

MagnaDrive Synchra Series

PROVIDES NO-CONTACT SOLUTION FOR ROTATING EQUIPMENT

MATTHEW JASTER, SENIOR EDITOR

Trouble-shooting often leads to product development. This was the case when MagnaDrive (Woodinville, Washington) was approached by several customers to help prevent downtime in various machining operations. In previous circumstances, the couplings, bearings, and motors were failing prematurely due to vibration, heat generation and strong attraction forces.

“One customer application involving elastomeric couplings only lasted around two months before they needed to be replaced,” said Jake Lee, global CTO, at MagnaDrive Corporation. “So two years ago, we began to develop a solution where our disc-style couplings could handle higher horsepower, but not cause any axial forces on the motor or load shafts.”

The MagnaDrive Synchra couplings (patented May 28, 2019) harness the power of a no-contact, magnet-to-magnet synchronous connection for all types of rotating equipment. Compact and tough, the interior magnet rotors of this patented design uses Neodymium-Iron-Boron magnets—the strongest permanent magnets in the world.

The Synchra Series maximizes torque while eliminating any magnetic slip, resulting in consistent performance for vital equipment, with zero rpm’s lost. These couplings are much lighter, and in many cases, half the weight of magnet-to-copper type couplings. They can be used on high-speed applications more often than the magnet-to-copper type.

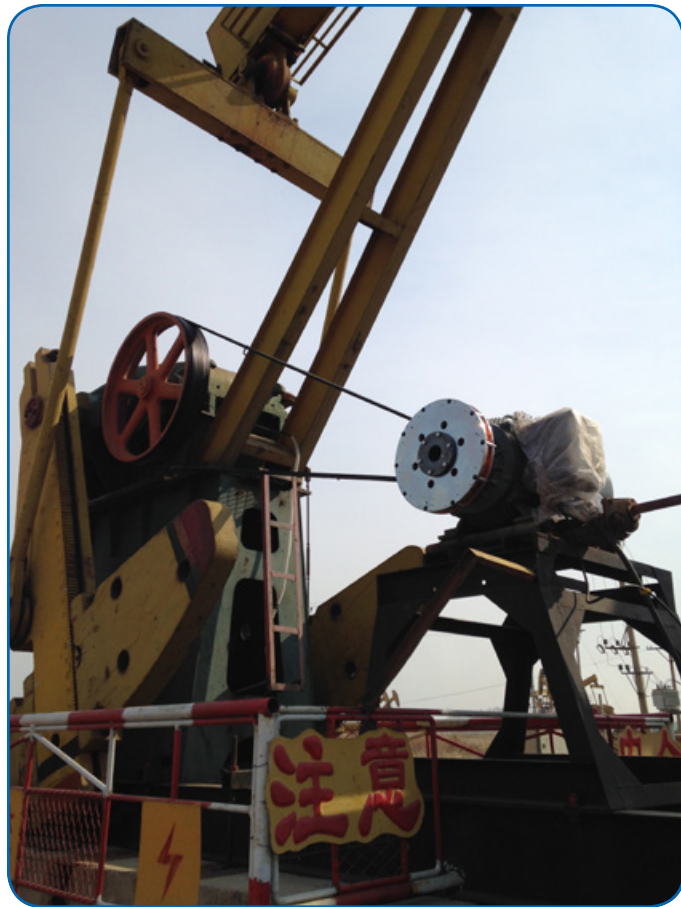
“We basically developed the Synchra series to reduce the size and the heat generation of our traditional magnet couplings and provide an opportunity to handle a larger range of horsepower,” said Geoff Harmon, senior applications engineer at MagnaDrive. “The Synchra has no physical contact between the motor shaft and the load shaft. It creates very large torque in a very compact design. It has a much higher torque to weight ratio than other magnetic couplings.”

The end game is a magnetic coupling designed for lifetime operation; a nice change of pace for customer’s switching out components every couple of months and shutting down production lines for maintenance and reliability concerns.

A History of Magnetic Force

MagnaDrive’s original patented technology uses high power magnets to create an induced electromotive force used for torque transfer. The system physically separates the two elements of the motor system, placing magnet discs on the load shaft and a conductor assembly on the motor shaft. Motor torque is transferred to the load across an air gap. Varying the air gap between the magnets and conductor changes the strength of the magnetic field and hence controls output speed. A portfolio of 20 domestic and more than 200 foreign patents protects this technology.

This includes disconnected torque-transfer technology that reduces maintenance and operating costs, increasing process availability, and improves system reliability. This



technology is demonstrating substantially reduced energy requirements associated with the operation of a vast base of motors that drive pumps, fans, blowers and other processing and manufacturing equipment used in industry.

Early funding for MagnaDrive was supplied by a grant from the U.S. Department of Energy (DOE). Also, DOE testing demonstrated that MagnaDrive’s products reduce energy usage by up to 70 percent. The DOE operates several units in mission critical applications at nuclear facilities. The U.S. Navy and U.S. Air Force also utilize MagnaDrive’s technology.

The Synchra series was developed as an evolving piece of technology to handle certain critical applications where other couplings were failing prematurely or causing production downtime.

Application Examples

Due to the Synchra’s ability to handle critical applications, MagnaDrive offered the coupling to a hospital where a customer was having serious vibration and thermal growth issues with a small pump shaft. The Synchra was the best selection for this due to its reliability.

“Most of these applications are critical, so it’s really important to use equipment that doesn’t shut down for maintenance or doesn’t need to be rebuilt or any other problems,”



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Offset Couplings from Zero-Max reduce space requirements for parallel offset shafts in large system applications. These specialized couplings provide machine designers with an important option for reducing overall machine size and footprint.

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Schmidt Offset Couplings can be mounted to shaft hubs or directly to existing machine flanges. They are available for shaft displacements of 0.156 inches to 17.29 inches and torque capacities from 55 to 459,000 inch-pounds. Many design configurations are available including specials.



Harmon said. "If they can install components that just run over a lifetime, they'll be much better off long-term regarding efficiency and reliability."

In this application, the Synchra coupling reduced most of the vibration and solved the misalignment issues that had occurred with previously-installed radial couplings. Although this coupling is heavier than a standard coupling, the bearing can handle the added weight. "The weight was not the issue," Lee said. "The issue was the vibration. The Synchra does not transmit vibration through the coupling."

"If you have a vibrating load shaft the Synchra coupling will not transmit it back to the motor. This will occur if you've installed a solid coupling," Harmon added. "The vibration ends up through the system while our coupling is basically a big shock absorber."

Another application example involved controlling an aggregate mixer that was causing too much torque and significant damage in the process.

"Our coupling is ideal for overload protection from high torque as it will slip at the same torque specification every time and will not damage the equipment. It will keep the



belts from breaking and prevent any damage to motors, bearings, etc.," Lee said.

Harmon said that the company tests these couplings thoroughly at their own R&D facility before they go out to market. "Even though our customer's expectations for magnetic couplings are very high and they've been on the market for a long period of time, they still want to see advancements in areas like efficiency and reliability."

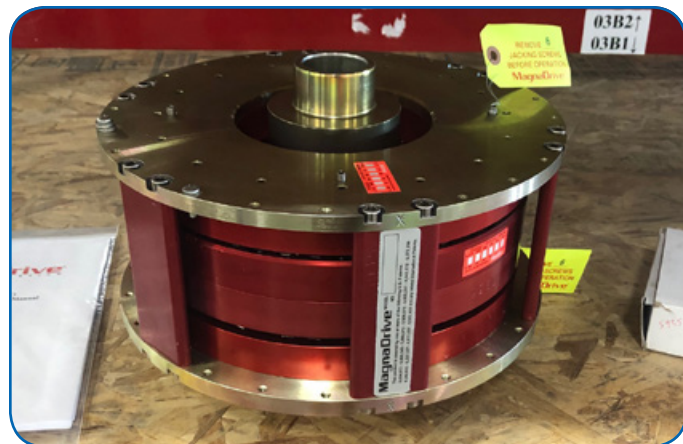
With each application, MagnaDrive finds new and exciting ways to bring this magnetic technology to market. Case in point, one of the first customers that purchased the Synchra coupling was for an electric locomotive.

"You never know who might be interested in the technology. It was surprising to find out that our coupling was being used to drive these electric locomotives. This is very different and unique from our other customer requests," Harmon said.

Additional Benefits

What are some of the other advantages of this technology? Both Lee and Harmon said there's no risk from heat due to clashing even from wrong installation or rotating equipment

bearing failure. Only a speed sensor is required to monitor operating conditions for the load speed in case of any RPM slip to prevent some increased vibration. Any RPM slip should trip the coupling so no heat and vibration are generated. Magnet and copper-type couplings always have some slip to operate which can cause heat from magnetic friction. Clashing is also a source for heat from the magnet/copper type couplings, but the Synchra does not slip so clashing does not damage the coupling.



"If customers are using very low-speed applications, the Synchra coupling can be utilized without any heat during operation," Lee said.

And Harmon believes the diversity of the component is also noteworthy. "You can utilize the Synchra in any pump application where there are misalignment issues, load seizures, shock loading, even boiler feed pumps that run at high temps where the shaft turns the pump and thermal expansion occurs. We will eliminate those issues with the Synchra," Harmon said.

Material handling is another area where these couplings can thrive. Any application such as conveyors, buckets, elevators or excavators that may need torque protection, for example.

An Evolving Technology

As machinery evolves, so will the components within each system. MagnaDrive is increasing the horsepower for the Synchra line. They offer 200 and 300 hp capabilities and they're currently going into 400 hp as well. "We'll continue to scale up as customer demand increases," Lee said.

"We're also working on heatless versions that can be installed in hazardous environments," Harmon added. "Components that can meet these requirements without any instrumentation or monitoring whatsoever, this would be ideal. We're looking at that for the future."

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Connecting machines and facilities with IT systems opens up enormous potential for more economical and intuitive processes. This is exactly where Bosch Rexroth's new CytroBox hydraulic power unit comes in. With its intelligent, energy-efficient modular design, CytroBox provides a new solution for the medium performance range up to 30 kW. With its integrated IoT technol-

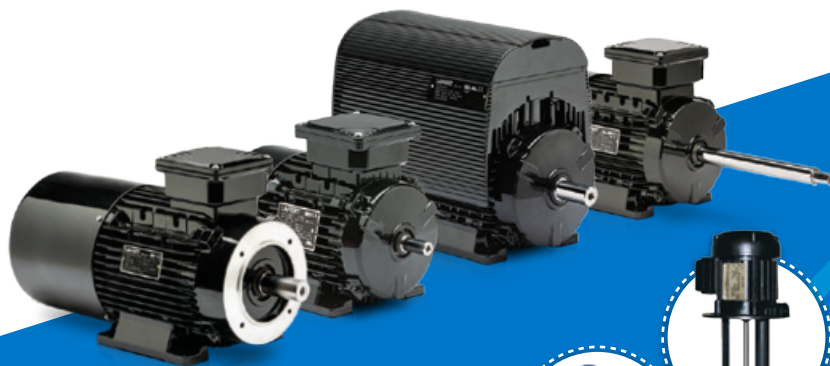
ogies, CytroBox is paving the way for consistently implementing Industry 4.0 concepts.

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energy requirements on an individual basis.

The speed is switched off during no load in order to save energy and is controlled under full load in a closed loop to the exact pressure command value with a highly dynamic response. This saves up to 60 percent of energy compared to conventional power units. The high efficiency of the manifold block, which is manufactured using the 3D sand core printing method, also contributes to overall efficient operation. Made via additive manufacturing, the manifold block is up to 40 percent more compact and boasts improved flow channels. This improves oil flow, reduces pressure losses and minimizes the areas where leaks could occur because fewer plug screws are required. The hydraulic power unit is also equipped with an active dewatering unit to protect against external contamination.

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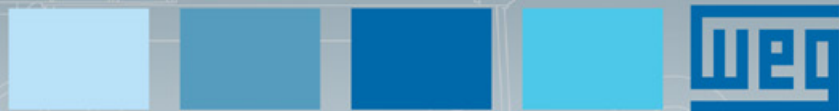
Save money and space by utilizing the IDEA Motor's integrated package of motor, drive, and feedback connections in a compact and programmable unit. A single motor/drive unit reduces motion system components by up to 75% per axis and simplifies machine troubleshooting. Further reductions can be achieved by wiring sensor inputs and control outputs directly to the IDEA Motor, rather than through a control cabinet.

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RS-485 communications fieldbus ports are integrated for programming autonomous motion sequences, monitoring system status, or streaming commands to synchronize motion among multiple motors. The EC042B IDEA Motor is available in three motor lengths, each with optional factory-configurable gearboxes.

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schedule replacement and thus reduce unexpected, costly and lengthy downtime.

If a building machine fails, packaging equipment comes to a standstill, or a wind turbine no longer revolves due to a bearing failure, the breakdown creates stress for operators of the machines and equipment. The



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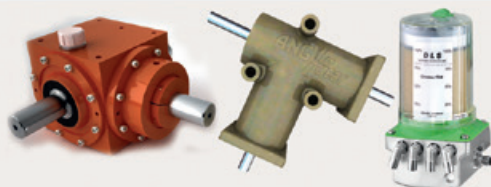
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intelligent bearing detects wear and sends a signal to the user if the bearing threatens to fail. Maintenance work can therefore be planned, and operators of agricultural machines, for example, are not surprised during harvest season with an unanticipated breakdown and work stoppage.

“We have primarily developed iglide for difficult-to-access bearing points and for applications where no regular maintenance intervals have been planned,” said Stefan Looockmann-Rittich, head of the business unit iglide plain bearings at Igus GmbH.

Smart Plain Bearings Are Individually Designed

The body of the new smart iglide plain bearing consists of two components: the internal, lubrication-free iglide material and an outer hard polymer shell that protects the bearing. “The customer can choose the material that is most suitable for the application. “The complete range of iglide materials is available,” Looockmann-Rittich said.

In order to measure the amount of wear, an intelligent sensor is used between the two components. The measured data of the sensor can be integrated by the machine and equipment operators in their systems in different ways.

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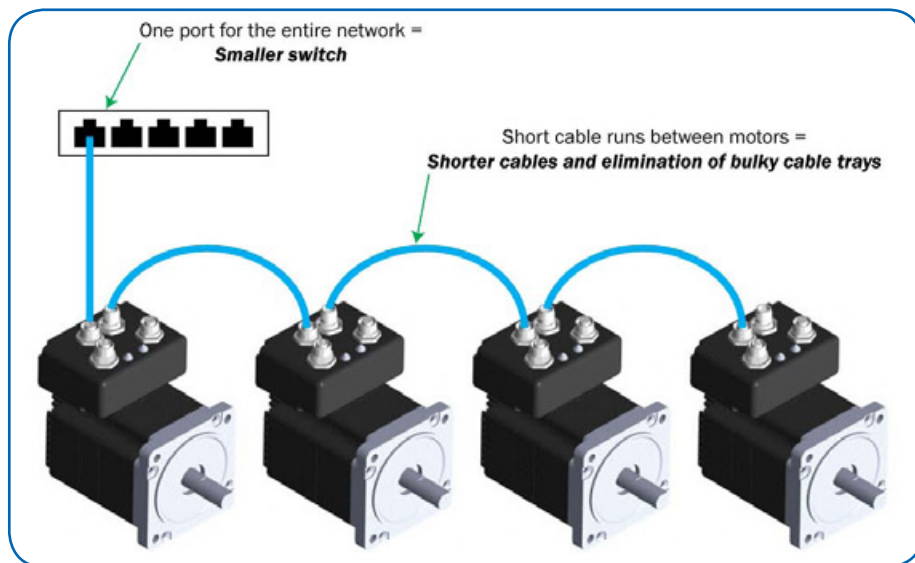
NEMA 24 FRAME INTEGRATED MOTORS OFFER DUAL-PORT COMMUNICATIONS

Applied Motion Products introduces two new NEMA 24 frame integrated motors with dual-port communications for connecting to the industrial EtherNet/IP network of a plant or machine. By incorporating two M12 EtherNet/IP connectors instead of just one on each axis, the SWM24IP-3DE Integrated Stepper Motor and TXM24IP-IDG StepSERVO Integrated Motor support more efficient network topologies such as line networks and daisy-chain connections.

EtherNet/IP network communications are the widely used industrial protocol for manufacturing automation applications. With EtherNet/IP, users can control, configure and query a drive using an open, standards-based, industrial EtherNet connection at speeds up to 100 Mbits/sec. All drive and motor features are accessible over the EtherNet/IP network, including

more than 100 commands and 130 registers for controlling motion, I/O, configuration, polling, math, register manipulation, and Q programming.

The additional EtherNet/IP communications port on the motors allows for cost savings and design simplification by reducing cables, eliminating bulky



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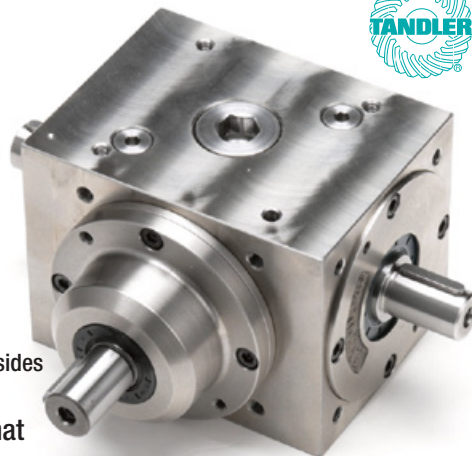


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cable trays and downsizing network switches. For example, in a star network, every single motor must connect to the central switch on a dedicated cable. In a line network using motors with dual-port communications, only the closest motor connects to the switch with the rest connecting to each other in a daisy-chain configuration. In addition to shortening cable runs between motors, only one port is needed for the entire network, which means a smaller Ethernet switch.

The SWM24IP-3DE and TXM24IP-1DG integrated motors are IP65 rated for use in splash-zone and dirty environments. Each motor features a NEMA 24 (60 mm) mounting flange, which has the same mounting dimensions as a NEMA 23 motor but with a larger shaft to accommodate a higher torque output. Both

motors include a built-in encoder for enhanced positioning capabilities. The SWM24IP-3DE can perform stall detection and stall prevention functions for more reliable and accurate performance than an open loop motor in a broader range of applications.

The TXM24IP-1DG utilizes Applied Motion's StepSERVO Closed-Loop Stepper technology to greatly improve the performance of the step motor with greater acceleration, increased efficiency, increased accuracy as well as decreased motor heating and noise.

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