



High-speed drive train on magnetic bearings. Motor shown is 400 kW at 20 000 r/min.

## Recent Advances Give Magnetic Bearings a New Spin

The use of magnetic bearings in high-speed rotating machinery has been steadily growing thanks to recent technical advances in miniaturization, integration and standardization. Reductions in size, complexity and cost have greatly increased the acceptance of active magnetic bearings while an increasing number of users are discovering the advantages and benefits they can provide over traditional oil-lubricated bearings.

Industrial applications for oil-less, direct-drive systems are growing rapidly across a broad spectrum of sectors, including petrochemical, oil and gas, power generation, HVAC and precision manufacturing. Synchrony, a Virginia,

U.S.A.-based company has been providing advanced products and technology to clients since 1993. Founded by its CEO and President, Dr. Victor Iannello, Synchrony provides the latest products, systems and services for industries using rotating machinery who want to improve quality, productivity and profitability.

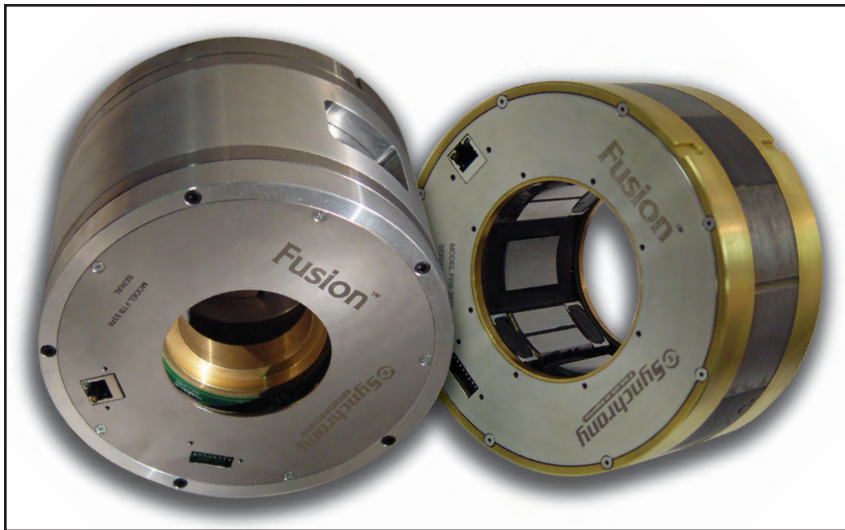
Previous generations of magnetic bearings were complex and costly, prone to electromagnetic interference (EMI) and required a large external control box (about the size of a household refrigerator) along with a myriad of cables and connectors. Today's digital age has brought higher reliability and vast reductions in size and through advances in standardization, integration and manufacturing, the cost has greatly come down. Although

the engineering effort to develop a new magnetic bearing system is often higher than traditional systems, once developed, it can be supplied to users and OEMs at a much lower price than oil-film bearings. The net result is that magnetic bearings can be more economical to use in new and existing rotating machinery. Synchrony also said that through recent design innovations, the size of radial magnetic bearings has been reduced by more than 30%.

The small size of the controller used with modern magnetic bearings allows it to be integrated into the drive train housing so the only required connections to the controller are DC power and an Ethernet network cable. The bearing controller can also control other aspects of the machinery, such as the position of inlet guide vanes and machine protection functions, through spare I/O and processing capability. Often, the built-in intelligence of the drive train can eliminate the need for an external controller.

The new, compact controllers may be integrated into the casing of the

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**Fusion radial and thrust bearings with integrated control electronic.**

machine, mounted on its exterior or even integrated into the magnetic bearing itself. Because the wires between the controller and bearings are short, cabling and connecting are greatly simplified, EMI is reduced and no special tuning of the position sensors is required.

According to Synchrony, one of the main advantages of a magnetic bearing is improved bearing “health” monitoring with the resulting benefit of reduced downtime. In the past, health monitoring of a rotating machine required a dedicated vibration monitoring system — a large, expensive device

consisting of proximity probes, conditioning electronics, high-speed data acquisition systems, digital processors and alarm hardware. Now, a machine already equipped with a magnetic bearing system can also perform bearing health without any additional investment in hardware.

Inherent in magnetic bearings are high-resolution position sensors, digital processing and communications. Also, much of the vibration data processing can be performed in the bearing controller itself instead of a separate data acquisition system and processor.

Synchrony claims that users of criti-

cal industrial equipment that use magnetic bearings will realize many benefits, including reductions in downtime and in the need for handling, storage and disposal of hazardous materials. The company said its bearings are less prone to fires and can eliminate introducing “clean” processes that are intolerant to contaminants. Maintenance operations can be reduced as well as the need for attended operations at remote facilities. Finally, Synchrony said its bearings can decrease life-cycle costs while, at the same time, increase system reliability.

Examples of industrial equipment, processes and plants that can benefit from magnetic bearings include refineries, petrochemical plants, offshore and undersea oil and gas extraction, oil and gas pipeline transmission, LNG conversion, distributed energy power distribution and more.

“Through technical advances, magnetic bearings now offer many advantages over a much broader range of machines and applications,” said Iannello. “Design innovations related to miniaturization, integration and standardization continue to increase the general acceptance of magnetic bearings for many new and existing applications, while we at Synchrony are setting the standard for better, smaller and greener bearings.”