CASE STUDY

AMB Controller Upgrade Optimizes Turboexpander Performance In NGL Recovery

Turboexpanders are the beating heart of midstream natural gas liquid (NGL) operations. As a radial in-flow turbine through which high-pressure gas is driven to power a compressor or generator, turboexpanders help enable fast and efficient liquid recovery.

Bearings are a crucial component of a turboexpander, supporting the weight of the turboexpander's rotor and helping the machine maintain correct relative positioning. Active magnetic bearings (AMBs) are an oil-free bearing system that uses electromagnetic forces to maintain the relative position of a rotating assembly (rotor) to a stationary component (stator). An advanced electronic control system adjusts these electromagnetic forces in response to forces generated from machine operation, and any issue that compromises the operation of an AMB controller can bring NGL processing to a halt.

So, when an NGL processing company approached Troy O'Steen looking for the best way to upgrade an outdated analog AMB controller, he understood the importance of finding a reliable and expedient solution.

As Sales Director at Valencia, CA-based L.A. Turbine (LAT), a Chart Industries company, O'Steen was accustomed to working with all brands of turboexpanders and supporting equipment. In addition to designing and building its own turboexpanders, the company specializes in aftermarket service and repair for turboexpanders from any OEM. However, the analog controller was outdated and repair wasn't feasible.

Luckily, LAT had a history of successful collaboration with Waukesha Magnetic Bearings of Worthing, United Kingdom, a subsidiary of Waukesha Bearings, Waukesha, WI, that has been providing complete solutions for AMBs and magnetic bearing controllers in a variety of specialized applications for nearly 40 years. Waukesha Magnetic Bearings has designed magnetic bearing controllers to be compatible with a wide range of AMB sizes, sensor technologies and operational environments. This versatility and experience enable the company to design controllers that are effectively brand-agnostic, making them the perfect partner to help LAT promptly deliver a cost-effective application-specific solution.

OUTDATED ANALOG AMB CONTROLLER STALLS NGL PROCESSING

The troublesome analog AMB controller, and the cabinet in which it was housed, were due for an update. Over several months, the company tried to troubleshoot its shortcomings, but the original manufacturer considered the controller obsolete. That meant the OEM would no longer provide support. Instead, the OEM pushed its customers to upgrade to new AMBs with a more advanced controller.

The concern was that installing new bearings would require significant investment, a capital commitment that was beyond the company's allocated budget for the project. Plus, they would have to wait for an opening in the previous supplier's schedule to get the engineering support required for the AMB controller's installation, which meant extended turboexpander downtime. By extension, NGL processing would be stalled during the upgrade, and it was uncertain when a regular NGL processing schedule could resume.

The company sought an alternative that didn't involve the considerable expense and lengthy downtime of upgrading to entirely new AMBs and controllers. Unfortunately, the quotes they received weren't any more appealing. Most companies proposed the same solution: replace the entire AMB system, including the controller, for easy compatibility.

It seemed like there was no choice but to purchase the expensive replacement AMB system until a service call with LAT yielded a different and more satisfying solution.

CONTROLLER RETROFIT BEATS COSTLY REPLACEMENT

Rather than replacing the entire system, LAT proposed working with Waukesha Magnetic Bearings to retrofit a new, more modern and feature-rich controller for the existing AMBs and turboexpander. Pairing a new controller with an existing AMB is not typical because most companies require using the same manufacturer for both pieces of equipment. However, LAT and Waukesha Magnetic Bearings already had collaborated on similar projects in the past with great success.

In fact, the two companies had a history of ambitious collaborations. When LAT set out to design the industry's first and only skid-mounted turboexpander cabinet for hazardous-area applications, they reached out to Waukesha Magnetic Bearings to be a design partner. Together, the companies built the ARES AMB Turboexpander, featuring a skid-mounted Zephyr® controller.

The Zephyr controller also proved to be an ideal solution for retrofitting the midstream energy customer's obsolete analog controller. The Zephyr controller is highly configurable, making it "bearing-agnostic," or able to integrate with many different sensors and magnets.

Beyond technical compatibility, Zephyr controllers are simple to operate, which was a key requirement for LAT's customer. After relying on the outdated analog controller for so long, they were also seeking a more robust solution with modern features such as remote monitoring and adjustment capabilities.

All in all, Zephyr fit the bill.

A DEDICATED SERVICE TEAM MAKES INSTALLATION SEAMLESS

While it was clear the new controller and cabinet would be an enormous upgrade, the engineers at LAT and Waukesha Magnetic Bearings most impressed the customer with their responsiveness and customer service.

Because the LAT and Waukesha Magnetic Bearings teams understood the impact downtime has on NGL-processing companies, they worked tirelessly to install the upgraded equipment as quickly as possible.

"This type of integration isn't simple," Carlos Pi, Key Account Manager at Waukesha Magnetic Bearings, explained. "But we do everything in our power to make it easy." In this case, that meant constant communication – plus sharing lessons learned from previous retrofitting projects.

Years of experience taught the team to spend plenty of time collecting relevant details and preparing thoroughly before the shutdown for installation. They meticulously familiarized themselves with the OEM's programmable logic controller (PLC) to make integration seamless.

An onsite commissioning engineer also proved critical for smooth installation, providing detailed information about the site and assembling the controller according to design specs.

As a result, the LAT and Waukesha Magnetic Bearings teams were able to install the controller and make it operational quickly. "We make every effort to make this plug-and-play. We don't just drop it off; we'll help you troubleshoot until it's done," said Pi.

ADVANCED NEW CONTROLLER EXCEEDS EXPECTATIONS

The new controller has proven to be an optimal solution. Now, LAT's customer can keep an eye on the AMB remotely and make adjustments if needed. Zephyr's remote monitoring and adjustment functionality includes multi-coordinate control, runout compensation, an automatic balancing algorithm and an advanced amplifier algorithm for software flux feedback.

With inductive sensor support, Zephyr also boasts simple troubleshooting features – a stark contrast to the old analog controller. Its diagnostic capabilities include a web-server interface, event logging, automatic clearance check, and built-in tools that show compliance with ISO sensitivity performance criteria. It offered everything the customer wanted, and then some.

Backed by the LAT team's exceptional customer service and field support, the upgraded controller gave the customer renewed peace of mind about the AMB's long-term performance. In fact, Waukesha Magnetic Bearings' devices are known to stay operational for decades, and Zephyr controllers have the same reputation for long-term reliability. With no moving parts, predictive maintenance and an extended warranty option, the AMB controller is expected to perform reliably in the field for many years to come.

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