

Customer Success Story: Robotics Integration

Zetec Puts Eddy Current Array Probe at the Forefront of Automated Weld Inspections



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Diane Lawson
Vice President, Eddy Current Technology
Zetec

When global petroleum companies look for ways to develop lower cost, safer, more efficient approaches to oil and gas exploration, they’re thinking beyond incremental improvements in day-to-day operations. Way beyond.

Researchers tasked with using automation, robotics, advanced materials and other technologies to substantially enhance productivity see nondestructive testing as essential to keeping upstream assets working as expected.

Zetec has long been at the forefront of robotics and automation in eddy current testing; for instance, Zetec’s ZR-100 inspection and repair robot is the industry’s most field-proven probe delivery platform for steam generator tubing testing, with the ability to significantly reduce the downtime and human intervention required for routine inspection campaigns.

Automating Weld Inspections

Zetec also collaborates with robotics partners around the world to automate weld inspections in oil and gas, manufacturing and other heavy industries.

One example is a robotics project that uses Zetec eddy current array technology and a laser-guided robotic crawler for weld inspections on bullet tanks for liquefied natural gas (LNG) at a refinery in Southeast Asia.

With a capacity of 124,000 barrels per day, the facility’s core business is to refine crude oil into high-value petroleum products for domestic and export markets. The refinery has nine mounded tanks comprised of a lightweight stainless steel inner vessel fortified by a steel outer jacket.

Reducing Downtime

Each tank is approximately 60 meters in length and 6 meters in diameter and the interior has a 0.6-mm epoxy coating between the 4 o'clock and 8 o'clock positions of the tank bottom.

Every year, the refinery shuts down one tank for cleaning and inspections of circumferential welds and other structural elements. The conventional inspection method is magnetic particle testing, which means the technicians have to enter the vessel and remove the coating before they can do their work.

The surface preparation and cleanup required for magnetic particle testing, including reapplying the epoxy, is time consuming. Each campaign takes up to three weeks.

The inspection team also has to erect a complex network of scaffolding to support them while they're inside the tank and remove it when they're done.

From the Lab to the Field

Zetec worked with a robotics partner on an automated eddy current inspection that could eventually replace magnetic testing and eliminate the need for people to work inside the tank.

The system involves mounting an eddy current probe to a robotic crawler and guiding it along each weld seam. The window for a field trial was tight—the team would have a couple of days to work in the vessel and needed to ensure that the equipment would perform as seamlessly as possible.

To validate the process, Zetec created a customized Surface Array Flex Probe connected to the MIZ-200 eddy current array instrument and Zetec's Velocity acquisition software at its lab in Snoqualmie, Washington. In tests of coated and uncoated P355 calibration blocks supplied by refinery owner, Zetec's eddy current array probe running at 475kHz and 450kHz in driver pick-up configuration was able to accurately detect and characterize all defects including an axial 0.5-mm deep flaw in the toe of the weld.

Zetec also was able to determine the amount of downward pressure the robot would need to apply to the Surface Array Flex Probe in order to match the contour of the weld crown during the inspection, which is essential to a successful eddy current test.

Successful Results

Zetec's work in the lab translated well in the field. Based on the results of the laboratory tests from Zetec and other tests in the field, the refinery owner was able to qualify the robot and eddy current array probe as a valid weld inspection technique for its LNG bullet tanks. The next step is to formalize technical requirements for the refiner's inspection service providers.

"Using eddy current array for data acquisition is a good fit with the use of automation to improve the accuracy and efficiency of manual processes," said Diane Lawson, Vice President, Eddy Current Technology, at Zetec. "Given the success of this bullet tank inspection trial, we can look at other types of tanks where robotics and eddy current array can deliver even greater benefits."



Zetec holds ISO 9001
and ISO/IEC 17025
certifications



Zetec, Inc.
8226 Bracken Pl. SE | Suite 100
Snoqualmie, WA 98065
Toll Free: 800.643.1771
P: 425.974.2700