TCR Arabia Company Limited

Inspection - Testing – Consulting

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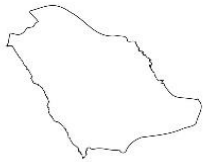
Joint Venture



Joint Venture between TCR Engineering Services (India) and Gas Arabian Services (KSA) established in the year 2007 in KSA.

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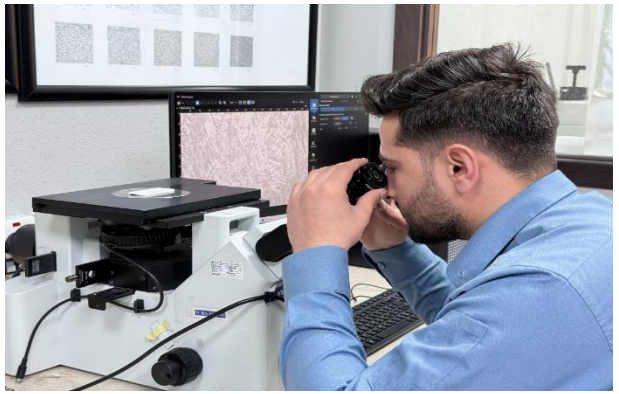
Asset Integrity Specialists

Material Testing



Metallurgy & Corrosion Studies

Welding Inspection & Certification

Non-Destructive Testing

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About TCR

Our Service Story

850+
Employees in Global Offices

19 Years
of service in Saudi Arabia

500+
Valued Clients served in Saudi Arabia

250+
Major NDT Projects executed in Saudi Arabia

8
Global Service Partners for advanced inspections

1800+
FI/RCA cases handled

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TCR Arabia – Company Introduction

- Joint Venture between TCR Engineering Services (India) and GAS Arabian Services (KSA) established in the year 2007 in KSA. TCR Engineering (India) was established in 1973.
- Approved vendor in Saudi Aramco, SABIC, SWCC, WTCO, SERA, SEC, Petrorabigh, TASNEE, MARAFIQ, MAADEN, CRISTAL, YASREF, SAMREF, LUBEREF, SATORP, SADARA, Advanced Petrochemical, Saudi Chevron Philips, Hadeed & with other major clients in KSA.
- Presence on Eastern and Western Provinces in Saudi Arabia.
- TCR has a global presence with operations in India, KSA, Kuwait, Qatar, UAE, Nigeria and Malaysia.
- Availability of In-House Training Facility to develop skills of Technicians in advanced inspection methods.
- Highly experienced team of NDT Inspectors, Welding / Coating Inspectors, Metallurgists, Civil Engineers and Project Managers.
- Provides advanced inspection techniques for faster, accurate and safe results.
- ISO 9001-2015 certified company.
- ISO 17025 certified company.
- ISO 45001 - 2018 certified company.
- ISO 14001 - 2015 certified company.
- Certified Laboratories - Metallurgy, Mechanical and Corrosion Testing.

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TCR Arabia Certificates

intertek
Total Quality. Assured.

CERTIFICATE
OF REGISTRATION

This is to certify that the management system of:

TCR Arabia Company Ltd.

Main Site: King Abdul Aziz Seaport Facility, P.O. Box 8143, Dammam 32211, Kingdom of Saudi Arabia

has been registered by Intertek as conforming to the requirements of:

ISO 9001:2015

The management system is applicable to:

Conventional Non-Destructive Testing Services (NDT), Advanced Non-Destructive Testing Services (ANDT), Metallurgical Services, Mechanical Laboratory Testing Services, Welding Inspection Service, Post Weld Heat Treatment (PWHT).

Certificate Number: 21111010003
Initial Certification Date: 25 March 2014
Date of Certification Decision: 02 March 2023
Issuing Date: 02 March 2023
Valid Until: 24 March 2026

Calin Moldovean
President, Business Assurance

Intertek Certification Limited, 10A Victory Park, Victory Road, Derby DE24 8ZF, United Kingdom

Intertek Certification Limited is a UKAS accredited body under schedule of accreditation no. 014.

In accordance with the agreed upon Certification Intertek's requirements for systems certification. Validity myhome. The certificate remains the property of Intertek.

ilac-MRA IAS INTERNATIONAL ACCREDITATION SERVICE®

CERTIFICATE OF ACCREDITATION

This is to attest that

TCR ARABIA COMPANY LTD
KING ABDUL AZIZ SEAPORT ROAD
DAMMAM 32211, SAUDI ARABIA

Testing Laboratory TL-783

has met the requirements of AC89, *IAS Accreditation Criteria for Testing Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Expiry Date April 1, 2025
Effective Date April 23, 2024

IAS ACCREDITED

President

Visit www.iasonline.org for current accreditation information.

KVQA ASSESSMENT

CERTIFICATE

This is hereby certified that the Occupational Health & Safety Management System of

TCR ARABIA COMPANY LTD.

P.O. Box 8143, Dammam 32211, TCR Arabia Company Ltd. Gas Gardens, King Abdul Aziz Seaport Facility, Dammam, Kingdom of Saudi Arabia.

Has been found to comply with the requirements of

ISO 45001: 2018

This certificate is applicable for the following scope:

Conventional Non-Destructive Testing Services (NDT), Advanced Non-Destructive Testing Services (ANDT), Metallurgical Services, Mechanical Laboratory Testing Services, Welding Inspection Service, Post Weld Heat Treatment (PWHT).

Certificate Number: KAOH202405032

Date of initial registration:	13 May 2024
Surveillance audit on/before:	13 April 2025
Certificate expiry:	13 May 2025
Recertification due:	12 May 2027

Authorised Signatory
KVQA Assessment Pvt. Ltd.

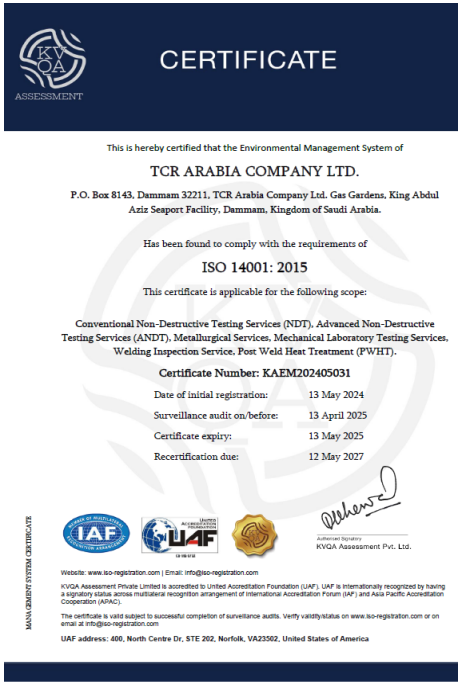
MANAGEMENT SYSTEM CERTIFICATE

Website: www.iso-registration.com | Email: info@iso-registration.com

KVQA Assessment Private Limited is accredited to United Accreditation Foundation (UAF). UAF is internationally recognized by having a signatory status across multilateral recognition arrangement of International Accreditation Forum (IAF) and Asia Pacific Accreditation Cooperation (APAC).

The certificate is valid subject to successful completion of surveillance audits. Verify validity/status on www.iso-registration.com or on email at info@iso-registration.com

UAF address: 400, North Centre Dr, STE 202, Norfolk, VA23502, United States of America



KVQA ASSESSMENT

CERTIFICATE

This is hereby certified that the Environmental Management System of

TCR ARABIA COMPANY LTD.

P.O. Box 8143, Dammam 32211, TCR Arabia Company Ltd. Gas Gardens, King Abdul Aziz Seaport Facility, Dammam, Kingdom of Saudi Arabia.

Has been found to comply with the requirements of

ISO 14001: 2015

This certificate is applicable for the following scope:

Conventional Non-Destructive Testing Services (NDT), Advanced Non-Destructive Testing Services (ANDT), Metallurgical Services, Mechanical Laboratory Testing Services, Welding Inspection Service, Post Weld Heat Treatment (PWHT).

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UAF address: 400, North Centre Dr, STE 202, Norfolk, VA23502, United States of America

intertek UKAS MANAGEMENT SYSTEMS 014

IAS INTERNATIONAL ACCREDITATION SERVICE®

ASNT Corporate Partner

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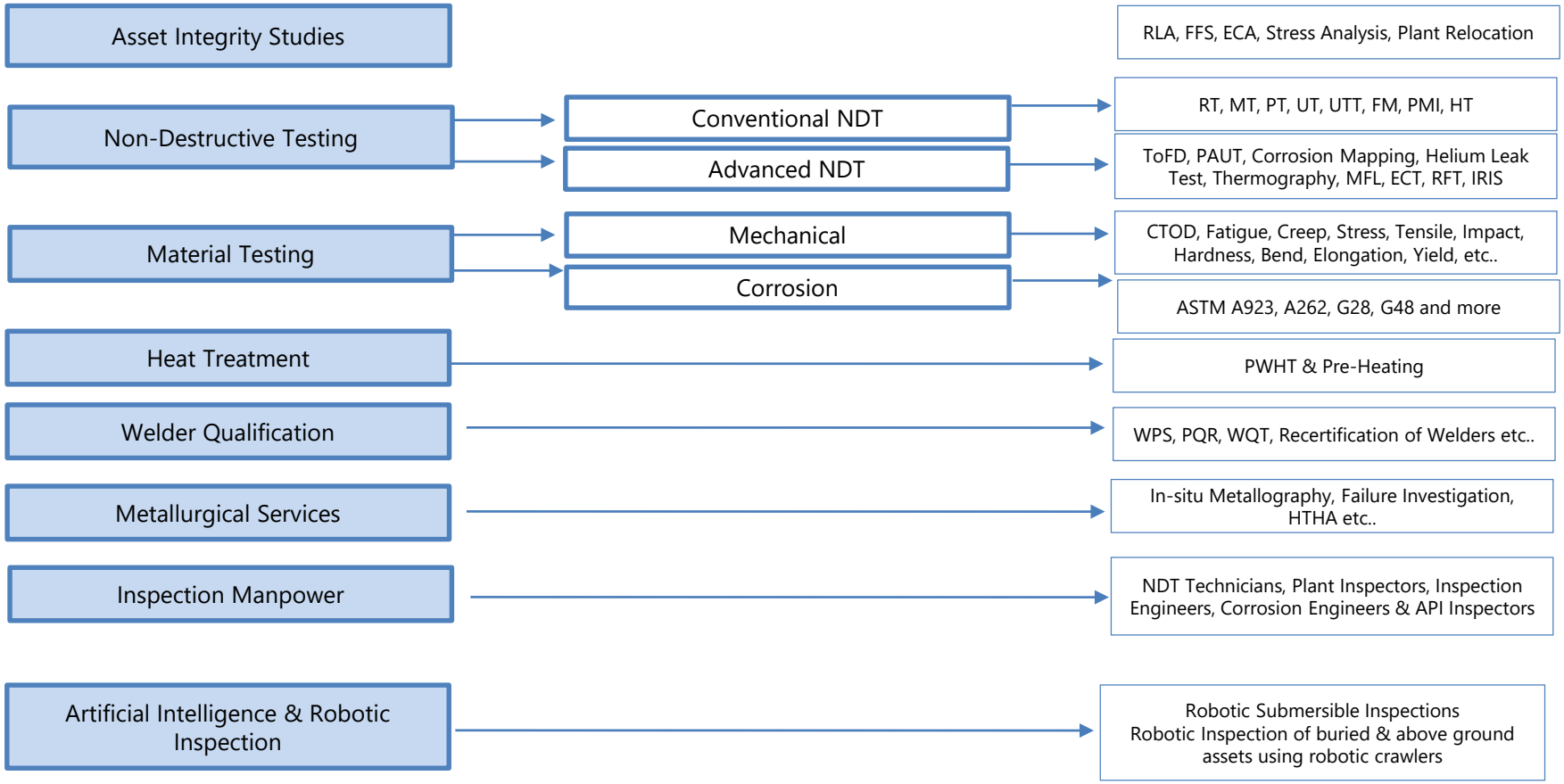
TCR – Services Portfolio



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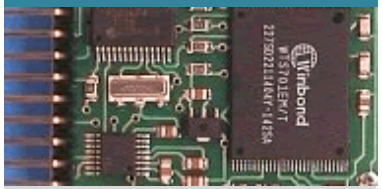
Serving Multiple Industry Verticals:

Onshore O&G plants

Refining & Chemicals

Electronics



Manufacturing

Offshore Oil Plants

Power Generation

Automotive

Shipping

Construction

Pulping

Defence

Fabrication

Pharma and Biotech

Mining & Metals

Aerospace

Desalination

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Office Locations

Yanbu Office

Riyadh Site Office

Jubail office

TCR Head Office, Dammam

- Mechanical Laboratory
- Metallurgical Laboratory
- Corrosion Testing Laboratory

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TESTING LABORATORIES

- Mechanical Testing Laboratory
- Metallurgical Testing Laboratory
- Non-Metallic / Composite Laboratory
- Corrosion Testing Laboratory

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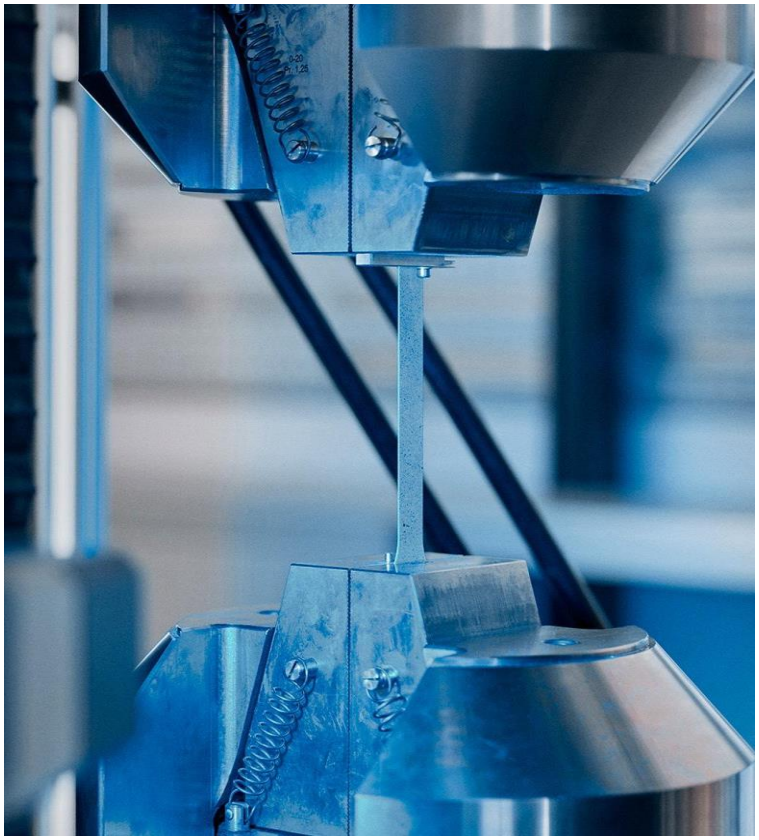
Mechanical Testing Laboratory



Services capability:

- Tensile Testing
- Impact Testing
- Hardness Testing
- Bend Test
- Macro Test
- Proof Load Test
- Wedge Load Test
- Chemical Tests
- Nick Break Test
- Ferrite Test
- Section/Peel Test

- **TCR Arabia's Mechanical Testing Lab is approved by Saudi Aramco.**
- **ISO 17025 Certified & SASO Accredited Lab.**

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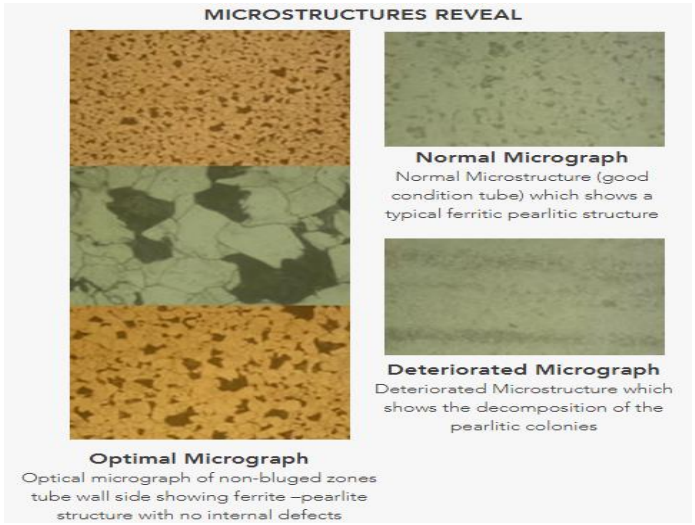
Metallurgical Testing Laboratory



Services capability:

- Microstructure Analysis
- Macrostructure Analysis
- In-situ Metallography
- Failure Investigation / RCA
- Scanning Electron Microscopy (SEM)
- Remaining Life Assessment (RLA)
- Corrosion Studies
- Condition Assessment
- Fitness for Service

- **TCR's global research center located in India serves all major clients worldwide**

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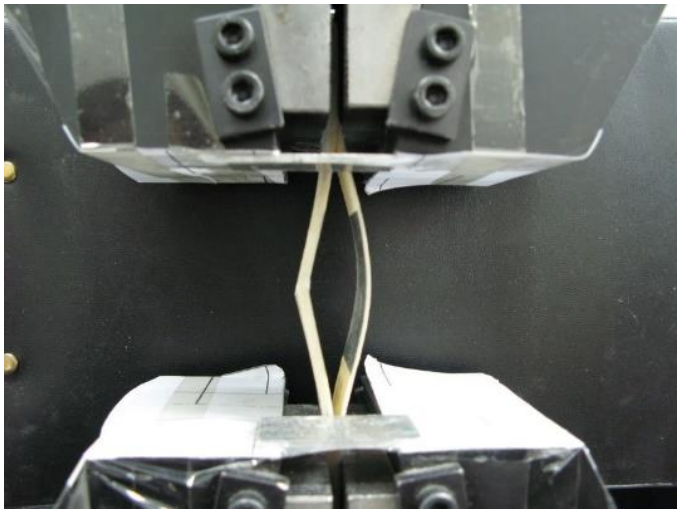
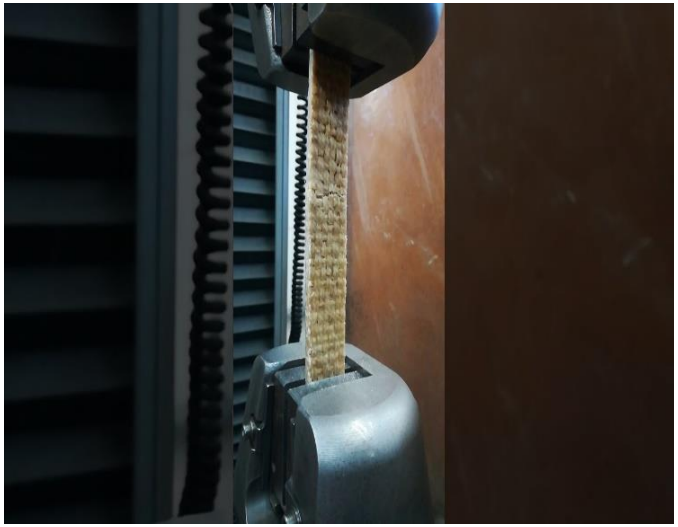
Non Metallic / Composite Laboratory





Services capability:

- Density & Specific Gravity
- Hardness Durometer
- Rockwell Hardness
- Tensile & Elongation properties
- Compressive Strength & Modulus
- Flexural strength & Modulus
- Izod & Charpy Impact Strength
- Short Beam Strength
- Shear properties / In-plane shear properties
- Lap shear strength of FRP
- Interlaminar Fracture Toughness
- Adhesion Strength to plastics/Metal
- Heat Deflection Temperature/Vicat Softening point

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Corrosion Testing Laboratory

Services capability:

- ASTM A923 Method A
- ASTM A923 Method C
- ASTM A262 Practice A
- ASTM A262 Practice C
- ASTM A262 Practice E
- ASTM G48 Method A
- ASTM G28 Method A

- **Saudi Aramco Approved & ISO 17025 Accredited**

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Non-Destructive Testing

Conventional NDT

Advanced NDT

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Conventional NDT

Services capability:

- Radiography Testing
- Penetrant Testing
- Magnetic Particle Testing
- Visual Testing
- Ultrasonic Testing
- Thickness Gauging
- Ferrite Measurement
- Paint & Coating Measurement
- Holiday Detection
- Roughness Testing
- Positive Material Identification (PMI) – XRF & OES
- Hardness Testing
- Borescope Inspection

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Advanced NDT

Services capability:

- ToFD
- Phased Array UT (PAUT) – normal & high temp
- Tube Inspection (ECA, SECT, ECT, RFET, IRIS, MFL)
- Corrosion Mapping – normal & high temp
- Tank Floor Mapping by MFL
- Stepwise Crack Detection
- High Temperature Hydrogen Attack (HTHA)
- Helium Leak Test
- Robotic Video Inspection (RVI)
- Thermal Imaging
- Acoustic Wave Tank Inspection
- Corrosion Under Insulation (CUI)
- Short Range Ultrasonic Testing (SRUT)
- Medium Range Ultrasonic Testing (MRUT)
- Long Range Ultrasonic Testing (LRUT)
- EMAT (Electromagnetic Acoustic Transducer)

- TCR Arabia is an approved vendor for all above techniques in Saudi Aramco, SABIC, SATORP, TASNEE, Saudi Chevron, Maaden and all major companies in KSA.

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Time of Flight Diffraction (TOFD)

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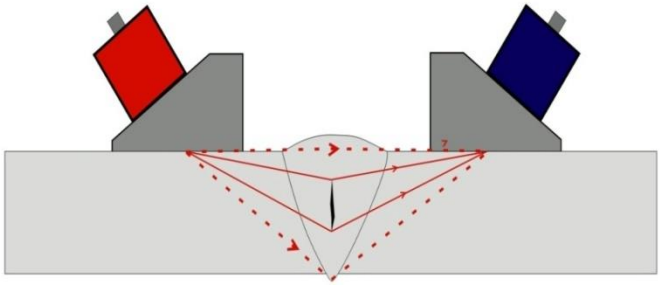
Time of Flight Diffraction (TOFD)

- **A field-proven advanced ultrasonic inspection technique for accurate sizing of defects**
  - Rely on the time of flight, rather than the amplitude of the ultrasound signal to size the defect therefore not as sensitive to defect orientation.
- **Computerized image and record of the inspection results**.
  - Ability to scan, record, export results to database and compare past reports
- **Sizing is not sensitive to defect orientation**
  - Facilitate characterizing lack of fusion defects or other planar flaws (cracks).
- **Typically very fast once all of the probes have been positioned and setup.**
  - In many cases, an entire weld can be inspected with a single pass of the rail.



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Capabilities - TOFD

- 9 mm to 300 mm thickness equipment/Piping can be inspected.
- Heat resistant material engineered to handle temperatures from 10°C up to 150°C.
- 6" and above diameter pipelines can be inspected.
- Detection, Sizing and monitoring of weld defects, HTHA and transvers cracks.
- Accurate locating and sizing of damages/Weld defects.
- High POD (Probability of detection).
- Recordable encoded Data/image of weld.
- TOFD is sensitive to all defects including volumetric defects easily detected by RT.

Applications & Advantages - TOFD

- Speed
- Reliability
- No radiation
- Real time results – feedback to welders
- Defect sizing – reduce false calls
- New construction weld inspection of Tanks, Vessels, Piping, Towers and Drums.
- Highly sensitive, useful for HTHA type of damages and transvers crack detection (in-service inspection).

- Alternative to RT (as per ASME cc-2235, ASME B 31.3 cc-181)

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Phased Array Ultrasonic Testing (PAUT)

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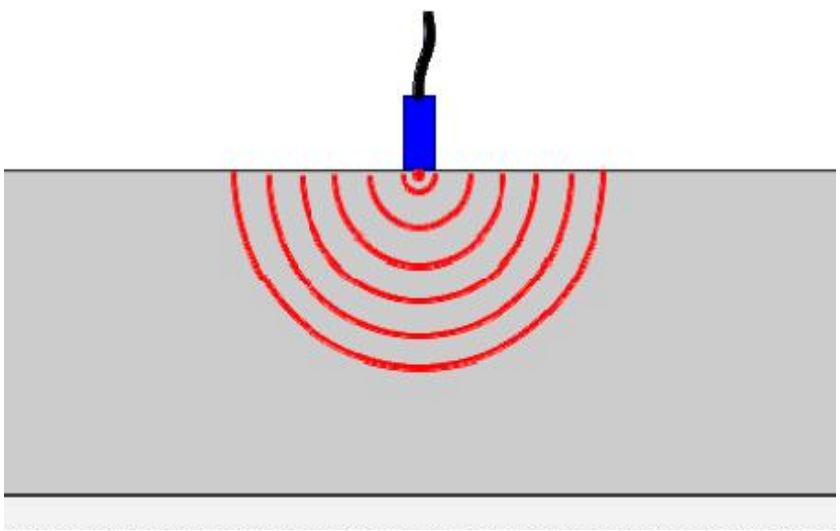
Phased Array Ultrasonic Testing (PAUT)

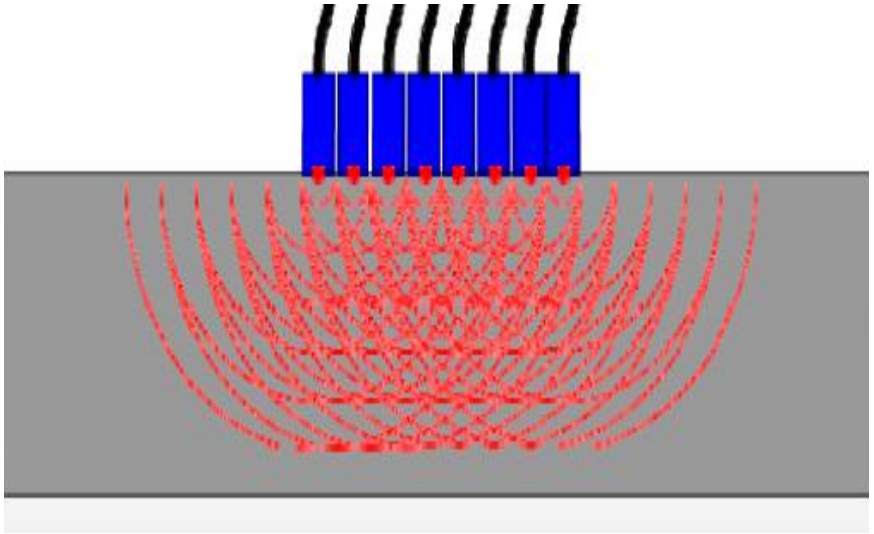
Phased Array ultrasonic testing is Specifically designed to operate in the demanding inspection environments on vessels and piping from the external surface by Automated scanners connected to PC.

PAUT inspection has several elements (16, 32, 64 or 128) combine in one probe unlike A conventional Ultrasonic testing uses 1 or 2 elements.

Conventional UT probe



PAUT Probe



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Capabilities – PAUT Technique

- 3 mm to 300 mm thickness equipment/Piping can be inspected.
- Heat resistant material engineered to handle temperatures from 10°C up to 350°C.
- 3/4" and above diameter pipelines can be inspected.
- Detection, Sizing and monitoring of corrosion, weld defects, HTHA, HIC-SWC damage and stress corrosion cracks.
- Inspection of welds accessible from one side only.
- Accurate locating and sizing of damages/Weld defects.
- High POD (Probability of detection).
- Recordable encoded Data/image of weld.
- Inspection of dissimilar welds joints (CS/SS).
- Inspection of Inconel material.

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Application – PAUT Technique

PAUT inspection applications include in-service welds and new construction weld inspection of:

- Vessels
- Tank
- Towers
- Drums
- Pipes with a diameter greater than 3/4" and above
- In-line inspection validations.
- Detection of HTHA, Stress corrosion cracks, SWC-HIC damage in-service equipment and pipeline.
- No radiation
- Real time results – feedback to welders

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Tube Inspection
(ECA,SECT,ECT, RFET, IRIS & MFL)

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Tube Inspection

TCR Arabia provides entire range of Tube Inspection Services which includes but not limited to the following;

- Eddy Current Array (ECA)
- Saturated Eddy Current Testing (SECT)
- Eddy Current Testing (ECT)
- Remote Field Eddy Current Testing (RFET)
- Internal Rotary Inspection System (IRIS)
- Magnetic Flux Leakage (MFL)
- Acoustic Eye Inspection (AEI)



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CORROSION MAPPING (CM)

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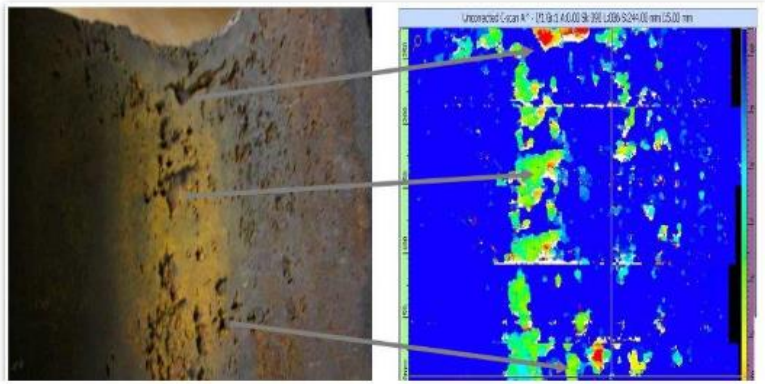
Corrosion Mapping (CM)

Corrosion mapping is an ultrasonic technique which maps and identifies variations in material thickness due to corrosion. Corrosion is the deterioration of a metallic material by chemical (or electrochemical) attack. This is normally caused by the environment (most often water), and sometimes by another material.

To perform corrosion mapping an automatic or semi-automatic scanner is used to scan an inspection surface, using various ultrasonic techniques including pulse echo, eddy current and phased array.

Results for corrosion mapping provide a high degree of repeatability and the advantage of position and size data for every flaw which can be compared for repeat scans of the same area to track flaw growth or corrosion rates both generally and for individual pits.

Sample evidence of corroded areas detected with ultrasonic corrosion mapping



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CM – Capabilities

- 5 mm to 125 mm thickness equipment/Piping can be inspected.
- Heat resistant material engineered to handle temperatures from 10°C up to 350°C.
- 6" and above diameter pipelines can be inspected.
- Detection, Sizing and monitoring of corrosion, Erosion, HIC-SWC damage.
- precise sizing of damages within 0.1 mm accuracy.
- High POD (Probability of detection).
- Recordable image of corrosion mapping.

CM – Applications & Advantages :

Automated Corrosion Mapping/SWC/HIC applications include in-service scanning of:

- Vessels
- Tank Walls
- Towers
- Drums
- Steel Plates
- Pipes with a diameter greater than 6"
- in-line inspection validations.
- Detection of SWC-HIC damage in equipment and pipeline used for hydrocarbon.

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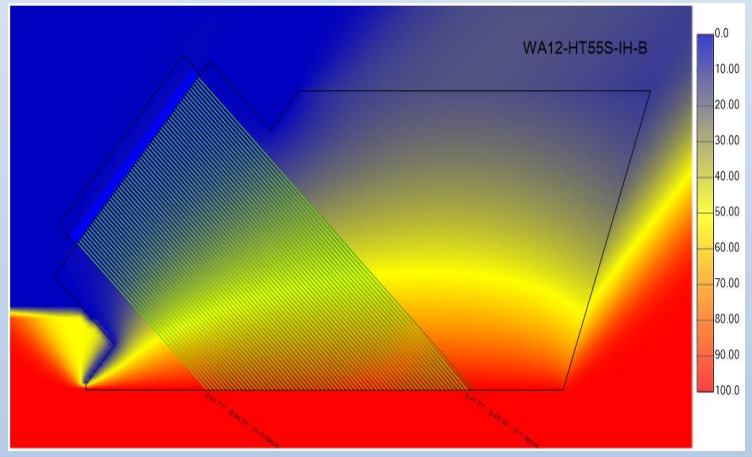
HIGH TEMPERATURE APPLICATION

TOFD, PAUT, CORROSION MAPPING



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High Temperature Inspection - Introduction

High Temperature Applications / Online Inspection Techniques

High Temperature ToFD, PAUT & CM are non-destructive testing methods to inspect Plant Equipment/piping welds and parent metal while in-service for corrosion and In-service defects. The benefit of this technology is the ability to detect and monitor corrosion and In-service defects of Plant piping & Equipment operating at elevated temperatures up to 700^0 F (350°C).

The primary applications of High Temperature PAUT (HT), ToFD (HT) and Corrosion Mapping are in-service Piping, Vessels and Tanks. High temperature PAUT (HT), ToFD (HT) and ultrasonic inspection systems can also be used to locate wall thinning, determine corrosion rates and monitor defect growth rates for engineering evaluations. Determining corrosion rates and defect growth rates while equipment is on-stream can assist Engineers and Operational personnel to schedule T&I's and equipment repairs and replacement, therefore lowering the overall risk to the facility.

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High Temperature Inspection - Benefits

High Temperature Applications / Online Inspection Techniques

Benefits;

- Reduced down time of the plant, by improved maintenance planning.
- Reduced shutdown time by improved RBI input.
- Reduced production losses as inspection of an industrial plant can be carried out online.
- Determine corrosion rates and monitor defect growth rates for FFS -engineering evaluations.
- Monitoring of cracking growth and corrosion spots during production.
- Inspection of on-line repaired areas, in accordance with ASME code case.
- Wall thickness mapping of the area, before making hottaps.
- Accurate corrosion monitoring and defect detection up to 350 deg C, on critical positions.
- Significant reduction of risks on weld repairs during the construction phase of heavy wall vessels or "golden" welds at eleveted temperature.
- Provides immediate feedback.
- Digitised inspection records for future reference and verification.
- Highest consideration of your health, safety and environment (HSE) rules.

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Tank Floor Mapping by MFL

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Tank Floor Mapping – MFL - Introduction

MFL Inspection is a method of non Destructive Testing used to detect and assess corrosion, Pitting and wall loss in lined and unlined metallic storage tanks.

All the Ferromagnetic Storage Tank Bottom Floor can be inspected using MFL Tank Inspection in the range of 6mm to 20mmThickness and limited bottom floors can be tested as well. Based on the MFL Tank inspection data Tank Floor condition will be reported.

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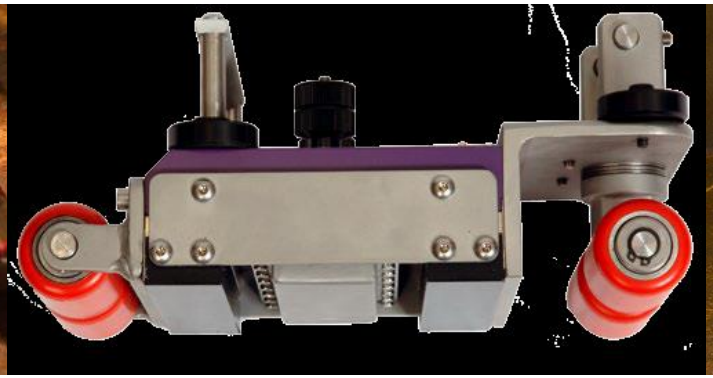
Tank Floor Mapping – MFL - Benefits

1. High inspection capacity/short inspection period
2. Coated tank floors can be inspected
3. Automatic feature sizing and discrimination between internal and external features
4. Steerable in any direction, the TBIT can inspect the annular plates and areas close to the plate welds
5. High sensitivity to corrosion and low sensitivity to debris
6. Online data evaluation provides minute information about tank floor condition



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Stepwise Crack Detection (SWC)
&
High Temperature Hydrogen Attack (HTHA)

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HTHA & SWC - Introduction

- High temperature hydrogen attack (HTHA) is a phenomenon of metal degradation that is well known in the petrochemical and refinery industry.
- HTHA occurs in carbon and low steels exposed to high partial pressure of hydrogen at elevated temperatures.
- Such damage has occurred over time on the long-term exposure of steels in hydrogen service .
- Equipment designed to be safe as per engineering codes has experienced such damages as well.
- Detection of hydrogen attack is important to assure safe operation of pressure vessels and piping susceptible to such damage.
- HTHA can lead to failure of equipment and major accidents (See Fig 1 & 2).

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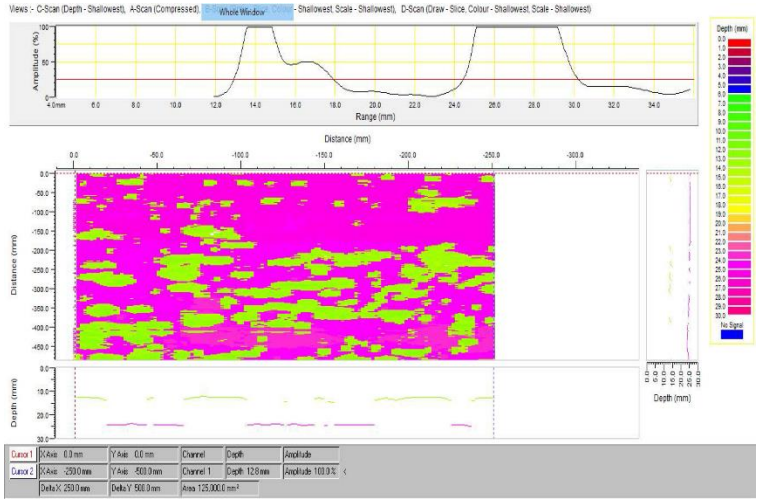
HTHA & SWC – Associated Techniques

- Time of flight diffraction (ToFD) Technique.
- Automated ultrasonic inspection for HIC/SWC (AUT-P-SCAN)
- Phased Array Ultrasonic Testing (PAUT) Technique.
- Advance Ultrasonic Back scatter (AUBT-L) Technique using longitudinal wave.
- Advance Ultrasonic Back scatter (AUBT-S) Technique Using shear wave.
- Secondary damage caused by HTHA failure in a Refinery/Petrochemical Plant



C-Scan image depicting Stepwise Crack

Secondary damage caused by HTHA failure

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Helium Leak Testing

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Helium Leak Test – Benefits

Why Helium Leak Test?

- **Product Life**
- **Reliability**
- **Avoid unexpected shutdown**

Why Helium is a good tracer gas?

- Low concentration in air , only 5 ppm, so low natural background
- Inert gas, non toxic, non- explosive, environmentally friendly
- Good separation in a mass spectrometer (no cross sensitivity to other gases and no mass fragments
- Lighter than air
- Very small gas molecule, can easily pass through small holes/gaps

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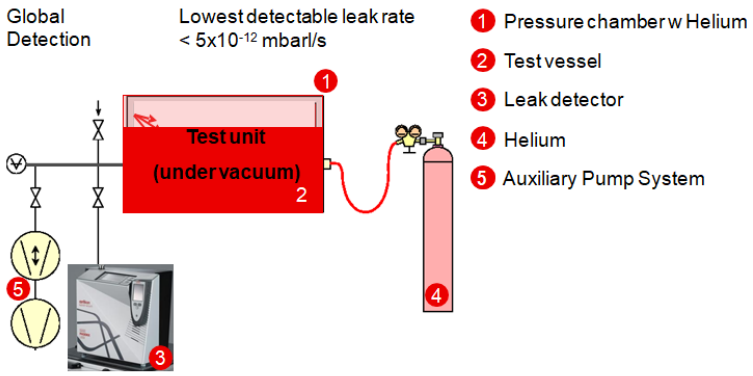
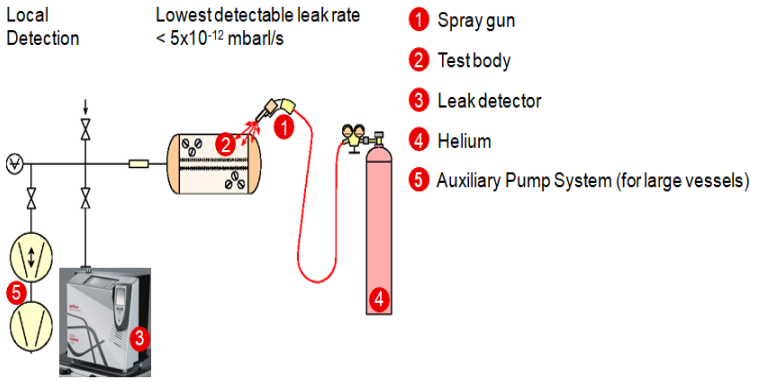
Helium Leak Test – Technique

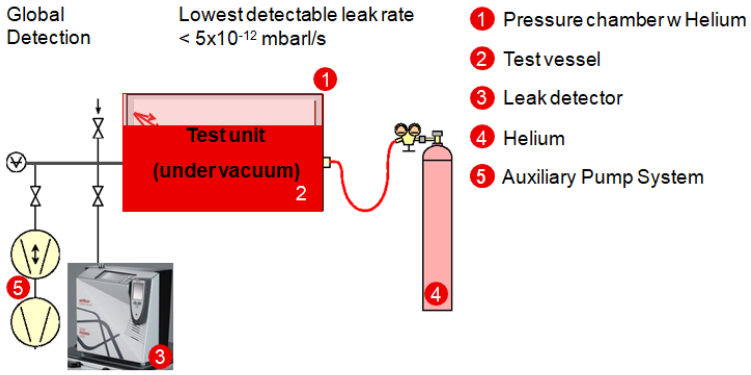
Vacuum Method



Global Detection – He Outside



Global Detection – He Inside



Local Detection

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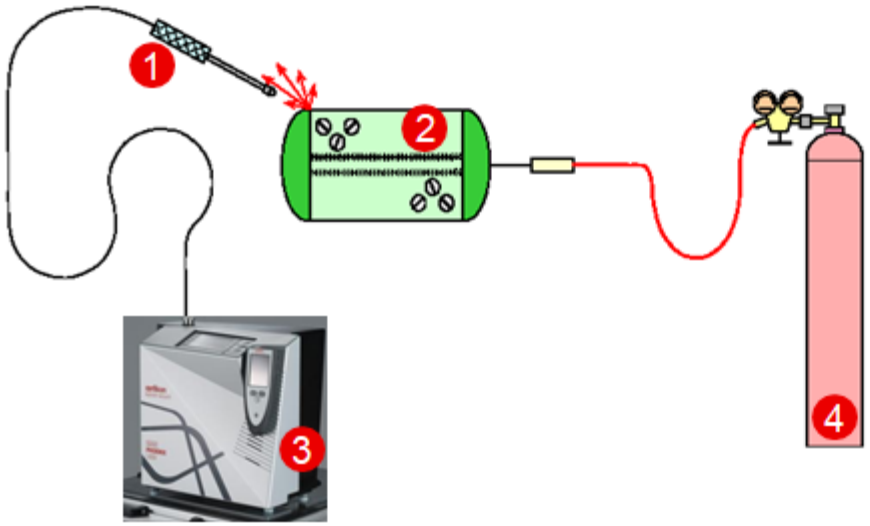
Helium Leak Test – Technique

Pressure Method

Local Detection (sniffing)

Lowest detectable leak rate < $1x10^{-7}$ mbarl/s!!!



1. Sniffer probe
2. Test vessel
3. Leak detector
4. Helium

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Robotic Video Inspection (RVI)

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Remote Visual Inspection - Introduction

Inspection using crawler systems.

- Crawler based cameras systems are used for inspection of long length horizontal lines.
- For best visual inspection, different crawler systems are used for different diameters of pipes.
- Trained and qualified crews are deputed for inspection projects.
- State of art equipment (cameras) and related support systems are utilized for inspection.

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RVI – Capability & Application

Capability:

Robotic Crawler based pan tilt zoom camera is used for inspection of any diameter pipelines up to 200 meter length.

Retrieving of foreign objects while inspection for testing & evaluation.

- High-definition visual inspection in areas not accessible to humans.
- Real-time video recording and reporting
- Remote operation in hazardous, confined, or contaminated spaces
- Data capture for documentation, analysis, and trending

Application:

- Water Supply Pipelines (raw water, potable water, cooling water)
- Slurry Pipelines
- Storm Water Pipelines
- Sewer Pipelines

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Thermal Imaging

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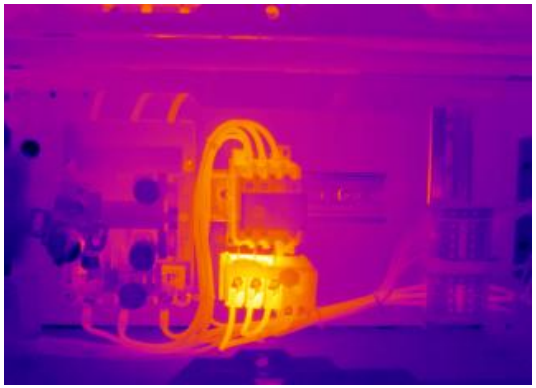
Thermal Imaging

- Thermography helps in easily determining hot-spots (overheating) specially on electrical systems which can produce catastrophic hazards.
- Qualified team of inspectors to carry out thermography service



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Acoustic Emission Testing of Storage Tanks

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Acoustic Emission Testing - Introduction

Capability:

- Real-time monitoring of tank structure for active flaws.
- Detection of crack initiation and growth in tank walls and welds.
- Leak detection without draining or disassembling the tank.
- Evaluation of structural integrity under operational conditions.
- Continuous or periodic monitoring for early warning of failures.
- Sensitive to multiple defect types: stress cracks, corrosion, weld defects, and buckling.

Applications:

- Aboveground storage tanks (ASTs): Shell, roof, floor, and weld inspections.
- Corrosion monitoring: Identify thinning areas or active corrosion.
- Leak detection: Identify leaks in pressurized or unpressurized tanks.
- Operational load monitoring: Detect stress-induced cracks during filling, emptying, or thermal cycles.
- Weld integrity assessment: Monitor new and existing welds for defect propagation.
- Turnaround inspection fast assessment during maintenance shutdowns.

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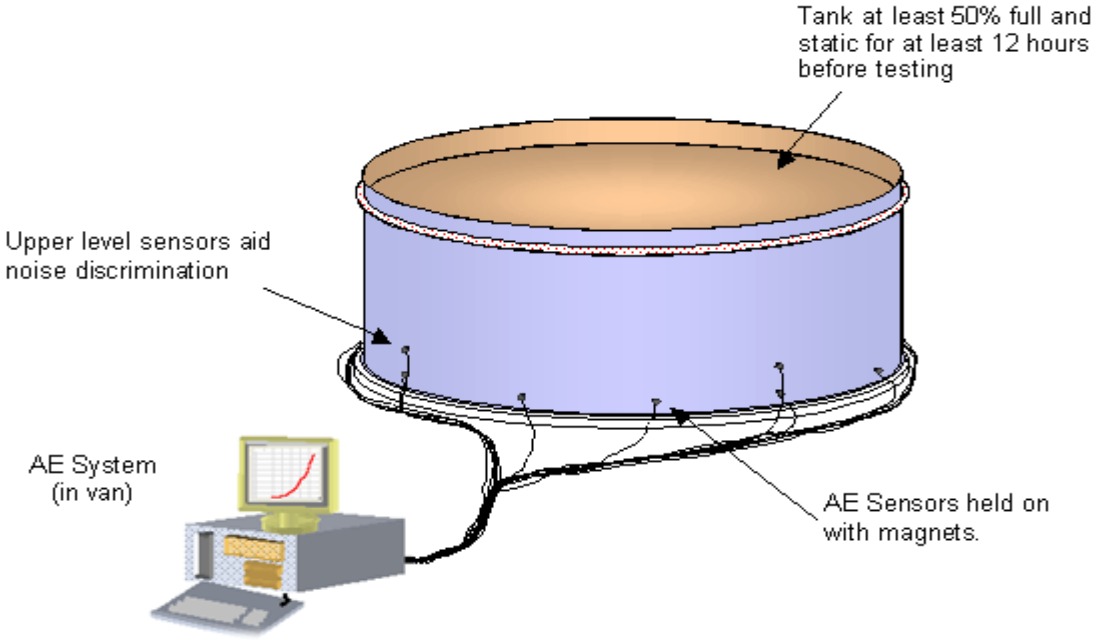
AET - Advantages

Advantages of AET :

- Non-intrusive and safe: No need to drain or enter the tank.
- Early detection: Identify defects before they become critical.
- Comprehensive coverage: Entire tank can be monitored in one session.
- Cost-efficient: Reduces downtime and avoids unnecessary repairs.
- Documentation-ready: Event logging and data visualization for decision-making.



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Pulsed Eddy Current Testing (PECT) CUI & CUF Inspection

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Pulsed Eddy Current Testing (PECT) - Introduction

- Pulsed eddy current (PEC) is a versatile NDT technique uniquely suited to detecting **corrosion under insulation (CUI), corrosion under fireproofing (CUF)** in vessels, sphere legs, and more.
- PEC is an **excellent screening tool** because of its ability to inspect in-service components through insulation and jackets.
- PEC enables **expanding the scope and frequency of inspections** without affecting schedules, which allows the more efficient use of quantitative methods such as radiography and ultrasonic testing during shutdowns.
- PEC can easily be used to inspect through up to approximately **1 mm (0.039 in) thick aluminium or stainless steel weather jackets** over the insulation.

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PECT – Advantages & Limitations

Advantages of PECT :

- Direct Contact with the surface or surf ace preparation is not required.
- Measures the full wall thickness
- Sensitive to near-side and far-side defects.
- Inspect through insulation, coatings, paints, concrete fireproofing. Marine growth.
- Inspect through aluminium stainless steel, and galvanized steel weather jackets.
- Inspect structures featuring chicken wire and rebar's.
- Unaffected by water and ice
- No costly or unnecessary removal of insulation
- No safety issues (unlike X-rays) and performed on working components
- Easy to use, fast learning curve.

Limitations:

- Edge effect (about the size of the probe's footprint) near metallic structures.
- Unable to discriminate near-side and far-side defects
- small pitting's will not be detected.
- Undersize flaws smaller than the averaging area of the probe
- Difficult to use on elbows smaller than 200 mm (8 in) in diameter.

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Short Range Ultrasonic Testing (SRUT)

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SRUT – Introduction

The Short Range Guided Wave Ultrasonic Technique (SRGUT) was designed to test the annular plate of above ground storage tanks (AST's) while the tank remains in-service.

Short Range Guided Wave Testing has become a proven and reliable technique as one method for determining the integrity of tank annular plates where the highest probability of corrosion exists to help prioritize out of service tank maintenance requirements.

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SRUT – Applications

Applications:

- Tank Floor Annular Plate Testing
- Testing Concrete Coated Interfaces
- Testing Under Pipe Supports
- Tank Dyke Piping Interfaces
- Scan Under Vessel Supports

Capabilities:

- Detects corrosion, pitting, and wall thinning.
- Identifies weld defects and localized flaws.
- Can inspect small, confined, or hard-to-reach areas.
- Works on pipes, small vessels, elbows, and joints.
- Can be used without removing insulation in some cases.

Advantages:

- Non-destructive, safe, and fast.
- Reduces the need for scaffolding or insulation removal.
- Provides early detection of defects.
- Can complement conventional UT or other inspection techniques.

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Medium Range Ultrasonic Testing (MRUT)

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MRUT – Introduction

- Propagation: Parallel to the entry wall and within the boundaries of the top and bottom walls.
- Lamb & Shear Horizontal Guided Waves and Rayleigh waves in frequencies ranging from 50 kHz to 10 MHz

Applications:

- Corrosion detection in tubes and tanks.
- Corrosion detection in inaccessible areas (under supports, buried areas)
- Surface inspection.

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Long Range Ultrasonic Testing (LRUT)

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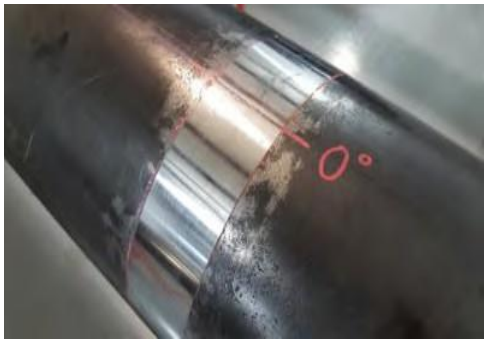
LRUT – Introduction

- Inspection of pipes & tubes using torsional waves in reflection mode.
- Axisymmetric collar provides superior signal- to-noise ratio (SNR) and a pure wave with minimum blind zone (more uniform loading of sound in the pipe)
- PE configurations.
- Covers up to 80 m per acquisition
- Different belts depending on the pipe diameter.
- Quick Assessment.
- Transmits and receives with axisymmetric collar.
- Requires one magnetostrictive strip for the axisymmetric collar.
- It allows for fast pipe screening – maximizing productivity.
- Low profile for limited access locations.
- Pipe diameters 2" and larger.
- Axisymmetric collar has the following advantages over rings:
  - Pure axisymmetric wave generation and transmission (more uniform loading of sound in the pipe)
  - Smaller dead zone
  - Simpler to install
  - Lower profile



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Electromagnetic Acoustic Transducer (EMAT)

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EMAT – Introduction

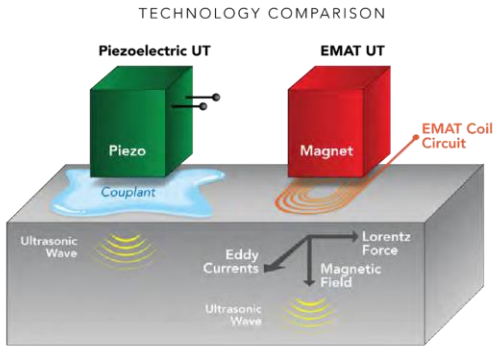
- Conductive material: EMAT works only in metal (ferromagnetic or non ferromagnetic)
- Electrical field. Generated by the current in the coil
- Magnetic field. Generated by the magnet (permanent or pulsed)
- EMAT does not require physical contact with the test surface, as it operates effectively at a short proximity to the material.

Applications:

- Weld inspection in pipelines and structures.
- Boiler and furnace tube inspection.
- Rail inspection for cracks.
- Corrosion mapping in storage tanks or pipes.
- High-temperature or moving surfaces (hot pipes, rotating equipment).

Limitations:

- Works mainly on conductive materials.
- Lower sensitivity than conventional UT for certain defect types.
- Specialized trained operators required.



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AI & Robotics

Submersible Robotic Inspection

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Submersible Robotic Inspection

Maritime

(Ports, Terminals, Shipping)

Infrastructure

(Dams, Rail and Road Bridges)

Energy

(Oil & Gas, Thermal, Hydroelectric, Wind Farms, Nuclear)

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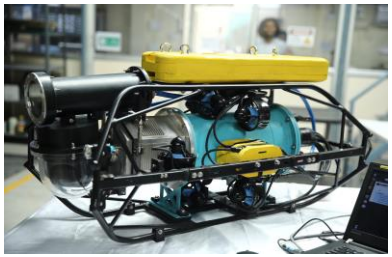
Submersible Robotic Inspection

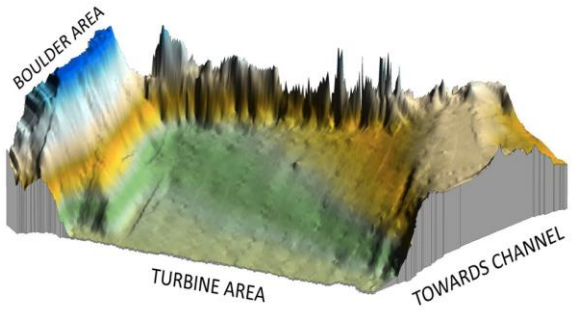
Robotic Platform - ROV Fleet



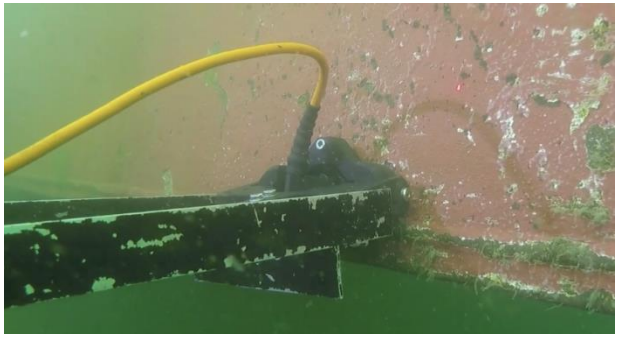
Payloads

Analytics

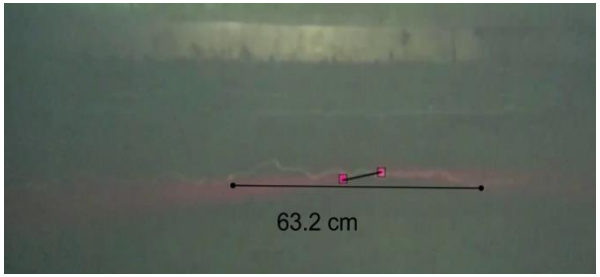
HD live video streaming



SONAR/Bathymetric Surveys

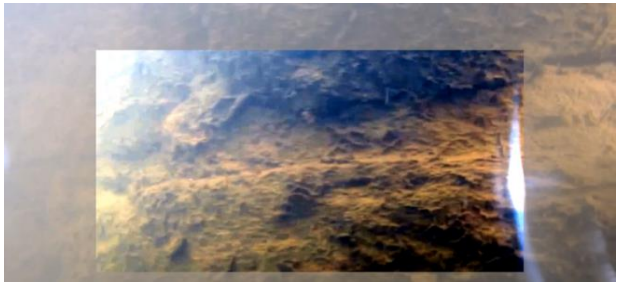


Ultrasonic Thickness Measurement



LASER aided defect quantification

Spot Cleaning of Marine Growth



Turbid Water Inspection

Automated Robotic Tubular Inspection System (ARTIS)

Reformer & Boiler Tubes Inspection

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ARTIS - Introduction

ARTiS is abbreviated to Automated Reformer Tube Inspection System.

This is a robotic crawler to aid ultrasonic testing of reformer tubes in a more systematic manner and provide tabular and interactive digital output.

The method follows same principle of manual scanning.
While crawling it measures:

- Ultrasonic attenuation
- Outer diameter of tube
- Tube bowing

The outcome of inspection is more systematic and traceable throughout the tube height.

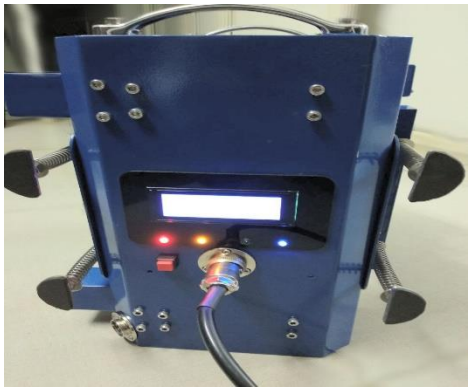
Water tank
with pump

Drive

OD measurement

Adjustable arm

UT Probes



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Pipeline & Weld Joints Radiography Crawler RT

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Crawler RT - Introduction

- Pipeline crawlers designed and manufactured by East west follow the concept of modular construction to provide safe, efficient and cost-effective field units, easy to operate and maintain.

- The crawler is essentially a battery-powered, remote controlled mobile radiographic vehicle designed to produce signal wall, single image (SWSI) radiographs of circumferential butt welds in pipelines.

- The principles of operation are based on the specifications laid down for welding and radiography, and depend essentially on the placement of the Magnetic Emitter centrally within the weld to be examined.

- Modules are quickly and easily interchanged. All crawlers are constructed using highest grade materials to provide good finish, superior corrosion resistance, easy maintenance and extended service life.

- Crawler functions may be pre-set to suit each particular pipeline, with full remote control being achieved from the outside of the pipeline by means of the Magnetic Emitter (Pilot).

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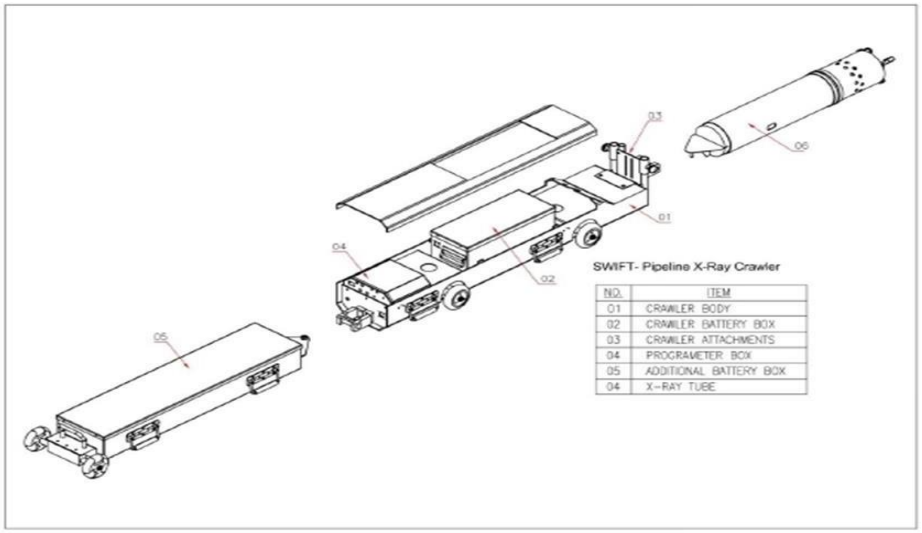
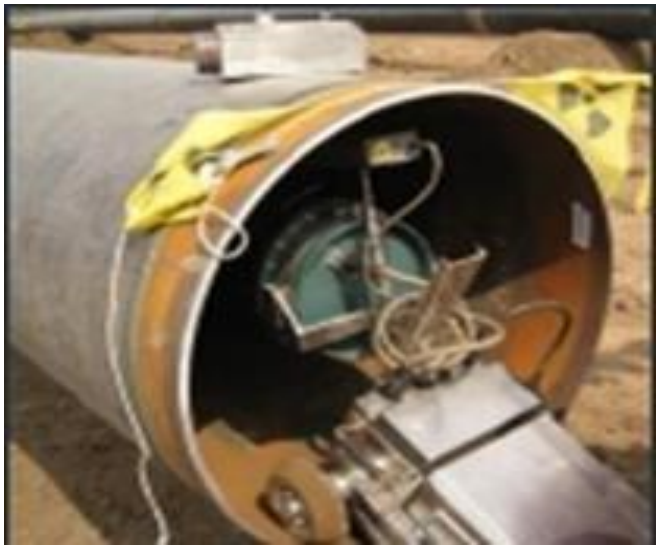
Crawler RT - Equipment





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Heat Treatment Services

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Heat Treatment – Introduction

TCR Arabia offers Resistance-Type Heat Treatment Services in compliance with ASME and client specifications.

Purpose

- Improve mechanical strength and toughness
- Relieve residual stresses after welding or forming
- Enhance wear and fatigue resistance
- Restore material properties after fabrication or repair

Applications

- Pressure vessels and boilers
- Pipelines and piping systems
- Storage tanks
- Structural steel
- Power plant components
- Petrochemical and refinery equipment




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Inspection Manpower

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Inspection Manpower

TCR Arabia provides Inspection Manpower on Long-Term & Short-Term basis.

Following are the categories of Inspection Manpower available with TCR Arabia;

- API Inspectors (510, 570, 580, 653)
- Refractory Specialists (936)
- Welding Inspectors
- Inspection Engineers
- Plant Inspectors
- NDT Technicians (Level II – ASNT)
- Corrosion Engineers
- RBI Specialists

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Welder Qualification Services

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Welder Qualification - Introduction

The basic criterion for establishing welder qualification is to determine the welder's ability to deposit sound weld metal. The purpose of the performance qualification test for the welding operator is to determine the operator's mechanical ability to operate the welding equipment.

TCR Arabia's team of qualified CSWIP & AWS inspectors is approved by major companies in KSA to qualify welders in accordance with global standards.

TCR Arabia provides WPS development, welder qualification, brazier qualification, and consultancy for all welding support services.

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Saudi Aramco Approvals

Classification: Saudi Aramco: Company General Use

Greetings,

We are pleased to inform you that your company has been approved for the below services with indicated information:

Vendor Name	Vendor Number	Location	Service	Description
TCR ARABIA COMPANY LTD.	10040677	Dammam	Welder Testing Agency	Qualifying welders working for Saudi Aramco

This approval, however, should not be construed as an agreement or commitment by Saudi Aramco to make a contract with **TCR ARABIA COMPANY LTD.**, but your company will have the opportunity along with other approved sources to respond to requests for submitting proposals in accordance with Saudi Aramco's established policies and procedures.

Regards.

Inspection Department
Service Provider Review Committee

This email has been classified as Saudi Aramco: Company General Use on 7/20/2020 2:44 PM

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For more information about Saudi Aramco's corporate profile, please visit http://saudiaramco.com.
للمزيد من المعلومات عن ملف الشركة الخاص

From: Ghamdi, Tariq A (CSD) TARIQ.GHAMDI.11@ARAMCO.COM
Subject: RE: Maintaining CSD approval - TCR Arabia
Date: 21 Jun 2020 at 7:26:33 AM
To: syed.ahsin@tcr-arabia.com
Cc: Waranbi, Maslat S maslat.waranbi@aramco.com, Kim, Choongmyeong choongmyeong.kim@aramco.com, *CSD Welding CSDWelding@exchange.aramco.com.sa, syed@tcr-arabia.com, *CSD Materials E GroupLeader CSDMEGroupLeader@exchange.aramco.com.sa

Classification: Saudi Aramco: Company General Use

Dear Mr. Syed,

A desk assessment was conducted on TCR Arabia-Dammam on June 18. 2020. TCR Arabia is currently an approved third party testing laboratory and qualified to conduct mechanical tests and welding procedure qualification. The TCR Arabia testing facility has upgraded their services by including additional corrosion tests, ASTM A923, ASTM G28, and ASTM G48, specialized in the detection of intermetallic phases in duplex stainless steel, susceptibility to intergranular corrosion, and pitting corrosion resistance for high alloy materials, subjected to chloride containing environment. TCR Arabia has demonstrated satisfactory capabilities to meet the requirements of Saudi Aramco and Industry standards for corrosion testing requirements. TCR Arabia has a valid ISO 17025 certification which with an effective date of May 11, 2020. Thus, TCR Arabia is given the CSD approval to provide the following services to Saudi Aramco and its clients:

Mechanical tests, including Tensile, Bending, Hardness, V-Charpy Impact

Macrographic and Metallographic

Chemical Analysis including PMI and OES

Corrosion Tests, including ASTM A923, A262, G28 and G48

Failure Analysis

Replica

Should you require further clarification, please contact Tariq Alghamdi on 013-880-9561 or Choongmyeong Kim, on 013-880-9540.

Regards,

Tariq A. Al-Ghamdi, Ph.D.
Materials and Welding Consultant

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Training Services

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Training Services

TCR Arabia's Training Center in Dammam provides following Training Services;

- NDT Level I & II (RT, PT, VT, MT, ECT, UT)
- Welder Qualification (WQT)
- Mechanical Laboratory Testing
- Infrared Thermal Imaging
- Metallurgy for Non-Metallurgists
- Microstructure Analysis
- Introduction to Metallography

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Appreciation Letters

EBARA ELLIOTT ENERGY

Certificate of Recognition

Proudly Awarded to

TCR ARABIA COMPANY LTD.

We proudly acknowledge the outstanding commitment you have shown to the Ebara Elliott Energy throughout **SATORP TA 2025 (October)**. The effort of your entire site team was a part of our success during the outage. We value your partnership, Thank you very much for your support.

C Watson
Christopher Watson
SATORP Project Manager

Hassan Al Hudaibi
Hassan Al Hudaibi
Regional Service Manager
KSA & Bahrain

المتقدمة Advanced

CERTIFICATE OF APPRECIATION

This Certificate is presented to

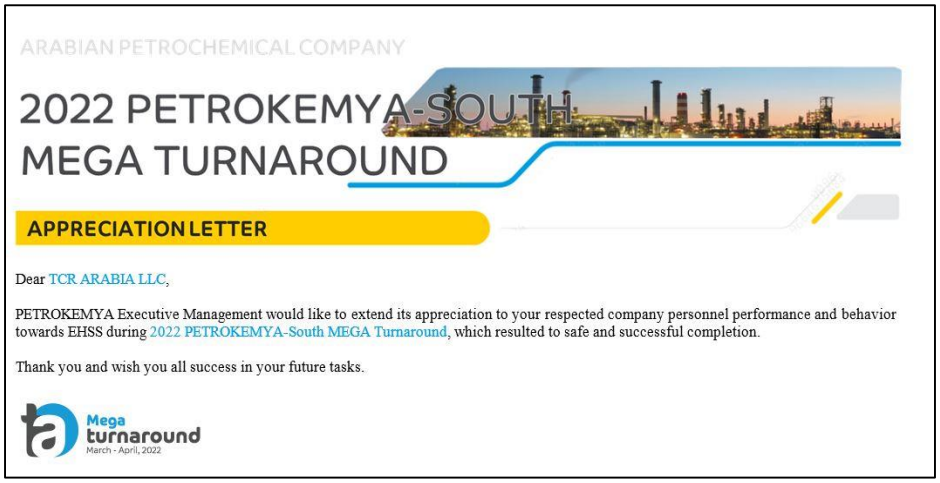
MUNAWAR

PAUT Technician(TCR)

In appreciation for his hard work & dedication during Turnaround held in Feb'2024 at Advanced Petrochemical Company, Jubail Industrial City, KSA.
His commitment during shutdown activities in timely & safely manner is highly appreciated.

Rajakumar Sreenivasan
Manager, Rot. Equipt. & Inspection-Asset Engineering

Classification: Public Use



ARABIAN PETROCHEMICAL COMPANY

2022 PETROKEMYA-SOUTH MEGA TURNAROUND

APPRECIATION LETTER

Dear TCR ARABIA LLC,

PETROKEMYA Executive Management would like to extend its appreciation to your respected company personnel performance and behavior towards EHSS during 2022 PETROKEMYA-South MEGA Turnaround, which resulted to safe and successful completion.

Thank you and wish you all success in your future tasks.

Mega turnaround
March - April, 2022

certificate of appreciation

This is to certify

Ehsanullah Mohammed ID#8662170

RTR Inspection Section appreciates your extraordinary efforts and contributions during RT Refinery 2024 MEGA T&I as PAUT Technician. Your positive contribution towards RTR integrity and reliability was unconditional. We appreciate you for the cooperative spirit and the attention to details that enabled us to streamline the entire process to achieve success and meet our goal safely.

Mishaal R Al-Harthi
SUPERVISOR GAS PLT INSPECTION
Refinery Inspection Section, RTR Engineering Department

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Appreciation Letters

بتروكيميا
petrokemya

CERTIFICATE OF APPRECIATION

PETROKEMYA would like to express sincere appreciation to :

SONU KUMAR (ID NO.C-1236792)

TUBE SCANNING (ECT, RFT, MFL , SECT, IRIS) TCR ARABIA.

In recognition of your excellent performance and outstanding support during Petrokemya – South Y'2024 VCM TURNAROUND.

"WE THANK YOU FOR ALL YOUR EFFORTS AND EXCELLENT JOB."
" WISH YOU ALL SUCCESS IN YOUR FUTURE TASKS."

FAISAL A. KHALDI
INSPECTION ENGINEER
INSPECTION – PK (SOUTH)

Date: 07-12-2024

VCM TURNAROUND

CHEMISTRY THAT MATTERS™

سابك
sabic
Agri-Nutrients

CERTIFICATE OF APPRECIATION

On behalf of SABIC Agri-Nutrients Site Management team, AN4 SD execution Leaders would like to express their appreciation to

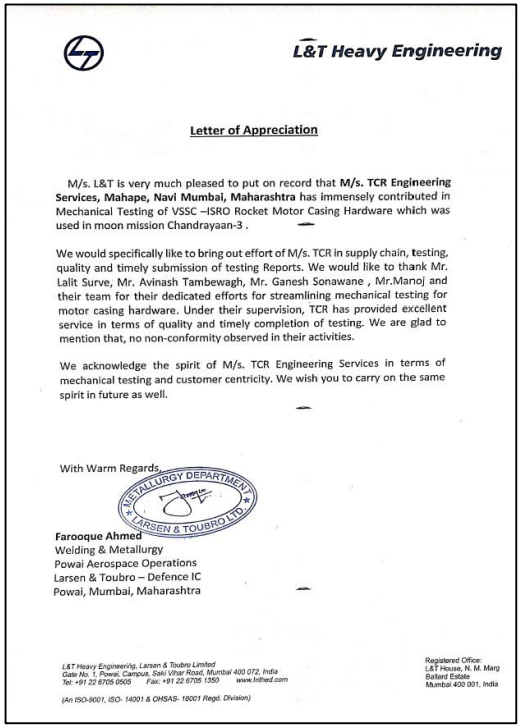
ASHUTOSH RAWAT ID # C2129645
TCR PAUT OPERATOR

For excellent contribution, commitment and ownership towards "AN4 SD-2025".
SABIC Agri-Nutrients team wish you all the best in future assignments.

YOU MAKE A DIFFERENCE

AN4 SD
DATE: OCT 2025

73312



L&T Heavy Engineering

Letter of Appreciation

M/s. L&T is very much pleased to put on record that **M/s. TCR Engineering Services, Mahape, Navi Mumbai, Maharashtra** has immensely contributed in Mechanical Testing of VSSC –ISRO Rocket Motor Casing Hardware which was used in moon mission Chandrayaan-3 .

We would specifically like to bring out effort of M/s. TCR in supply chain, testing, quality and timely submission of testing Reports. We would like to thank Mr. Lalit Surve, Mr. Avinash Tambewagh, Mr. Ganesh Sonawane , Mr.Manoj and their team for their dedicated efforts for streamlining mechanical testing for motor casing hardware. Under their supervision, TCR has provided excellent service in terms of quality and timely completion of testing. We are glad to mention that, no non-conformity observed in their activities.

We acknowledge the spirit of M/s. TCR Engineering Services in terms of mechanical testing and customer centricity. We wish you to carry on the same spirit in future as well.

With Warm Regards

METALLURGY DEPARTMENT
LARSEN & TOUBRO LTD

Farooque Ahmed
Welding & Metallurgy
Powai Aerospace Operations
Larsen & Toubro – Defence IC
Powai, Mumbai, Maharashtra

L&T Heavy Engineering, Larsen & Toubro Limited
Gate No. 1, Powai, Campus, Saki Vihar Road, Mumbai 400 072, India
Tel: +91 22 6705 0505 Fax: +91 22 6705 1350 www.lnthed.com

(An ISO-9001, ISO- 14001 & OHSAS- 18001 Regd. Division)

Registered Office:
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Ballard Estate
Mumbai 400 001, India

فرع شركة سينوبك انترناشيونال بتروليوم سيرفيس كوربوريشن
Branch of Sinopec International Petroleum Service Corporation

S.No. A 25183

TCR Arabia Company Limited,
Dammam,
KSA

20th March, 2022

Letter of Appreciation

SINOPEC would like to appreciate the efforts of TCR Arabia in supporting our emergency welder qualifications requirement by meeting our stringent deadlines with utmost care and professional ability. We would like to express our appreciation to the strong technical team of TCR Arabia for the services rendered to SINOPEC.

We are delighted to find a technically sound, professionally able and a reliable partner to support in our inspection and testing needs.

Wishing TCR Arabia great success in the years ahead.

Best Wishes,

Zhao Gangchen
Project Director
Branch of SINOPEC International
Petroleum Services Corporation

• Geophysical Exploration • Drilling • Construction • Heavy Equipment Lease

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Subject: Approval Notification of TCR ARABIA COMPANY LTD. (Vendor No. 10040677)

Classification: Saudi Aramco: Company General Use

Greetings,

We are pleased to inform you that your company has been approved for the below services with indicated information:

Vendor Name	Vendor Number	Location	Service	Description
TCR ARABIA COMPANY LTD.	10040677	Dammam	Welder Testing Agency	Qualifying welders working for Saudi Aramco

This approval, however, should not be construed as an agreement or commitment by Saudi Aramco to make a contract with **TCR ARABIA COMPANY LTD.**, but your company will have the opportunity along with other approved sources to respond to requests for submitting proposals in accordance with Saudi Aramco's established policies and procedures.

Regards.

Inspection Department
Service Provider Review Committee

أرامكو السعودية
saudi aramco

This email has been classified as Saudi Aramco: Company General Use on 7/20/2020 2:44 PM

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Commitment to Excellence

- TCR Arabia is a Corporate Partner of American Society of Non-Destructive Testing (ASNT).
- Participated in ASNT Conference in Bahrain in 2007, 2009 & 2012, 2014
- Participated in Corrosion Conference in Bahrain in 2008 & 2010,2022 & 2024
- Saudi Aramco invited to participate in ITEME 2008, Technical Exchange Meet.
- Saudi Aramco invited to participate in Heat Exchanger Technical Exchange Meet, 2010
- Saudi Aramco invited to participate in Corrosion Exhibition in 2009
- Participated in Middle East Corrosion Conference in Bahrain in Feb, 2012
- Participated in NACE Exhibition in Jubail in October, 2011
- Participated in World NDT Conference in Durban, South Africa in April, 2012
- Participated in SABTANK Reliability Technical Exchange Meet in 2011, 2012 & 2013
- Participated in SABIC STC – 2014, 2016
- Participated in Middle East Corrosion Conference in Bahrain in Feb, 2018 & Oct 2018
- Participated in Saudi Robotics Conference, Al-Jubail, Saudi Arabia - 2019
- Participated in JUBCOR Jubail Corrosion Conference, Al-Jubail, Saudi Arabia - 2019
- Participated in Materials Performance & Welding Technologies, Dammam, Saudi Arabia – 2019
- Participated in NAPD 2021 hosted by Saudi Aramco-2021
- Participated in The NDT Exchange forum organized by Saudi Aramco on 6th September 2023
- Participated in Asset Integrity and Process Safety conference hosted by Royal Commission for Jubail and Yanbu on May 2023

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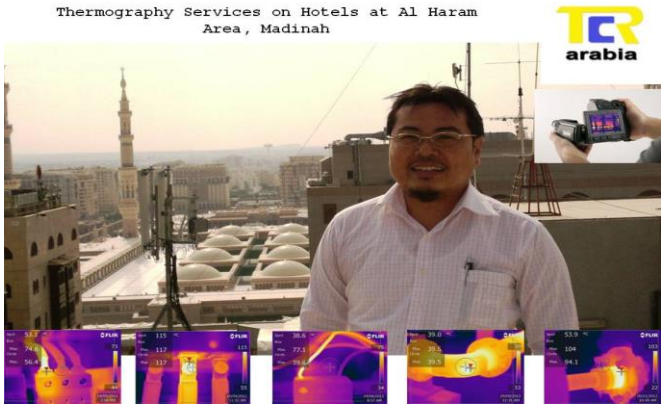
Prestigious Projects:

NDT in Masaa Project, Mecca

Harmain Rail Project, Medina



Thermography at Haram area in Medina

PMI of Zam Zam Filtration Tanks in Haram, Mecca

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Major Clients:

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Thank You!

Questions or inquiries?

sales@tcr-arabia.com

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