



Date: 11th & 12th October, 2019

Timing: 9:00 am to 6:00 pm

Venue: Evolve by TCR, 215 Pancham Icon, Nr. D-mart, Vasna Road, Vadodara, Gujarat.

Course Need:

- When designing equipment for low-temperature applications, it is important to keep in mind that low temperature can adversely affect on properties of many commonly-used engineering metals.
- Low temperature application of metallic components needs an engineering understanding for reliable and safe operation. It is well known that metals/alloys behavior different with respect to temperature applications. For cryogenic or low temperature services the principal damage mechanism is susceptibility to brittle fracture arising from DBTT (ductile to brittle transition temperature) phenomena. The mechanism and behavior of different metals would help to take timely decision with respect to allied damage mechanisms and its effect on properties. This course is designed to help design, fabrication, maintenance and inspection engineers dealing with cryogenic services.

Course contents

I. Basic principles of Metallurgy

- Metallurgical Characteristics controlling properties
- Strengthening Mechanism
- Guidelines for selection of materials

II. Tensile Properties and Testing

- Basics of Elastic & Plastic Deformation
- Strain Hardening & Strain Rate Hardening
- Concept of Safety Factor
- Material & Test Variables affecting Tensile Properties

III. Hardness Test

- Basics of Indentation Hardness Test
- Macro v/s Micro Hardness

- Guidelines for accurate Hardness Test

IV. Bend Test

- Test Variables v/s Bend Ductility
- Bend Test for Welding Qualifications

V. Impact Toughness Test

- Ductile v/s Brittle Fracture
- Toughness Test parameters for Characterizing susceptibility to Brittle Fracture
- Low Temperature Embrittlement and fracture

VI. Inspection Techniques for low temperature services

- Basic Concepts & Test methodologies

VII. Significance of Flaws with respect to Brittle Fracture

- Defect types having pronounced effect in low temperature service
- Non-ferrous materials in low temperature service

VIII. Assessment of existing equipment for brittle fracture

- API 579 Evaluation approach
- Data required to be studied
- Levels of Assessment Involved and their basis

X. Ductility to brittle transition

- Conditions leading to loss of ductility
- What makes metal brittle?

XI Practical Demo for various mechanical tests

Who should attend?

- Mechanical Engineers of middle management level
- Maintenance / Inspection Engineers
- Process engineers/ Design engineers

- Plant Engineers / Managers
- Other Technical, Laboratory, Sales Personnel, Engineer from other disciplines
- Management and administrative staff, who needs a working knowledge and understanding of metals and their applications

Registration:

The course is limited to **25 participants** only and participation will be decided on first come first served basis. Interested candidates can register by filling attached registration form. The course fee includes participation, course material and stationery. Tea / coffee and working lunch will be served. Participants have to make their own arrangements for accommodation and local conveyance. The course fee is non-refundable; however in the event of cancellation of training program by TCR for some unavoidable reasons, it will be refunded. TCR accepts the change in nomination.

Course fee:

Single participant: Rs. 20000.00 for Indian delegates & USD 370 for foreign delegates.
GST @ 18.00 % applicable on above fees.

Payment mode:

Interested participants should mail/ E-mail the registration form along with DD/at par cheque in favour of "TCR ADVANCED ENGINEERING P LTD." at the address mentioned in attached registration form.

Forward your Registration forms to: Mr.Rajesh Kumar

Training In-Charge,
TCR Advanced Engineering Pvt. Ltd.,
250/9 GIDC, Makarpura, Vadodara.
Ph: 0265-2657233, 7574805594-96
Email: rajesh@tcradvanced.com

Registration form can be downloaded from our website:

<http://tcradvanced.com/coursecalender.php>

For more course details, check our FB page: -

<https://www.facebook.com/EvolveTCR/>

Faculty:



Mr. Paresh Haribhakti
MD, TCR Advanced

Authored the book titled as "Failure Investigation of Boiler Tubes". He has over two decades of experience in the field of metallography & microstructural examination and has solved more

than 3000 industrial problems. He is pioneer in promoting in situ-metallography. Solved materials and service related problems and performed failure analysis on components from petrochemical plants, oil and gas transmission pipelines, offshore structures, ships, pharmaceutical plants, food processing equipment, gas turbine engine components, and weldments.



Dr. P B Joshi

Professor
Metallurgical & materials MSU- Baroda
Consultant, TCR Advanced

Authored the book titled as "Failure Investigation of Boiler Tubes".

Dr. P B Joshi is a professor in department of metallurgical and materials engineering, Faculty of technology and engineering, Maharaja Sayajirao University, Vadodara. He is a Ph. D. in material engineering.

Dr Joshi is having more than 25 years of teaching experience in the field of metallurgy. He has more than 50 research publications in international journals & national journals, and authored a book titled "Materials for Electrical and Electronic Contacts".



B.K.Shah

EX-Head,
Quality Assurance Division.
BARC

- Shri B.K. Shah has done B.Sc. Eng. (Metallurgy) from Regional Institute of Technology (RIT), Jamshedpur (First Class with Distinction- 1st Rank) and MTech. (Corrosion Sc. & Eng.) from Indian Institute of Technology (IIT), Bombay (CPI 10.0- 1st Rank). He joined BARC in 1973(17th batch of BARC Training School). He has been outstanding scientist of the department of Atomic energy. He retired as head, Quality assurance division, BARC on 31st December 2011. Presently, he is Raja Ramanan Fellow at BARC, Mumbai.

His field of work includes:

- Quality assurance in the manufacture of nuclear fuel & reactor core components
- Material characterization & corrosion monitoring by NDT
- Metallurgical failure analysis
- In-service inspection
- Corrosion studies on reactor materials
- NDT education & training



EVOLVE by TCR

INNOVATE YOUR SKILLSET, EMPOWER THE MIND

**** Please contact our training centre for any specific or customised programs**



Mr. Ketan Upadhyay

GM – Reliability Engineering
TCR Advanced

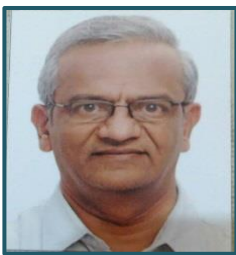
- He has experience of 26 years in the field of NDE, acoustic emission techniques, vibration measurement and signature analysis, failure Investigations, microstructure interpretation, scanning electron microscopy and digital imaging system.
- He is a qualified level II for acoustic emission testing (IISC Bangalore), vibration analyst VT-II (Entec IRD) and ultrasonic flaw detection (EEC Mumbai) techniques.



Mr. M. N. Patel

Ex. Associate Professor
Metallurgy & Materials Eng. Dept.
Consultant, TCR Advanced

- He has 35 years of teaching experience in UG and PG level in subjects like plastic deformation of metals, mechanical metallurgy, NDT and failure analysis, mechanical behaviour of materials, selection of materials and failure analysis, physical metallurgy and welding metallurgy.
- He has Published 16 research papers in various national journals in the field of weldability of steels, corrosion, sensitization of stainless steels and failure analysis.



Mr. Hemant Pradhan

Technical consultant
TCR Advanced

- Hemant Pradhan is a Mechanical engineer with over 34 years of experience in design, detail engineering services, projects, inspection, mechanical construction, procurement, estimation etc. for fertilizer and petrochemical plants and projects.
- His major experience field has been design, detailed engineering, trouble shooting of fertilizer plants like ammonia, urea, DAP, ASP, AS, phosphoric acid, sulphuric acid etc.; petrochemical plants like Caprolactam, Melamine, Nylon-6, and utility/co-generation/boiler, water treatment plants. He is also involved in engineering jobs for installing new projects, de-bottlenecking, capacity augmentation, plant modifications, addition of

new sections; trouble shooting; estimation; procurement; inspection; expediting for more than 30 years.

- He has participated in design conferences at international and national level with process licensors/ detail engineering firms like M/s Enco, Switzerland; M/s INCRO SA, Spain; Tunisian Joint Venture, Tunisia; M/s Schmidt & Clemens, Germany M/s Davy power gas, M/s Uhde, M/s Linde, at India.
- He has vast experience in executing trouble shooting jobs in major plant equipment like primary reformer, air pre-heaters, waste heat boilers, various heat exchangers, isothermal shift reactor, urea reactor, high pressure decomposer, high pressure plunger pumps & their discharge piping, contact furnace, decomposer, sulphur combustion furnace boiler, etc.
- Mr. Pradhan has headed various departments like inspection, mechanical construction, workshop and phosphoric acid and fibre unit plants. He also has experience in dealing with statutory authorities and third-party inspection agencies.