



TCR Arabia Company Limited

Inspection - Testing – Advisory

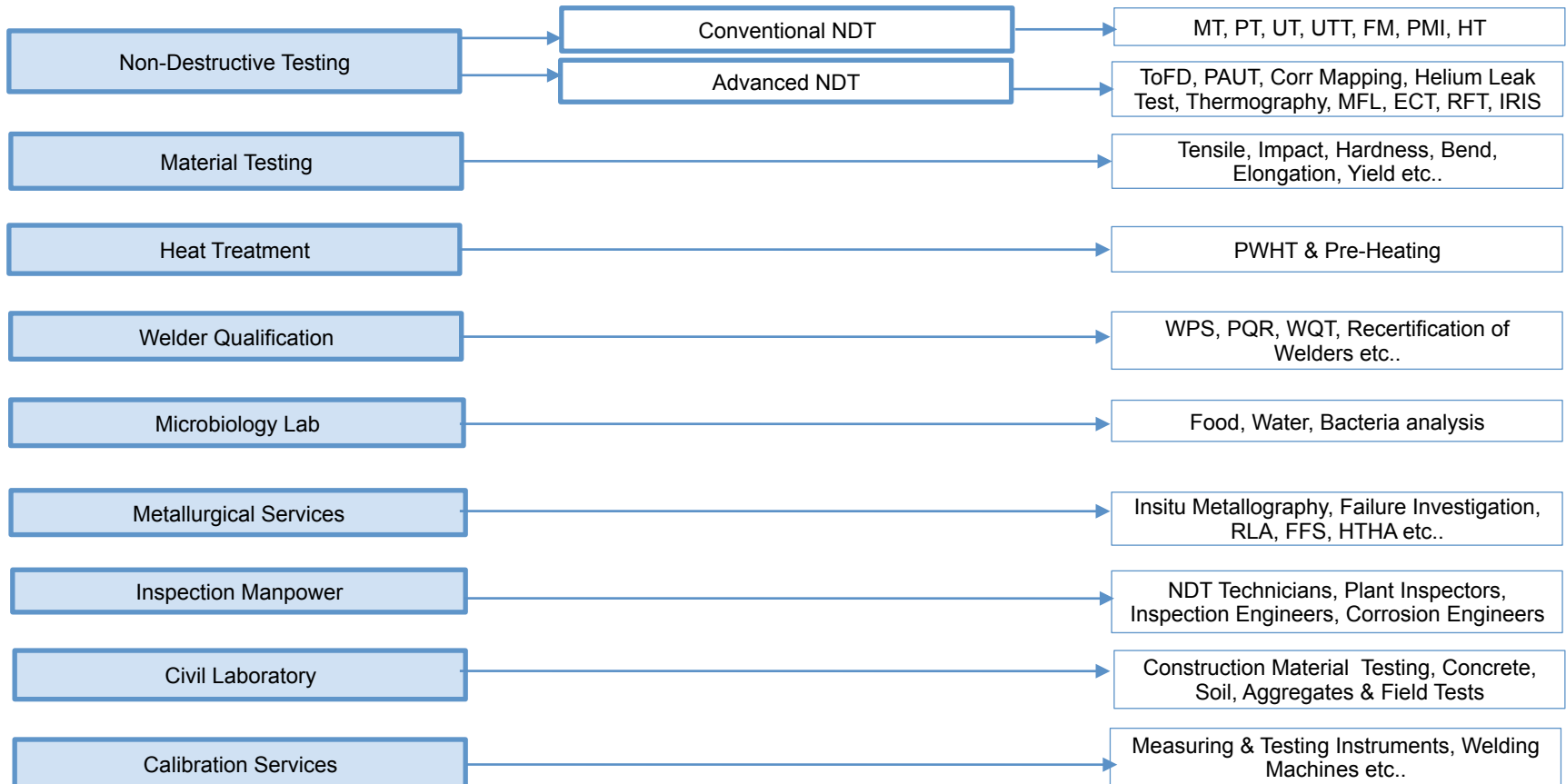
TCR – Company Introduction



- 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 contractor in Saudi Aramco, SABIC, SWCC, SEC, Petrorabigh, TASNEE, MARAFIQ, MAADEN, CRISTAL, YASREF, SAMREF, LUBEREF, SATORP, SADARA & with other major clients in KSA.
- Presence on Eastern and Western Provinces in Saudi Arabia
- TCR has a global presence with operations in India, Kuwait, KSA, 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.
- Certified Laboratories – Metallurgy, Civil, Mechanical and Microbiology.



TCR – Services Portfolio



Serving Multiple Industry Verticals:

Onshore O&G plants



Offshore Oil Plants



Construction



Pharma and Biotech



Refining & Chemicals



Power Generation



Pulping



Mining & Metals



Electronics



Automotive



Defence



Aerospace



Manufacturing



Shipping



Manufacturing Goods



Medical Products



Office Locations



- Mechanical Laboratory
- Metallurgical Laboratory
- Microbiology Laboratory
- Civil Laboratory

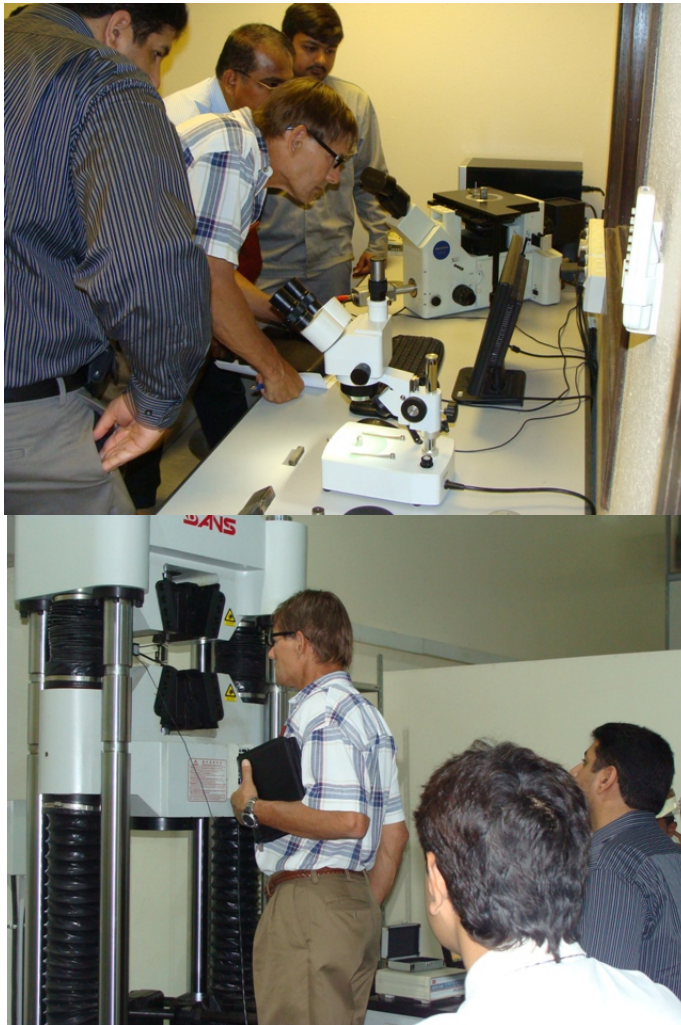
TESTING LABORATORIES

**Mechanical Testing
Laboratory**

**Metallurgical Testing
Laboratory**

**Microbiology Testing
Laboratory**

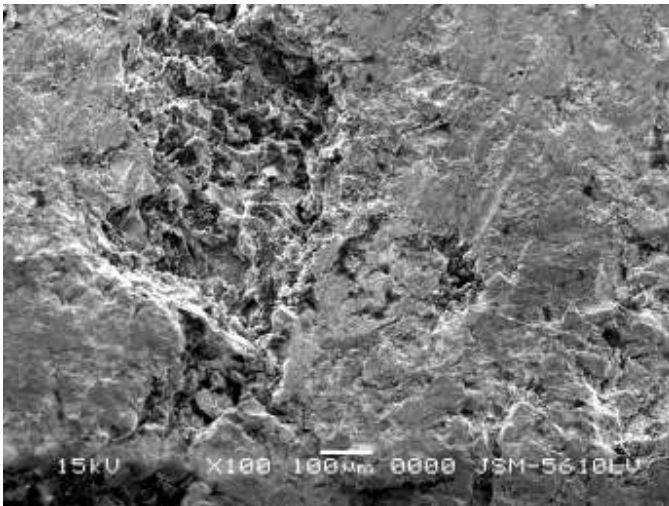
**Civil Testing
Laboratory**



Services capability:

- Tensile Testing
- Impact Testing
- Hardness Testing
- Bend Test
- Macro Test
- Proof Load Test
- Wedge Load Test
- Chemical Tests

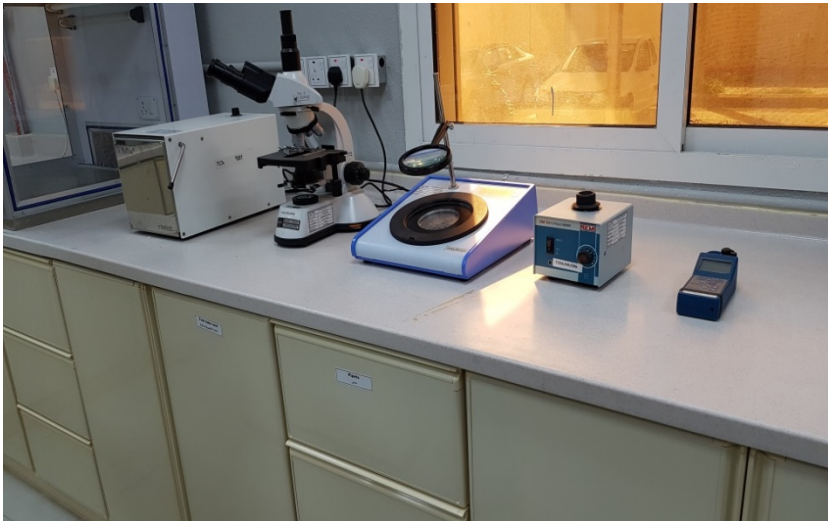
- TCR Arabia's Mechanical Testing Lab is approved by Saudi Aramco.
- ISO 17025 Certified & SASO Accredited Lab.



Services capability:

- Microstructure Analysis
- Macrostructure Analysis
- Insitu 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



Services capability:

- Meat and Meat Products testing.
- Bakery products testing.
- Poultry Products.
- Dairy products.
- Water testing.
- Disinfectants and chemical.
- Food born illness investigation.



- ISO 17025 Certified & SASO Accredited Lab.
- The Material testing in TCR Arabia is conducted in accordance with American Standards (ASTM), British Standards (BS), Saudi Arabian Standard organization (SASO) or International Standards Organization (ISO).



Services capability:

- Concrete Tests
- Soil Tests
- Aggregate Tests
- Field test for Soil & Concrete
- Structural assessment of concrete & Concrete delamination Survey



Non-Destructive Testing

Conventional NDT

Advanced 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
- Boroscopic Inspection



Services capability:

- ToFD
- Phased Array UT (PAUT) – normal & high temp
- Tube Inspection (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)
- Long Range Ultrasonic Testing (LRUT)

➤ TCR Arabia is an approved contractor for all above techniques in Saudi Aramco, SABIC, TASNEE, Saudi Chevron, Maaden

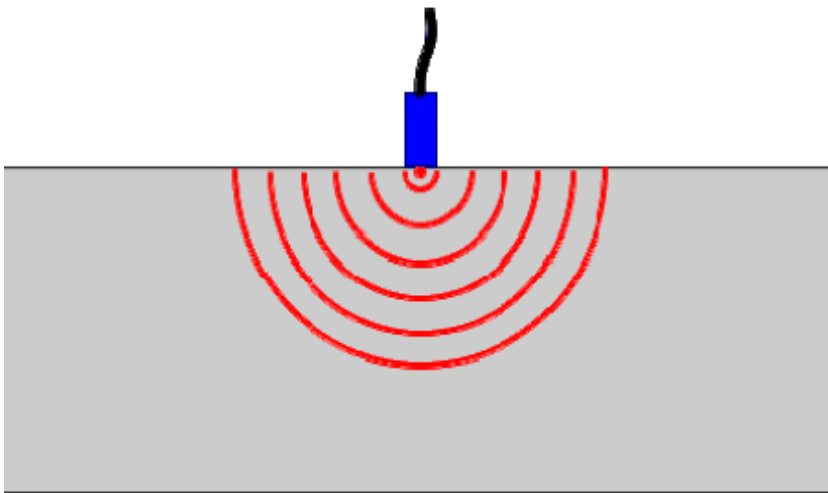
Phased Array Ultrasonic Testing (PAUT)

Phased Array Ultrasonic Testing (PAUT)

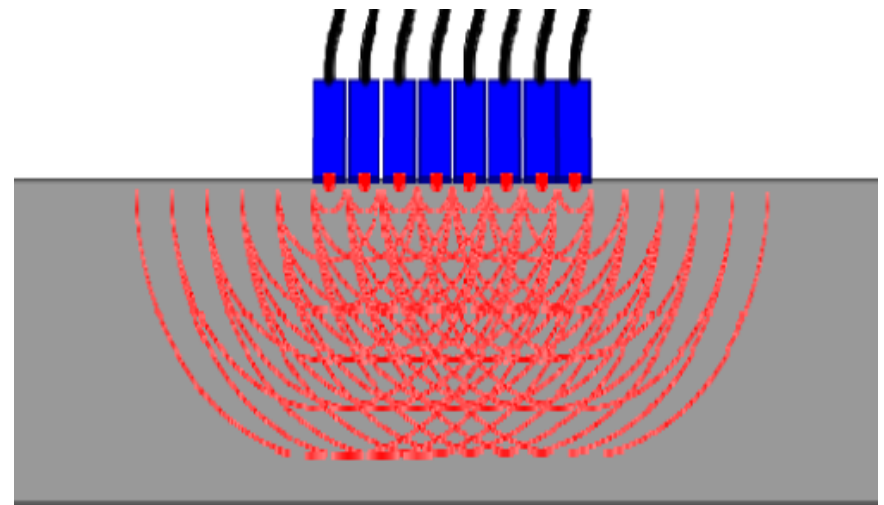
Ultrasonic phased array testing is a powerful NDT technology and one whose use is growing rapidly.

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



- 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.

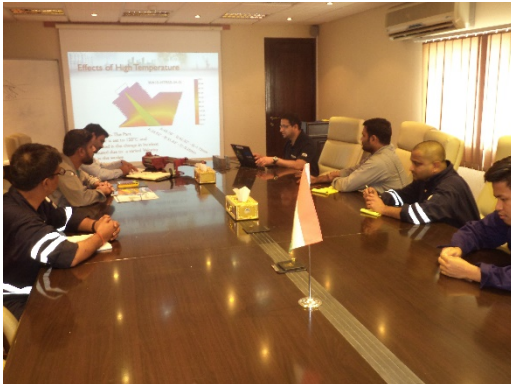
PAUT inspection applications include in-service welds and new construction weld inspection of:

- 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 in-service equipment and pipeline.
- No radiation
- Real time results – feedback to welders

Trainings – TCR Team - PAUT



PAUT - Training & Qualification of TCR Arabia Team Members by Eclipse Scientific of Canada in JIC, Al-Jubail.



High Temp. PAUT - Training & Qualification of TCR Arabia Team Members by Eclipse Scientific of Canada in TCR Arabia Facility, Dammam.

PAUT – Major Projects

SL	CLIENT	SERVICE	LOCATION	YEAR
1	Advanced Petrochemical Company	PAUT Service	Al Jubail	2013
2	Tasnee (Saudi Ethylene & Polyethylene Co)	PAUT Service	Al Jubail	2013
3	Saudi Arabian Oil Company (Saudi Aramco)	PAUT Service	Ras Tanura	2013
4	Professional Industrial Services Est.(PISCO)	PAUT Service	Al Jubail	2013
5	Farabi Petrochemicals Co.	PAUT Service	Al Jubail	2013
6	GE Energy Power & Water	PAUT Service	Dammam	2014
7	Al-Waha Petrochemicals Company	PAUT Service	Al Jubail	2014
8	SABIC -Ibn Zahr	PAUT Service	Al Jubail	2014
9	SABIC -United	PAUT Service	Al Jubail	2014
10	GE Energy Manufacturing Technology	PAUT Service	Dammam	2014
11	Saudi Arabian Oil Company (Saudi Aramco)	PAUT Service	Khursaniyah	2015
12	SEIMENS - Iscosa	PAUT Service	Dammam	2015
13	SABIC - Safco	PAUT Service	Al Jubail	2015
14	Samsung Saudi Arabia	PAUT Service	Shaybah	2015
15	SABIC - Saudi Kayan	PAUT Service	Al Jubail	2015
16	Sendan International	PAUT Service	Al Jubail	2015
17	Kanooz Industrial Services	PAUT Service	Al Jubail	2015
18	H.K. Al Sadiq Sons Contracting Co. Ltd	PAUT Service	Al Jubail	2015
19	NTS Saudi Co. Ltd	PAUT Service	Dammam	2015
20	Northern Region Cement Co.	PAUT Service	Najran	2016
21	Great Lakes Dredge & Docks - Sea Port	PAUT Service	Dammam	2016
22	Tasnee (Saudi Ethylene & Polyethylene Co)	PAUT Service	Al Jubail	2016
23	SABIC - United	PAUT Service	Al Jubail	2016
24	Shams Mohsen Contracting - Aramco	PAUT Service	Ras Tanura	2016
25	CTCI (Ibn Sina)	PAUT Service	Al Jubail	2016
26	SABIC - Ibn Zahr	PAUT Service	Al Jubail	2016
27	SABIC - United	PAUT Service	Al Jubail	2016
28	SABIC - Safco	PAUT Service	Al Jubail	2016

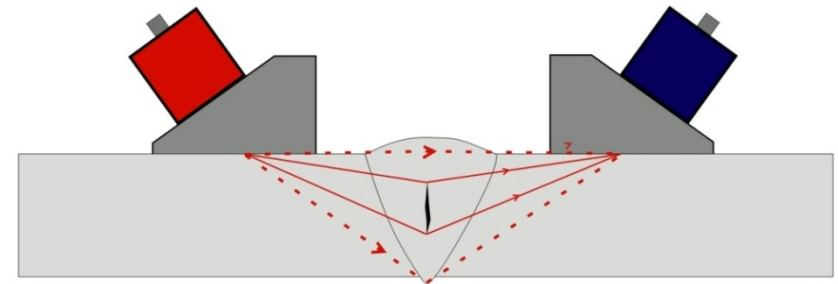
PAUT – Major Projects

29	Mohd. Bin Hasan Bin Makki Al-Muzain	PAUT Service	Al Jubail	2017
30	Advanced Petrochemical Company	PAUT Service	Al Jubail	2017
31	SABIC - Safco	PAUT Service	Al Jubail	2017
32	Al Rushaid Construction Co. Ltd	PAUT Service	Al Jubail	2017
33	Sabic - Sharq	PAUT Service	Al Jubail	2017
34	Industrial Minerals Company (Maaden)	PAUT Service	Ras Al Khair	2017
35	SABIC - Sabtank	PAUT Service	Al Jubail	2017
36	H.K Al Sadiq Sons Contracting Co. Ltd	PAUT Service	Al Jubail	2017
37	Sendan International Company - Arrazi	PAUT Service	Al Jubail	2017
38	Northern Region Cement Co.	PAUT Service	Najran	2017
39	SABIC - Sharq	PAUT Service	Al Jubail	2017
40	SABIC - Ibn Zahr	PAUT Service	Al Jubail	2017
41	Mohd. Bin Hasan Bin Makki Al-Muzain - Safco	PAUT Service	Al Jubail	2017
42	Baxter Company Limited	PAUT Service	Dammam	2017
43	SABIC - United	PAUT Service	Al Jubail	2017
44	SABIC - Sharq	PAUT Service	Al Jubail	2017
45	Industrial Minerals Company (Maaden)	PAUT Service	Ras Al Khair	2017
46	Sendan International Company (Petrokemya)	PAUT Service	Al Jubail	2017
47	Sendan International Company (Ar-Razi)	PAUT Service	Al Jubail	2017
48	NDT CCS - Safco	PAUT Service	Al Jubail	2017
49	Tasnee (Saudi Ethylene & Polyethylene Co)	PAUT Service	Al Jubail	2017
50	Sendan International Company - Arrazi	PAUT Service	Al Jubail	2017
51	Saudi Arabian Oil Company (Saudi Aramco)	PAUT Service	Khursaniyah	2017
52	SEIMENS - Iscosa	PAUT Service	Dammam	2017
53	Al Rushaid Construction Co. Ltd - Aramco	PAUT Service	Ras Tanura	2017
54	Mohd. Bin Hasan Bin Makki Al-Muzain - Safco	PAUT Service	Al Jubail	2017
55	ENPRO - Arrazi	PAUT Service	Al Jubail	2017
56	SABIC - Ibn Al Baytar	PAUT Service	Al Jubail	2017
57	SABIC - Arrazi	PAUT Service	Al Jubail	2017
58	Al Rushaid Construction Co. Ltd - Safco	PAUT Service	Al Jubail	2017
59	Petrofac Saudi Arabia Co. Ltd.	PAUT Service	Al Jubail	2017
60	GE Energy Power & Water	PAUT Service	Jordan	2017
61	Saudi Arabian Oil Company (Saudi Aramco)	PAUT Service	Abqaiq	2017
62	Saudi Arabian Oil Company (Saudi Aramco)	PAUT Service	Hawiyah	2017
63	SABIC - Safco	PAUT Service	Al Jubail	2017

Time of Flight Diffraction (TOFD)

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.



- 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)

Trainings & TCR Team - TOFD



ToFD – Training & Certification conducted by Eclipse Scientific of Canada in TCR Arabia facility in Dammam

TOFD – Major Projects

SL	CLIENT	SERVICE	LOCATION	YEAR
1	Kuwait Oil Company - KOC	TOFD Service	Kuwait	2008
2	TEKFEN - Petrorabigh	TOFD Service	Rabigh	2008
3	SINOPEC - Petrorabigh	TOFD Service	Rabigh	2008
4	TEKFEN - Saudi Aramco	TOFD Service	Khurais	2009
5	ENCOCORP - KAIA Airport	TOFD Service	Jeddah	2010
6	SABIC - Al Bayroni	TOFD Service	Al Jubail	2010
7	Advanced Petrochemical Company	TOFD Service	Al Jubail	2011
8	Mc. Dermott - FMQ	TOFD Service	Khursaniyah	2011
9	Petrorabigh	TOFD Service	Rabigh	2011
10	SINOPEC	TOFD Service	Rabigh - Revamp	2012
11	SABIC - United	TOFD Service	Al Jubail	2012
12	Zamil Heavy Industries	TOFD Service	Jeddah	2012
13	Sin Sina	TOFD Service	Qurayyah	2011
14	TURB Arabia	TOFD Service	Qurayyah	2012
15	SABIC - STC	TOFD Service	Al Jubail	2013
16	Saudi Aramco	TOFD Service	Safaniyah	2013
17	Saudi Aramco	TOFD Service	Qatif	2013
18	Advanced Petrochemical Company	TOFD Service	Al Jubail	2014
19	Saudi Aramco	TOFD Service	Khursaniyah	2014
20	U-SONIX Inspection Solutions Pvt Ltd	TOFD Service	Jeddah	2015
21	Shams Mohsen Contracting	TOFD Service	Ras Tanura	2015
22	SABIC - Saudi Kayan	TOFD Service	Al Jubail	2016
23	Saudi Aramco	TOFD Service	Hawiyah	2016
24	GE Power & Water	TOFD Service	Jordan	2017
25	Saudi Aramco	TOFD Service	Udhailiyah	2017

CORROSION MAPPING (CM)

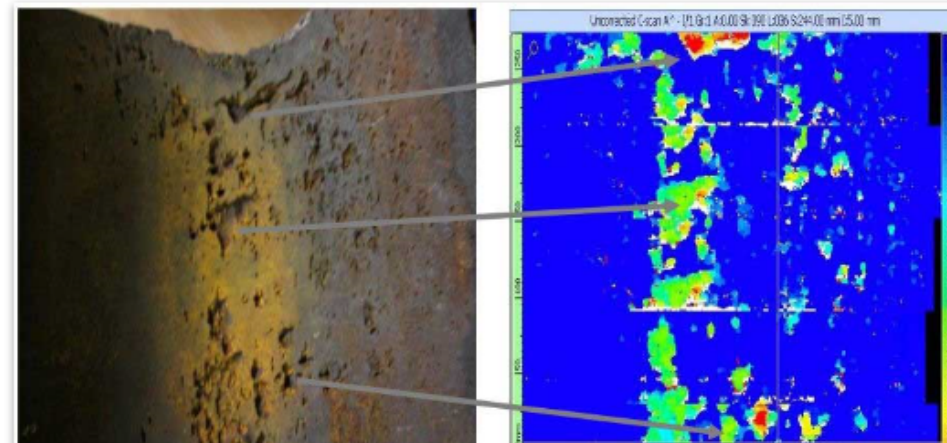
Corrosion Mapping (CM)

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



- 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.

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.

Training & TCR Team - CM



TCR team is trained by Technology Design in Manchester UK & AUT Solutions of USA to conduct Corrosion Mapping (CM), Stepwise crack detection (SWC) & High Temperature Hydrogen Attack (HTHA) inspections.



Team & Assets – CM, TOFD, PAUT

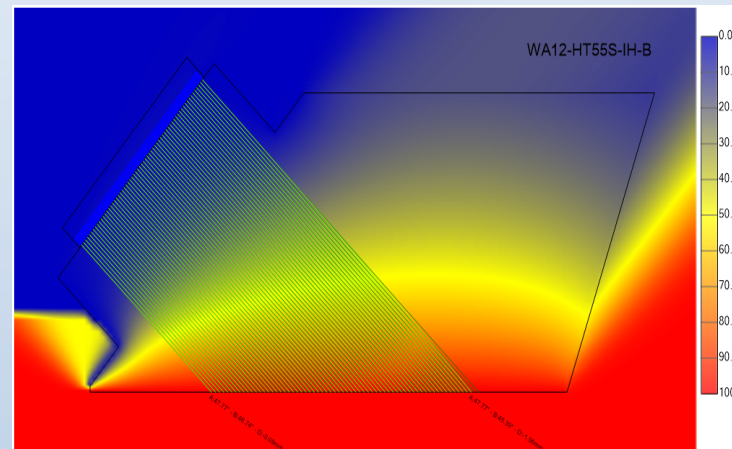
TECHNIQUES	Number of Scanner	Number of Approved Technician	Number OF Olympus Equipment	Number of TD Handy scan Equipment
Automated High /Normal Temperature Corrosion Mapping HIC-SWC Inspection.	3	4	10	2
Phased Array Ultrasonic Testing (PAUT)	10	12	10	2
Time Of Flight Diffraction Ultrasonic Testing (ToFD)	5	4	4	2

CM – Major Projects

SL	CLIENT	SERVICE	LOCATION	YEAR
1	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Hawiyah	2016
2	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Jeddah	2016
3	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Ras Tanura	2016
4	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Abqaiq	2016
5	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Hawiyah	2016
6	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Udhailiyah	2016
7	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Khursaniyah	2016
8	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Abqaiq	2016
9	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Jeddah	2016
10	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Hawiyah	2016
11	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Shaybah	2016
12	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Khursaniyah	2016
13	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Dhahran	2016
14	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Ras Tanura	2017
15	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Uthmaniyah	2017
16	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Abqaiq	2017
17	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Khursaniyah	2017
18	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Qurayyah	2017
19	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Dhahran	2017
20	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Hawiyah	2017
21	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Khursaniyah	2017
22	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Dhahran	2017
23	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Uthmaniyah	2017
24	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Khursaniyah	2017
25	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Shedgum	2017
26	Saudi Arabian Oil Company (Saudi Aramco)	Corrosion Mapping	Abqaiq	2017

HIGH TEMPERATURE APPLICATION

TOFD, PAUT, CORROSION MAPPING



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 700⁰ 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.

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 elevated temperature.
- Provides immediate feedback.
- Digitised inspection records for future reference and verification
- Highest consideration of your health, safety and environment (HSE) rules

High Temperature Inspection - Resources

TECHNIQUES	Number of AUT Scanner	Number of Approved Technician	Number OF Olympus Equipment	Number of TD Handy scan Equipment
Automated High Temperature Corrosion Mapping	2	4	2	2
Automated High Temperature PAUT	2	4	2	2
Automated High Temperature ToFD	2	4	2	2
Stepwise Crack Examination (SWC)	2	4	2	2
Hydrogen induced Crack Examination (HIC)	2	4	2	2

High Temperature Inspection – Projects

Client	Location	Technique	Inspection Purpose
Petrorabigh	Rabigh	HT Corrosion Mapping	Detection of Corrosion & H2S Cracks at 150°C
Northern Cement Factory	Turaif	HT PAUT	Detection of in-service cracks on kiln tyres at 200°C
Saudi Aramco	Safaniya	HT Corrosion Mapping	Inspection of KO Drum for HIC detection at 150°C
Saudi Aramco	Ras Tanura	HT Corrosion Mapping	Inspection of in-service lines for HIC detection at 180°C
Saudi Aramco	Safaniya	Automated Corrosion Mapping	Detection of Corrosion rate at normal temp.
Saudi Aramco	Hawiyah NGL	Automated Corrosion Mapping	Detection of Corrosion rate at normal temp.
Saudi Aramco	Jeddah Refinery	Automated Corrosion Mapping	Detection of Corrosion rate at normal temp.

Tube Inspection (ECT, RFET, IRIS, MFL)

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

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



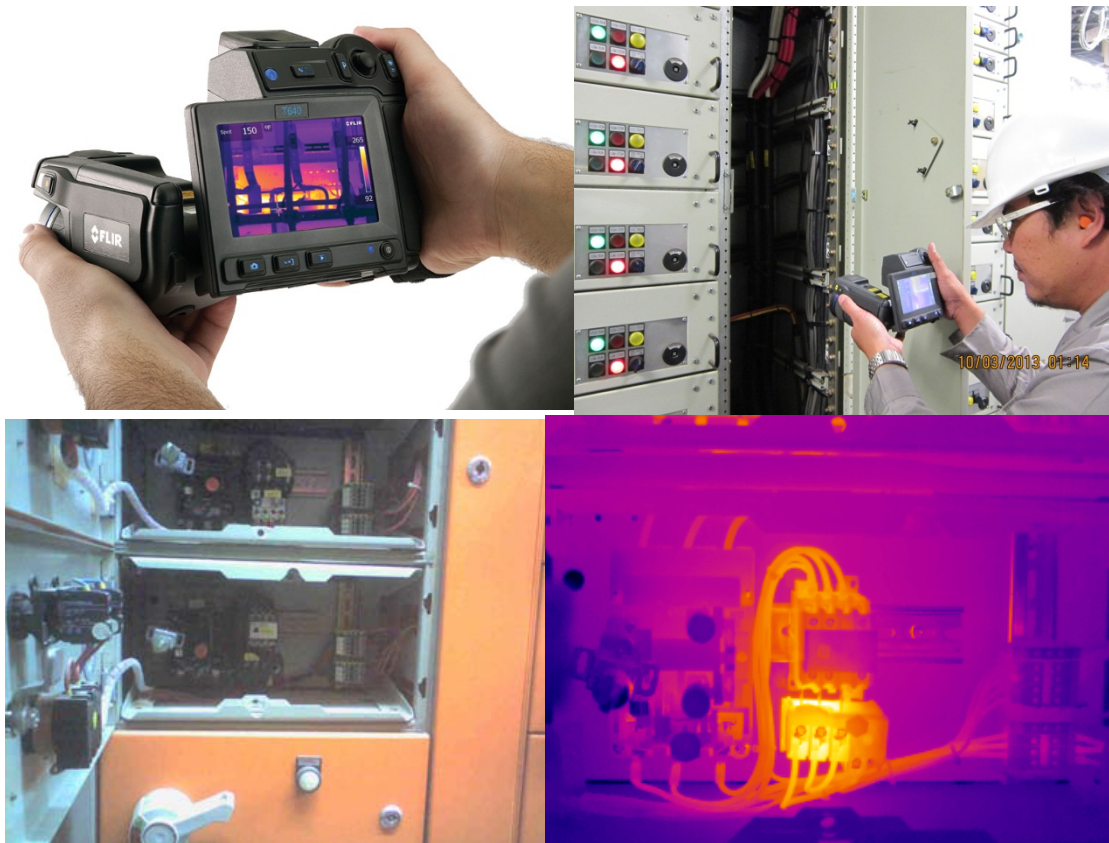
Tube Inspection – Major Projects

SL	CLIENT	LOCATION	SERVICES
1	Farabi Petrochemical	Al Jubail	Iris & Rfet Services
2	Saudi Aramco	Dharan	Tubes Inspection
3	Sabic Sharq	Jubail	Eddy Current Testing
7	Sabic Safco (Urea Plant)	Jubail	IRIS,ECT & RFT Services
7.6	Sabic Safco (Utility Plant)	Jubail	IRIS,ECT & RFT Services
8.2	Saudi Aramco (Juaymah)	Juaymah	MFL Tube Inspection
11	Saudi Aramco	Harad Gas	MFL Tubes Inspection
11	Advanced Petrochemical Co.	Jubail	ECT/MFL/RFT/IRIS
13	Nesma Trading Co. Ltd.	Al Khobar	Eddy Current Testing
14	SABIC - Sharq	Jubail	Eddy Current Testing
14	SABIC - Safco	jubail	Eddy Current Testing
15	SABIC - United	jubail	Eddy Current Testing
15	Mis ARABIA	jubail	Eddy Current Testing
17	SABIC - Petrokemya	jubail	Eddy Current Testing
17	SABIC - Safco	jubail	Eddy Current Testing
18	SABIC - Yansab	Yanbu	Tube Inspection
19	SABIC - Sharq	Jubail	Tube Inspection
20	CHEMANOL	Jubail	Tube Inspection
21	SABIC - United	Jubail	Eddy Current Testing
22	Tasnee	Jubail	Eddy Current Testing

Thermal Imaging

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



Helium Leak Test

Helium Leak Test – Benefits



Why Helium Leak Test?

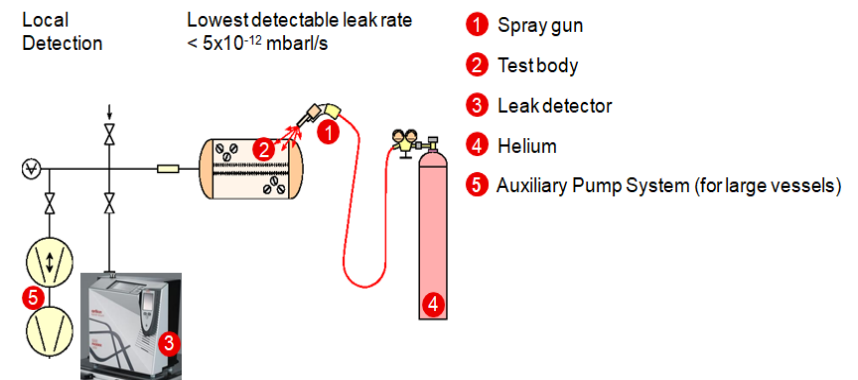
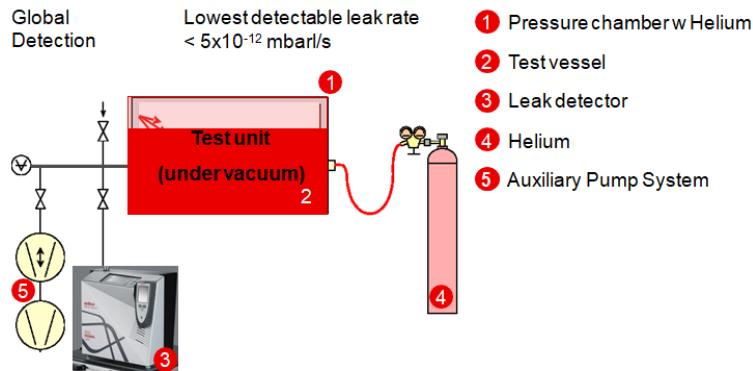
- **Product Life**
- **Reliability**
- **Avoid unexpected shutdown**

Why Helium is a good tracer gas?

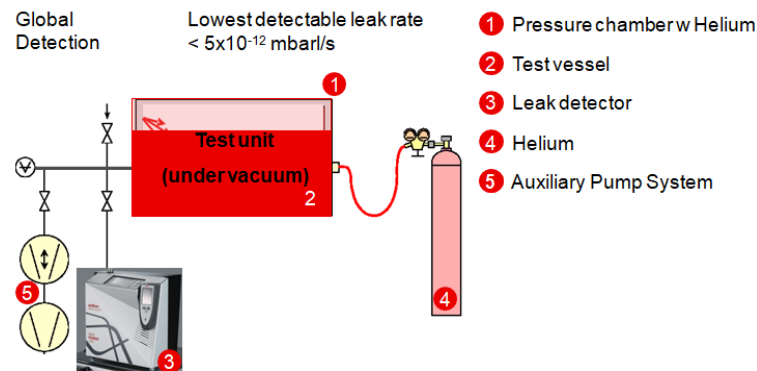
- Low concentration in air , only 5 ppm, so low natural background
- Inert gas, non toxic, non- explosive, environmentally friendly
- Good separation in a mass spectrometer (no cross sensitivity to other gases and no mass fragments)
- Lighter than air
- Very small gas molecule, can easily pass through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

Helium Leak Test – Technique

Vacuum Method



Global Detection – He Outside

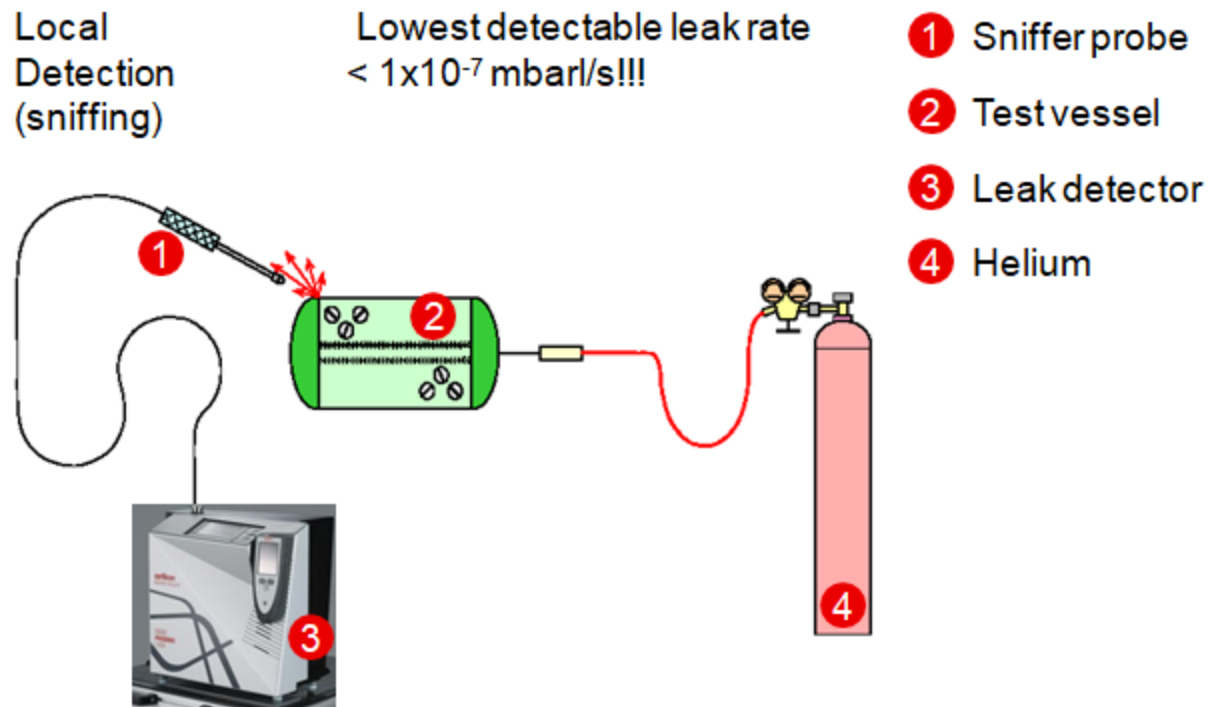


Global Detection – He Inside

Local Detection

Helium Leak Test – Technique

Pressure Method



Helium Leak Test – Major Projects

SL	CLIENT	LOCATION	SERVICES
1	Sabic (Kemysa)	Jubail	Helium Leak Test
2	Hydro Pumps & Seals Industries	Jubail	Helium Leak Test
3	Al Sharq Flexible Packaging Fac.	Riyadh	Helium Leak Test
4	TCR FZC (UAE)	Kuwait	Helium Leak Test
5	Saudi Chevron	Jubail	Helium Leak Test
6	Daelim Saudi Arabia Co.	Jubail	Helium Leak Test
7	Sabic Sharq	Jubail	Helium Leak Test
8	Advanced Petrochemical Co.	Jubail	Helium Leak Test
9	Samsung C & T	Qurrayah	Helium Leak Test
10	Al Sharq Flexible	Riyadh	Helium Leak Test
11	Sabic Gas	Jubail	Helium Leak Test
12	Advanced Petrochemical Co.	Jubail	Helium Leak Test
13	SABIC Arrazi	Jubail	Helium Leak Test
14	Saudi Kayan	Jubail	Helium Leak Test
15	WAHAJ	Riyadh	Helium Leak Test
16	ISCOSA	Dammam	Helium Leak Test
17	MIS Arabia	Jubail	Helium Leak Test
18	Sadara Chemical Company	Jubail	Helium Leak Test
19	Gulf Heavy Industries Co.	Jubail	Helium Leak Test

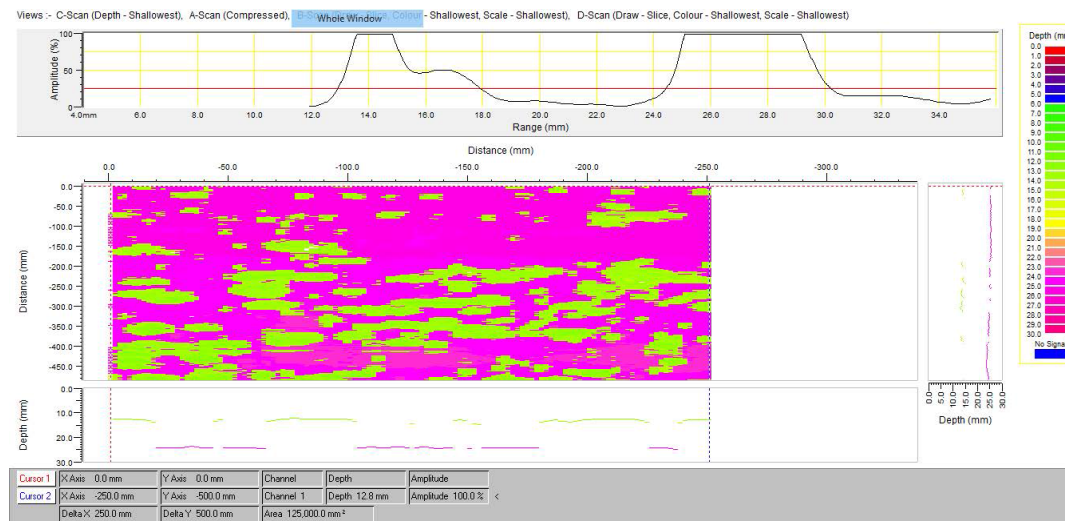
Stepwise Crack Detection (SWC) & High Temperature Hydrogen Attack (HTHA)

- 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).

- Secondary damage caused by HTHA failure in a Refinery/Petrochemical Plant.



- 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



C-Scan image depicting Stepwise Crack

HTHA & SWC – Major Projects

SL	CLIENT	LOCATION	SERVICES
1	GAS / Ibn-SINA Job # 002	Jubail	Corrosion Mapping
2	Saudi Aramco	Marjan	Stepwise Cracking
3	Saudi Aramco	Qatif	Step Cracking/Corrosion Mapping
4	Saudi Aramco	Shaybah	Corrosion Mapping
5	Saudi Aramco	Kursaniyah Gas Plant	Corrosion Mapping
6	Saudi Aramco	Rastanura	Corrosion Mapping
7	Saudi Aramco	Khursaniya	Corrosion Mapping Services
8	Precision Forging Factory (job # 3)	Dammam	Corrosion Testing
9	Saudi Aramco	Haradh Gas Plant	Corrosion Mapping Services
10	Saudi Aramco	Khurs Gas Plant	Corrosion Mapping Services
11	Saudi Aramco	Khurais / Dahrhan	Corrosion Mapping Services
12	Saudi Aramco (HGP)	Hawaiyah	Corrosion Mapping Services
13	Saudi Aramco (HGP)	Hawaiyah	Corrosion Mapping
14	Saudi Aramco - Abu Ali	Abu Ali	Stepwise Cracking
15	Saudi Aramco (ABQ/UDH)	Udhaliyah	Corrosion Mapping
16	Saudi Aramco	Abqiuq	Corrosion Mapping
17	Saudi Aramco	Khursaniya	Corrosion Mapping
18	Saudi Aramco	Jeddah	Corrosion Mapping
19	Saudi Aramco	Shaybah	Corrosion Mapping

Robotic Video Inspection (RVI)

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.



Capability:

Robotic Crawler based pan tilt zoom camera for inspection of any diameter pipelines upto 200 meter length.

Retrieving of foreign objects while inspection for testing & evaluation.

Application:

- Pipelines
- Turbines
- Vessels
- Heat Exchangers
- Coke Drums
- Buried Lines
- Storage Tanks

RVI – Major Projects

Client	PO Number	Year	Plant	Description
SABIC (Ibn-Al-Baytar)	4300043816	2016	Ammonia	Cooling Water Lines
				Sea Water Lines
		2016	Utility	Cooling Water Lines
				Sea Water Lines
		2016	Urea	Cooling Water Lines
				Sea Water Lines
SABIC (SAFCO-IV)	4300141765	2017	Utility	INTERNAL INSPECTION OF UG-SW/CW RTR-FRP INSPECTION, ASSESSMENT AND REVIEW OF ROV CAMERA RESULTS AND CORRECTIVE RECOMMENDATIONS FOR 72" TO 20" SEAWATER SUPPLY AND RETURN UNDERGROUND & ABOVEGROUND FRP & RTR PIPING NETWORK FOR (SAFCO-4)

Automated Robotic Tubular Inspection System (ARTIS)

Reformer & Boiler Tubes Inspection

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.

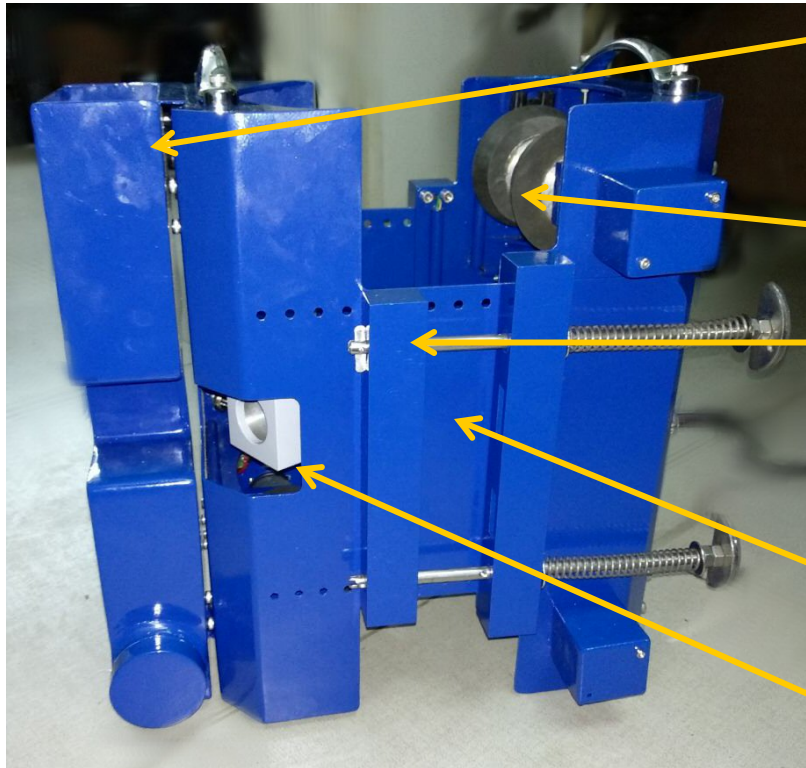
The method follows same principle of manual scanning.

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.

ARTIS - Equipment



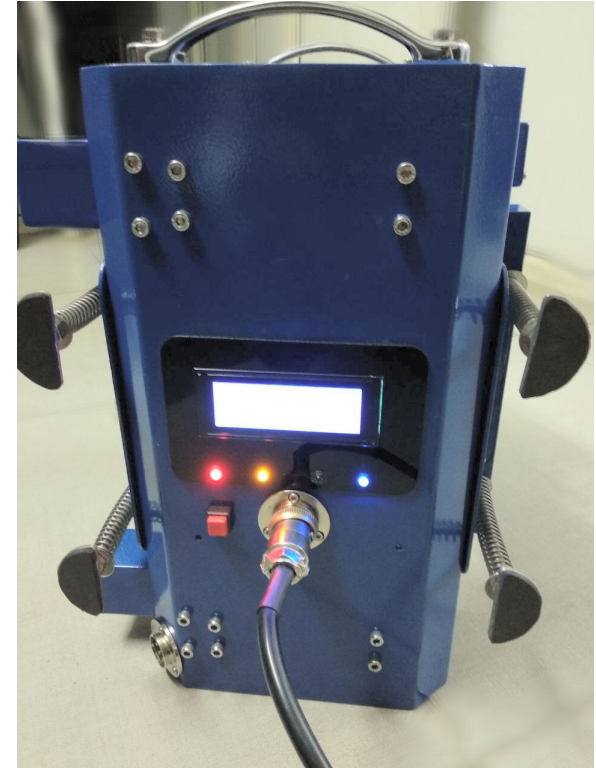
Water tank with pump

Drive

OD measurement

Adjustable arm

UT Probes

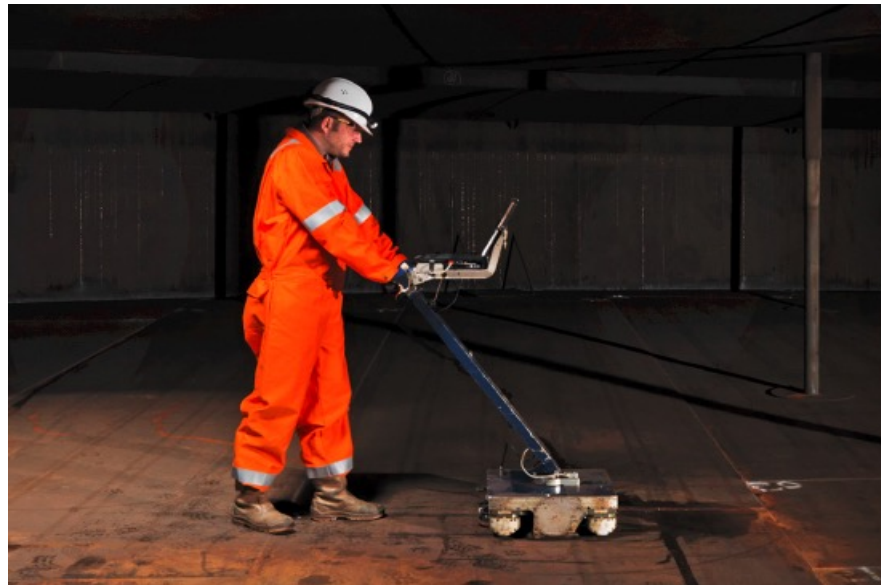


Tank Floor Mapping by MFL

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 20mm Thickness and limited bottom floors can be tested as well. Based on the MFL Tank inspection data Tank Floor condition will be reported.



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



Short Range Ultrasonic Testing (SRUT)

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



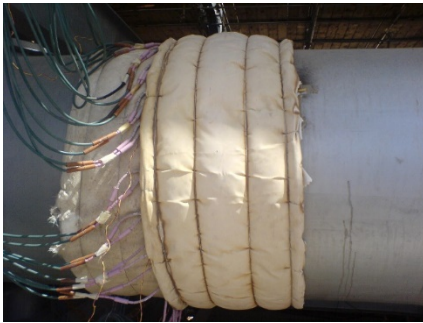
Applications:

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

Heat Treatment Services

Heat Treatment – Major Projects

TCR Arabia provides Resistance Type Heat Treatment Services.



Heat Treatment

SL	CLIENT	SITE LOCATION	SERVICES
1	Saudi Aramco	Hawiyah Gas Plant	Plant Piping
2	Inspection Quality	Marafiq (Jubail)	Plant Piping
3	Saudi Aramco	Hawiyah Gas Plant	Stabilization HT
4	SABIC (Ibn Zahr)	Jubail (During MTBE II TA,2016)	HC Header
5	Al Rushaid Middle East	Al Jubail	CS Piping HT
6	Saudi Aramco	Shedgum	Face Flange
7	MIS Arabia	Jubail, Saudi Arabia	CS Plate HT
8	Welding Alloys	Najran Cement Factory	Heat Treatment
9	Promech	Dammam 1st Industrial	Spool HT
10	Welding Alloys	Turaif Cement Factory	Heat Treatment
11	Al-Tawleed, Shoaiba	Shoaiba IWPP Site, IWPP Project	Plant Piping
12	Al-Toukhi, Riyadh	SEC PP-8 Site, SEC Project	Plant Piping
13	TEKFEN, Khurais	Khurais, Saudi Aramco	Plant Piping
14	Nasser Al-Hajri	Saudi Kayan Project	Plant Piping
15	MIS Arabia	Jubail, Saudi Aramco Project	Pressure Vessels
16	MEPCO	Jeddah	Plant Piping
17	SANTEK	Jizan, SWCC Project	Storage Tanks
18	GATCO	Jizan, SWCC Project	Storage Tanks
19	Al-Hammam	Yanbu, SABIC Project	Plant Piping
20	Arabian BEMCO	Juaymah, Saudi Aramco	Plant Piping

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**
- **Welding Inspectors**
- **Inspection Engineers**
- **Plant Inspectors**
- **NDT Technicians (Level II – ASNT)**
- **Corrosion Engineers**
- **RBI Specialists**

Welder Qualification Services

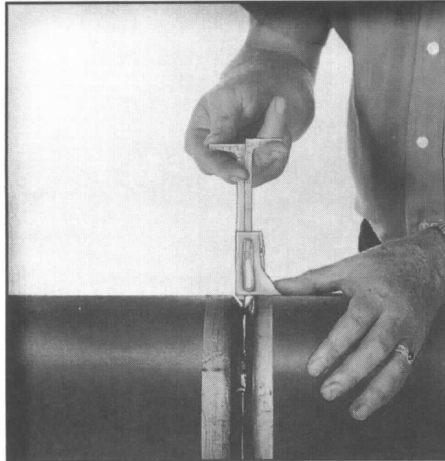
Welder Qualification - Introduction

The basic criterion establishment for 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 welding operator's mechanical ability to operate the welding equipment.

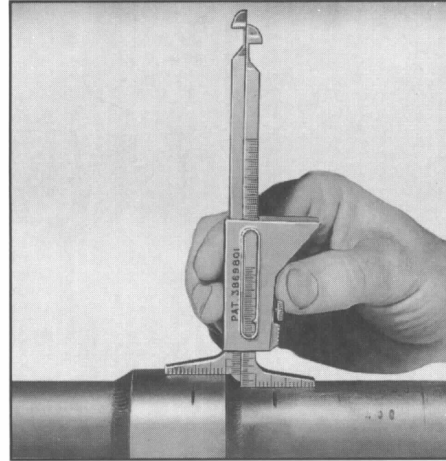
TCR Arabia's team of qualified CSWIP & AWS inspectors are approved by major companies in KSA to qualify welders as per Global Standards.



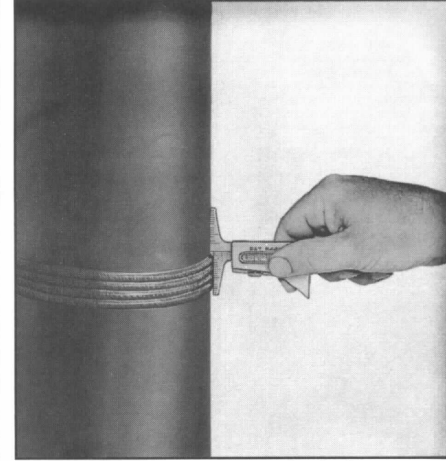
Welder Qualification - Introduction



Measure internal mismatch,
pipe wall.



Measure scribe lines, weld fillet.



Measure crown height.

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Welder Qualification – Major Projects

Sl.	Client	Site Location	Services
1	SAMSUNG Engineering	shaybah	PQR & WQT
2	Br. C.A.T International Co. LTD.	shaybah	PQR & WQT
3	SAUDI ARABIAN ENGG.CO.LTD	Dammam	PQR & WQT
4	Wasmi Holding Co. Ltd.	shaybah	PQR & WQT
5	GAS ARABIAN SERVICES	Jubail	PQR & WQT
6	CRYSTAL GLOBAL	Yanbu	WQT
7	AL SHUWAYER SONS	Dammam	WQT
8	FAUD AL ESSA & PARTNER Co.	Yanbu	PQR & WQT
9	DEMAG CRANES	Dammam	WQT
10	WEATHERFORD	Dammam	PQR & WQT
11	Hadi AL Hammam Est.	Ras Tanurah	PQR & WQT
12	SAUDI SCAFFOLDING	Dammam	WQT
13	NTS Middle East	Dammam	WQT
14	Olyan Descon	Dammam	PQR & WQT
15	Maritime Industrial Services Arabia Co.Ltd.	Jubail	PQR & WQT
16	Saudi Arabian Kentz Co. Ltd.	shaybah	PQR & WQT
17	Al-Babtain Power & Telecommunication Ltd Co.	Riyadh	PQR & WQT
18	AI RUSHAID CONSTRUCTION Co. Ltd	Jubail	PQR & WQT
19	SAUDI KAYAN PETROCHEMICAL COMPANY	Jubail	PQR
20	TAMIMI Industrial Services	Jubail	PQR & WQT
21	Petrojet	Abqaiq	PQR
22	AL Nazim	Jubail	PQR & WQT
23	BEMCO	Riyadh	PQR & WQT
24	EES Vessels Head	Jubail	PQR
25	GULF METALS ENGG.	Dammam	WQT
26	ZAMIL Steel Company	Dammam	PQR & WQT
27	CRISTAL (A TASNEE COMPANY)	Yanbu	PQR& WQT
28	NOMAC	YANBU	PQR& WQT

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
- Failure & Root Cause Analysis



Training – Major Projects

SL	CLIENT	LOCATION	SERVICES
1	Petrorabigh	Rabigh	NDT Level II
2	Future Pipe Industries	Dammam	Metallurgy
3	SABIC (Yansab)	Yanbu	Metallurgy
4	Petrol Steel	Jubail	ToFD Interpretation
5	TUV Rheinland	Dammam	NDT Level II
6	SABIC (MCE)	Dammam	Metallurgy
7	Tihama Power	Dammam	Welder Qualification
8	Olayan Deson	Dammam	UT Level II

Staff Trainings:

Training / Seminar Title	Attended By	Organized by	Location
Corrosion Mapping	<ul style="list-style-type: none"> Nagesh Shinde Mohammed Ehsanulla 	Technology Design	Chershire, UK
Thermography Services	<ul style="list-style-type: none"> Abdul Raheem Dinesh Gupta 	Scanstar	Chennai, India
Phased Array UT	<ul style="list-style-type: none"> TCR Team 	Eclipse Scientific, CANADA	Jubail, KSA
High Temp PAUT	<ul style="list-style-type: none"> TCR Team 	Eclipse Scientific, CANADA	TCR Office, Dammam
Tube Inspection	<ul style="list-style-type: none"> TCR Team 	EIS Inspection, INDIA	TCR Office, Dammam
Metallurgy Services	<ul style="list-style-type: none"> Mohammed Abizur 	TCR Advanced	Baroda, India



Appreciation Letters

بسم الله الرحمن الرحيم

المتحدة
united

Appreciation Letter

SABIC (United) appreciates the efforts of TCR Arabia in providing quality NDT Services during the EG1 plant Shutdown in December, 2010.

Efforts of Inspectors from TCR Arabia helped us complete the desired Turnaround in the specified time.

We wish TCR Arabia great success and anticipate availing their services in future.

Best regards,



Homam Al-Madini
Inspection & Corrosion Section Head


Letter
To: Mr. J. D. Dey
Address: P.O. Box 10000
Riyadh 11511, Saudi Arabia
Tel: +966 (0) 11 500 0000
Fax: +966 (0) 11 500 0000

جيسك
GPIC

Certificate of Appreciation

to
Mr. Jaidev Hasubhai Patel
From TCR Arabia

In recognition of his dedication and hard work in the Gulf Petrochemical Industries Company During Turnaround 2015.


Nader Al-Madani
Inspection Superintendent


Khalid Al-Munir
Technical Services Manager



22 April 2015

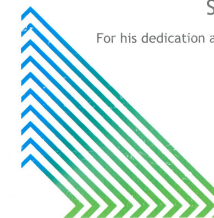


certificate of appreciation

Presented to

Shaik Irfan Allabakshi

For his dedication and outstanding contribution to the Saudi Aramco,
Gas Treat Unit 3 T&I Team



Uti Aramco: Company General Use

أرامكو السعودية
saudi aramco


Mohammed Al-Wadie
HGPMD Superintendent



GE Power Generation Services
Dammam - Saudi Arabia
2015 Supplier EHS Award

Presented to

TCR ARABIA COMPANY LTD

In appreciation and recognition for their outstanding
performance in meeting our EHS expectations.

Kamran Baig
PGS Executive Services Fulfillment

Ferooz Saudagar
PGS Sourcing Manager MEA



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
- 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 STM – 2014
- Participated in Middle East Corrosion Conference in Bahrain in Feb, 2016



Prestigious Projects:

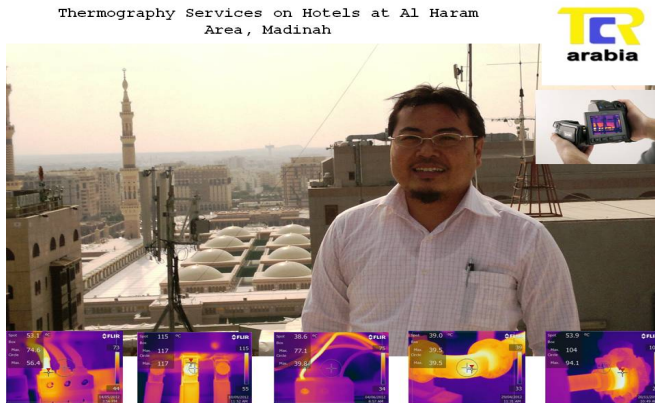


NDT in Masaa Project, Mecca



Harmain Rail Project, Medina

Thermography Services on Hotels at Al Haram Area, Madinah



Thermography at Haram area in Medina



PMI of Zam Zam Filtration Tanks in Haram, Mecca

Major Clients:

سابك
SABIC

أرامكو السعودية
Saudi Aramco



S-Chem

التصنيع TASNEE

صدارة
Sadara



ساتورب
satorp

المتقدمة
Advanced

مرافق
MARAFIQ

بترو رابغ
Petro Rabigh



كيما نول
CHEMANOL
مجموعة كيما نول
METHANOL CHEMICALS COMPANY

الزامل للحديد
ZAMIL STEEL



لوبريف
luberef

BAKER
HUGHES

SAMSUNG SAMSUNG C&T

السعودية
SAUDIA

ياسرف
Yasref

FARABI
PETROCHEMICALS
الفارابي



TEKFEN CONSTRUCTION
SAUDI ARABIA BRANCH

Thank You!

Questions?

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