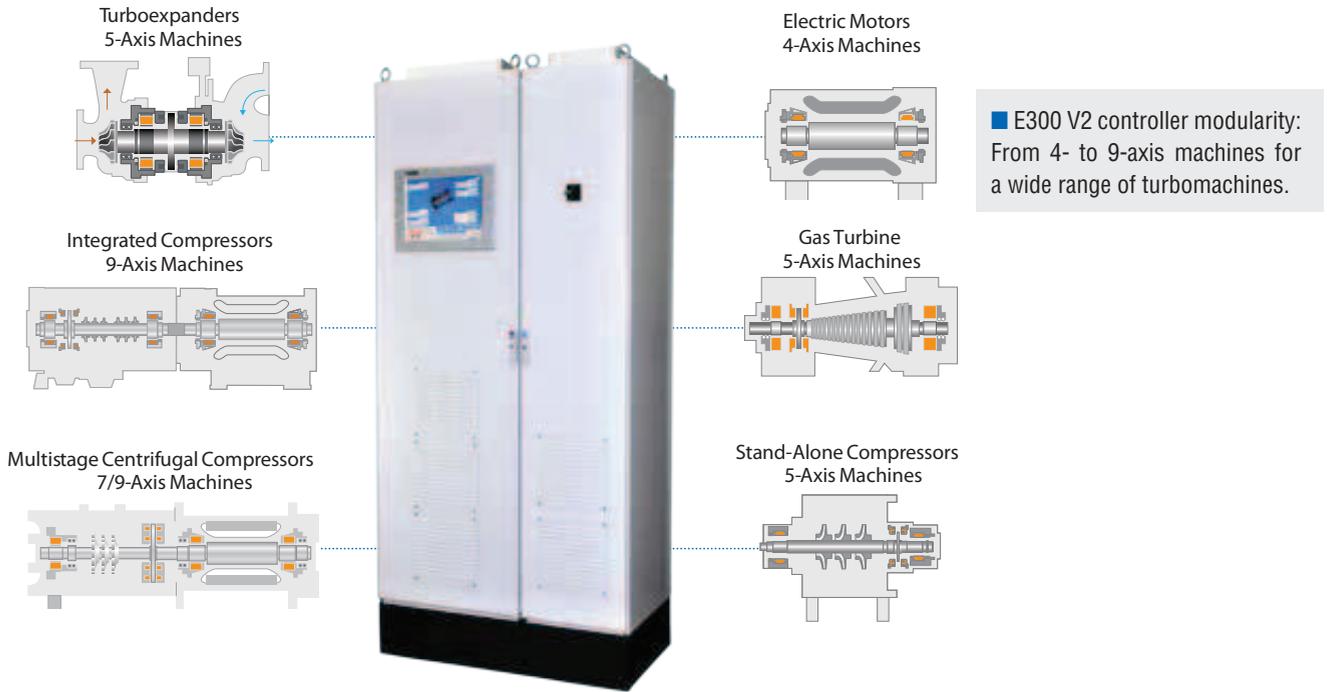


Magnetic Bearings Success In The Oil And Gas Industry > SKF surpasses milestone

BY ROBERTO CHELLINI



■ E300 V2 controller modularity: From 4- to 9-axis machines for a wide range of turbomachines.

SKF recently announced the commissioning of the 1000th SKF S2M active magnetic bearing (AMB) system for the oil and gas industry, which is integrated in a stand-alone centrifugal compressor for a natural gas transportation application. This milestone demonstrates the success of a system that has undergone continuous development and refinement to reach the reliability and availability of the present generation of AMB.

SKF Magnetic Mechatronics has pioneered the AMB system that allows the shaft, which can weigh as much as 25 tons (23 tonnes), to levitate and rotate in a frictionless way without the need for lubrication. The French company S2M started to produce AMB 38 years ago and has manufactured to date more than 130,000 systems, the majority of which are for turbo-molecular vacuum pumps.

The 1000 units for rotating machinery used in the energy industry are applied to turboexpanders (560 units),

centrifugal compressors (230 units), high-speed electric motors (160 units), gas turbines, generators and other heavy equipment.

The most significant advancement was the launch of the new E300 V2 control cabinet, which maximizes the operation of a majority of AMB systems. This cabinet is an industrial standard digital E300 Volt/30 Amp (a

system that has accumulated over tens of millions of hours of operational experience in the oil and gas industry). The AMB controller is optimized by taking into account all aspects of complex rotor dynamics of the machine.



■ SKF S2M magnetic bearings to equip high-speed offshore natural gas compressor (North Sea applications).

The new cabinet, in addition to operating the AMB system, also features a lean condition monitoring and diagnostic system that monitors the behavior of the machine by mastering vibrations, unbalances, temperatures of the bearing coils, and providing many other parameters, which allow performing machine analyses. The data is post-processed providing rotation orbits, 3-D waterfall cascades, time snapshots, etc.

Progress has been made also on the mechanical side to keep pace with the increased interest of oil companies toward the exploitation of sour/acid gas reserves. Bearing coils are manufactured taking into account the gas contamination level. All sensors (temperature probes, position sensors, etc.) are of more robust construction to increase even further the operating life of the whole system.

The present generation of AMB features SKF hybrid ball bearings (with ceramic balls), which support a higher number of hard landings. Previously, the health check of the ball bearings (clearance) has been performed by specialized personnel in situ, while now a special function integrated into E300 V2 allows this operation to be performed easily by a plant operator.

Tuning operations carried out on a new system, where once highly specialized personnel took time to customize the controller, have now been reduced to just a few days. The main tuning is carried out at the original equipment manufacturer (OEM) facility during the mechanical test of the machine; once the machine is installed, a final setting at the site can be done using a remote connection. The operator can remotely monitor the state of the machine by means of a real-time, high-resolution, data-acquisition system. Additional condition monitoring systems, such as a SKF @plitude suite, can be integrated into the system. Furthermore, trip analysis can be performed in a short time in case of a turbo-machine failure. With the new system, end users will gain substantial autonomy.

S2M is working with its key custom-

ers on AMB software, which assists the OEM in designing a machine with an AMB system to rationalize the layout of the various components.

If the footprint of a machine fitted with AMB is practically the same as a machine with conventional oil-lubricated bearings, the footprint and weight of the auxiliaries needed for an AMB machine are very much reduced. AMBs do not require lubrication, so the complete oil system (tanks, pumps, fil-

ters, etc.) can be eliminated with great savings in space and weight, which is most important for offshore platform installations.

Also, maintenance is reduced and simplified. Many users have reported that their machine has operated for 100,000 hours without any failure related to magnetic bearings. Typically, the mean time between failures (MTBF) is more than 40,000 hours and reliability of 99 to 100% is a standard. [CT2](#)

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**mean time between failure*