

## Inspection Advantage Comparison: Array Inspection Solutions

### Comprehensive Detection Capabilities for Balance of Plant Heat Exchanger Applications



Zetec CXB4 array probe for heat exchanger tubing inspections

Defects in heat exchanger tubes can be axial, volumetric or circumferential in orientation, and it can be critical to be able to identify and characterize the difference. Heat exchanger owners may respond to an axial crack or volumetric indication by simply monitoring the tube, while a circumferential flaw would more likely require plugging the tube or changing out the entire bundle—a costly process for Balance of Plant (BOP) asset owners.

For a variety of reasons, circumferential cracking is difficult to detect with standard eddy current bobbin probes, particularly at expansion transitions and support structures. Zetec, with nearly 50 years of industry leadership in NDT inspection solutions, uses an innovative approach. The solution combines a full set of X-Probe™ array coils for detecting circumferential flaws with a bobbin coil to provide the typical bobbin data all in one pass of the probe. Integrating these two technologies can produce faster results, fewer probe changes, and more reliable inspections of non-nuclear heat exchangers.

Zetec's MIZ®-200 Eddy Current instrument coupled with the CXB4 Probe and Velocity® software is designed to produce a more comprehensive inspection result compared to conventional array systems, including reliable and accurate detection of circumferential and axial flaws. This technology is unique in the industry and delivers a simplified approach to determining the orientation of indications.

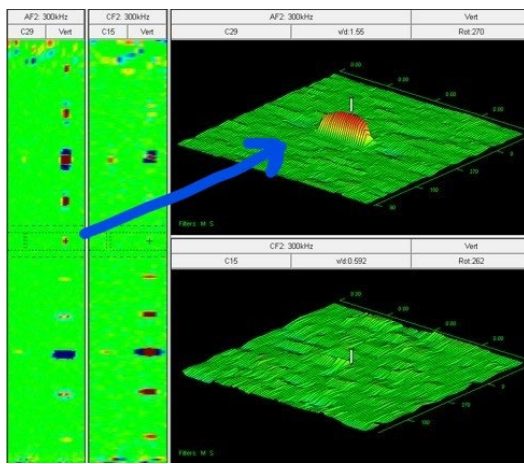
### Array System Comparison

To evaluate the data-acquisition and analysis capabilities of the Zetec system, we compared it to a competing system consisting of an array probe, test instrument, and software. The test calibration standard had 10 EDM (Electrical Discharge Machining) notches: two 100% TW EDM notches in the axial and circumferential orientation, and eight EDM notches in the axial and circumferential orientation in both ID and OD at the depths of 60% and 20% TW. The width of the EDM's are .010". The length of the axial EDM's are .5". The length of the circumferential EDM's are .785" (90 degrees around the 1" tube).

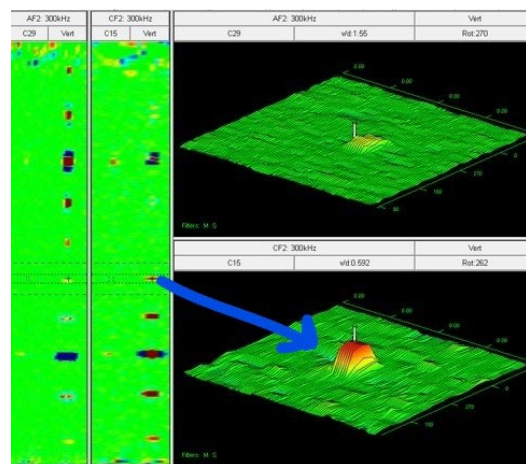
Both array probes in this evaluation had the same diameter and incorporate bobbin and array coils intended to find and characterize axial and circumferential flaws. The Zetec CXB4 probe has two rows of 19 coils each which act as driver and pickup coils in a robust body. The competing probe has two rows of 14 coils each.

## Results

**1. Separate C-scan/Waterfalls Improve Flaw Detectability:** The Zetec MIZ-200 Eddy Current instrument, CXB4 Probe and Velocity software provide two separate C-scan/waterfalls, which helps the user easily differentiate between axial and circumferentially oriented indications.



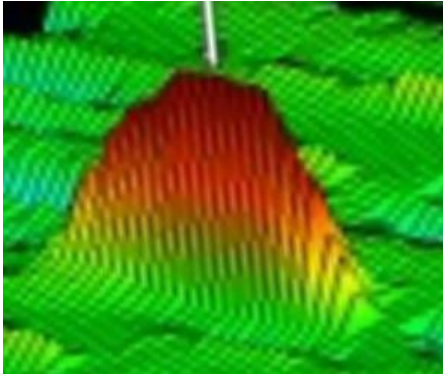
Zetec 20% OD Axial



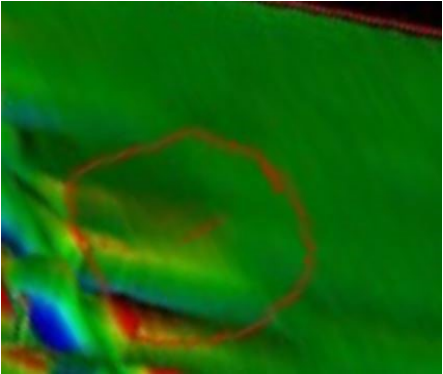
Zetec 20% OD Circumferential

The competing software uses a single channel when displaying the data. The user is limited in determining if the indication is axial, volumetric or circumferential by the ratio of the indication on the display. This is more problematic when the flaws are inexact or imprecise, as they would be in a real-world environment.

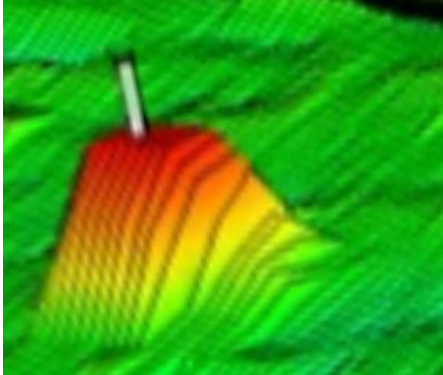
**2. The Zetec System Detected All ID and OD Flaws:** The 20% EDM notches were utilized for this comparison as they are the smallest EDM notches in the standard. The Zetec system easily detected all four 20% EDM notches in axial and circumferential orientations. The competing system was able to detect the axial and circumferential OD notches but did not detect the axial and circumferential ID notches as shown in the areas circled and indicated in red:



Zetec 20% ID Axial



Competitor 20% ID Axial



Zetec 20% ID Circumferential



Competitor 20% ID Circumferential

**3. The Zetec System Filtered Unwanted Signals:** Zetec’s Velocity software has multiple filters to reduce or eliminate unwanted noise signals that the competing system does not have, which further complicates their analysis of the signals.

## Conclusion

Zetec's MIZ-200 Eddy Current instrument, CXB4 Probe and Velocity software delivered better detection and sensitivity compared to the competing system, which failed to detect half the 20% EDMs during the test.

The recommended tubing inspection solution for BOP heat exchanger applications is a complete system:

### Test Instrument: Zetec MIZ-200 Eddy Current Instrument

- Industry-leading data signal-to-noise ratio for superior probability of detection
- Compact, lightweight, and portable
- Aluminum case designed to IP-65 for harsh environments
- A/C and battery powered with two hot swappable batteries

### Probe: Zetec CXB4

- Array and bobbin technology combine for fast, accurate, detailed results
- Detect and differentiate axial, circumferential, and volumetric indications
- Excellent detection of indications at expansion transitions and support structures
- Rugged design for longer service life

### Software: Velocity Acquisition and Analysis Software

- Includes Velocity/AQ for data acquisition, Velocity/AN for data analysis, and Velocity/DM for data management. Each module has been perfected for BOP and heat exchanger eddy current inspections
- Best-in-class enhanced C-scan presentations derived from software
- The combination of Zetec Velocity software and the Zetec CXB4 probe provides axial and circumferential C-scan/waterfalls, giving the user the ability to differentiate between axial and circumferentially oriented indications



Zetec holds ISO 9001  
and ISO/IEC 17025  
certifications



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