

# High Temperature Hydrogen Attack (HTHA)

## Application Note

### Inspection Challenges

In the Oil and Gas industry, High Temperature Hydrogen Attack (HTHA) can occur in steels operating at high temperature, usually above 205°C (400°F). It is the result of hydrogen disassociating and dissolving in the steel, eventually leading to fissures as well as cracking. This challenge is most commonly found in hydrogen environments within refinery, petrochemical and chemical facilities.

Early stages of HTHA are very difficult to detect because of the small size of the methane voids, typically <0.1 mm (0.004"). The degradation can build up over time ultimately resulting in unexpected plant downtime, reduction in productivity, employee safety hazards and even catastrophic damage to critical assets.

### Recommended Solution

Due to the challenges of inspecting for HTHA, a combination of advanced ultrasonic examination techniques, with carefully selected instruments and probes is recommended in order to achieve a highly efficient, powerful and accurate inspection. An operator that has been specifically trained for and uses this optimal solution will gain a significant inspection advantage.

The proposed solution includes the following components and techniques:

- ▶ **A powerful and portable PA UT** unit with all tools and features to efficiently set up and deploy the following recommended examination techniques:
  - **TOFD (Time of Flight Diffraction)** - A rapid and robust technique for initial screening of base material and welded regions (HAZ). Increased grain noise (short indications) and clustering (beehive) in A-Scan signals are indicative for early stage HTHA
  - **TULA (TOFD Ultra Low Angle)** - Well suited for initial screening of thicker base material. Like TOFD, increased back-scattering and clustering in A-Scan signals are indicative of HTHA
  - **Beamforming phased array UT** - Used for secondary inspection and key to detecting clusters of small methane voids and micro-fissures
  - **Live TFM (Total Focusing Method)** - Provides confirmation and further characterization of HTHA damage
- ▶ **Specifically designed probes** for this type of inspection, capable of completing the recommended examination techniques

## Products

Zetec offers the optimal solution for this type of inspection challenge, delivering efficient detection and characterization of HTHA damage. The following complete solution kit from Zetec features the necessary components to confidently perform all the examination techniques in the inspection and has been successfully used in Lavender International HTHA Training Certification.

### Zetec TOPAZ64 Fully integrated, portable PA UT unit

- A fully integrated, portable 64 channel Phased Array UT (PAUT) device delivering faster, more reliable inspections. It intelligently combines the power of 64 active channels for PAUT applications with the industry's most advanced live Total Focusing Method (TFM) capabilities.

#### Features include:

- Excellent 64 active element PA UT
- 2 high-SNR TOFD channels at 200 V
- 12" Hi-Res multi-touch display
- Best-in class « live » TFM
- Parallel recording of PA UT & TFM
- Bipolar pulse (150Vpp) option
- Driven by industrially-proven UltraVision Touch software



#### DLA 10 MHz Probe

- Pitch & Catch PA 64E with small pitch used in LW mode for improved TFM imaging



#### AL-TFM 5 MHz Probe

- Pulse Echo PA 64E with small pitch used in SW mode for improved TFM imaging in HAZ under weld cap

## Benefits

A fully integrated, portable 64 channel Phased Array UT (PAUT) device delivering faster, more reliable inspections. It intelligently combines the power of 64 active channels for PAUT applications with the industry's most advanced live Total Focusing Method (TFM) capabilities.

### ► Highly Efficient and Powerful

- One instrument handles the entire inspection -- the Zetec TOPAZ64 includes the required tools and features to efficiently set up and deploy all recommended techniques. No additional instruments or software needed.

### ► Field Proven

- This solution has been successfully deployed in the field and is referenced in Lavender International's HTHA Training Certification.

### ► Accurate and Confident

- Confidently inspect for HTHA using highly advanced PAUT examination techniques that can detect all flaws including early stages of HTHA.

## The Zetec Advantage

Zetec is a global leader in nondestructive testing (NDT) solutions for the critical inspection needs of industries the world counts on every day— including power generation, oil and gas, aerospace, transportation, military, heavy industry and manufacturing. By integrating design and engineering with our own manufacturing, Zetec delivers solutions that optimize productivity, safety and total cost of ownership.

**For more information about the Zetec HTHA Inspection solution, TOPAZ64 PAUT instrument or other Zetec products contact your local Zetec representative, email us at [info@zetec.com](mailto:info@zetec.com) or visit [www.zetec.com](http://www.zetec.com).**



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