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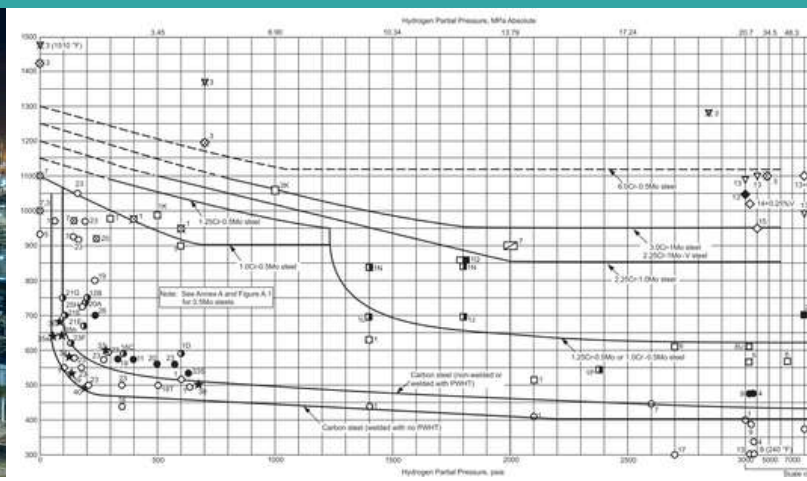
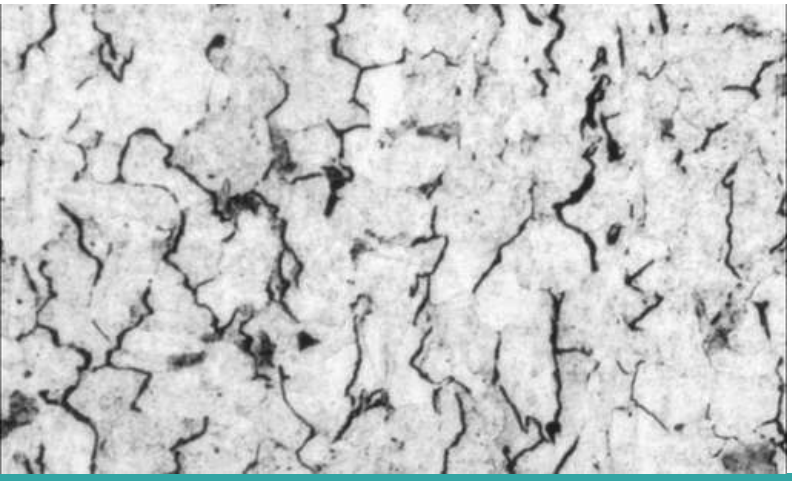
TCR ADVANCED

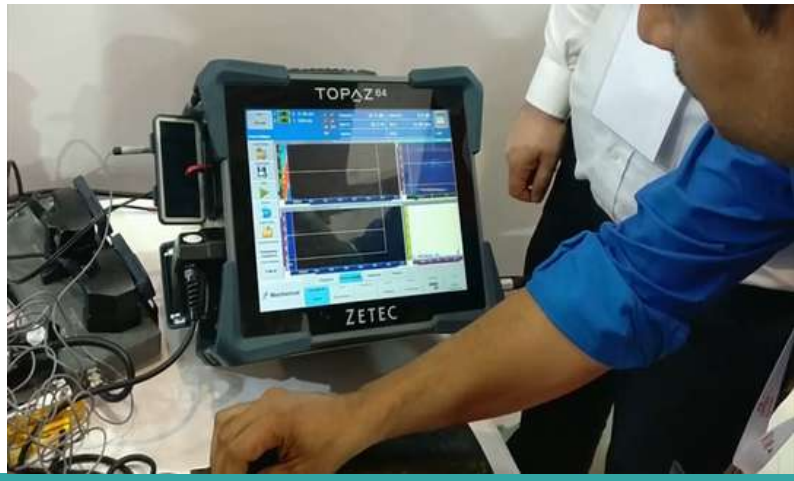
HIGH TEMPRETURE HYDROGEN ATTACK (HTHA)

2-DAY TRAINING PROGRAM

HTHA - THE UNSEEN KILLER: WHY OLD PLANTS NEED NEW VIGILANCE







High Temperature Hydrogen Attack (HTHA) remains one of the most elusive and destructive damage mechanisms affecting high-pressure hydrogen service equipment. This specialized training program is designed to demystify the complexities of HTHA, particularly in aging plants where outdated material selections and historical process conditions increase risk. Delivered by industry veterans from TCR Advanced Engineering Pvt. Ltd., the course blends metallurgical insight, field-tested methodologies, and international best practices drawn from API, ASME, ASTM, and NACE standards. With hands-on exposure to cutting-edge NDT techniques and real-world case studies, this two-day program is tailored for decision-makers, asset integrity managers, inspection leads, and maintenance professionals who influence plant reliability and safety.

Why Is HTHA Training Important?

HTHA remains difficult to detect and often goes unnoticed until failure occurs—especially in older plants using outdated material specs and without robust inspection histories.
Standards like API 941 (Steels for Hydrogen Service at Elevated Temperatures and Pressures) provide guidance, but field application remains inconsistent.

HTHA A New Era of Engineering Judgement

Key Benefits of HTHA Training:

- Understand the metallurgical mechanism of HTHA per API 941 and field experiences.
- Learn from actual failures involving components operating beyond Nelson Curve limits.
- Explore microstructural damage recognition using ASTM E3, E407, and E566 for replica preparation and analysis.
- Detect early-stage damage using in-situ metallography aligned with ASTM E1351.
- Get hands-on exposure to PAUT, TOFD, and Backscatter UT—techniques compliant with ASME Section V and SNT-TC-1A.
- Apply API 579-1/ASME FFS-1 Part 13 for Fitness-for-Service evaluation of components with HTHA damage.
- Develop risk ranking and inspection plans in line with API 580 and API 581 RBI guidelines.
- Enhance documentation and decision-making with structured inspection data forms, flaw characterizations, and remaining life tools.
- Create a plant-specific HTHA action plan using code-referenced checklists.

Program Overview : Course Structure

Day 1: Understanding the Threat-

- Overview of HTHA: Damage mechanisms and case failures (API 941 focus)
- Material susceptibility and role of stress, temperature, and hydrogen pressure
- Introduction to Nelson Curves and their field interpretation
- Microstructure changes: Decarburization, fissuring (ASTM references)
- Inspection strategy mapping using API 580 principles
- Risk areas in reactors, exchangers, reformers, hydrogenation units
- Introduction to replica analysis (ASTM E407, E3)

Day 2 : Detection, Assessment & Life Extension-

- In-situ metallography demo (ASTM E1351 compliant methods)
- Advanced UT for HTHA: TOFD, PAUT, Backscatter (as per ASME Section V)
- Fitness-for-Service as per API 579-1/ASME FFS-1, Part 13
- Case-based calculations: Flaw acceptance, risk evaluation
- RBI planning with API 581 models
- Documentation and compliance (SNT-TC-1A/NDE qualifications)
- Live Q&A: Aligning inspection with shutdown timelines
- Final session: Group exercise on HTHA strategy creation

Course Material and Resources

Participants will receive comprehensive course material including:

- Presentation Slides and Handouts.
- A training kit and certification.

Faculties

Mr. Paresh Haribhakti, MD

Mr. Paresh Haribhakti, Managing Director of TCR Advanced Engineering and a globally recognized expert in metallurgical failure analysis. With over 9000 industrial investigations and authorship of "Failure Investigation of Boiler Tubes" published by ASM International USA, Mr. Haribhakti brings unparalleled expertise in decoding HTHA-related failures. He has contributed to ASM Handbook Volume 11A and played a central role in applying API 579-1/ASME FFS-1 to real-world problems. As the creator of the AiOM™ platform for digital integrity management, he will guide participants on how to integrate inspection data with operational insights to manage HTHA risks proactively.

Mr. Ketan Upadhyaya, GM (Reliability), TCR Advanced Enginering

- BE in Metallurgical engineering, PGD in computer science. He has experience of 25 years in the field of NDE, Acoustic emission techniques, Vibration measurement and signature analysis, Failure Investigations, microstructure interpretation, Scanning electron microscopy and digital imaging system
- He is a qualified level II for Acoustic Emission testing (IISC Bangalore), Vibration Analyst VT-II (Entec IRD) and Ultrasonic Flaw Detection (EEC Mumbai) techniques. He has expertise in Engineering Critical Analysis, high-temperature degradation of materials, Remaining Life Assessment (RLA), and Fitness-for-Service (FFS) evaluations. He has investigated over 1,000 failure cases related to petrochemical and oil & gas plants.

Mr. Nikhil Sabhya

NDT Level III expert at TCR, specializes in ultrasonic evaluation of hydrogen-induced damage using TOFD, PAUT, and backscatter techniques. He brings practical knowledge of implementing ASME Section V-compliant testing strategies and has led inspection campaigns on high-pressure equipment operating above Nelson Curve limits. Nikhil will present real-case UT scans and teach the art of interpreting signal fidelity to separate genuine flaws from false indications. His role is crucial in ensuring that the metallurgical findings are seamlessly integrated with inspection data for comprehensive integrity assessments.

Who Should Attend This Program?

This two-day training program is designed for professionals that handle integrity and reliability of plant assets. It is particularly suited for:

- Equipment Design Engineers & Plant Managers
- Inspection, QA/QC, and Safety Engineers
- Operation and Maintenance Engineers
- Asset Integrity and Reliability Professionals
- Fresh graduates or technologists aiming to understand equipment damage evaluation

Program Details:

- **Duration:** 2 Days
- **Dates:** 05th & 06th December, 2025
- **Venue :** EvolvebyTCR. 215, Pancham Icon, vasna road, near D-Mart, Vadodara, Gujarat 390007.

Registration Fee: Rs. 25000/- + 18% GST per candidate

10% Discount on total amount of invoice for 03 or more nominations from the same organization.

SPECIAL OFFER

For registration or more details, please contact:

Mr. Deepak Chandrana, Vice President of Evolve - 9909035325

Mr. Parth Bhatt, Training Coordinator of Evolve - 7574834848

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IFSC: BARBOINDMAK (5th letter is zero)
Bank: BOB, Makarpura Branch
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