

# TCR Technology Newsletter

**2nd Quarter  
2018**

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## Topic of the Quarter – Fatigue Test and Fracture Toughness Test



The material testing laboratory of TCR Arabia, has a dedicated team and setup for a large number of metallurgical tests. We have facilities now to undertake Fatigue, Fracture Toughness and Creep testing as well.

We understand that your company seeks testing laboratories. TCR is established and long term service provider and our team would like to present its credentials.

TCR has our strong capabilities in undertaking all your mechanical, chemical, corrosion, fatigue/CTOD, civil and NDT tests. You are sure to find our highly responsive customer service, timely sample pickup, professional and expert analysis of test samples, accurate reporting and above all a competitive pricing model that takes into account your project requirements. TCR is accredited to NABL/ISO 17025 and BIS Standards.

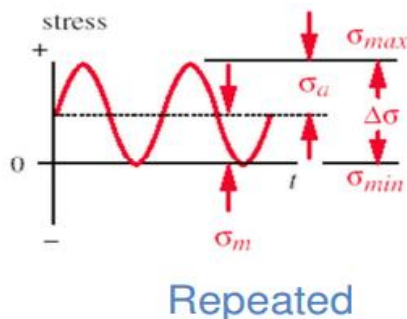
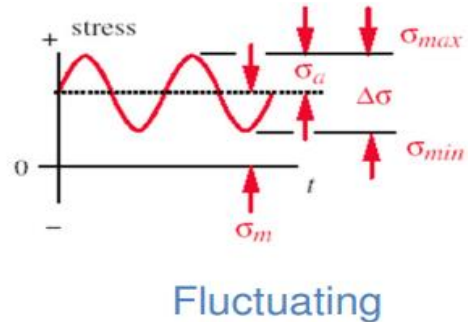
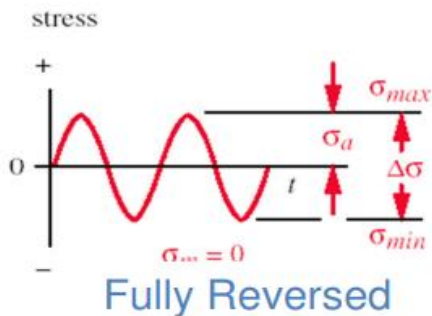
The Fatigue and Fracture Toughness Division comprises of an expert team that undertake the following tests in a timely, cost-effective manner.

### Topic of the Quarter – Fatigue Test and Fracture Toughness Test

#### Introduction to Fatigue Test

- Fatigue may occur when a member is subjected to repeated cyclic loadings (due to action of fluctuating stress and/or strain).
- The fatigue phenomenon shows itself in the form of cracks developing at particular locations in the structure.
- Component subjected to repeated cyclic loadings can undergo progressive damage which shows itself by the propagation of cracks. This damage is called **FATIGUE FAILURE**.

#### Types of fatigue Loading:

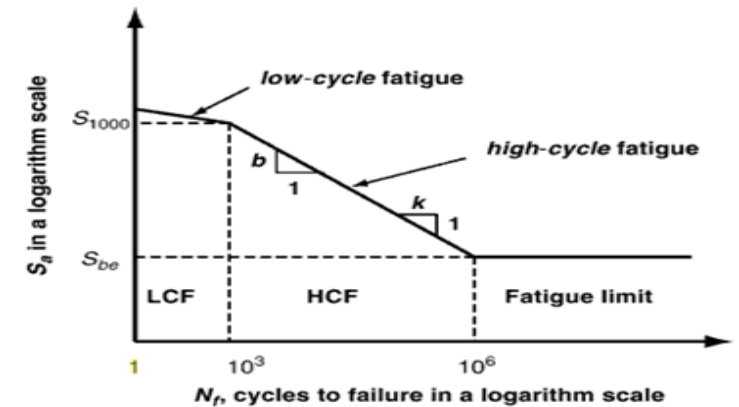
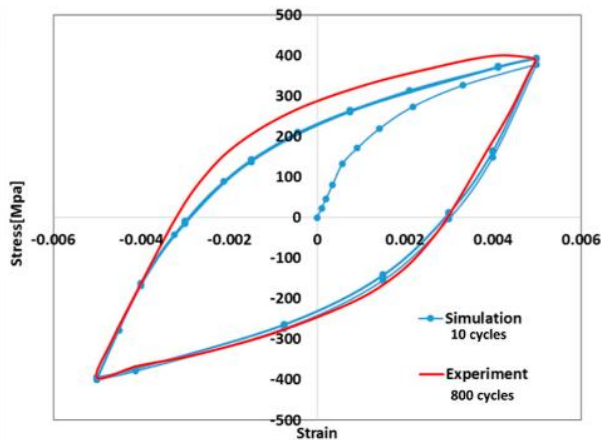


### Topic of the Quarter – Fatigue Test and Fracture Toughness Test

#### Type of Fatigue Test

##### Low Cycle Fatigue testing:

- ▶ In Low Cycle Fatigue (LCF) Testing, i.e. Strain-controlled fatigue, the specimen is cycled to strain levels in elastic-plastic region. This test is conducted in strain-control mode using an extensometer attached to the specimen.
- ▶ LCF tests provide data to generate strain vs. Mo. of cycles curves and are often performed at elevated temperatures to replicate the thermal environments of components designed with a finite life methodology.
- ▶ It is important for situations in which components or portions of components undergo either mechanically or thermally induced cyclic plastic strains that cause failure within relatively few (that is, approximately  $<10^5$ ) cycles.
- ▶ Information obtained from straincontrolled fatigue testing may be an important element in the establishment of design criteria to protect against component failure by fatigue.



### Topic of the Quarter – Fatigue Test and Fracture Toughness Test

#### Type of Fatigue Test

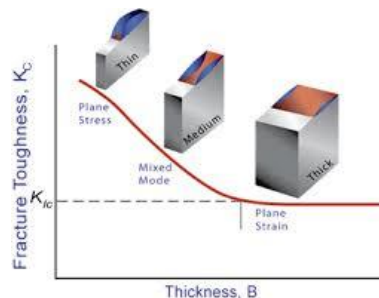
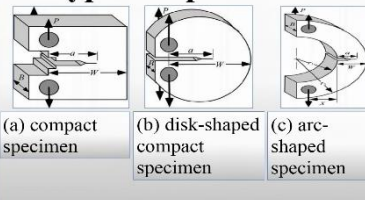
#### High Cycle Fatigue testing:

- ▶ Fatigue is the process of progressive and permanent structural change in a material subjected to cyclic loading.
- ▶ Cyclic loading may lead to crack formation, propagation and eventually fracture.
- ▶ Laboratory fatigue tests are most commonly conducted on smooth bar specimens.
- ▶ High-cycle fatigue (HCF) tests are typically conducted on smooth bar specimens in force control.
- ▶ These tests determine the number of cycles to fracture for each specimen, and the data can be compiled into stress-life (S-N) curves.
- ▶ Nominal stress levels in HCF tests are generally low, significantly below the material's yield strength.
- ▶ As a result, specimen runout may last millions of cycles, creating a need to conduct HCF tests at high frequencies in order to minimize testing time.
- ▶ High-cycle fatigue (HCF) testing, a relatively low force is applied with sub millimeter displacement.
- ▶ This test is typically used in aerospace to study rivets, bolts and other fasteners.

#### Fatigue Testing Facilities at TCR

- ▶ Fatigue is the process of progressive and permanent structural change in a material subjected to cyclic loading.
- ▶ High-performance digital controllers and servohydraulic components for precise control
- ▶ High-lateral-stiffness load frames (50kN & 250kN) and actuators that minimize specimen buckling under high compressive strains.
- ▶ Superior system alignment for minimal bending strain, which helps improve accuracy.
- ▶ Advanced, user-friendly software for test design, execution and data acquisition
- ▶ Extensive selection of grips, extensometers and heating furnace.
- ▶ Unique grips and fixtures specifically designed for 100 Hz HCF applications.
- ▶ Advanced algorithms for maintaining constant load amplitude.
- ▶ Superior system alignment that minimizes bending strain to enhance accuracy for fatigue test of helical springs.

#### V. Types of specimen



### Certifications:

Microbiology Lab of TCR Arabia is now ISO-17025 / SAC Accredited

### شهادة اعتماد Accreditation Certificate



تشهد اللجنة السعودية للاعتماد (ساك) بأن  
Saudi Accreditation Committee (SAC) Declare that

TCR Arabia Co. Ltd. Lab .

Address: Dammam

Scope : Food and agricultural

مختبر شركة تي سي آر العربية المحدودة

العنوان: الدمام

المجال : الغذائية والزراعية

قد حقق متطلبات اللجنة السعودية للاعتماد (ساك) وتم اعتماده وفقاً لمتطلبات المواصفة القياسية السعودية ساسو / آيزو / آي إي سي 17025 وذلك في المجال الملحق بهذه الشهادة

Has met the Requirements of Saudi Accreditation Committee (SAC) and has been accredited in compliance with SASO/ISO/IEC 17025 for the scope attached with this Certificate

رئيس اللجنة  
SAC Chairman



سعد بن عثمان الفصبي  
Saad O. Alkasabi



18/05/1442 : تاريخ الانتهاء / Expire Date

19/05/1439 : تاريخ الاصدار / Issue Date

N-T-00053



### Certifications:

Mechanical Testing Lab of TCR Arabia is now ISO-17025 Accredited



INTERNATIONAL  
ACCREDITATION  
SERVICE®

## CERTIFICATE OF ACCREDITATION

*This is to attest that*

### TCR ARABIA COMPANY LTD.

KING ABDUL AZIZ SEAPORT ROAD  
DAMMAM, KINGDOM OF SAUDI ARABIA  
32224

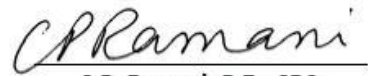
Testing Laboratory TL-783

has met the requirements of AC89, IAS Accreditation Criteria for Testing Laboratories, and has demonstrated compliance with ISO/IEC Standard 17025:2005, General requirements for the competence of testing and calibration laboratories. This organization is accredited to provide the services specified in the scope of accreditation maintained on the IAS website ([www.iasonline.org](http://www.iasonline.org)).

*This certificate is valid up to April 1, 2019.*

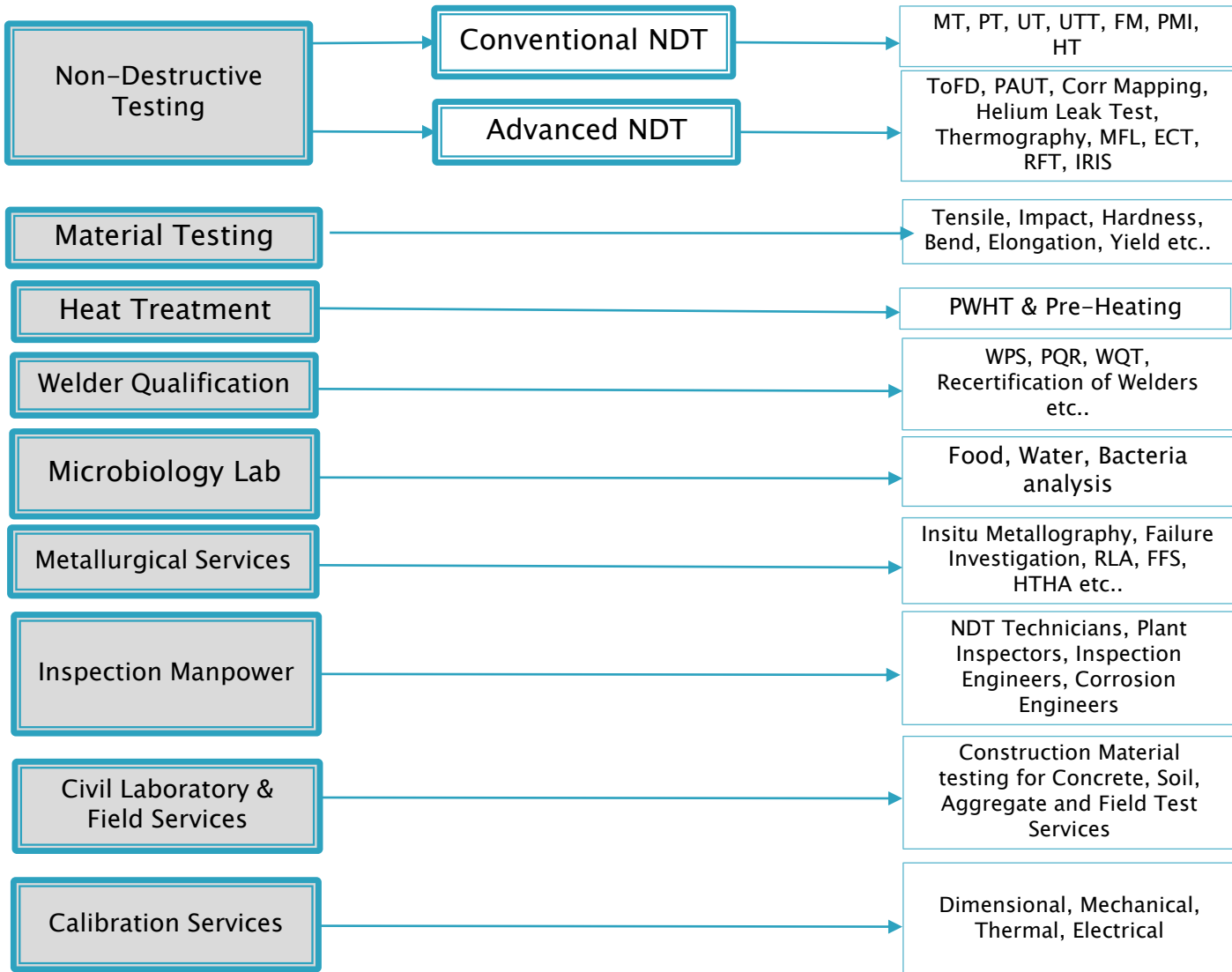


This accreditation certificate supersedes any IAS accreditation bearing an earlier effective date. The certificate becomes invalid upon suspension, cancellation or revocation of accreditation. See [www.iasonline.org](http://www.iasonline.org) for current accreditation information, or contact IAS at 562-364-8201.



C.P. Ramani, P.E., CBO  
President

### Services Portfolio



### Advance / High Temperature Inspection Techniques

Sl.	Service Description
01	Automated High Temperature Corrosion Mapping
02	Automated High Temperature Time of Flight Diffraction UT (ToFD)
03	Automated High Temperature Phase Array Ultrasonic Testing (PAUT)
04	Hydrogen induced Crack Examination (HIC)
05	Stepwise Crack Examination (SWC)

### Advanced Metallurgical Services

Sl.	Service Description
01	Root Cause / Failure Analysis
02	Remaining Life Assessment
03	Fitness for Service
04	Condition Assessment
05	Metallographic Replication / Insitu Replica

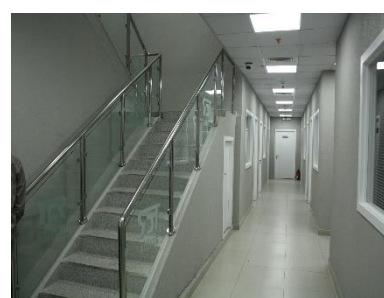
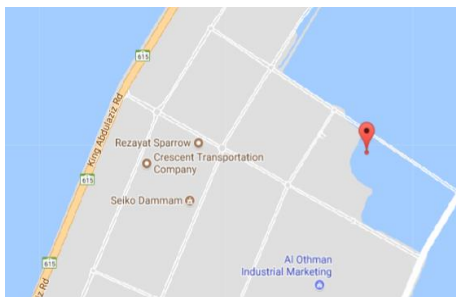


### Events

TCR Arabia Head Office & Labs are now shifted to new location in Dammam



GPS Location: 26.450525, 50.193787



### Events

#### Safety Orientation



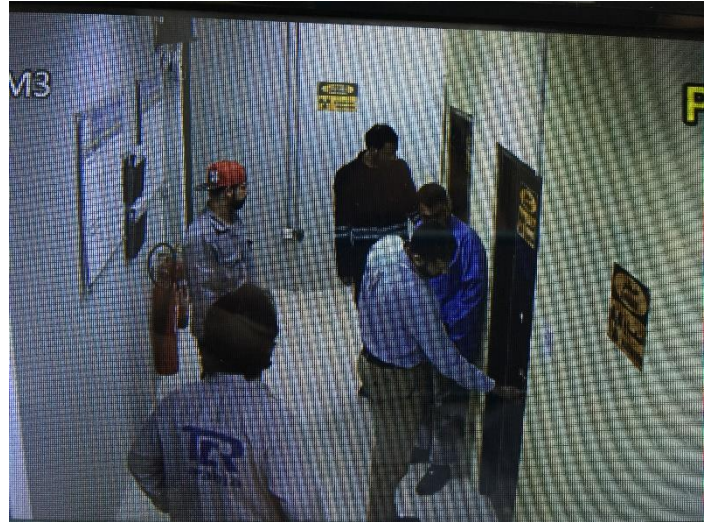
#### Microbiology Laboratory Awareness Campaign





### Events

#### Trainings & Introduction to Radiographic Testing



### Events

#### Trainings & Introduction – ARTIS





### Events

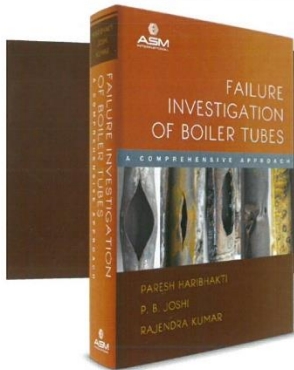
#### Iftar 2018



### Events

#### Book Launch

TCR Arabia is pleased to announce that ASM International is publishing a book authored by our Director Mr. Paresh Haribhakti on "Failure Investigation of Boiler Tubes". Book your copy today at [www.asminternational.org/05243G](http://www.asminternational.org/05243G) or call 800.336.5152



#### FAILURE INVESTIGATION OF BOILER TUBES: A COMPREHENSIVE APPROACH

BY PARESH HARIBHAKTI, P.B. JOSHI,  
AND RAJENDRA KUMAR

Scheduled Release: August 31, 2018

Product Code: 05243G | ISBN: 978-1-62708-156-6  
Hardcover | Estimated Pages: 500

Failures or forced shutdowns in power plants are often due to boilers, and particularly failure of boiler tubes. This comprehensive resource deals with the subject of failure investigation of boiler tubes from basic fundamentals to practical applications.

Coverage includes properties and selection of materials for boiler tubes, damage mechanisms responsible for failure of boiler tubes, and characterization techniques employed for investigating failures of boiler tubes in thermal power plants and utility boilers of industrial/commercial/institutional (ICI) boilers. A large number of case studies based on the actual failures from the field are described, along with photographs and microstructures to allow for easy comprehension of the theory behind the failures.

This book is geared to practicing engineers and for studies in the major area of power plant engineering. For non-metallurgists, a chapter has been devoted to the basics of material science, metallurgy of steels, heat treatment, and structure-property correlation. A chapter on materials for boiler tubes covers composition and application of different grades of steels and high temperature alloys currently in use and future materials to be used in supercritical, ultra-supercritical, and advanced ultra-supercritical thermal power plants. A comprehensive discussion on different mechanisms of boiler tube failure is the heart of the book. Additional chapters detailing the role of advanced material characterization techniques in failure investigation and the role of water chemistry in tube failures are key contributions to the book.

The authors have long-standing experience in the field of metallurgy and materials technology, failure investigation, remaining life assessment (RLA), and fitness for service (FFS) for industrial plants and equipment. They have conducted a large number of failure investigations of boiler tubes and have recommended effective remedial measures in problem solving for power and utility boilers.

Non-Member: ~~\$220~~ **\$199**

ASM Member: ~~\$165~~ **\$149**

Prepublication prices good  
through August 31, 2018

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ORDER YOUR COPY TODAY AT

[www.asminternational.org/05243G](http://www.asminternational.org/05243G)

or call the ASM International Service Center at 800.336.5152.





# TCR Arabia Company Limited

## Inspection, Testing & Advisory

Redefining Reliability

### Training Announcements

#### Month of July 2018

Start Date	End Date	Title	Location
03 July 2018	05 July 2018	NDT-Level II (MPT)	Dammam
11 July, 2018	12 July, 2018	WPS, PQR, WQT	Dammam
17 July, 2018	19 July ,2018	NDT-Level II (MPT)	Dammam
18 July ,2018	19 July,2018	Welding Technology & Qualification	Dammam
24 July, 2018	26 July,2018	Metallurgy for Non-Metallurgist - Training	Dammam
29 July,2018	30 July, 2018	Welding Technology & Qualification	Dammam

#### Month of August 2018

Start Date	End Date	Title	Location
08 Aug 2018	09 Aug 2018	Welding Technology & Qualification (WPS,PQR,WQT)	Dammam
14 Aug 2018	16 Aug, 2018	NDT-Level II (LPT/PT)	Dammam
22 Aug 2018	23 Aug ,2018	Welding Technology & Qualification (WPS,PQR,WQT)	Dammam
29 Aug 2018	30 Aug 2018	Welding Technology & Qualification (WPS,PQR,WQT)	Dammam

#### Month of September 2018

Start Date	End Date	Title	Location
02 Sep 2018	06 Sep 2018	Infrared & Thermography Level I Training	Riyadh
09 Sep 2018	13 Sep, 2018	Infrared & Thermography Level I Training	Dammam
16 Sep 2018	20 Sep ,2018	Infrared & Thermography Level I Training	Abha
30 Sep 2018	04 Oct 2018	Infrared & Thermography Level II Training	Riyadh

### Staff Skills Enhancement

Certifications achieved by TCR Arabia employees in the 2<sup>ND</sup> Qtr. 2018.

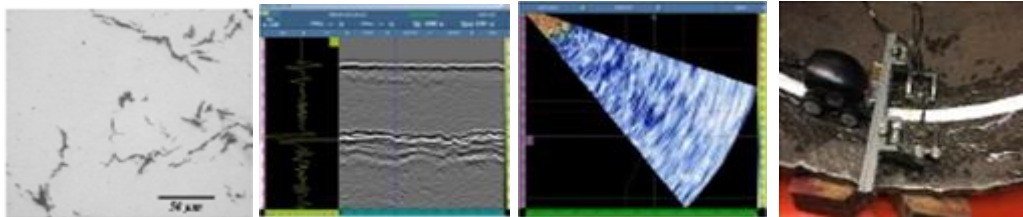
Name	Certification
Waqas Qasim	API 577 / API 653
Mustafa Mohammed Al-Jaber	ASNT Level II, ECT
Hussain Al-Safwan	ASNT Level II, ECT

### HTHA training of TCR Employees in U.S.A

TCR Arabia recently completed training of its chosen staff on HTHA Detection and Sizing (HTHA-40). The training was concluded at Houston, Texas, U.S.A. by Lavender International last May 1-5, 2017.



HTHA course is designed to educate advance UT inspectors on methodologies and techniques to more reliably detect HTHA. The course is founded on extensive work and experience gained during industrial trials as part of the E2G HTHA JIP. Lavender are custodians of the extensive E2G sample inventory and this will be used for HTHA training and certification purposes.



### Client Appreciation Letters



04<sup>th</sup> December 2017

#### EMPLOYEE WORK EXPERIENCE CERTIFICATE

TO WHOM EVER IT MAY CONCERN

This is to certify that **Mr. Waqas Qasim** from M/S TCR ARABIA was assigned as a Plant Inspector during SPV Scheduled Shutdown 2017. He has fulfilled his duties to our satisfaction with respect to his assigned designation in this S/D and he was involved in the inspections for piping, welding, equipment and lead the other disciplines with full dedication and found reliable, self-motivated, and trustworthy. We strongly recommend him to any petrochemical industry, which are undergoing any Turn around and Shut Down.

We wish him best of luck for his future Assignments and Endeavors.

Thanks & Best regards

**Sayed Mumtaz Zaidi**  
Sr. Inspection Engineer

### New Staff

TCR welcomes its new team members and wishes them great success ahead



#### **Mr. Abdullah Mohammed Al-Hasson – Coordinator – Metallurgy Department**

Mr. Ahmed has vast knowledge when in terms in NDT, he graduated with Mechanical Inspection and NDT Technology. His skills list in Radiographic Testing, Ultrasonic Testing, Penetrant Testing, Material Testing and Post Weld Heat Treatment is only few listed in his resume. He believed that joining TCR makes his skills improve and he is confident that growth with TCR makes him dwell in the field of the career he chooses.



#### **Mr. Mustafa Abu Jawhar – Sales Executive – Sales Department**

Mr. Mustafa graduated from university of St. Thomas at United States of America as communication of Business, He was a working student while studying his course, he worked at his school library as IT, after his graduation his first job was and representative in FedEx and when he came back to Saudi Arabia he worked with Extra in few months as HR Support and now he is working with TCR to support the company goals



#### **Mr. Nikhil George – Sales Engineer – Sales Department**

An Engineer with a master's in manufacturing engineering, worked as a QA/QC engineer at an aluminum component manufacturer specializing in automotive components at Pune, Maharashtra. Also certified Level II in the NDT methods of UT, MT, PT, LT, RT and ET as per SNTC-IA-2016



#### **Mr. Khalid Alsabi Al-Bennaqi – NDT Technician – NDT Department**

Mr. Al-Bennaqi has completed high school with general average of 77% overall. His entry level qualification landed him an NDT job at TCR Arabia. He has 2 months experience in Jarir Bookstore and has 1 month experience in Axiom Telecom. He has familiarize with most computer operations. Good thing about Mr. Al-Bennaqi is fervor to learn and he is willing to improve the new path that he is taking, he has great desire to work in TCR Arabia to comply and be part of it's success, also desires to develop himself and contribute to the new field he has chosen.



#### **Mr. Ahmed Al-Nasserallah – NDT Technician**

Mr. Ahmed has vast knowledge when in terms in NDT, he graduated with Mechanical Inspection and NDT Technology. His skills list in Radiographic Testing, Ultrasonic Testing, Penetrant Testing, Material Testing and Post Weld Heat Treatment is only few listed in his resume. He believed that joining TCR makes his skills improve and he is confident that growth with TCR makes him dwell in the field of the career he chooses.