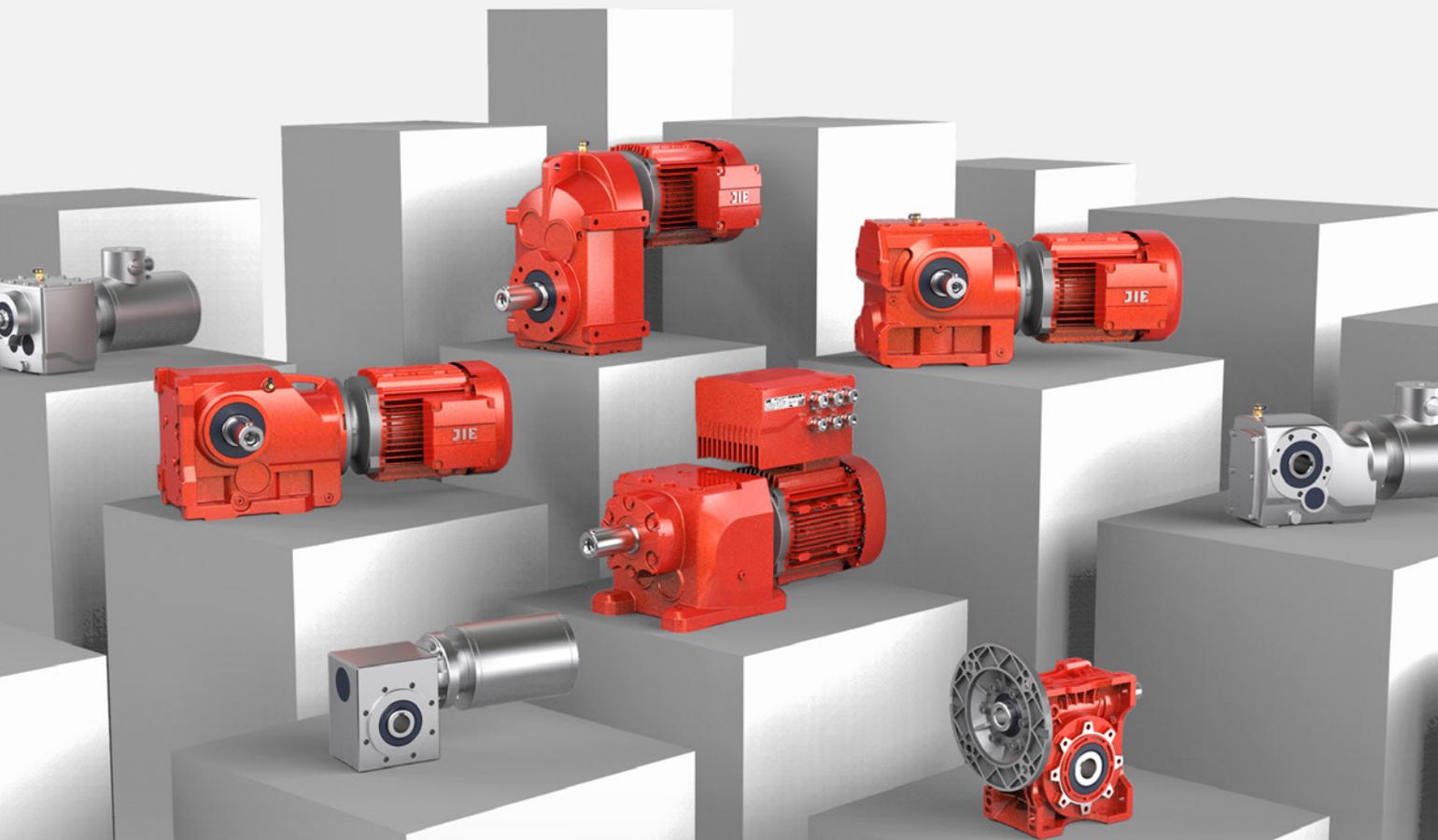
President
Matthew Croson
croson@agma.org

FOUNDER

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.



- *Quick Delivery*
- *Great Service*
- *Top Quality*



Options are Worm gear unit; Helical inline, Parallel shaft, Helical bevel and Helical worm gearmotor; Available in aluminum, cast iron and stainless steel housing.

JIE USA INC.

493 Mission St. Carol Stream, IL 60188
www.jie-drives.com | Info@jie-drives.com | +1 630 580 9986

Cool Kids in Tractors

Everybody's making electric cars these days. Luxury cars, sports cars, even trucks. And demand for them isn't going to slow anytime **SOON**, thanks to their better fuel efficiency, lower emissions, reduced noise and overall environmental friendliness.

But there's another factor, too. An electric vehicle is also a status symbol. To own one is to make a personal statement. In the early 2000s, that statement was mostly about environmental consciousness, when the Toyota Prius became the vehicle of choice for politically correct celebrities and tree-huggers alike. And while reducing carbon emissions is still an important factor in the demand for electric cars, it's probably not the most significant. Today's electric vehicles have come a long way in terms of performance, technology, styling and sophistication, to the point where the cars are as much cutting-edge tech gadgets as they are transportation. Owning a Tesla has become akin to owning an iPhone back in the day. Only the cool kids had them.

So, the demand is going to keep growing.

Which means the automotive industry will keep transforming.

Which means the rest of manufacturing will follow as the technologies become more ubiquitous.

As a result, electrification has become the No. 1 trend in manufacturing, not just in the automotive industry, but throughout the manufacturing world. And although the automotive industry gets all the press, it's not just cars getting amped up with batteries and motors. Electrification is also making serious inroads in surprising places, like the diesel- and hydraulics-dominated off-highway industry.

I mean, who wouldn't prefer to drive a tractor with a giant tablet-style touch screen, especially one that's quieter and lets you connect your phone via Bluetooth. Pretty soon, it's what all the cool farm kids will be driving.



In this issue, we take a look at some of the trends and technologies actually being implemented in off-highway and other vehicles. In the article "An Underground Conversion in Mining" (p.24), for example, we see Freudenberg and MacLean partnering to create battery-electric equipment to support many mining companies' commitment to become carbon neutral over the coming decades.

The article "Electric Integration" (p.28) from ABM Drives presents examples of electrification in vehicles as diverse as off-road sports cars and three-wheeled postal delivery vehicles that can handle the snowy, slippery conditions of the Swiss Alps.

Senior Editor Matt Jaster explores the mobile machinery market in detail with his article, "Transforming the Drivetrain" (p.34). In the article, experts from Bosch Rexroth describe how a traditionally mechanical and hydraulic industry is embracing electrification.

Of course, there's plenty more in the issue, so we hope you spend some time looking through our extensive product news, industry news and technical sections. As always, we appreciate you spending some of your valuable time with us. More importantly, we appreciate your feedback. Drop me a line at stott@agma.org to share your thoughts and comments on the issue or any of its articles.

Randy Stott

SDP/SI offers the industry's most comprehensive selection of precision gears, timing belt & pulley drives, mechanical components, motors, gearheads, and motion control products.

Facing a design challenge? SDP/SI engineers provide problem solving, customized solutions. With over 70 years of engineering development and precision manufacturing experience, SDP/SI is a proven partner to the most recognized names in medical, aerospace, defense, and robotics industries.



From prototype to high-volume production, SDP/SI high-quality components and subassemblies provide the reliable performance your application requires. Our products are found worldwide in surgical gear drivers, pharmaceutical processing & packaging, robotic surgery, patient positioning, drug delivery, pumps, and aerospace & defense applications including actuation/positioning systems, instrumentation, door releases, stabilization systems, camera positioning, weapons targeting, and cargo movers.



- 88,000 Stock Components
- Custom Gears and Gearboxes
- Custom Timing Belt & Pulley Drive Systems
- Couplings
- Bearings & Linear Motion Products
- Brushless DC Motors
- Integrated Motor Drive Controllers
- Frameless Motors
- Miniature Gearheads
- Planetary Gearheads



Call Us at 516-328-3300 or Shop SDP/SI at www.sdp-si.com
We have the expertise, state-of-the-art CNC machinery and world-class manufacturing facility you need.

Eaton Cummins

RELEASES ENDURANT XD SERIES FOR ON-HIGHWAY APPLICATIONS

MATTHEW JASTER, SENIOR EDITOR

Eaton Cummins Automated Transmission Technologies recently released specifications for its new Endurant XD series and announced it will include Endurant XD and Endurant XD Pro models.

The Endurant XD series are purpose-built, high-performance automated transmissions designed for on-highway applications with high gross combined weight ratings, such as double and triple trailer trucks, and severe-duty on/off highway applications like dump and logging trucks.

“Purpose-built means designed from the ground up—from the gear architecture to the shifting to the actuation. It is all meant to be an automated transmission. There’s no manual version, it’s not human shiftable,” said Ken Rocker, Endurant XD series product manager, Eaton Cummins Automated Transmission Technologies. “This opens up changes to improve the shift qualities as well as the introduction of a new ratio gearset.”

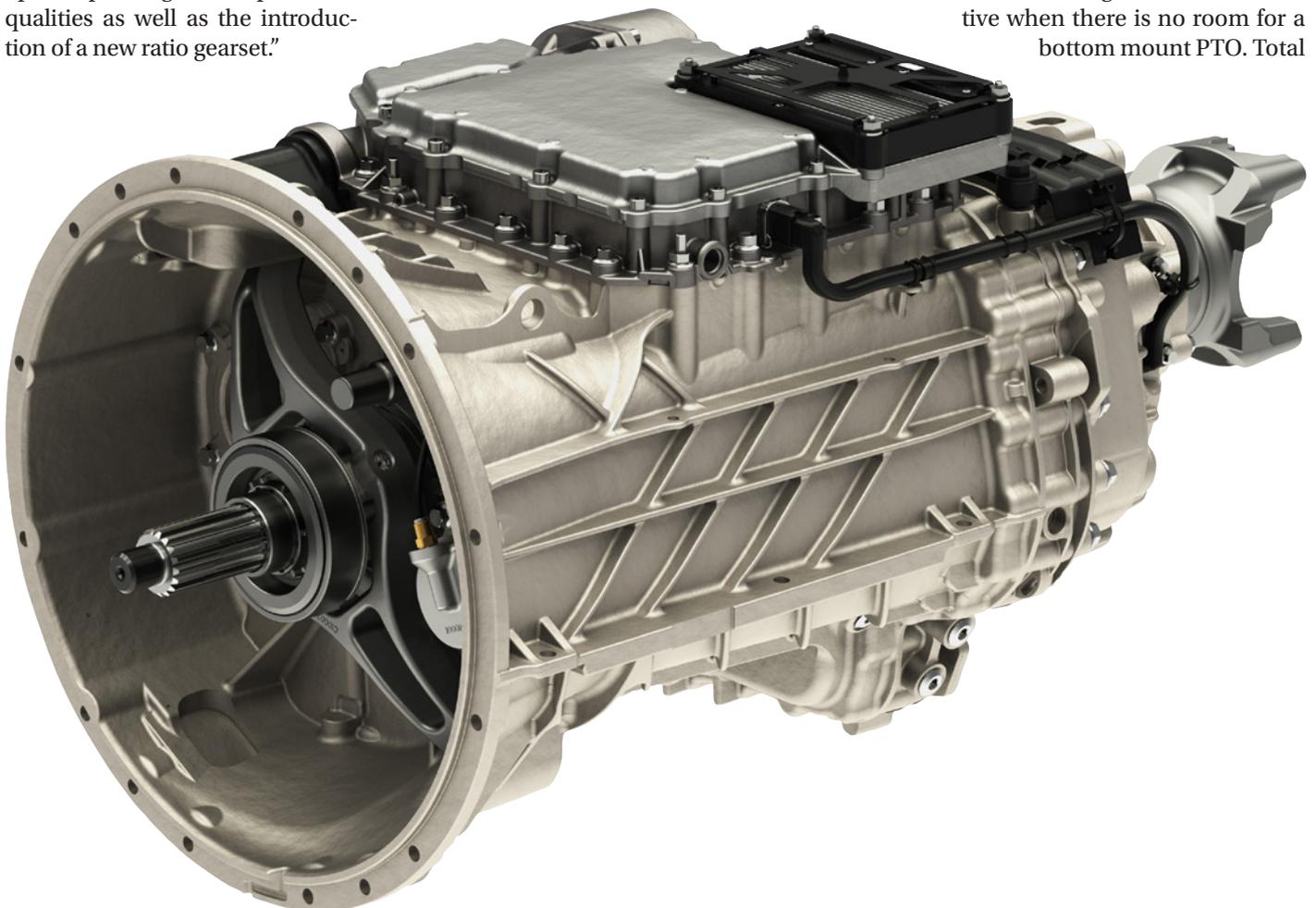
The Endurant XD series features a twin-countershaft design with helical gearing and large bearings optimized for higher engine torque. A new 18D ratio set with 20.5:1 overall ratio with small, even steps ensure smooth shifts and performance benefits in all driving conditions. It is packaged in a clean, contained design with internal wiring and sensors to minimize exposure and corrosion for improved reliability. Overall, its design is 225 pounds lighter than comparable UltraShift PLUS models.

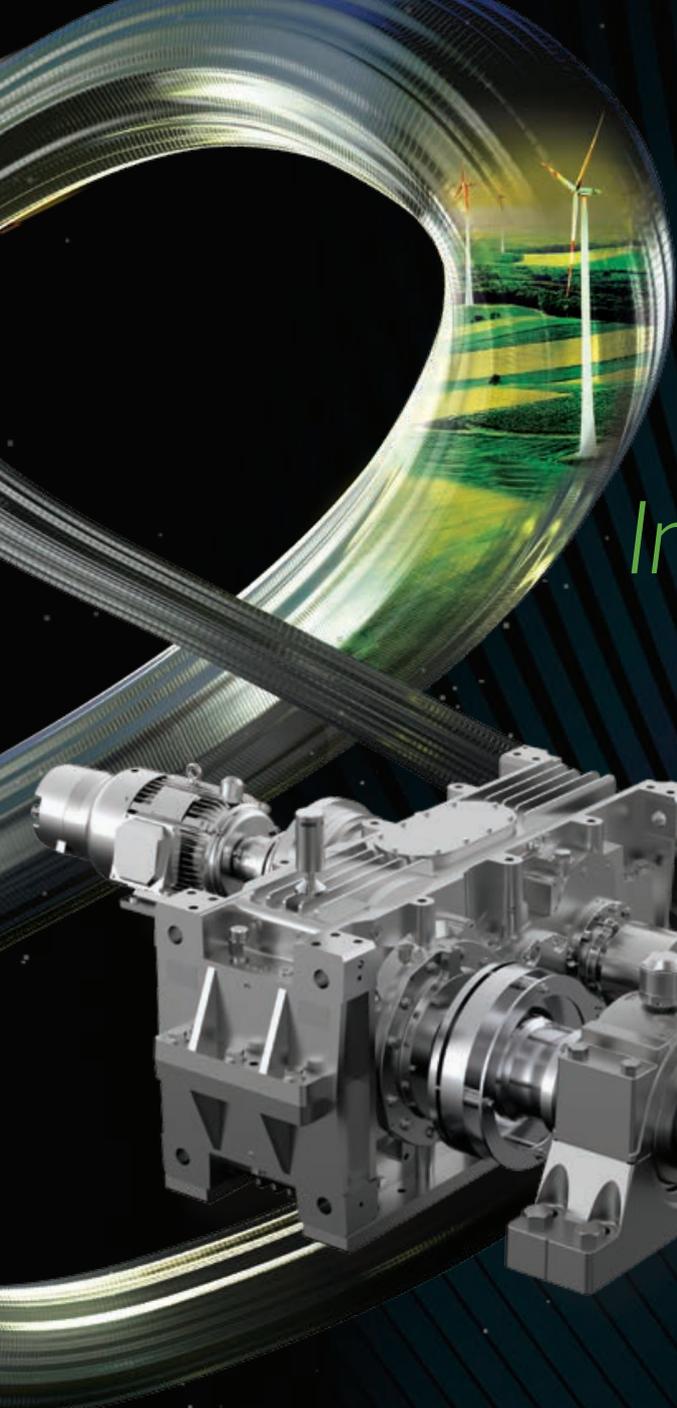
“One of the major differences between this gearbox set—a three by three by two architecture—is that there’s one less gear layer in this transmission compared to the legacy 18-speed models. There are less gears in this transmission, but we still achieve 18-speeds,” Rocker said. “Some of the weight savings came from

fewer components and a large savings came from the all-aluminum enclosures as opposed to cast iron. We’ve also gone from a twin-plate clutch to a single-plate clutch, so additional weight was removed.”

Twin countershaft technology is all about balancing the thrust and loading of the forces as you distribute the torque across the gear meshes, according to Rocker. “Splitting the torque in both directions keeps everything in balance and cancels out some of the thrust loadings you would typically have to account for in your bearing, gear and shaft design,” he added.

A new, input shaft driven Power Takeoff (PTO) system delivers power to an 8-bolt bottom mount and 4-bolt rear mount that can operate independently of the transmission gear. The 4-bolt rear mount features an external pressurized lube port and a large center distance, making it an ideal alternative when there is no room for a bottom mount PTO. Total





Industrial powertrains that drive endless potential

The new Regal Rexnord introduces engineered-to-order industrial powertrains, delivering power for the most demanding of applications



It took the combined strengths of our new company to develop complete industrial powertrain solutions, custom designed and built for applications across the full spectrum of horsepower and torque. From start to finish, Regal Rexnord™ electromechanical industrial powertrains are designed, configured, integrated and optimized for your unique applications, opening the door to new ideas and unlimited possibilities.

Read about Regal Rexnord and our prominent brands. Go to regalrexnord.com.

Rexnord® | Sealmaster® | Stearns® | Kop-Flex® | Link-Belt®
Falk® | Marathon® | Perceptiv™ | Browning® | Tollok®

All trademarks, service marks and company names are the property of their respective owners.
© 2022 Regal Rexnord Corporation, All Rights Reserved. MCAD21056E • MB0122E

Regal **Rexnord**™

Creating a better tomorrow™ ...

regalrexnord.com/powertrain

combined PTO capacity is 160 hp or 610 lb.-ft. of torque.

Fuel and maintenance are two of the largest expenses for a trucking operation.

One of the big improvements is that the clutch is self-adjusting, maintenance-free, greased for life, so there is no maintenance. The efficient design features a Precision Lubrication system for up to two percent better fuel economy than UltraShift PLUS. Additionally, smart features such as new internal oil

temperature and fluid pressure sensors help protect the transmission from damage.

“The new gear architecture layout improves fuel economy so now the most efficient gears are in the top half of the gearbox, above 20–25 mph, you’ll be in more efficient gear paths,” Rocker added.

Trucks operating below 110,000 pounds do not require a transmission cooler, reducing the risk of cooler leaks. Maintenance costs are minimized

thanks to long service intervals—up to 500,000 miles depending on vehicle application—and help keep the truck on the road and making money.

New for the Endurant XD series are Performance Goals, which combine transmission shift points and clutch calibrations with unique software. This allows operators to easily tailor transmission performance to the demands of the job.

“This used to be called shift calibration and they’re made up of shift maps or shift points specific to the targeted activity (i.e., performance and economy) but they also contain clutch calibration characteristics (control, smooth or aggressive clutch closure rates) and the third piece is specific software algorithms that we use to adapt the shifting. We can monitor how quickly the transmission adapts and changes to the environment,” Rocker said.

Endurant XD is rated for engines with a maximum torque rating of 1,650 to 1,850 lb.-ft. and is designed for on-highway applications up to 166,000 pounds Gross Combined Weight Rating (GCWR).

Endurant XD Pro utilizes Eaton’s Extreme Duty clutches, which feature robust components designed for increased durability, improved noise, and vibration, in addition to higher thermal capacity for enhanced low-speed maneuverability.

Unique software features to the Endurant XD Pro include *Rock Free*, which helps avoid getting stuck in sand, mud, or snow by using the accelerator to rock the vehicle free, and the *Off-highway Performance Goal*, which is an optimized calibration for operation on natural rolling terrain and soft soil.

“Endurant XD Pro has the right mix of hardware and intelligence to give drivers more confidence in the most challenging applications such as construction, heavy haul, towing/ recovery, and logging,” Rocker said.

Production of the Endurant XD series begins in Q3 2022. Truck manufacturers are expected to announce availability of Endurant XD series at a later date.

www.eaton.com

Schaeffler

TRIFINITY WHEEL BEARING PROVIDES E-MOBILITY SOLUTION

MATTHEW JASTER, SENIOR EDITOR

Schaeffler's TriFinity wheel bearing is a fully optimized, three-row, angular contact ball bearing that provides higher stiffness and longer service life by minimizing friction and mass.

"Generally, when we look at wheel bearings, we're looking for solutions that provide higher load carrying capacity," said Michael Eastman, Director of BU Wheel Modules for the Americas at Schaeffler. "We've been working on high-capacity density solutions for years. How can you provide more life to the bearing in a smaller package?"

This occurs through material selection, bearing design, etc. Over the last three years, Schaeffler took this concept and focused on friction reduction with an eye on the battery electric vehicle (BEV) market. The North American market is focused on larger electric vehicles, so the Schaeffler team thought it made sense to find a lower friction solution to the standard bearings produced today.

A Closer Look at Wheel Bearings

"There are two different types of wheel bearings—ball bearing and tapered hub units. They are typically two row bearings. The tapered hub units have typically been used on trucks," Eastman said. "We wanted to produce an electric market solution for trucks and SUVs that was really able to bring the rolling resistance down. Along with these benefits, the TriFinity wheel bearing can improve camber stiffness and while meeting life requirements for the application as well."

The TriFinity wheel bearing can get friction down around 50 percent compared to a tapered hub unit. It can also provide a downsizing solution when a customer is designing a new BEV and the bearing needs a little more capacity.

"If you have a smaller package, your friction is going to be smaller because your seals and your rolling elements are all operating on a smaller diameter. So, we can get decent friction improvements there—somewhere between

eight and 20 percent with the downsizing solution," Eastman added.

While the concept of the TriFinity wheel bearing was created with BEVs in mind, it's also translatable to ICE vehicles as well.

"We've done some similar vehicle level testing in the past. If you take an existing tapered hub unit and replace it with the TriFinity wheel bearing on all four wheels, based on our data we'd expect a one to two percent improvement in fuel economy. It all depends on the motivation of the customer," Eastman said.

For monitoring purposes, wheel bearings typically use ABS encoders. The wheel speed encoders are integrated.

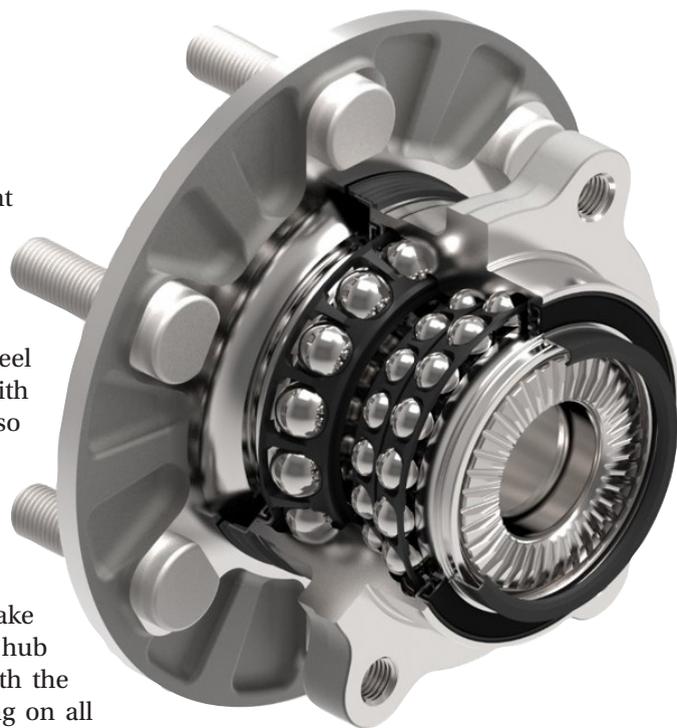
"Down the road for autonomous vehicles—Level 5, people mover applications—condition monitoring might be something we have to think about because the vehicle needs to know the operating conditions of the components and the wheel bearing is one of them," Eastman said. "Once these vehicles become more prevalent in the market, we'll look closer at these technologies."

Additional Technology

Usually, forces are transferred between the drive shaft and wheel hub via a radial spline. To meet vehicle manufacturer's growing CO₂ reduction requirements and address NVH issues with the radial spline design, a new transfer variant was developed by Schaeffler known as face spline.

The face spline is positioned axially on the half-shaft and at the transmission-side end of the wheel hub. During wheel bearing production, the orbitally formed shoulder and face spline are made in a single step.

"When you look at the BEV market



two things come to mind: The vehicles are heavy and they have high torque," Eastman said. "Face spline gives us the ability to integrate the technology into the TriFinity wheel bearing and hit both of those marks. We can not only manage the loads but also addresses the needs on the torque side."

Friction benefits happen at the component level, but at the system level it translates into range extension and fuel economy improvements for ICE engines.

Future Considerations

Schaeffler is looking at other improvements to reduce friction and increase life. Some of those areas involve seal development advancement and grease technology.

"Sensor integration is another focus area," Eastman said. "What type of sensor integration do we need? What type of condition monitoring systems do we need? We're collaborating with our colleagues to answer those questions."

The TriFinity wheel bearing will go into production toward the end of 2022 or early 2023. Visit the PTE website to learn more about this and other e-Mobility solutions.

www.schaeffler.us

Moog

PARTNERS WITH DOOSAN BOBCAT ON ALL-ELECTRIC COMPACT TRACK LOADER

Moog Inc. recently announced that the company is providing Doosan Bobcat with its intelligent machine electrification system to help Bobcat design and build the world's first all-electric compact track loader: the Bobcat T7X, which does not use hydraulic parts or oil. The T7X is a zero-emission and all-electric machine with the power and performance of a diesel hydraulic machine but without the noise, emissions, and hydraulic leaks.

Moog's intelligent machine electrification system consists of Moog's integrated software framework, an electric machine controller, lift and tilt electric cylinders, electric traction motors, and power electronics.

"Bobcat had a vision for an all-electric machine," said Joe Baldi, director of strategy and partnerships for Moog. "Our conversation began with Moog's all-electric actuators, but ultimately our talks led to the

intelligent machine electrification system. Working in partnership with Bobcat, we were able to bring that all-electric vision to life in six months."

Moog has a long history of converting

hydraulic systems to electric in industries including aerospace, defense, and industrial machinery as well as in applications such as simulators for air, sea, and land vehicles. Moog's

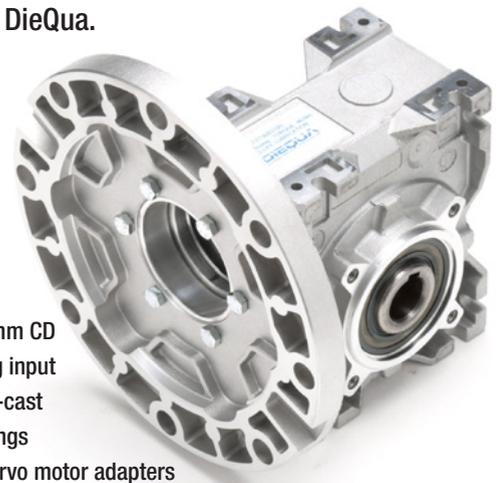


aluminum worm speed reducers 

Did you mean: **DieQua Corporation?**

The search is over!

For quality aluminum worm gear speed reducers providing improved performance, high reliability and easy maintenance, look no further than DieQua.



- 7 sizes, 28-110mm CD
- Flexible coupling input
- Light weight die-cast aluminum housings
- NEMA, IEC, or servo motor adapters

To finally find what you're looking for, check us out on the web, or give us a call.

diequa.com/pte 800-269-4715
DIEQUA
 Corporation

intelligent machine electrification system helps the T7X control the motion of the tracks, as well as lift and tilt functions with enough efficiency to enable a zero-emission machine with significantly increased run time and reduced maintenance costs.

“To describe our contribution to the T7X in anatomical terms,” added Baldi, “we supplied the part of the brain that controls motion; the nervous system helping to intelligently coordinate actions, power, and sensor information; and the muscles, which are the all-electric actuators and motors.”

Production-ready solution

On January 4, 2022, in Las Vegas at CES 2022, Doosan Bobcat announced that Sunbelt Rentals will invest in a fleet of the all-electric T7X compact track loaders. The all-electric machines will

be co-branded by Bobcat and Sunbelt and made available in 2022.

Moog Construction

Moog Inc. has launched a new venture called Moog Construction. “Our focus is accelerating electrification, automation, and connectivity by enabling the world’s safest, most sustainable, and most productive machines,” said Joe Alfieri, vice president and general manager for Moog Construction.

Moog Construction is bringing the intelligent machine electrification system to market for customers looking to create zero-emission, connected, and more automated machines.

By integrating multiple subsystems including power management, motion control, connectivity, and automation, Moog enables customers

to develop their own differentiated offerings and bring their vision for next-generation machines to life, while decreasing development costs and the time to bring products to market.

“Our vision is to be the leading provider of electrification and automation solutions,” said John Scannell, chairman and CEO of Moog Inc. “This effort brings differentiated technology that will enable the construction industry to move to a more productive, safe, and sustainable future. Moog’s 70 years of experience supporting customers around the world means that we can draw on our existing infrastructure to manufacture, service, and support customers at scale.”

www.moog.com

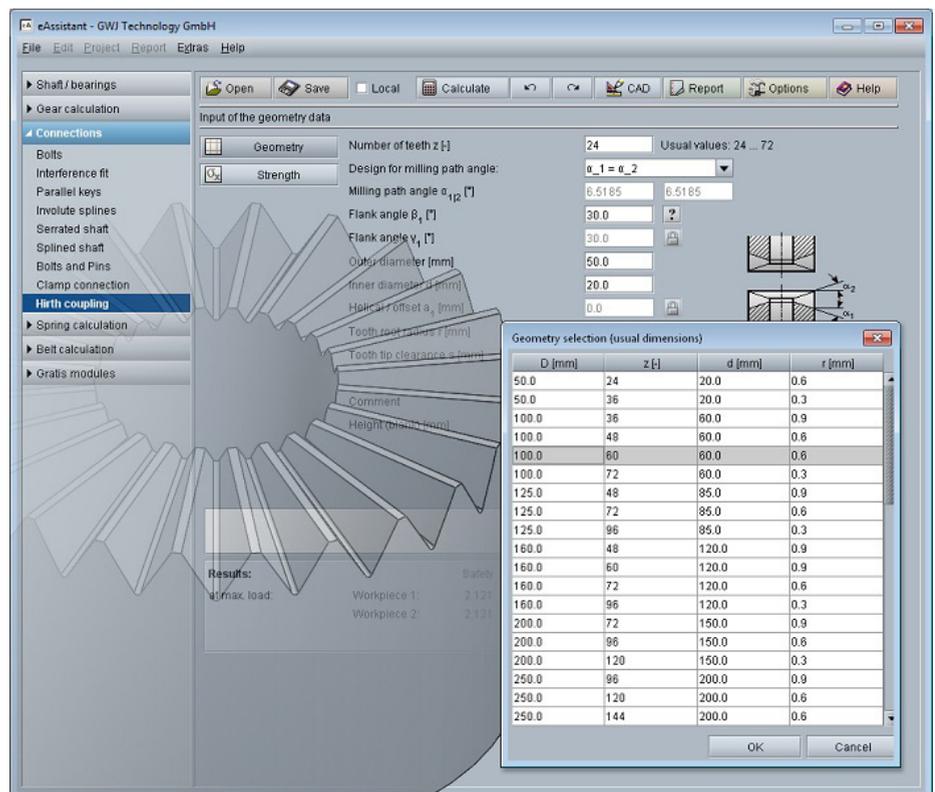
GWJ Technology

ADDS ONLINE CALCULATION FOR HIRTH COUPLINGS

GWJ Technology GmbH, calculation specialist from Braunschweig, has added a new module to its web-based calculation software eAssistant—this now enables the calculation of Hirth couplings.

The new module is part of the web-based calculation software eAssistant to design, recalculate and optimize classic machine elements such as shafts, bearings, gears, cylindrical and bevel gears, etc. The Hirth coupling (or Hirth serration), a shaft hub connection with tapered, symmetrical teeth, is a form-locking, self-centering, and easily detachable connection component.

Because of the high torque stability together with the positioning accuracy, the Hirth coupling is successfully used across many industries for various applications, for example to connect shafts, disks, rotors, wheels, and cranks together. This type of connection offers a number of significant



advantages: robustness, suitable for changing forces and it requires only minimal space due to the small size. Assembly and disassembly are quick and easy. During assembly, the components are self-centering. Thanks to modern machine tools and manufacturing processes, the connection can be manufactured cost-effectively by using grinding or milling operations.

With the input of the number of teeth, outer and inner diameter, flank

angle and tooth root radius, the new eAssistant module calculates the geometry of the Hirth coupling. Various special cases of the connection are also supported. In addition to the geometry, axial load, preload as well as the permissible surface pressure and the corresponding safeties are determined at maximum load. Results are displayed directly in the results overview of the calculation module. Common dimensions can be selected from an

integrated database. Here, diameters from 50 to 900 mm can be chosen each with a suitable number of teeth, inner diameter, and tooth root radius.

The permissible pressures are determined from material properties. Already existing materials can be easily selected from the integrated material database. Additionally, the user can enter individual materials for the calculation. After completion of the calculation, a detailed calculation report is



The Power of One²

Your Objective:
One face in perfect alignment with another. *For infinity.*

No problems. No distress. No delays.

That's the same objective you have for choosing your gear producer. Circle Gear's objective is to engage with every customer's objectives.

- ▶ **One to 1000 gears**
- ▶ **Customer designed or reverse engineered**
- ▶ **Gearbox repair, rebuild or redesign**
- ▶ **OEM or end-users**
- ▶ **ISO 9001:2015 Certified**

1501 S. 55th Court, Cicero, IL 60804
(800) 637-9335
(708) 652-1000 / Fax: (708) 652-1100
sales@circlegear.com
www.circlegear.com



Spiral and Straight Bevel Gears (*Cut, Ground or Lapped*) • Spur Gears • Helical Gears • Long Shafts • Herringbone Gears • Involute and Straight Sided Splines • Internal Gears • Worm and Worm Gears • Racks • Sprockets • ISO Certified

Partnering with QualityReducer to provide Gearbox repair, rebuilding and reverse-engineering.



Dana

INTRODUCES PLANETARY DRIVES FOR MOBILE AND INDUSTRIAL APPLICATIONS

Dana Incorporated has announced the introduction of three new planetary drives with wide ratio ranges, better power density, and modular designs that expand the company's Spicer Torque-Hub support for tracked and wheeled vehicles, as well as Brevini winch applications.

Available now, the new drives offer output torque ratings from 80 kNm to 130 kNm. The new planetary drives can be configured with Brevini hydraulic motors or Dana TM4 electric motors for a wide range of conventional and next-generation electrified machines, such as crawler cranes, piling rigs, drill rigs, track tool carriers, straddle carriers, and tracked undercarriages. They can also be packaged with hydraulic or electric motors for winches used in a variety of lifting applications, including construction cranes, offshore cranes, rotary drilling machinery, and shiplifts.

By sourcing these drives and associated components from Dana as a single point of contact, original-equipment manufacturers can simplify procurement, streamline integration and assembly, and improve speed to market.

"As mobile and industrial

available to the user in HTML and PDF format. The output of the 3D model of the Hirth coupling is also possible directly in a 3D CAD system by using the eAssistant 3D CAD plugins.

www.gwj.de



applications grow in size to meet more demanding market requirements, planetary drives face increased torque requirements within existing design envelopes,” said Jeroen Decler, senior vice president, off-highway drive and motion sys-

tems for Dana Incorporated. extreme conditions from minus-40 to 120 degrees Fahrenheit (minus-40 to 50 degrees Celsius).

The drives for mobile applications can manage input speeds up to 5,000 rpm and provide heavy-duty bearing load capacities as well as cartridge motor mounts with integrated parking brakes.

The winch drives accommodate electric and hydraulic motor inputs and supply exceptional radial load capacities with best-in-class torque ratings under standards established by the European Federation of Materials Handling (FEM). Supporting winch applications with line pulls up to 83 tons (75 tonnes), the drives can be customized for marine applications with a sealing system specifically engineered for harsh environments, and they meet safety certification standards for major international organizations governing marine applications.

www.dana.com

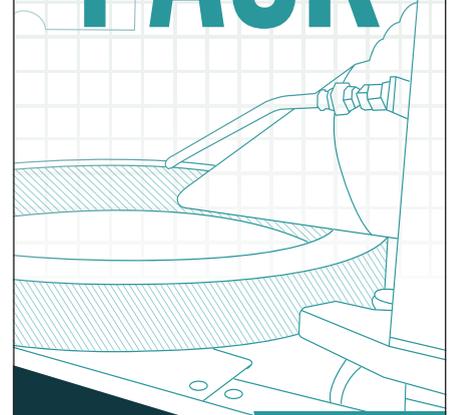
“The drives for mobile applications can manage input speeds up to 5,000 rpm and provide heavy-duty bearing load capacities as well as cartridge motor mounts with integrated parking brakes.”

tems for Dana Incorporated.

The introduction of the new planetary drives is part of a series-wide redesign that updates Dana’s field-proven technologies with improved torque density, lower package weight, increased input speeds, and more design flexibility.

Dana’s full line of planetary track drives now offers output torque ratings from 10kNm to over 130kNm, with ratios available from 26:1 up to 210:1. Large drives in the RCT series are engineered to operate reliably in

FORGING AHEAD OF THE PACK



MADE IN THE
USA

**Fast.
No Fine Print.
No Premium.**

At McInnes Rolled Rings, we provide quality products, shipped fast. And we partner that with exceptional customer service to forge the perfect partnership with our customers.

**McINNES
ROLLED RINGS**

1.877.736.4409

www.McInnesRolledRings.com

SKF

DEVELOPS DUAL-PISTON GREASE GUN

SKF has developed a tool that simplifies the critical task of lubrication. The SKF Lincoln dual-piston lever-action grease gun (Model 1154) has a thumb-operated switch that allows it to toggle between high-volume and high-pressure. This makes it easier for technicians to quickly adjust the tool to match the equipment's lubrication requirements.

"Lubrication jobs are effortless with the uniquely versatile design of the 1154," says Keith Rohan, product manager at SKF. "It handles a variety of applications and speeds up working times."

The grease gun is perfect for farmers and construction workers, who need reliable, durable tools in rough working environments as well as users in vehicle repair garages.

For high-volume applications, users can benefit the more efficient design. The 1154 requires three times less strokes, compared to standard grease guns, administering the same amount.

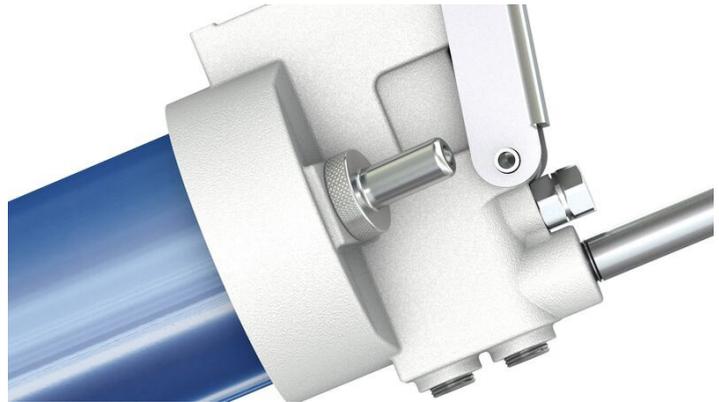
If high pressure is needed, such as when a fitting is blocked, it can be difficult for the operator to clear it but in the standard output, pressure position, the 1154 can successfully open the fitting without the operator having to apply excessive force.

The 1154 can manage all lubrication tasks very easily, because the technician can adjust the grease gun

to meet their needs with the press of a switch. A typical application would be a piece of farm equipment that has a variety of high-pressure and high-volume lubrication points.

The volume position allows efficient greasing of all lubrication points with fewer strokes. Large joints, bushings and bearings can be filled quickly. It is also excellent for lubricating large surface areas such as fifth wheels, chains and conveyors. The pressure position has a standard grease output of 34 strokes/oz and develops 10,000 psi for use whenever high-pressure requirements are needed — such as track adjusters, clogged fittings and high-tolerance locations.

www.skf.com



High-Speed Bearing Testing

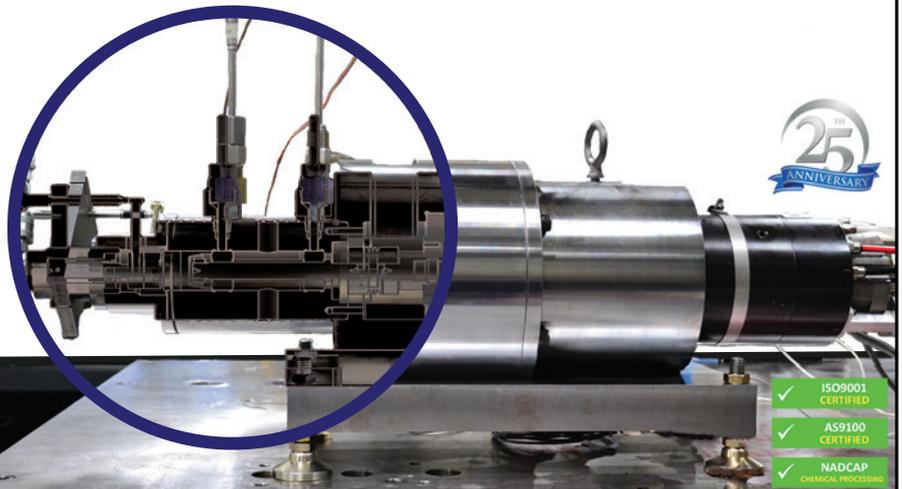
North America's *Largest Independent Bearing Testing & Inspection Facility*

Evaluating:

- ✓ Power Loss
- ✓ Fatigue Life
- ✓ Cage Design
- ✓ Accelerated Wear
- ✓ Surface Treatments
- ✓ Lubricant Efficiency



Bearing Testing in support of Electric Vehicles of the future with NES High-Speed Testers

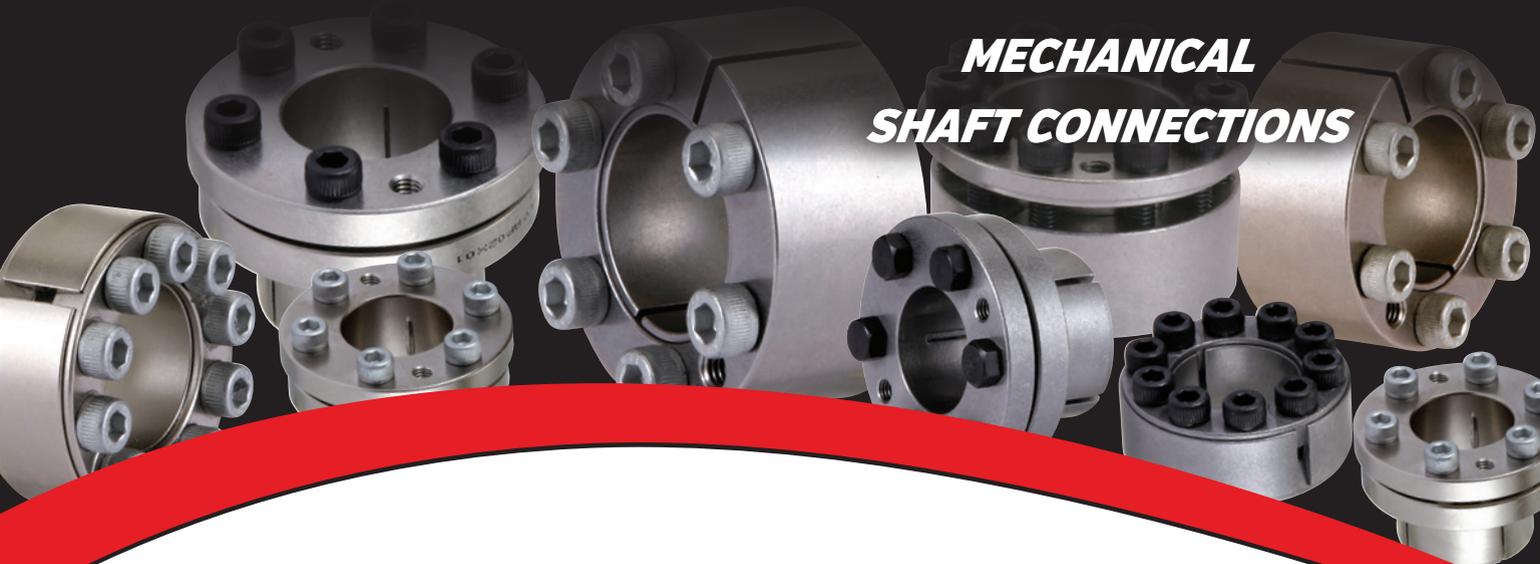


Napoleon Engineering Services
 sales@nesbearings.com
 nesbearings.com
 Olean, NY USA
 (877) 870-3200

HYDRAULIC SHAFT CONNECTIONS



MECHANICAL SHAFT CONNECTIONS



PRECISE. ROBUST. AVAILABLE.

Keyless Shaft Bushings

- Precise & Reliable Shaft Component Mounting
- Single-Screw Models for Fast & Frequent Use
- Steel, Nickel-Plated, and Stainless-Steel
- Variety of Mounting Styles Available
- English & Metric Sizes in Stock
- Engineering Assistance / **Fast** Delivery



www.zero-max.com 800.533.1731

ZERO-MAX

Renewable Lubricants

INTRODUCES BIO-ULTIMAX 1000

Renewable Lubricants has introduced Bio-Ultimax 1000, readily biodegradable biosynthetic formulas which perform like mineral oil based hydraulic fluids but are environmentally friendly. With oxidation performance comparable to full synthetics, this is one of the safest hydraulic fluids for the environment. Ideal for stationary or mobile environments, Bio-Ultimax su-

per high Viscosity Index (VI) fluids are proven in systems up to 10,000 psi and in systems with ultra-fine filtration. To ensure performance and long life, Renewable Lubricants developed the stringent IsoGreen filtration standard which meets or exceeds the Rexroth pump guidelines for hydraulic fluids. Nontoxic, zinc-free formulations contain no heavy metals. In addition to

enhancing performance, Bio-Ultimax helps companies achieve their sustainability goals. They are ideal for use in all types of hydraulic systems including trash compactors, waste and recycling collection vehicles, hydraulic pumps, pile driving equipment, and more.

With a higher VI than synthetics (Energy Conserving Formulas), Bio-Ultimax 1000 has improved thermal shear stability and increased load capacity. Their extremely low volatility increases the flash and fire safety features, making them safer to use. A direct replacement for mineral oil based hydraulic fluids, Bio-Ultimax is ideal for hydraulic systems where low toxicity, biodegradability, and non-bio-accumulation properties are required.

These patented biobased hydraulic fluids are formulated to perform in high- and low-pressure hydraulic systems that require anti-wear, anti-rust, anti-oxidation, anti-foam, and demulsibility properties. With patented antioxidants (Stabilized by Renewable Lubricants), these



YOU CAN DEPEND ON WORLDWIDE ELECTRIC

Quality, Affordable Motors, Controls, and Gear Reducers for Demanding Industries and Applications



WorldWide Electric is a leading manufacturer of quality, affordable electric motors, motor controls, and gear reducers and an exclusive master distributor of **Hyundai Electric** low-voltage motors and drives. Offering fast, often same-day, shipping from 6 regional warehouses, WorldWide Electric is committed to exceeding your expectations on product availability, value, and speed & quality of service.

Call us or visit us online!
(800) 808-2131 / worldwideelectric.net

-  **Superior Customer Support**
Driven to provide the best possible customer experience
-  **Proven Quality & Affordability**
Premium motors, controls, & gear reducers at competitive prices
-  **In Stock When You Need It**
\$50M in inventory stocked at 6 regional warehouses
-  **Same-Day Shipping Available**
Most orders placed before 2PM local warehouse time can ship same-day

WorldWide Electric Corporation | 3540 Winton Place, Rochester, NY 14623
Distribution Centers located in Allentown, PA | Atlanta, GA | Dallas, TX | Indianapolis, IN | Los Angeles, CA | Seattle, WA



Zero-Max

SAFETY DEVICES OFFER OPTIONS FOR CORROSIVE AND WASHDOWN APPLICATIONS

biosynthetics provide improved performance in oxidation stability over standard plant/vegetable/HETG and unsaturated HEES type fluids. They are highly inhibited against moisture and rusting in both fresh and sea water, and pass A and B sequences of the ASTM D-665 Turbine Oil Rust Test. Formulated to provide a longer seal life with reduced oil leakage, this environmentally friendly, zinc-free product meets or exceeds high-pressure pump requirements.

Little wear was encountered in field studies and in accelerated pump tests using biobased formulations in Denison T-5D, Vickers 20VQ, 35VQ-25 (M-2950-S), and V-104C (ASTM D-2882), Vickers I-286-S pump stand tests and pressures and temperatures ranging from 2,000 to 3,000 psi and from 150° to 210°F. Anti-wear performance exceeds requirements for US Steel 126, 136, and 127, load stage 10 in the FZG (DIN 51354) and GM (LS-2).

www.renewablelube.com



Zero-Max Overload Safety Devices protect motor and drive systems from overload while offering options to withstand corrosive environments and necessary washdowns. These options provide protection from direct water spray, washdown chemicals, detergents, chemical exposure, and debris.

These unique Overload Safety Devices are ideal for applications ranging from food processing, packaging, commercial dishwashers, industrial parts washers, and any applications

also offer easy re-engagement, allowing the system to be running again as quickly as possible.

Torq-Tender Overload Safety Devices include high-phosphorous nickel-plating, stainless-steel exterior, O-ring seals, lubrication options (food grade grease and/or dry lube coating) and more.

Standard H-TLC Overload Safety Devices include stainless steel exterior, stainless steel springs, food grade grease and more. Both Torq-Tender



with similar challenging operating conditions.

Providing both torque limiting and coupling functions in a compact design, these Zero-Max Overload Safety Devices can operate as a coupling and an overload safety device connecting two inline shafts in a power transmission system. Power Take-Off models are also available for use with chain or belt drives. These Overload Safety Devices protect motor and drive systems from excessive overloading and potentially expensive system jam ups, especially after factoring in for equipment repairs, product loss, and any downtime incurred resulting from a jam up. They

and H-TLC models are available in a variety of mounting configurations including use as a coupling model, or as a power take-off model for use with chain or belt drives.

Actuating Pin or Actuating Disc options are available for interfacing with a limit switch, proximity switch, or other sensing device to signal that an overload is occurring, or to shut down the drive motor when an overload occurs. This automated shut-down prevents excess wear on the machine's driveline components.

www.zero-max.com

Bodine Electric

OFFERS HOLLOW SHAFT GEARMOTORS

Bodine Electric Company recently introduced four new type 42R-HG/H hollow shaft gearmotors. These new geared motors combine Bodine's type 42R inverter-duty AC 3-phase motor with a new hollow shaft type HG/H gearhead. When used with an AC inverter (VFD) control, the type 42R motor delivers variable speed and maintenance free operation over a wide speed range. The new offset parallel shaft HG/H gearhead provides flexible mounting and high torque in a small package. Typical applications include conveyor systems, chip conveyors, patient mobility applications, food processing equipment, automated watering systems for greenhouses, and many other industrial automation applications.

Designed as a space-saving drive solution, the Bodine type HG/H hollow shaft gearhead is shorter in length but taller than comparable parallel shaft

gearheads. The offset design allows the gearmotors to deliver high torque for their size through a range of gear ratios. The large center distance between the gearbox and the motor enables these units to be fitted with dual drive shafts. The HG/H gearhead also features large hardened helical and spur gears and needle bearings to ensure quiet, long-lasting operation.

Bodine's HG/H hollow shaft geared motors optimize mounting space, simplify installation, and reduce the number of component parts. They can be connected directly to the driven load

eliminating expensive shaft couplings and mounting hardware that can be unsafe, bulky, and present alignment issues. These hollow shaft gearmotors offer left- or right-hand face mounts for maximum application flexibility.

The initial product launch includes four standard gearmotor models with gear ratios from 27:1 to 108:1 with speeds from 16 to 63 rpm. Rated torque ranges from 294lb-in (33Nm) to 1020lb-in (115Nm). Bodine type 42R-HG/H gearmotors are available with 230/460VAC Inverter-duty (3-phase) windings.

www.bodine-electric.com



Hagglunds

FUSION DRIVE SYSTEM INTRODUCES PLUG AND PLAY OPTION

Hagglunds Fusion drive systems bring a new definition of compact to the already space-saving Hagglunds drive concept. An entire hydraulic direct drive system can now be mounted on the torque arm, making Hagglunds advantages even more attractive for wide range of applications.

For the first time, customers in mining, materials handling and other industries have a plug and play answer

to drive system needs. A Häglunds Fusion drive system puts everything on the torque arm, from the hydraulic motor and pumps to the cabinet that houses them.

"Not only is there no gearbox or foundation, there are no alignments or even hydraulic pipes or hoses to consider. A Hagglunds Fusion drive system is as compact it gets," says Wolfram Ulrich, vice president of sales

for Hagglunds products and solutions."

For owners of equipment in lower power ranges, such as apron feeders, belt feeders, belt conveyors and infeed conveyors, the Hagglunds Fusion benefits are especially clear. Streamlined installation means easier access to Hagglunds strengths, which save money over time compared to electro-mechanical drives.

"These applications have much to gain from a Hagglunds hydraulic solution, due to their many starts, stops and reversals," says Ulrich. "Choosing Hagglunds gives them maximum torque from zero speed and built-in protection from torque peaks, which ensures high productivity and low cost of ownership. Now we add easier installation to the mix."

Ulrich concludes: "Hagglunds Fusion is compact and dependable power, fused with plug-and-play simplicity."

www.boschrexroth-us.com/hagglunds



Tolomatic

RSH ACTUATORS MEET HYGIENIC STANDARDS FOR AUTOMATION MACHINERY



A new RSH electric hygienic rod-style actuator from Tolomatic delivers clean, continuous control to automation machinery. RSH actuators are designed to help improve repeatability, enhance quality, reduce contamination potential and increase flexibility of hygienic machine designs, particularly for the food, beverage, medical, healthcare and pharmaceutical industries.

The RSH is clean-in-place (CIP) compatible, allowing designers to achieve open machine designs, and rated IP69K to withstand high-pressure washdown. The front-face sealing O-ring ensures a hygienic design from head to toe. The polished all-316 stainless-steel, smooth exterior resists corrosion and eliminates the need for protective shielding, which simplifies and lowers the cost of machine design. Design engineers can leverage the Tolomatic Your Motor Here database to select from a variety of stainless-steel motor manufacturers for a complete all stainless hygienic package.

The RSH is designed for forces up to 7,943 lbf (35 kN), speeds up to 20 in./sec (498 mm/sec) and stroke lengths up to 48 in. (1,200 mm). It is available in both ball screw and roller screw options. While ball screws are an economical option with medium life and force capabilities, roller screws (manufactured by Tolomatic) provide higher force capability, increased life and improved accuracy.

www.electromate.com

Isotech

LINEAR SHAFTING AND BEARING RAILS IMPROVE PERFORMANCE

From tapping and shaft-stepping to sophisticated spindle shaft and linear bearing rail manufacturing, Isotech offers products that improve damage resistance, decrease surface roughness and can be utilized to repair older components.

Using advanced heat treatment technology, Isotech can improve the resistance of rotational and linear shafting devices. The company's quenching and tempering processes creates a uniformly hardened outer layer that resists damage commonly incurred over time. Isotech linear bearing rails ensure roughness is limited to no more than Ra0.4. Additional options include: Various coatings, including chroming and ceramics, as well as repair and resurfacing services for older components; a range of different materials, including high-carbon chromium bearing steel and Martensitic stainless steel; multiple product types, including SFW/SFWS/SN/SNS/SNT components and other high-precision

shafts. Isotech can also manufacture SNB/SNSB center-lined tapped shafts and SFW-PD/SFWS-PD pre-drilled inch shafts for shaft support rails.

www.isotechinc.com



How to Improve the Energy Efficiency of Your Hydraulic Systems

Blayne McKenzie, Ph.D., Technology Manager, Industrial Oils, The Lubrizol Corporation

It's no small decision to invest in new hydraulic equipment. In addition to potentially daunting initial costs, other costs such as maintaining and running the equipment must also be taken into account. Taken together, these costs are called the total cost of ownership (TCO). When purchasing managers consider what equipment to add to their fleets, the TCO should factor heavily in the decision. One of the important influences on TCO is how the hydraulic fluid alleviates maintenance and operational costs.

Using the proper hydraulic fluid can lower TCO and allow end users to increase the profitability of their machines. In this article, we will discuss how hydraulic fluids containing performance polymers can improve equipment's energy efficiency without affecting durability—and we offer real-world examples of the ways improved energy efficiency can positively affect the equipment's overall performance.

Four-Step Process

Developing an effective hydraulic fluid is not a simple process. In fact, lubricant manufacturers must sift through many formulations before deciding which ones to take to market. In most cases, the different formulation candidates must undergo a rigorous four-step process:

Laboratory studies: First, researchers must run initial tests in a controlled, laboratory environment to see if specific fluids can even be used in hydraulic applications. Several bench tests are used to separate promising fluids from those that won't make the cut, and the ones that show the right characteristics are moved on to the next step.

Performance testing: While still done in the laboratory, the most promising fluids now undergo further testing on proprietary test rigs. The test rigs have been scientifically designed to replicate real-world conditions without the vagaries often encountered with in-equipment testing. This narrows the number of fluids once again, and the leading candidates are then moved to in-equipment testing.

Equipment testing: All the theoretical work in the world is no substitute for seeing how hydraulic fluids operate in actual equipment, which is what happens at Stage 3. The



Hydraulic fluids containing performance polymers can improve equipment's energy efficiency without affecting durability.

leading fluids are still not subjected to outside factors because the equipment is still operated within laboratory conditions, but it will reflect how the lubricant will behave in equipment environments. Only the best-performing hydraulic equipment progresses beyond this point into the final proof of its effectiveness as a lubricant and protector of the equipment's inner workings.

Final proof: After all possible proof has been done in the laboratory, it's time to put the best hydraulic fluids through their paces under real-world, actual working conditions. How the fluids perform at this stage will determine whether they are ready to be brought to market.

How Performance Polymers Help

Most multigrade hydraulic lubricant formulations today contain important elements referred to as performance polymers. In contrast with conventional monograde lubricants, performance polymers allow the fluids to operate in a wider range of conditions, providing consistent fluidity during cold-weather startups and maintaining proper viscosity and protective fluid film thickness when internal equipment temperatures increase. In addition, individual performance polymers also bring other important characteristics based on their formulation. Our focus in this article, however, will be on the specific advantages of using energy-efficient hydraulic fluids (EEHFs) to the overall TCO.

As discussed earlier, fluids are first tested in the laboratory to ensure they perform to the expected standards for different hydraulic applications, and that is no different for EEHFs. Under laboratory conditions, EEHFs that contain energy-boosting performance polymers (EPPs) lower traction coefficients by 9% compared to standard multigrade fluids. Practically speaking, that means the fluid more efficiently through the equipment. In addition, it has been demonstrated that they also reduce shear loss by 49%. Together, these results show that EEHFs allow equipment to perform more efficiently without sacrificing the protection of the equipment's components. EEHFs also show excellent performance in low-traction/high-efficiency applications, thermal and oxidative stability and are NSF H1 approved.

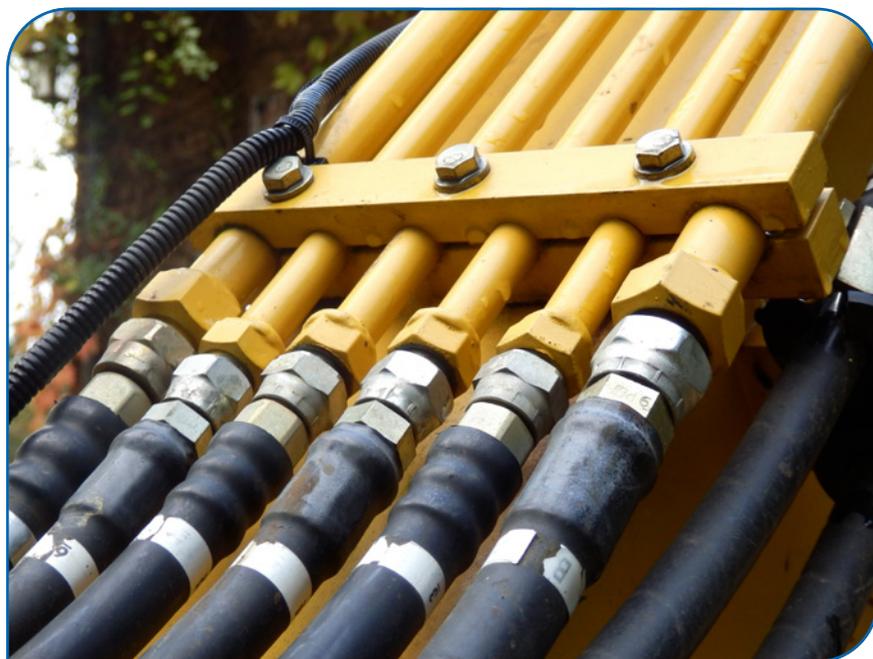
After proving themselves under laboratory conditions, the fluids are subjected to performance testing in elaborate test rigs, which are designed to mimic the hydrostatic drive system found in mobile hydraulic equipment. These tests are generally far more sophisticated than the initial lab testing and allow researchers to observe how the EEHF performs across the entire system.

When subjected to conditions in the test rigs, lubricants with EPP have been shown to improve efficiency by 28% and durability by more than 49%. To achieve these improvements, EPP are designed to reduce the inefficiency caused by secondary flows, which occur in a bend or change in pipe geometry. The test rigs have also revealed that EEHF with EPPs not only improved efficiency and durability, but also reduced the amount of power loss within the rigs.

Encouraged by the improvements seen in the test rigs, the next step was to put the EEHF with EPP into actual hydraulic equipment in climate-controlled chambers with controlled duty cycles. In these tests, the fluid reduced fuel consumption by 3.8% because the EPP forms flexible chains of small diameter with respect to their overall contour length. This allows the fluids to become viscoelastic because of their large extensibility parameters. At this point, the testing results were so encouraging that the candidates had reached the final step of testing before they were produced and brought to market. Since real-world hydraulic equipment can either be mobile or stationary, it's important to test them under both such conditions.

In the case of the mobile testing, it would ideally be completed in both winter and summer seasons to show how much fuel consumption is reduced under year-round conditions. The results of the testing showed that EPP can reduce fuel consumption by 1.4% in the summer and 2.7% in the winter, resulting in significant cost savings for the operator.

In stationary equipment, the method of measuring efficiency is different. Instead of reduced fuel consumption, efficiency can be measured by the amount of electricity used to power the equipment. Under these conditions, EEHF with EPPs have a demonstrated capacity to lower electricity usage by 8.5% over monograde fluids traditionally used in these applications. Additionally, they can help stationary machines operate more effectively, which allows operators to produce more parts per production run—once again improving the cost-benefit ratio to the operator.



To save money when deciding to invest in new hydraulic equipment, choosing the proper hydraulic fluid can have a significant effect on the TCO.

Choose Your Hydraulic Fluid Carefully

To save money when deciding to invest in new hydraulic equipment, choosing the proper hydraulic fluid can have a significant effect on the TCO. It's important to consider how energy efficient the hydraulic fluid you're using is. After all, EEHF can reduce the amount of money you spend on maintaining and operating your machines while not sacrificing the protection of the equipment's components. Improving the energy efficiency provided by your hydraulic fluid will bring real-world savings to your business's bottom line. **PTE**

www.lubrizol.com

For Related Articles Search

hydraulic fluid

at www.powertransmission.com

An Underground Conversion in Mining

Matthew Jaster, Senior Editor

Pumps, motors, brakes and even battery technology are changing how engineers approach mining applications in 2022. Areas like materials, condition monitoring, maintenance-free components and cost-efficient, zero-emission technologies are trending for mining applications across the globe.

Mining Solutions from Sulzer

The mining, quarrying and construction industries present some of the most challenging applications encountered by pumps. The range of process fluids handled varies quite significantly across these processes, ranging from clear water to heavy slurries and from alkaline, pH neutral to highly corrosive fluids.

Whilst the mining, quarrying and construction industries may seem quite far removed from each other, there are several similarities in the process fluids handled across all three industries. All incorporate an element of product extraction, followed by transfer through the various parts of the processes before handling the disposal and treatment of waste thereof. One way to distinguish between the various pump designs utilized is to segregate the fluids into process *streams*. In simplified terms these are: slurry, dirty water, process water and other processed fluids.

The pump types for each of these streams may vary by hydraulic design and/or materials of construction. Sulzer's

world-class range of pumps and materials offer a broad range of solutions for these challenging applications.

Fluids in mining and metals processing go through several stages. While there are some variations in this depending on the final product, the most common sequence involves ore extraction, comminution, separation, and thickening followed by the transport of the desired product to the refining and finishing process.

Extraction - To ensure safe mining, residual or incoming ground water must be removed continuously. Water ingress



Mining site (Courtesy of Sulzer).



EMW heavy-duty slurry pump and PLT slurry pump (Courtesy of Sulzer).

may come from a high-water table as well as from rainfall, localized flooding or snow melt. Deeper mines may also be affected by subterranean waterways or pockets of water in the ore body. Dewatering fluids are defined as being contaminated with < 50 g/l of fine solid particulates which may be abrasive, and the carrier fluid may also have some corrosive properties due to ground conditions. Fluids with a solids content above this are classified as slurry, with the classification dependent on size, concentration, density, and hardness of the solids.

Comminution—The ore starts off as large rocks and undergoes a series of steps to reduce its size so that the desired metal may be separated from the rock. The initial crushing and screening are dry processes and water is not added into the process until the ore gets to the grinding mills. Here the particle size becomes small enough to liberate the commodity from the rock through a separation process before it is finally thickened for the refining and finishing process. Methods for separation depend on the ore type, e.g. screening, gravity, dense medium, magnetic or flotation, resulting in the desired product in the form of a concentrate. The waste generated from the process forms the largest volume, and this then must be disposed of safely.

Quarrying—Quarry pits are essentially smaller open cast mines, and the requirements for dewatering the working areas are very similar to those in mining. The product being extracted may be inert (e.g., sand, rock, gravel) or containing minerals such as kaolin. With mineral quarrying, the key difference from mining is that here the product is often extracted by hydro-mining and the resultant slurry pumped out of the pit for further processing. One of the consequences of this is that stones and rocks can also find their way into pumping equipment, and the hydraulic and material design must allow for this. Pumps with large passage passing capability are required, often mounted inside the quarry pit, operating on a suction lift. Deeper quarries require correctly configured in-line booster pumps or intermediate pump stations.

Tunneling—Major tunneling projects involve the movement of large volumes of rock and soil as well as water. The selection, operation and maintenance of pumps and related equipment can therefore have a significant impact on costs and schedule compliance. Water management involves removal of excess water as well as process water feed for machinery operation, dust suppression, etc.

A closer look at pumps for these applications:

The majority of slurry pumps are centrifugal end suction or vertical shaft pumps. Key features are abrasion resistance through suitable materials, large clearances, large-diameter impellers for low operating speed to reduce wear, high hydraulic efficiency, and ease of maintenance. In long-distance

pumping applications, high-pressure pumps are required to allow staged pumping.

Froth pumps need to deal with artificially increased flow rates due to the presence of air and must be self-venting design to prevent air locking. Conventional horizontal slurry pumps can be adapted for this or vertical shaft pumps with integral tanks designed to allow air venting.

Gravel and dredge pumps are also types of slurry pumps and have much larger gaps between the impeller shrouds to enable large solids handling and have low NPSH characteristics as they often operate under suction lift conditions

Process water pumps are usually ISO/DIN/ANSI standard end suction pumps designed for high hydraulic efficiency and reliable operation.

Chemical process pumps are standard ISO/DIN/ANSI end suction pumps designed for high hydraulic efficiency with a variety of material options to handle various chemicals within the process.

Several technologies may be used in dewatering applications, and the pumps can be of fixed or mobile installations. Mobile installations normally use submersible or self-prime skid-mounted pumps, whereas fixed installations can have horizontal end suction, multi-stage, or vertical shaft centrifugal or turbine pumps.

For abrasive slurry applications, white iron alloys and elastomeric materials are used. Where the carrier or process fluid in a slurry application is corrosive, a fine balance between erosive and corrosive wear is sought to find the optimal performance. Material selection is determined by a thorough analysis of the solids being handled, and material toughness may also need to be considered where large solids are encountered.

The majority of chemical process pumps are of metallic designs in various stainless steels, duplex or super duplex alloys to suit the application. In some instances, non-metallic pumps may also be used where a metallic construction does not provide the required performance. Water pumps are more straightforward, with cast iron or stainless-steel alloys being most common.

“Sulzer offers a comprehensive portfolio of innovative pumps and agitators for mining, minerals, and metals processing, from slurry to clear liquid. Our equipment is tailor-made for challenging process conditions that include corrosive and abrasive liquids. A deep understanding of these applications, which involve handling harsh fluids, allows us to propose solutions that meet customer requirements,” said Harvinder Bhabra, head business segment fertilizers, metals and mining at Sulzer.

With a comprehensive worldwide service network supporting new equipment and supplying parts on a local level,

Sulzer offers its customers benefits from increased service intervals and exceptional reliability, through its wireless condition monitoring system. “Optimized designs and reduced energy consumption deliver low operational costs and help to lower carbon footprints. Furthermore, our extensive knowledge of customer processes ensures delivery of optimal, energy-efficient equipment and solutions,” Bhabra said.

www.sulzer.com

Force Control MagnaShear Brakes Accommodate Range of Mining Applications

MagnaShear motor brakes are ideal for mining applications where the motor is stopped, or reversed, each cycle such as loaders/unloaders, conveyors, rail car spotters and dumpers, overland and internal tripper cars, rotary coal sweep samplers, and more. These motor brakes are available to accommodate a wide range of applications. Spring set torque ratings from 3 to 1,250 foot-pounds are available. The MagnaShear motor brakes can be sized to the correct torque value independent of the motor frame size or horsepower by changing the combination of springs and friction discs.

MagnaShear motor brakes feature a “quick mount” feature for quick and easy mounting to drive motors in NEMA frame sizes 56 to 449 or some IEC frame motors. They are shipped ready to install, with no assembly or adjustments required. MagnaShear motor brakes can be furnished as a complete motor and brake assembly (assembled brake motor), or to mount on a machine frame or other special mounting configuration.

These motor brakes are totally enclosed from outside contaminants, with seal integrity for harsh and washdown environments. A modular design /assembly allows for ease of

servicing and maintenance. Hazardous duty units for class II, Group a, b, c, d, e and f are also available, as well as low temperature or Artic duty down to -40 degrees.

The totally enclosed MagnaShear motor brakes are impervious to moisture, dirt and dust that is common in mining applications, as well as concrete block plants, asphalt shingle manufacturing, bulk material handling, forest products manufacturing, and more.

Unlike dry brakes, oil shear technology includes a film of transmission fluid between the brake disc and the drive plate. As the fluid is compressed, the fluid molecules are put in shear— thus imparting torque to the other side. This torque transmission causes the rotating surface to come to a stop. Since most of the work is done by the fluid particles in shear, wear is virtually eliminated. Elimination of wear enables MagnaShear brakes to last significantly longer, while also eliminating the need for maintenance and adjustments which are common for dry braking systems.

In addition to transmitting torque, a patented fluid recirculation system helps to dissipate heat which causes friction disc wear and eventual failure in traditional dry brakes. Along with heat removal and torque transmission, the fluid serves to continually lubricate all components of the oil shear brake, increasing their service life. The oil shear technology also provides a smooth “cushioned” stop which reduces shock to the drive system, further extending service life of downstream components.

www.forececontrol.com

Freudenberg Partners with MacLean for Battery-Electric Equipment in Mining

Freudenberg battery companies XALT Energy and Freudenberg Battery Power Systems have forged a successful relationship with MacLean, a Canadian-based mining equipment manufacturer, to further the use of clean, battery-electric energy to power mobile equipment used in underground mines.

Freudenberg Battery Power Systems’ XMP76P battery sub-pack, part of its XPAND Modular Pack portfolio, is providing safer, more cost-efficient, zero-emission muscle to power MacLean’s EV-Series battery-electric mining equipment. MacLean chose the XMP76P for rock breakers, boom trucks, explosive loaders, bolters, cassette carriers, road graders, concrete trucks and sprayers and other mining equipment. The XMP76P also offers design flexibility and MacLean has configured more than 30 kinds of vehicles to accommodate the Freudenberg battery system.

“We are proud to support MacLean Engineering’s EV Series with a



MagnaShear motor brakes can be furnished as a complete motor and brake assembly (assembled brake motor), or to mount on a machine frame or other special mounting configuration.



Maclean battery-operated equipment for underground mining.

heavy-duty battery solution that meets the power requirements generated in a rugged, underground, mining environment,” said Nils Martens, senior vice president, Freudenberg Battery and Fuel Cell Systems.

The XMP76P, part of Freudenberg’s XPAND Modular Pack portfolio, is powered by XALT Energy’s premium lithium-ion cell technology. MacLean will use several sub-packs in series to provide energy levels of more than 106 kWh per vehicle. Building on a successful, five-year history of offering battery-electric equipment to mining companies across Canada, MacLean is now focused — with premium batteries from Freudenberg — on expanding its diesel-free, fleet options to customers around the world.

“As concerns about climate change and increasing CO₂ emissions drive much of the world to embrace battery-electric powertrains, the mining industry finds itself at a unique juncture,” said Patrick Marshall, vice president product management at MacLean. “Demand for the ores and minerals that support the development of emission-free, electric vehicles and machinery are increasing. However, without a shift to carbon-neutral mining operations the increased emissions from the extraction of these resources could potentially offset any environmental gains.”

MacLean launched its EV Series product line in 2016 and has been expanding the portfolio ever since. In 2021, MacLean added a heavy-duty, articulated shotcrete sprayer and a grader designed for the harsh realities of underground mining to its battery-electric offering. Importantly, the benefits of all of MacLean’s battery-powered vehicles go beyond environmental objectives.

“Electric equipment is quieter, eliminates diesel particulates and creates a healthier, less stressful environment for operators. It generates huge savings by lowering the cost of underground ventilation systems,” Marshall said.

In addition, MacLean’s EV-Series is playing a significant

role in helping the company’s mining customers meet emerging sustainability goals.

“Many mining companies have committed to becoming carbon neutral by 2050 and some by an even more aggressive goal of 2030,” Marshall noted. “They want to score well on key environment, sustainability and governance (ESG) performance indicators, which is increasingly important to investors. As governments set new CO₂ emission standards in accordance with the Paris Accord, the mining industry is pushing hard to do its part.”

With significant growth in this mining sector, MacLean reached out to Freudenberg for help. In short order, Freudenberg experts met with MacLean engineers to consider energy requirements, configurations,

and battery support systems. They chose the XMP76P sub pack as the optimal powertrain solution and are putting several sub-packs in series to provide energy levels of over 106 kWh per vehicle.

The XMP76P sub-pack uses XALT’s 43Ah High Power cells in a 2p24s architecture to provide 7.6 kWh total energy. With 6C discharge and 3C charge capability, XMP76P is ideal for applications with high discharge power demands and regen capture. Each sub-pack contains Voltage-Temperature-Balancing boards (VTBs) that measure voltages of all 24 cell pairs, measures internal pack temperatures, and performs cell balancing. XMP76P is designed for use with XALT’s Battery Disconnect Unit (BDU) and Master Control Unit (MCU) through the I/O port.

The sub pack’s variable bulkhead accommodates customized electrical and cooling interfaces, and its active liquid cooling system maintains ideal cell temperatures that respond quickly to increases in power demand and ambient (environmental) temperatures.

Marshall said. “We are really happy with the performance of the Freudenberg battery, the road map for the Freudenberg battery, the response and support we receive from the company’s technical sales and the fact that we now have a continental supplier chain for our electric vehicles. We see huge growth potential with this partnership.” **PTE**

www.fbps.com

www.xaltenergy.com

For Related Articles Search

mining

at www.powertransmission.com

Electric Integration

Kyburz Switzerland AG, Relies on ABM Drives for High-Performance Technology in Postal Delivery and Electric Sports Cars

ABM Drives Inc.

Kyburz Switzerland AG—headquartered near Zurich—offers high-quality mobility and transport solutions used for postal delivery.

When it comes to drive technology, the provider relies on the support and turnkey solutions of ABM Drives Inc., from concept to series production.

Founded in 1991, Kyburz Switzerland AG has 150 employees and is known for urban delivery vehicles featuring automatic parking brakes and reverse gears that are beneficial in the wintry Swiss conditions.

The E-Mobile fleet of Kyburz DXPs combines the efficiency of a two-wheeler with the safety and stability of a three-wheel vehicle. DXP is driven by postal operators in various countries such as Germany, Finland or Austria, as well numerous cities such as Winterthur or Montreux. However, postal and logistics companies are not the only ones relying

on these environmentally friendly vehicles. Many popular luxury electric sport cars like the eRod use ABM Drives Inc. technologies.

“We offer a comprehensive service package,” says Daniel Weber, head of development at Kyburz. “We develop, produce vehicles and take care of the after-sale service. We also take them back after being used, process them or take care of their recycling.” Currently, over 23,000 of these electric vehicles are on the roads worldwide. Apart from the USA, the company is active in all markets worldwide.

Required: High-Performance and Efficient Drives

Postal workers need to deliver their shipments quickly and reliably. They require vehicles that are efficient and inexpensive to maintain. This places particularly high demands on



The maintenance-free AC drive is suitable for journeys with high load peaks and high continuous performance (courtesy ABM).



the drives. Postal workers must be able to manage steep streets with fully loaded vehicles and be able to accelerate at all times. Since these vehicles are used daily, both acceleration and range play a major role and require motor performance and efficiency.

ABM Drives Inc. develops and manufactures systems for stationary and mobile applications in areas like conveyors, hoists or forklifts. In addition to modular system solutions, ABM Drives Inc. also integrates application-specific drive solutions.

“Even before the turn of the millennium, we started to transfer our know-how from battery-powered applications to e-Mobility. Even back then, we were able to implement the first customer-specific projects,” said Jürgen Schliermann, head of mobile drive technology development at ABM. “We

recognized new trends early on—this is important—especially in a future-oriented industry such as electric mobility. We take this into account thanks to our comprehensive development and production capabilities.”

High Acceleration from Standstill

“We were looking for a reliable partner for our ever-increasing production and for the high user demands,” explained Kyburz’s Weber. “We were familiar with the high level of expertise of ABM and the good reputation of the supplier.”

The emission-free eRod provides maximum driving pleasure both on and off-road (courtesy Kyburz).



ABM supplied the AC end shield motors for the DXP series delivery vehicles. Weighing only around 48.5 lbs., these three-phase asynchronous motors are quiet, environmentally friendly and optimized for the stressful stop-and-go operation. They reliably perform with their high acceleration capacity even from the standstill position.

“The weight-optimized AC end shield motors are also robust and durable. Their special design without housing makes them suitable for applications with high load peaks and high dynamics,” said Schliermann.

Heat generation is also a major issue with high torques and low speeds which ABM managed with the specialized motors.

It was also important for Kyburz to have a drive which requires little or no maintenance. In addition, the motor draws energy from maintenance-free lithium iron phosphate batteries. External drive controllers assume the power supply and speed/torque control. Thanks to the optimized interaction with the controller, the system is very well regulated, ensuring a high level of power density. “We can deliver a light, efficient and compact drive that optimally accelerates, provides a good driving dynamic and therefore also achieves a long range,” added Schliermann.

Emotions Instead of Emissions

As mentioned earlier, ABM drives are also installed in the eRod—a roadworthy electric sports car. The electric drive ensures that the 1,300-lb. vehicle has the thrust needed to achieve a top speed of 75 mph and a range of around 110 miles.

“We already developed our ring rib motor and only had to adapt it to the electrical properties,” said Schliermann. In contrast to the end shield motors, the compact and 95-pound AC drive has a housing. There is also the ring-shaped design of the ribs. Both protect the motor against dirt and ensure a good heat dissipation. It is installed on the differential axle transversely to the driving direction.

“Thanks to this installation position we have adapted the ribs of the drive in such a way that ensures optimal air cooling,” said Schliermann. This solution is suitable for journeys with high load peaks and high continuous performance.” In other words, perfect for a vehicle that is not only emission-free but also with quick acceleration even from a standstill position. Voltage supply and speed/torque control are both performed by an external control. The ring cooling fin motor is also optionally available with higher protection class (IP6K9K). In addition to a cost-effective solution, the performance values were particularly decisive for Kyburz.

Benefits Across the Board

“With ABM drive solutions we have achieved optimal performance across all our applications,” Weber said. “This also includes higher temperature resistance, allowing vehicle operation at performance limits for longer periods.” Kyburz is very satisfied with both drive solutions because the ABM drives are suitable for short, dynamic stretches as well as for the continuous operation in postal services.

“We always get quick, competent support. Should modifications be required, we always quickly find the suitable solution,” Weber said.

For its part, ABM opted for a sustainable delivery vehicle of DXP series for its energy efficiency and zero emission. “We use the vehicles for journeys between our two plants in Marktredwitz in Upper Franconia. Our employees are also excited,” Schliermann added. **PTE**

www.abm-drives.com
kyburz-switzerland.ch



The optimized cooling is further supported by installing the drive transversely to the driving direction (courtesy of ABM).

For Related Articles Search

electrification

at www.powertransmission.com

Hungry for More



Everything you
need if you buy
gears, bearings,
motors, couplings
and clutches.

Power Transmission Engineering

- Product and Industry News Updated Daily
- Directory of Mechanical Power Transmission Suppliers
- Exclusive online content in our e-mail newsletters
- Back Issues and Article Archive
- Calendar of Upcoming Events for power transmission professionals

FREE SUBSCRIPTION!

www.powertransmission.com

Zero-Max, Inc.

Innovative Motion Control Products

For over 70-years, **Zero-Max, Inc.** has created innovative motion and control solutions such as servo-rated shaft couplings, adjustable speed drives and keyless shaft bushings. We have an international reputation for innovative designs that provide the quality, durability and performance required for demanding applications. Our high precision engineered solutions are used in automation machines world-wide including packaging, printing, CNC machine tools, wind turbines, forestry and construction equipment, servo motor driven machines, and more.

With strategic distribution points located throughout the world, Zero-Max can deliver your motion control solution. Whether you need a high-performance flexible shaft coupling, a SAE mount or non-SAE mount overhung load adaptor, or a counter-rotating gearbox, our team of application specialists can engineer a solution to meet your motion control requirements.



FOR MORE INFORMATION
 13200 Sixth Avenue North Plymouth, MN 55441-5509
 Phone: 763-546-4300
www.zero-max.com

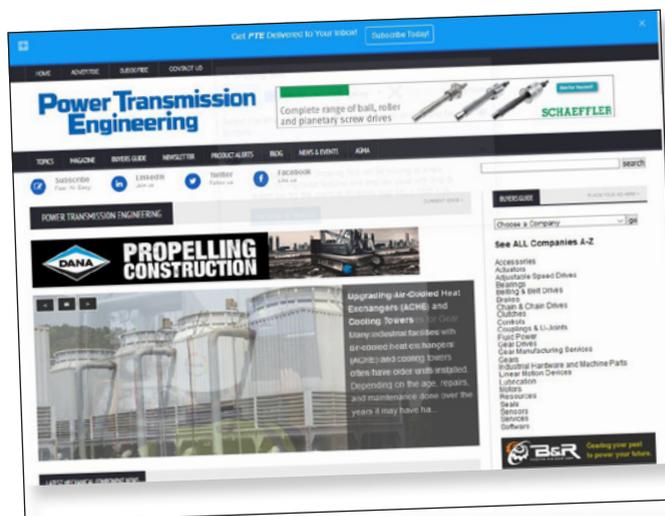
Power Transmission Engineering

Free Knowledge Served Daily

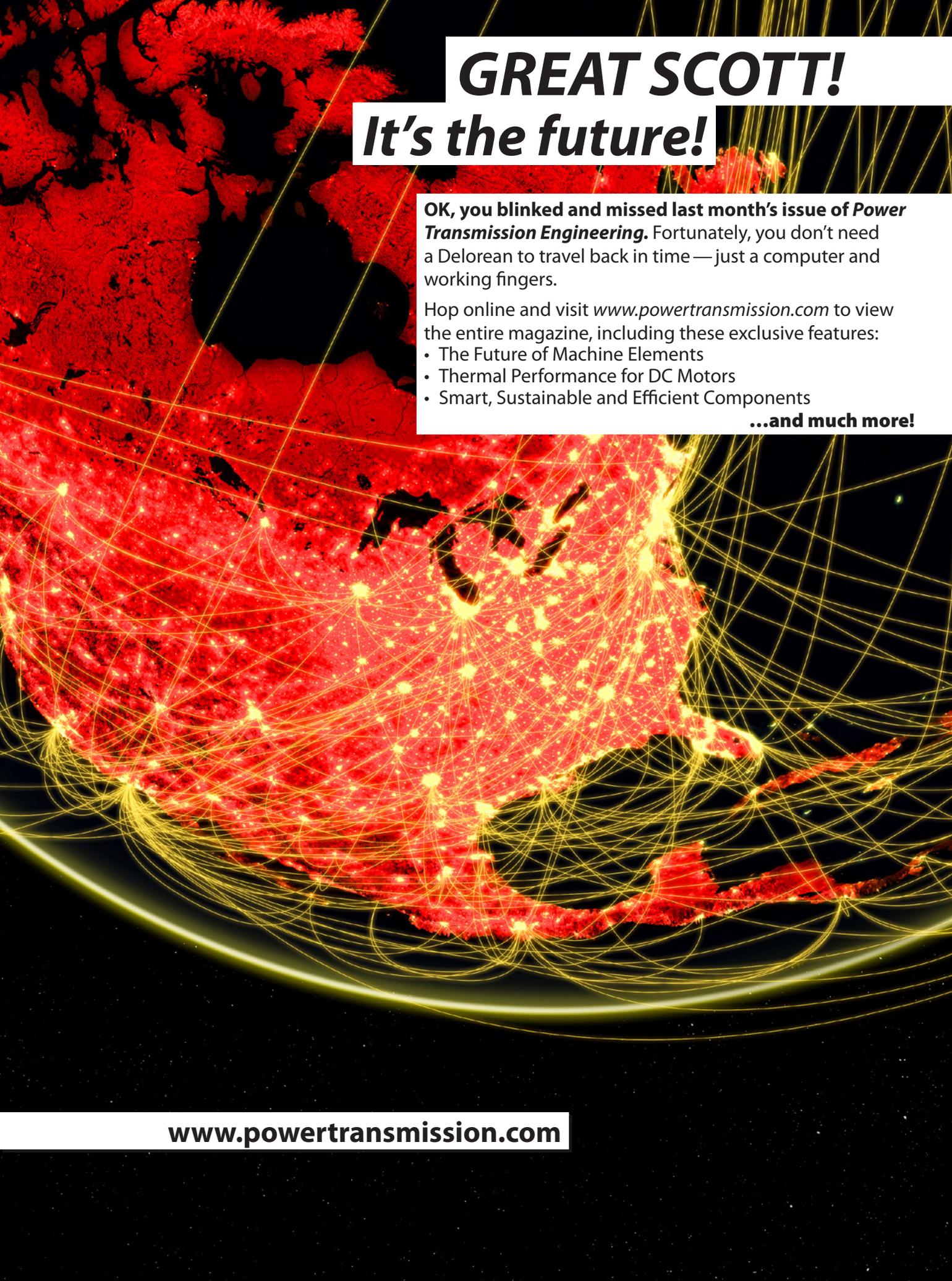
For even more great information on automation, including technical articles, features and insight from the leading manufacturers, case studies and application examples, visit the *Power Transmission Engineering* archive.

www.powertransmission.com

But don't stop there! Just type what you're looking for into our search box at the top-right of any page, and you'll find just as much great information from our archives on virtually any topic related to mechanical power transmission and motion control, whether it's gears, bearings, motors, clutches, chain, gearboxes and more.



FOR MORE INFORMATION
 1840 Jarvis Avenue, Elk Grove Village, IL 60007
 Phone: 847-437-6604
 Fax: 847-437-6618
 Email: publisher@powertransmission.com
www.powertransmission.com



GREAT SCOTT!

It's the future!

OK, you blinked and missed last month's issue of *Power Transmission Engineering*. Fortunately, you don't need a DeLorean to travel back in time — just a computer and working fingers.

Hop online and visit www.powertransmission.com to view the entire magazine, including these exclusive features:

- The Future of Machine Elements
- Thermal Performance for DC Motors
- Smart, Sustainable and Efficient Components

...and much more!

www.powertransmission.com

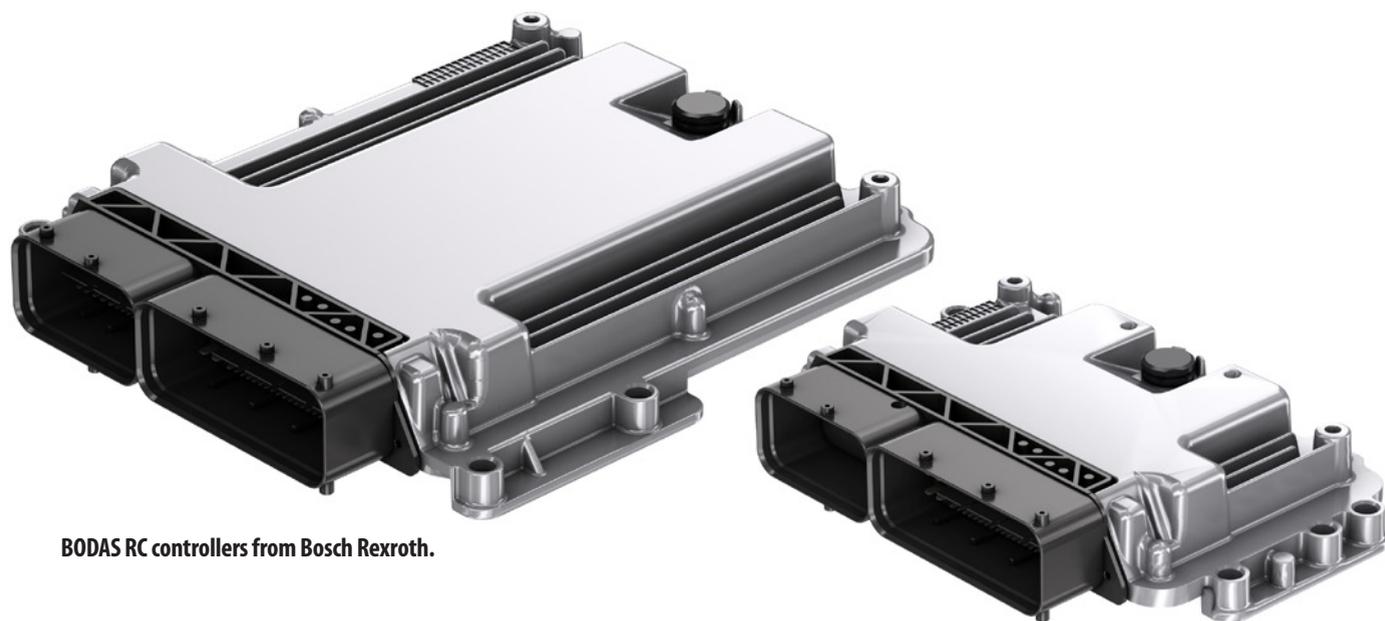
Transforming the Drivetrain

A Look at the Mobile Machine Market in 2022

Matthew Jaster, Senior Editor

The mobile machine market encompasses equipment supporting the movement of materials and components. This includes agricultural machinery, construction vehicles, municipal machinery, etc. These non-road mobile vehicles—tractors, cranes, forklifts and material handling equipment—often require personalized solutions focused on machine safety, automation and electrification.

Manufacturers today are merely scratching the surface when designing electric drive equipment for these challenging environmental applications. The end game is to create a modular, scalable platform that provides motor-generators, inverters, gearboxes, software and matching hydraulics to meet mobile machinery demands.



BODAS RC controllers from Bosch Rexroth.

“As with any industry, the adoption of new technologies is challenged by technical know-how, proper support infrastructure, and resources for implementation and market deployment. Hydraulics and gears are very well-known components in the off-highway market that have already been revolutionized with the advent of electronic controls,” said Enrique Busquets, director, product area electronics and electrification NAM at Bosch Rexroth.

What customers both want and need today are systems that can be easily deployed to fit each unique mobile application, according to Busquets. Bosch Rexroth, for example, has spent decades to provide a scalable, mobile hydraulics portfolio that goes beyond restrictions and boundary conditions.

Growing Trends

Electrification in this market mirrors the automotive industry. Areas like climate change, urbanization, and stricter energy regulations are forcing the mobile machinery market to look closely at exhaust, emission and noise reductions as well as an increasing demand for renewable energy sources.

Matthias Kielbassa, vice president electrification at Bosch Rexroth, discussed the importance of scalability, robustness and functional safety when introducing a line of components for the electrification of mobile working machines called the eLION platform. Kielbassa said that the eLION developers relied on the company’s own experience with electrical industry solutions and its comprehensive knowledge of the mobility sector throughout the development process.

An Electrification Platform

Bosch Rexroth’s eLION platform includes the electric 700 V eLION motor-generators covering a nominal power range from 20 to 200 kW (peak power up to 400 kW) and nominal torques of up to 1050 Nm and maximum torque of up to 2,400 Nm. Additionally, eLION offers inverters in various power classes with up to 300 A continuous current and high overload capacity.

Gearboxes with high power density for hub and central drive configurations (eGFT and eGFZ) are also part of the eLION portfolio and allow compact drive units for a wide range of applications. BODAS software modules—for controlling mobile machines—are available for the entire eLION platform, along with matching hydraulic components such as axial piston pumps.

The eLION motor-generator focuses on functional and electrical safety.

Other electrical components include DC/DC converters, power distribution units, on-board chargers and high-voltage cables. Manufacturers can rely on integrated solutions, irrespective of the energy source.

“For electrics, the challenge is formidable. From the development of efficient, compact, scalable, functionally safe, and reliable components to the pairing of each component with the appropriate accessories and software to allow the system to operate at its best. For that reason, the eLION portfolio has been developed with the highest flexibility, functional-safety-ready software at the component level, and specifically developed based on off-highway specifications,” Busquets said.

With regards to electronics and IoT, the know-how on the application level and expertise on architecture design and functional safety has been central to software development. *BODAS* (Bosch Rexroth Digital Application Solutions) software, for example, can examine drive control for wheeled vehicles, travel control for track drives, valve control, control solutions for hydraulic systems and more. This package stands for the company’s entire portfolio of IoT solutions, software and electronic hardware for the off-highway market.

“These solutions significantly speed customers’ machines time to market while operating at the highest levels of safety and security,” Busquets added.

For electrics, Bosch-Rexroth’s portfolio is a combination of decades of industrial applications expertise and an innovative approach to the design of each component based on specific requirements for the off-highway market. This give and take wouldn’t be possible without the company’s experience in factory automation.

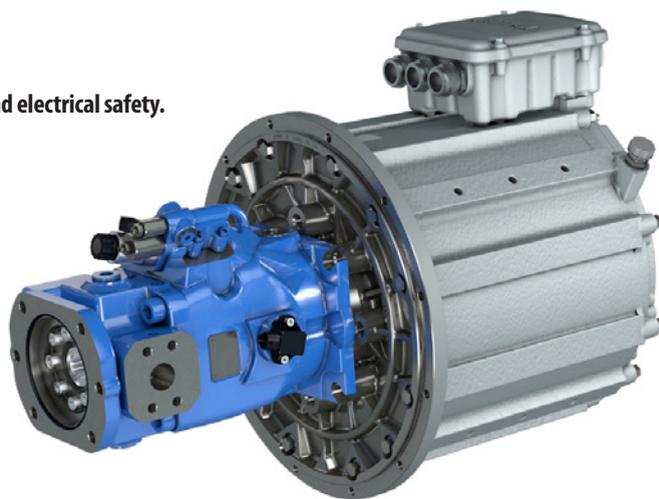
People who work in different parts of Bosch Rexroth regularly collaborate with each other, according to Kielbassa.

“The factory automation division, with its deep technology expertise in electrics, contributed a lot to the development of



Bosch Rexroth eLION platform inverters are available in various power classes.

our new electric motors and inverters. The ISO 13849 norm for functional safety, for example, applies for factory automation and for off-highway vehicles as well,” he said. At the core of Bosch Rexroth’s experience is automotive and commercial



vehicles. That means there are Bosch business units with a lot of knowledge in powertrain technology, a unique advantage to have when developing systems for the mobile machine market.

Busquets said that the eLION portfolio has already made an impressive impact in the off-highway market for 2022. “Customers around the world and especially in the United States have experienced the total transformation of their machines. We expect this trend to continue strongly as the year progresses.”

Future-Viable Equipment

The eLION motor-generators and inverters are highly robust: both comply with the IP6K9K ingress protection requirements and can be used at a temperature range between -40 °C and 85 °C. The maximum temperature for the motor-generators is as high as 100 °C. The shock and vibration resistance of the eLION components is up to 50 g for shock and 10 g for vibration. A particular focus during product development was on functional and electrical safety. Manufacturers and users benefit from inverter safety functions in accordance with industry standards.

“Functional and electrical safety are not only at the core of the eLION and mobile electronics portfolios but also of every developed solution at Bosch-Rexroth. These aspects are crucial to overcome the challenges related to the adoption of this new technologies in the off-highway market and ultimately gives customers the highest degree of confidence when developing and deploying their next generation machines in the market,” Busquets said.

Higher efficiencies, lower noise pollution and less air pollution will certainly help customers strengthen their mobile machinery technologies in the future.

“Our efforts will continue toward developing products for the future and exploiting the potential of our extensive portfolio through the power and flexibility of software and electronics,” Busquets said. **PTE**

www.boschrexroth-us.com

For Related Articles Search

off-highway

at www.powertransmission.com



BDH BELTS

Ph: 717-871-0994 • Fax: 717-871-0995
 Email: sales@bdhbelts.com • Web: bdhbelts.com

MANUFACTURERS • DISTRIBUTORS • FABRICATORS

“Over 30 Years Under Our Belts” — BDH is the *ONLY* U.S. owned Mfg. of Link-V Belting.
 All BDH Link-V Belting is Mfg. in Our Facility Located in Conestoga (Lancaster County), PA.

TELCO
 MOTION



For over 35 years, TelcoMotion has been bringing together the world's largest selection of quality motion control assemblies, components, and parts—coupled with the industry's top experts and engineers—to create optimized solutions for every project.

TelcoMotion carries a wide variety of motors including BLDC, PMDC, Gear-motor, Stepper, blower, and the AC motors. Email us about your customized motor inquires!

Visit us at
telco-gearmotor.com

sales@telcointercon.com

B&R
 MACHINE AND GEAR CORP

BRGEAR.COM

Engineering sMart is your resource for the latest in great ideas from our advertisers. Check this section every issue for sMart Engineering ideas and technology.

For information about advertising, contact Dave Friedman at
(847) 437-6604
 or
friedman@agma.org



**Custom Engineering,
 Prototype Work,
 Precision Machining,
 Assemblies and
 Standard Components**

www.nordex.com

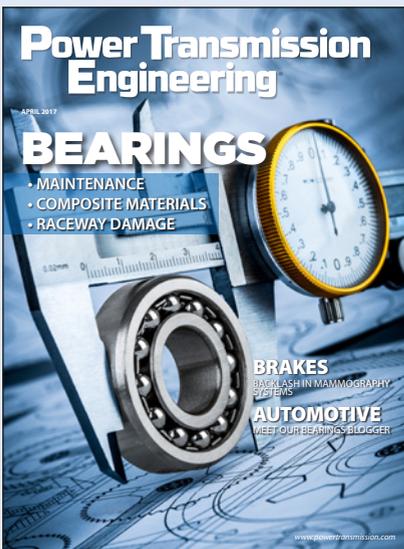
Your online source for Gears, pulleys, shafts, bearings, couplings, fasteners, custom gear boxes,



Sales@Nordex.com Eng@Nordex.com 203-775-4877

ISO9001:2015 & AS9100D, ITAR Registered, NIST.SP800-171R1, Trace Certified, Class 100 clean room

Subscribe TODAY



**IT's FAST. IT's EASY.
 IT keeps YOU in the KNOW.**

www.powertransmission.com/subscriptions

Screw Jacks

The NEW Zimm ZE screw jack series offers all the connecting, drive and safety components from a single source.



ZIMM USA
 by **DIEQUA**
screwjacks.com 800-459-5845

Helical Worm Speed Reducers

Our helical worm gearmotors and speed reducers provide unmatched performance, durability, and design flexibility.



- 6 sizes, fractional to 10 HP
- Multi-stage Ratios
- NEMA, IEC, or Servo Motor Adapters
- Low Backlash & Efficiency up to 90%
- Multiple Mounting Configurations

DIEQUA
 Corporation
diequa.com/pte 800-292-9135

How to Optimize Round Rail Performance and Cost with Informed Linear Bearing Selection

Charles Isaac, Thomson Industries

When designing for linear motion systems, the initial decision between round and square rail can significantly impact cost, performance and durability. Square rail, which is typically the more expensive option, has a higher load capacity and tighter accuracy. Round rail offers distinct cost and reliability advantages for certain applications, but maximizing those advantages depends on specifying the right bearing to minimize friction in each application. Designers must often choose between plain bearings — often called bushings — and

ball bearings. And within each type, they will have more options that impact price, performance, maintainability and durability. Understanding these options early in the design cycle will optimize the performance and cost of the linear motion application.

Plain and Simple

Because plain bearings have no balls or other rolling elements, they are the least expensive to manufacture and thus cost less. They also out-perform assemblies with rolling elements in terms of smoothness and quietness; and because they have fewer moving parts, they are less susceptible to dust and dirt.

Plain bearings with elastomer liners amplify these benefits. They are available with high-performance, bearing-grade materials applied to aluminum or other substrates to provide good load capacity (20% of that of a ball bearing) and a reasonably low friction coefficient — typically between 0.05 to 0.25.

Since the contact area of a plain bearing is distributed over a large area, plain bearings can also be used with unhardened round shafting, giving designers more flexibility to choose materials that address other design requirements such as corrosion protection or weight.

Some manufacturers make plain bearings from self-lubricating polymers that minimize the need for maintenance. (Fig. 1)

The cost savings and smooth operation of plain bearings, however, come at the cost of load handling, precision, and speed. They are best for applications in which alignment and moment load are noncritical, or those that require shafting that is incompatible with traditional ball bushings such as aluminum or 316 stainless steel. Plain bearings typically handle static loads up to 11,000 lbf, dynamic loads up to 2,023 lbf, and speeds of up to 100 fpm. When those parameters are met, plain bearings — especially those using polymers — are beneficial in both clean and harsh environments. Primary applications involving light loads, lower speed and precision are found in packaging, factory automation, robotics, health and fitness, woodworking, food-and-beverage, and vending. Applications that might also involve ultraclean, toxic or harsh environments include semiconductor production, medical automation and food production.

Scaling Up

Applications requiring higher load handling, speed or precision will need bearings with internal rolling elements. The type of bearing specified will vary according to the number of balls used, directly impacting the allowable load and speed.

The precision steel design (Fig. 2a) uses hardened-steel linear ball bearings that have point-to-point contact on a fixed surface ground into it, whereas 2b and 2c utilize floating bearing plates.



Figure 1 With no balls or rolling elements as part of their construction, plain bearings such as the recently launched Thomson polymer bushings provide a smooth, quiet and economical option for light-load linear motion applications.

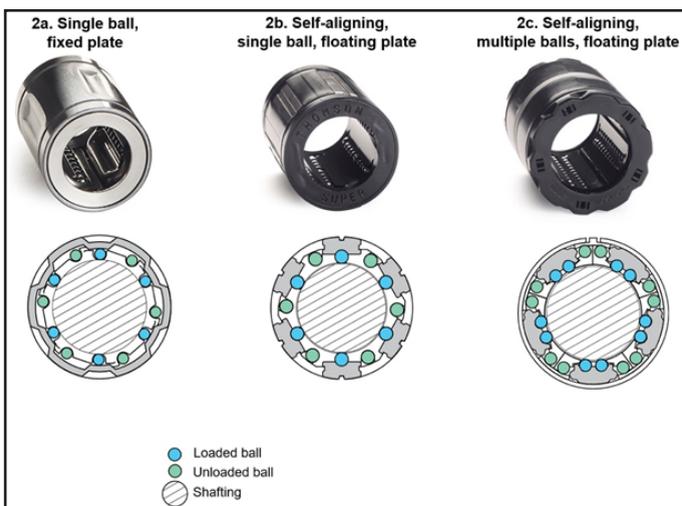


Figure 2 While all three linear bearings pictured use recirculating balls, their difference lies in that 2a employs a hardened sleeve that has a bearing surface ground into it, whereas 2b and 2c utilize floating bearing plates.

Table 1 Choosing the right linear bearing can be a make-or-break decision. Based on your application's requirements, the table above can help you determine an ideal solution.

Attribute	Self-Lubricated Plain Bushing	Ball Bushing Single Track, Fixed Plate	Ball Bushing Single Track, Floating Plate	Ball Bushing Multiple Tracks, Floating Plate
Load Capacity	★★	★★	★★★	★★★★
Speed	★★	★★★	★★★★	★★★★
Contaminant Resistance	★★★★	★★	★★	★★
Vibration/Impact Resistance	★★★★	★★	★★	★★
Temperature Resistance	★★	★★★★	★★★	★★★
Self-Alignment	N/A	N/A	★★★★	★★★★
Maintenance	★★★★	★★★	★★★	★★★

The next performance level up embeds a single ball track in a conforming groove on a floating plate (Fig. 2b). This bearing has a low coefficient of friction and can triple the load handling capability over the fixed plate — increasing bearing life up to 27 times longer than precision bearings. This configuration is optimal for rail 0.19 to 2 inches in diameter and dynamic loads up to 3,000 lbf.

The more load-bearing balls in the load zone, the greater the load handling and durability. Deploying two ball tracks in a conforming floating track, for example, can increase the load capacity six times and bearing life 216 times over the precision bearing (Fig. 2c). This configuration is also optimal for rail 0.5 to 1.5 inches in diameter and dynamic loads up to 3,880 lbf.

Self-Aligning Bearings Extend Life

When high load handling, speed, and precision are top priorities, a self-aligning bearing can maintain a low coefficient of friction while maximizing bearing life. Some manufacturers accomplish this by designing the bearing plate so that the radius of its outer surface is smaller than that of the inside radius of the hardened precision ring. This allows the bearing plate to roll against the ring, evenly distributing the load on each of its two ball tracks. The bearing designs also allow the bearing plates to rock 0.5° about the hardened precision ring to ensure smooth ball entry and exit in the load-carrying zone, and optimum ball loading from end to end.

This self-aligning structure compensates for the torsional misalignment that might result from inaccuracies in base machining or machine deflection — with little increase in stress to the bearing components. Once a self-aligning bearing is mounted in an adjustable housing, designers can achieve a selected preload. The bearing design allows the bearing plates to move radially, which provides the ability to achieve close bearing/linear race fit-ups for high-precision applications.

Furthermore, although ball bearings are not necessarily as environmentally resistant as polymer plain bearings, certain actions can be taken to protect their high load handling and durability in corrosive environments. This includes specifying stainless steel, nylon or nylon-coated rolling elements in corrosive environments (see Table 1).

In Closing

If applications requiring low cost, smooth and quiet operation, or reliable performance in corrosive environments are more critical to your operation than high load handling, precision, or speed, you should consider a plain bearing. If your shafting requirements are incompatible with traditional ball bearing materials such as aluminum or 316 stainless steel, polymer materials should be considered. If durability and maintainability are most important to your design, self-lubricating plain bearings would best suit your needs.

Otherwise, you will need a ball bearing, in which price, precision and load handling will vary — depending upon the number of balls loaded, whether the ball track is fixed or floating, or whether the assembly is self-aligning. We have presented general guides on bearing selection, but this, of course, will vary according to your application's requirements. Resources such as the sizing and selection tools on the Thomson Industries website (www.thomsonlinear.com) can help you optimize bearing selection for your round rail applications. **PTE**

www.thomsonlinear.com

www.thomsonlinear.com/en/products/linear-bearings

Charles Isaac is Global Product Line Manager - Linear Bearings and Guides, Thomson Industries, Inc. He is responsible for the short- and long-term strategic direction of the linear bearings and guides business, including the product roadmap. He earned his B.S. in Manufacturing Engineering from Fairmont State University and an MBA from Walden University. Charles has been with Thomson for three years.



Wendy Young

(1952–2022)

It is with great sadness that Forest City Gear announces the death of **Wendy Young**, president and CEO. Wendy passed away on Tuesday, February 22nd, peacefully, with her family at her side, after a tenacious battle with cancer. Although semi-retired for the past 2 years, Wendy has been an integral part of the company, alongside her husband, Fred Young, for nearly 4 decades.



The Young family and the greater Forest City Gear family are grateful for the support of the industry and the community.

Wendy was born October 7, 1952 in Anoka, MN; daughter of Arnold and Carol (Rehbein) Nutter. She was a graduate of Forest Lake High School, class of 1970. In a ceremony reflective of their shared love of kayaking, Wendy was canoed down the Wolf River on June 6, 1981 in Fremont, WI where she married Fred at the river's edge. Wendy obtained her BA in Economics and MBA from Rockford University. Her three daughters were her greatest joy and she treasured being able to stay home and rear them. Wendy's girls, along with their families, brought her immense joy. She was a devoted and treasured Oma to her grandchildren. She was involved in the community, serving on multiple boards over the course of her lifetime including the American Gear Manufacturers Association, Rockford Symphony Orchestra, Stateline YMCA, and as an Executive Committee Member for the Rock Valley College Foundation. Wendy worked alongside her husband at the company founded by his parents, Forest City Gear, located in Roscoe, IL, and was CEO & President of the company for nearly ten years. Wendy's leadership was an integral part of the growth and expansion of the company. She was named the Individual Business Catalyst of the Year in 2021—a prestigious award from the Rockford Chamber of Commerce. In 2022, she was selected to receive the AGMA's Chairman's Award as someone who has contributed in a meaningful way to the gear industry. In her younger years she was a gifted kayaker and outdoor enthusiast. She enjoyed attending Rockford Symphony Orchestra performances, creating beautiful and memorable holiday celebrations for her family and employees, and spending peaceful weekends at their lake home in Wisconsin.

www.forestcitygear.com

Voith

BECOMES SOLE OWNER OF ELIN MOTOREN

Since May 1, 2020 a 70 percent of ELIN Motoren GmbH has been owned by Voith Group. The other 30 percent of the company remained with the long-standing Managing Director Franz Hrachowitz. End of last year, the two parties agreed on the acquisition of the remaining stake.

“For Voith, this is a further step in strengthening our core business and consistently expanding it in the direction of sustainable technologies,” says Dr. Toralf Haag, CEO of the Voith Group.



ELIN Motoren GmbH has a total of about 1,000 employees and generates a turnover of about 120 million Euro. The company manufactures electric motors and generators in small series as well as individualized solutions for industrial applications. In this area, the company focuses on electric machines, motors in the low-voltage, medium-voltage and high-voltage range, and generators, in particular for wind energy and decentralized energy generation. With its product portfolio, ELIN Motoren serves the target markets wind energy, plastics, tunnels and mining, oil and gas, plant construction as well as power plants.

“Voith Turbo is regarded worldwide as a leading technology-independent supplier of drive systems. Together with ELIN Motoren, we have been able to achieve a significant advantage for our customers in the electrification of the drivetrain in recent years. The acquisition is therefore an important milestone and contribution to driving forward decarbonization and the associated reduction of CO₂,” adds Cornelius Weitzmann, CEO of Voith Turbo.

The full acquisition of ELIN Motoren by Voith will have no impact whatsoever on business operations. The areas of activity will remain unchanged. Furthermore, there will be no personnel changes in the Group Division's management. ELIN Motoren will continue to operate under the established brand. As a result, customers of both companies will continue to have access to the same sales channels.

www.voith.com

Hy-Tech Engineered Solutions and Power Transmission Group

ACQUIRES JACKSON GEAR COMPANY

Hy-Tech Engineered Solutions and Power Transmission Group, PTG, are pleased to announce the acquisition of Jackson Gear Company of Glenshaw PA, which specializes in the engineering, manufacture and sales of larger gears and shafts. We expect this addition will more than double PTG's capacity in overall production, as it broadens existing product lines, deepens engineering expertise and improves lead times.

"The ability to provide gears and spur gears up to 72" Maximum Pitch Diameter will be a huge benefit," observes Doug Ciabotti, Hy-Tech's president. "Aside from the advantages this brings to new and existing customers in terms of larger gear product availability and additional gear and shaft design engineering know-how, customers can expect it to help address issues of cost and supply chain problems across the board.



Patrick Curry, vice president and general manager of PTG comments: "Once again, we've expanded our abilities to address complex gearing challenges — in this case for larger gear applications — which have traditionally been difficult to design and manufacture. Combined with even larger, dedicated production capacity for rush and breakdown requirements, as well as "one-off" special orders, the Jackson acquisition further cements our reputation as the go-to provider of complete gear solutions. Bringing Jackson Gear into the fold gives us more resources to address the needs of dozens of industries — including Mining, Material Handling and Power Transmission — for highly engineered gearing, design consultation and reverse engineering."

From gear rating assistance to comprehensive CAD and CAM programs for engineering new or modifying existing products, Jackson Gear brings over 80 years of manufacturing experience to the Hy-Tech family of companies. Specifically, in product lines including Worm Gears, Sprockets, Bevel Gears, Internal Gears, Spur Gears, Helical Gears, Worm Shafts, Pinion Shafts, Helical Shafts and Spline Shafts. Already utilizing KISSsoft gear design software, PTG

has become a leader in both reverse engineering existing gears and in the design and development of complex new gear and transmission systems.

Continuing Hy-Tech's leadership position in domestic industrial manufacturing, Jackson Gear joins current brands Quality Gear, Blaz-Man Gear and Gear Products under the PTG banner, as well as the existing Hy-Tech brands: ATP Tools, Parts and Sockets, Thaxton and NUMATX.

Hy-Tech provides engineered solutions and reverse engineering services to many Original Equipment Manufacturers as well as a complete line of industrial air tools; over 20,000 replacement parts for recognized brand names including Ingersoll Rand and Chicago Pneumatic; heavy duty industrial impact sockets; high quality hydrostatic test plugs for pipe and pressure vessel weldment testing; hydropneumatic riveting systems; highly specialized machining services and a wide variety of standard and special gears and shafts.

www.hy-techinc.com

Siemens Digital Industries

ASSISTS LOCKHEED MARTIN WITH DIGITAL ENGINEERING TRANSFORMATION

Lockheed Martin's Aeronautics business has selected Siemens' Xcelerator portfolio of software and services to support its digital engineering transformation. Through a multi-year contract, the company plans to leverage Xcelerator to achieve its goals for mission-driven digital transformation—accelerating program lifecycles, driving cost savings and fostering greater innovation.



"Lockheed Martin Aeronautics is a leader in the aerospace industry, and their decision to expand adoption of Siemens' Xcelerator portfolio enables driving digital initiatives and winning programs," said Tony Hemmelgarn, president and chief executive officer, Siemens Digital Industries Software. "Building off of our experience on the F-35 program, and through close collaboration, Siemens is excited to help Lockheed Martin accelerate production and meet DoD contract requirements for both current programs and new initiatives."

www.sw.siemens.com

Höganäs

JOINS SCIENCE-BASED TARGET INITIATIVE

Höganäs is committing to the Science Based Target initiative (SBTi), which will help create transparency and accountability in its target to reduce greenhouse gas emissions to net-zero by 2045 at the latest.

Höganäs is already driving an ambitious sustainability agenda to achieve this target, and to inspire others by setting the benchmark within its industry. Committing to the Science Based Target initiative provides a standardized way to track the progress of Höganäs' ongoing sustainability business transformation journey to become the first green metal powder producer in the world.



Höganäs is actively working to minimize its environmental footprint and is committed to significantly reducing carbon emissions. The near-term target is a 50% reduction of the emissions in scope 1 and 2 by 2030, and the target for Scope 3 is a 30% reduction of emissions from raw materials by 2030. To achieve these targets, Höganäs is focusing on improving energy efficiency, transitioning to the use of fossil free energy in production and transport, replacing fossil process coals, and rethinking its materials supply. The ongoing initiatives include a plan to complete the preparation work for transition to 100% fossil free electricity from 2023, and to achieve a 40% reduction of emissions from fossil fuels by 2026, which can be accomplished through electrification and the use of biofuels.

“The commitment to the Science Based Target initiative is the right way to go in our journey towards becoming the first green metal powder producer in the world and to set the benchmark within our industry. Our climate ambition will be better showcased and our commitment and progress more transparent to all stakeholders. A way to demonstrate our accountability if you will,” says Fredrik Emilson, CEO Höganäs. “Being the sustainability leader will secure our competitive edge and we will be operating with the lowest emission footprint in our industry. Through this, we support our customers in fulfilling their respective ambitions to become more sustainable.”

Committing to the Science Based Target initiative is the first step in a process that takes several months. In the next stage, Höganäs will specify its climate targets further and then submit to the SBTi for official validation.

SBTi is a partnership between the Carbon Disclosure

Project (CDP), UN Global Compact, World Resources Institute (WRI) and World Wide Fund for Nature (WWF). The initiative supports companies in establishing scientifically based emission reduction targets.

www.hoganas.com

Ringfeder

ACQUIRES CARLYLE JOHNSON MACHINE

VBG Group, through its subsidiary Ringfeder Power Transmission US, has acquired all shares in the US company The Carlyle Johnson Machine Co., LLC for a purchase price on a cash and debt free basis of USD 16.5 million. The company was founded in 1903 in Hartford, Connecticut and designs and manufactures components for motion control that are used in industrial applications. The acquisition will have no impact on VBG Group's results for 2021 but will have in 2022.

Carlyle Johnson's product suite includes mechanical, electrical, and pneumatic clutches and braking systems, as well as associated electrical controls and lubrication seals for medical, aerospace, industrial and defense product applications.

Carlyle Johnson's products live up to unique safety requirements as they are used in critical processes and contexts. High product reliability in combination with high innovation capacity has meant that Carlyle Johnson's products are currently used in, for example, surgical robots.

The acquisition strengthens VBG Group's industrial business, and the company will be part of the Ringfeder Power Transmission division.

“This acquisition complements us in a natural way,” says Thomas Moka, division manager for Ringfeder Power Transmission. “Through Carlyle Johnson, we complement our existing product portfolio and enter interesting high market growth segments such as medical equipment. Above all, I see clear synergies in the organization and a great potential for our sales organization to market Carlyle Johnson's products in new markets.”



Michael Gamache, CEO of Carlyle Johnson, adds: “We see that VBG Group has the strength and the industrial knowledge to develop Carlyle Johnson further. We share the long-term perspective and have the same values, which means that our companies fit together well.”

“We are very pleased that we can complete this acquisition”, says the President and CEO Anders Birgersson. “The acquisition fits well with our goal of growing as an industrial group and Carlyle Johnson’s products match VBG Group’s mission to create a safer society.”

www.ringfeder.com

PTDA

ANNOUNCES 2022 BOARD OF DIRECTORS

The recently-elected 2022 Board of Directors and Manufacturer Council of the Power Transmission Distributors Association (PTDA) begins their leadership terms.

JP Bouchard, vice president, General Bearing Service Inc. (Ottawa, Ontario, Canada) assumes the leadership of the association as PTDA President. Bouchard has been active in PTDA since 2015 when he served on the editorial board of Transmissions, PTDA’s quarterly newsletter. Subsequently, he served on the Industry Insights and End Customer Needs Committee, respectively. Bouchard has served on the PTDA Board of Directors since 2018.

“This is a pivotal time for the PT/MC industry. Changes driven by the COVID pandemic make professional networking, development and knowledge sharing more valuable than ever. I look forward to collaborating with my fellow PTDA volunteers and members to develop programs and opportunities to help shape the future of the industry,” said Bouchard.

Joining Bouchard on the 2022 PTDA Board of Directors are:

- Immediate Past President Brian Davis, co-CEO, B & D Industrial (Macon, Ga.)
- First Vice President Mike McLain, vice president, Allied Bearing & Supply, Inc. (Harahan, La.)
- Second Vice President Brian Nowak, president and CEO, Kurz Industrial Solutions (Neeah, Wis.)
- Treasurer Bill Shepard, vice president, BDI (Cleveland, Ohio)
- Manufacturer Council Chair Randy Disharoon, sales director, conveying division, Regal Rexnord Industries, LLC (Charleston, S.C.)
- Manufacturer Council Vice Chair Kristin Jennings, director marketing & industrial distribution, Climax Metal Products Company (Mentor, Ohio)
- PTDA Foundation President Bill Moore, vice president business development (ERIKS North America)
- EPTDA President Des Spillings, director, Acorn Industrial Services Ltd (United Kingdom)

www.ptda.org



Neugart

ANNOUNCES SALES LEADERSHIP CHANGES

With a dual leadership arrangement, the gearbox specialist Neugart continues to develop its sales performance in Germany and abroad: Simon Zeller as the new sales manager and Clemens Maurer as head of the newly created Global Sales Development Department have been working with their teams since the beginning of the year to ensure even closer proximity to Neugart customers worldwide.



(Left to right) Clemens Maurer and Simon Zeller.

In a challenging economic environment, the requirements in the global machinery and plant engineering sectors are becoming increasingly complex. Against this backdrop, suppliers are also increasingly called upon to master the diverse challenges of the global markets and thus ensure sustainable growth in the long term.

As a response to this, Neugart as a manufacturer, is systematically expanding its international sales network. The goal is to provide even closer customer support. This means more flexibility with the fastest possible response speed, which pays off particularly in the case of complex tasks. Short distances and high performance logistics enable optimal delivery performance.

Swen Herrmann, who had headed sales since 2018, now supports the management of Neugart GmbH at the Kippenheim site as business development manager.

www.neugart.com

Dodge Industrial

ANNOUNCES NEW PRESIDENT

Dodge Industrial, Inc. has named **David Gilbert** as its new president effective immediately. Gilbert joined Dodge nearly 20 years ago and is an experienced manufacturing and operations management leader with proven knowledge and demonstrated results in the industrial automation industry.

“I am very pleased to see



David, a long-term and highly respected veteran of Dodge, taking over the office of president,” said Michael J. Hartnett, president and CEO of RBC Bearings, Inc. “David is an outstanding choice for the position, and I have every confidence he will lead the organization to continued success in industrial products and guide us on the development of our future product offerings. I look forward to working closely with David and all of the Dodge team in the coming years.”

Gilbert joined Dodge in 1998 as an engineering supervisor and has held numerous leadership positions, most recently serving as vice president of operations and manufacturing. In this role for five years, he was responsible for initiatives to drive continuous improvement and greater efficiency in safety, quality, delivery, inventory, and cost control across all Dodge locations. Headquartered in Greenville, SC, Dodge operates facilities in Belton, SC; Weaverville, NC; Marion, NC; and Rogersville, TN.

As president, Gilbert will drive Dodge’s growth and continue its focus on innovation and providing quality products and service to its customers. “This is an exciting time for our business with our new ownership and our recent move to a collaborative working environment at our new corporate headquarters,” said Gilbert. “I’m truly honored for the opportunity to lead Dodge during these exciting times and to continue our strong legacy.”

Gilbert earned his bachelor of science degree in industrial engineering from N.C. State University. He will lead the company from its corporate headquarters in Greenville, SC.

Dodge recently moved into its new headquarters, a 75,000-square-foot, state-of-the-art corporate office building. Dodge officially became part of the RBC Bearings Incorporated family following the completion of RBC’s acquisition of the Dodge mechanical power transmission division from ABB on November 1, 2021.

dodgeindustrial.com

Eaton’s Vehicle Group

FORMS NEW POWERTRAIN BUSINESS UNIT

Eaton’s Vehicle Group has formed a new ePowertrain business unit, which will focus on products from Eaton’s electrified vehicle (EV) transmission, reduction gearing and differential portfolios. Combining the product lines into a new ePowertrain business unit creates synergy among Eaton’s powertrain and EV experts and allows the Vehicle Group to offer its global customers solutions for commercial and light-duty EVs.

“Automakers face many challenges when developing an EV powertrain, such as optimizing efficiency, weight, and noise, vibration and harshness (NVH), and dealing with packaging constraints,” said Anthony Cronin, product director, EV Gearing and Differentials, Eaton’s Vehicle Group. “Eaton can help manufacturers overcome these challenges by utilizing our many years of experience and in-house capabilities in design, validation and manufacturing of high-precision, high-quality gearing, transmissions and differential solutions.”

Eaton’s portfolio of multispeed transmissions includes

2-, 4- and 6-speed electrified commercial vehicle transmissions. Eaton’s EV transmissions are based on proven, robust, and efficient layshaft architecture typical of automated manual transmissions (AMTs) and shifting is synchronized without a clutch using a traction motor.

Unlike direct-drive transmissions that have long been the standard in EVs, Eaton’s transmission portfolio offers significantly greater efficiency at high speeds as well as increased torque at launch and low speeds. The EV transmissions feature a lightweight countershaft gearbox that boasts a range of torque capacities and electric gearshift actuation, allowing use of smaller electric motors.

Eaton conducts total system analysis, using state-of-the-art tools and in-house expertise, to design EV gearing solutions optimized for efficiency and reliability, with low NVH levels and reduced manufacturing costs. A full-system approach is essential when tailoring a design to a specific customer need, as several factors influence the development of gearing solutions. Chief among those factors are the gears, bearings and lubrication system.



Eaton’s Vehicle Group offers a wide range of specialized differentials for EVs with performance comparable to differentials designed for traditional internal combustion engine (ICE) vehicles. As the passenger vehicle market increasingly transitions to EVs, Eaton has the capability to provide the solutions manufacturers need.

Eaton’s traction control family of differentials provide improved traction in adverse conditions such as snow and mud and improve stability while trailering. As a global supplier, Eaton has extensive knowledge of vehicle dynamics and safety standards, as well as decades of experience working with global automotive manufacturers to integrate differentials into new-vehicle platforms. Eaton has been supplying differentials to the EV market since 2015.

Eaton offers a full range of differentials for EVs, including automatic limited-slip, automatic locking and electronic selectable locking differentials. Each is highly engineered, tested and validated for a variety of traction control applications. Performance is verified at Eaton’s Proving Ground testing complex in Marshall, Michigan, which is home to more than 600 acres of testing facilities and tracks.

“Our new ePowertrain business unit can provide our customers with an optimized, integrated EV powertrain, which

will help simplify their engineering development process,” Cronin said. “We will work with our global customers to determine the ideal combination of transmission, gearing and torque solutions that best meet their EV needs.”

www.eaton.com

KUKA

PLAYS KEY ROLE IN UNIVERSITY OF MICHIGAN NSF GRANT RESEARCH

As part of a \$2 million National Science Foundation Grant, robots from Kuka Robotics are helping the University of Michigan (U of M) advance research that could result in robots working side-by-side with humans on building construction sites. The research involves three Kuka KR Quantec robots along with the company’s robot sensor interface (RSI) software, all of which will allow human workers to use interactive task learning technology to teach the robots to perform construction tasks.



The resulting symbiotic human-robot teams could then be widely deployed in the construction industry. The future human construction worker would then be responsible for high-level work planning and would transition to the role of robot programmer and supervisor. The robot would perform physically strenuous tasks and collaborate with the human supervisor to improvise when unforeseen work conditions are encountered.

The three Quantec Kuka robot models used across two labs at U of M are the KR 120, KR 60 and KR 6. For the research, the KR 120 is mounted on an external gantry while the KR 60 is on essentially a mobile hydraulic excavator platform. The KR 120 would be used for factory pre-fab/pre-manufacturing of construction assemblies, and the KR 60 would be the robot that would travel to job sites. The line of robots applies to a wide range of applications and provide high performance, cost-effectiveness and flexibility. Such an expansive robot portfolio also offers U of M the capability to upgrade payloads in the field as well as apply software add-ons to adapt to changing applications.

What makes the construction application a challenge is the unstructured and changing environment in which the robots will work. In addition to the Kuka robotics, other automation technology that will help U of M overcome this challenge and make its research goals a reality includes various automation software packages, sensors, point cloud scanners,

tool mounted laser scanners and vision systems. The sensors and scanners ensure complete safety in the construction environments where humans will be present, but not working in extreme proximity of the robots per se. However, if an individual does approach, the robots will slow their speed until it is safe to resume a normal work pace levels once that person is clear of the area.

www.kuka.com

B&R Automation

NAMES INDUSTRY MANAGER FOR E-MOBILITY

B&R has named **Ronny Guber** to the newly established position of industry manager for electromobility, offering automakers and their suppliers a single point of contact for solving a new set of manufacturing challenges. As the combustion-electric transition shifts into high gear, global demand for EV battery systems is headed into a steep curve, and Guber is convinced that automation will be the key to lowering unit costs and making the necessary leaps in productivity.



Working with car manufacturers and their supply partners to solve this crucial pinch point in the EV supply chain, Guber has noticed a common theme: “Traditional approaches to battery production are throttled by stop-and-go inefficiencies and vulnerable to downtime in the event of even minor disruptions.” As industry manager, he looks forward to promoting B&R’s vision for a new generation of battery factories that deliver continuous high-speed productivity on a dramatically reduced footprint. “It’s a pivotal moment in the automotive industry, and we’re excited to help battery producers accelerate through the turn and come out ahead.”

According to Guber, the speed and efficiency challenges faced in battery production play right to the strengths of an integrated ecosystem with robotics, machine vision and other components tightly synchronized around a mechatronic track system. Instead of the traditional linear model, battery cells are moved individually through a network of process stations and historically stationary tasks are accomplished in motion at high speeds. “With this approach, we’re able to accelerate many production steps by 90% or more and bring order-of-magnitude gains in output per square meter of footprint,” says Guber.

www.br-automation.com

CALL FOR PAPERS!

Are you sitting on an idea for a technical paper but wondering where to present it? Do you have one already written, sitting on your desk, gathering machine dust?

How about *Power Transmission Engineering*? We are always looking for gearing- and power transmission component-relevant technical papers for publication in the magazine and in its digital version. Having your work appear in *Power Transmission Engineering* guarantees you an audience of the most experienced and discriminating industry players. You say your work has not been peer-reviewed? Not a problem, as we are lucky—and thankful—to have on-hand some of the most experienced and brilliant minds in the industry—our technical editors. So if your work “passes muster” and is published, you’ll know you were reviewed by the best—and most demanding.

Chances are you’ll be creating the paper under the auspices of the company for whom you work or own, or for one of the various industry-relevant associations. That means they as well will bask in the reflected glory that accrues with publication in *Power Transmission Engineering*.

For publication guidelines and more information, please contact Randy Stott at stott@agma.org

ABB

Page 3
www.abb.com/motors-generators

B&R Machine and Gear

Page 36
www.brgear.com

BDH Belts

Page 36
www.bdhbelts.com

Brother Gearmotors

Inside Front Cover
www.brothergarmotors.com

Circle Gear

Page 14
www.circlegear.com

Designatronics

Page 7
www.sdp-si.com

Diequa Corp.

Pages 12, 37
www.diequa.com

JIE USA

Page 5
www.jie-drives.com

McInnes Rolled Rings

Page 15
www.mcinnesrolledrings.com

Napoleon Engineering Services

Page 16
www.nesbearings.com

Nordex Inc.

Page 37
www.nordex.com

PBC Linear

Outside Back Cover
www.pbclinear.com

Quicksilver Controls

Page 2
www.quicksilvercontrols.com

Regal Rexnord

Page 9
www.regalrexnord.com/powertrain

SDP/SI

Page 7
www.sdp-si.com

SEW-Eurodrive

Inside Back Cover
www.seweurodrive.com

Telco Intercontinental Corp.

Page 36
www.telco-gearmotor.com

U.S. Tsubaki

Page 10
www.ustsubaki.com

Worldwide Electric

Page 18
www.worldwideelectric.net

Zero-Max

Page 17
www.zero-max.com

Power Transmission Engineering®

FREE SUBSCRIPTION

20PTEALL

Please Respond

Your response ensures that we deliver the magazine only to those who want it. It also gives us the vital information we need to serve you best.

- YES** I want to receive/continue to receive **Power Transmission Engineering**
- NO** Thanks anyway, but I don't need the world's best publication on mechanical components.

Name _____ Job Title _____
(please print)

Signature _____ Date _____
(required)

How would you like to receive Power Transmission Engineering?

- PRINT Version (Verify mailing info below)
- DIGITAL Version (E-mail required)
- BOTH Print AND Digital (E-mail required)

E-mail _____ *

***You can OPT OUT of your e-mail subscription at any time.**

How is THIS LOCATION involved with power transmission products? (Check all that apply)

- WE MAKE power transmission products
- WE BUY power transmission products
- WE SELL power transmission products (Distributors, sales reps, etc.)
- WE DESIGN products with power transmission components in them
- Other (please describe) _____

What is your company's principal product or service? _____

MAILING INFORMATION

NAME:

JOB TITLE:

COMPANY:

ADDRESS:

- Check if this is a home address

CITY:

STATE/Province:

ZIP/Postal Code:

PHONE:

FAX:

If your label is incorrect or incomplete, please update it above!

FAX to 1-847-437-6618

SCAN to: subscribe@powertransmission.com

FADE IN: INT. FACTORY - DAY

Maybe its time to look at science, technology, engineering, and mathematics stories over more superhero films featuring Batman and Spiderman

Matthew Jaster, Senior Editor

It's award season and Hollywood could use a few more engineering and manufacturing stories. For every new *Batman* script, there's 15 engineering and manufacturing tales that would make far more interesting origin stories. Here's some thoughtful and funny quotes from some of our personal favorites:

***Tucker: The Man and His Dream* (1988)**

Abe (Martin Landau) while discussing Preston Tucker's (Jeff Bridges) concept for an automobile:

"Einstein's in the idea business; he makes up numbers so high only dogs can hear them. But what does it cost him? A piece of paper, a couple of pencils."

***Gung-Ho* (1986)**

Hunt Stevenson (Michael Keaton) leads his American workers to try and compete with automobile production numbers in Japan. Chaos ensues:

"Now on these last few we might need to cut a few corners. Just little things, like... engines."

***The Martian* (2015)**

Mark Watney (Matt Damon) tries to stay alive on Mars:

"I'm left with only one option, I'm gonna have to science the sh#\$ out of it!"

***Hidden Figures* (2016)**

Mary Jackson (Janelle Monáe) discussing the obstacles as her and her coworkers attempt to move their way up the NASA pipeline.

"Every time we have a chance to get ahead, they move the finish the line."

***Steve Jobs* (2015)**

Steve Wozniak (Seth Rogan) discusses Steve Jobs (Michael Fassbender) potential legacy:

"We will know soon enough if you are Leonardo da Vinci or just think you are."

***Real Genius* (1985)**

Professor Hathaway (William Atherton) tries to understand what's going on inside the head of uptight teenage prodigy Chris Knight (Val Kilmer).

Professor Hathaway: When you first started at Pacific Tech you were well on your way to becoming another Einstein and then you know what happened?

Chris Knight: I got a haircut?



***Black Panther* (2018)**

Shuri (Letitia Wright) spends much of the film in her state-of-the-art lab in Wakanda rolling her eyes at the people around her:

"Just because something works doesn't mean it can't be improved."

***Ford v Ferrari* (2019)**

Carroll Shelby (Matt Damon) discussing the difference in vehicles:

"We're lighter, we're faster, and if that don't work, we're nastier."

***The Aviator* (2004)**

Howard Hughes (Leonardo DeCaprio) and Glenn Odekirk (Matt Ross) discuss airplane engineering issues:

Hughes: So, if the struts won't sustain the engine we need—then we gotta get rid of them.

Odekirk: Then the top wing falls off.

Hughes: Let it.

Odekirk: What?

Hughes: Who says we need a top wing? Who says we need anything?

***Fletch* (1985)**

Ace reporter Irwin M. 'Fletch' Fletcher (Chevy Chase) pretends to know his way around an airplane and responds humorously to a mechanics question about the bypass line:

"It's all ball bearings nowadays. Now you prepare that Fetzer valve with some 3-in-1 oil and some gauze pads, and I'm gonna need 'bout ten quarts of anti-freeze, preferably Prestone. No, no make that Quaker State."

Okay, maybe *Fletch* isn't exactly a movie that focuses on manufacturing, but we absolutely love the line, "It's all ball bearings nowadays," and should really consider making some *Power Transmission Engineering* T-shirts with this quote! **PTE**

- ✓ Called SEW
- ✓ Got expert solution
- ✓ Ordered complete package
- ✓ Dinner with family M-F
- ✓ Home on Sat/Sun!



Honey, I'm home!

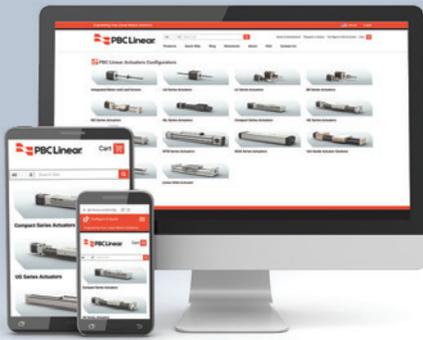
Tired of working nights and weekends on motion control projects? It's time to contact an automation specialist at SEW-EURODRIVE for help.

We provide a **complete package** from start to finish, including project planning, software, components, commissioning, troubleshooting, and worldwide support.

Get your free time back!

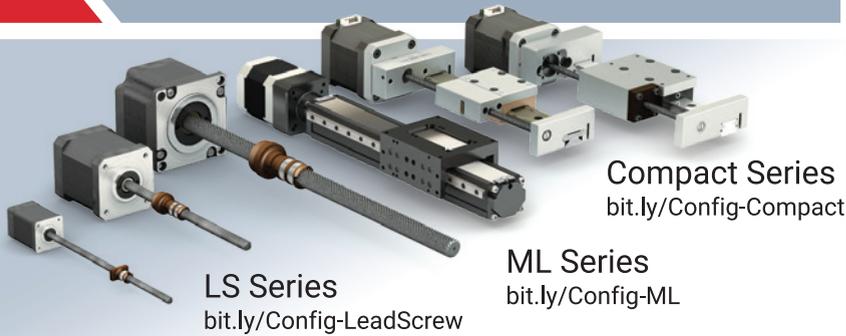
SEW
EURODRIVE

Configure an Application Specific Actuator Today!



The PBC Linear configurator provides a rich experience by predefining rules that create only valid configurations and more accurate pricing. The configurator allows you to research different options, making the buying process more self-serving and exploratory. Your configured actuator is a more precise product to your needs, saving time and money.

SMALL



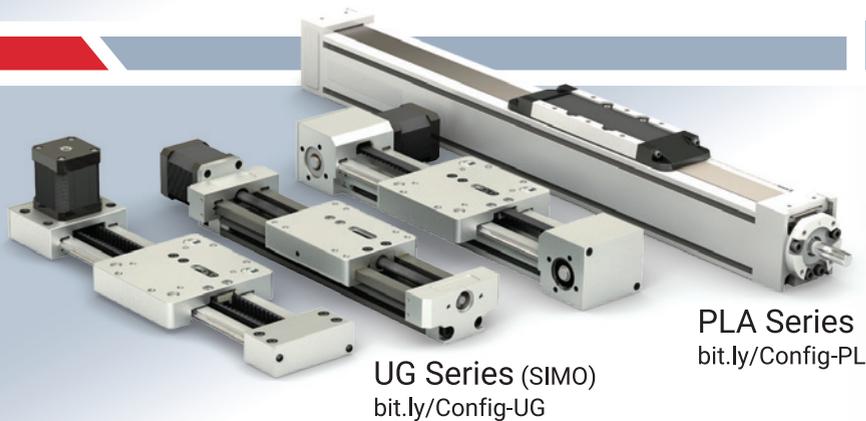
Compact Series
bit.ly/Config-Compact

LS Series
bit.ly/Config-LeadScrew

ML Series
bit.ly/Config-ML



MEDIUM



UG Series (SIMO)
bit.ly/Config-UG

PLA Series
bit.ly/Config-PL



LARGE



Simplicity Slides
bit.ly/Config-sslide

MUK Series
bit.ly/Config-MUK

MTB Series
bit.ly/Config-MT

