



**Dates:** 24<sup>th</sup> -25<sup>th</sup> - August 2018.

**Timing:** 9:00 am to 6:00 pm.

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

## Course Objective:

This intensive, 16-hour course will teach participants the role of metallurgy and prevailing high temperature degradation mechanism of various super alloys that defines the integrity of gas turbine unit. The most current industry problems and failure modes will be presented, along with many recent case histories. Time is allotted for course attendees to discuss their own case studies and establish next-step options for failure prevention and life assessment. Each participant receives a comprehensive set of course notes updated with the latest industry issues.

## Who Should Attend?

- Engineers of middle management level
- Maintenance / Inspection Engineers
- Process engineers/ Design engineers
- Plant Engineers / Managers
- Surveyors / Loss assessors
- Other Technical, Laboratory, Sales Personnel, Engineer from allied disciplines
- Management and administrative staff, who need a working knowledge and understanding of metals and their applications,

## Course fee:

- Single participant: **Rs. 14500** for Indian Delegates & USD 450 for Foreign Delegates.
- 10 % discount in case of 3 or more participants from same organization. GST @ 18.00 % applicable on above fees.

## Course Content:

**Super alloys:** Metallurgy of super alloys and coatings. Metallurgical degradation of base-metal and coating during service exploitation.

**Gas turbine Design:** Performance improvements and their effects on long term reliability. Risks of updating gas turbine output and industry experience.

**High Temperature Degradation/Failure Mechanisms:** Delving into gas turbine high temperature material degradation & component failure mechanisms contributed by: Creep, Fatigue, Thermal-Mechanical Fatigue, Creep-Fatigue Interaction, Embrittlement, Oxidation Damage, Hot Corrosion Damage, and Over-temperature Exposure.

**RCA Analysis:** Performing effective RCA analysis - Identifying mechanism, causes and circumstances of primary failure of a component failure. Methodology to arrive at recommendations to avoid recurrence.

**Turbine Casing Cracks:** Classifying the failure mechanisms that contribute to cracks and what are the areas of concern that should be evaluated during each outage.

**NDT Health Assessment of Turbine rotor blade, guide vane & Disc:** NDT selection criteria and execution for condition assessment of turbine units.

**Rejuvenation of Hot Gas Path Components:** Methodology for effective utilization of components by reclamation of original structure & properties at periodic intervals.

**Health assessment technologies:** Uncovering new advanced cost effective approaches to life extension of turbine units.

### Key Benefits:

- ✓ Providing delegates with a practical understanding of the prevailing high temperature degradation mechanism of various super alloys that defines the integrity of gas turbine unit.
- ✓ Making the delegates familiar with the most common industry problems and failure modes.
- ✓ Provides information about Residual Life Assessment Methodology and Non-destructive

### Registration:

The course is limited to 15 participants only and 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.

### 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.

### Training Sessions

#### Topics

Introduction to Gas Turbine

Basics of Metallurgy for Gas Turbine Materials

Damage Mechanism of Gas Turbine Component

Coatings for Gas Turbine components and degradations

Rejuvenation and Remaining life assessment of hot gas path components

NDT for Gas Turbine components

Failure analysis: fatigue due to over temperature & hot corrosion, TMF cracking and fatigue due to over temperature.

Case studies of Gas Turbine components

Advances in Gas Turbine Technology

### Online Registration:

Registration form can be downloaded from our website: <http://tcradvanced.com/coursecalendar.php>

For more course details, check our FB page: - <https://www.facebook.com/EvolveTCR/>

**Mr. Karan Shah**, Manager

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Mobile: +91 7574801050

## Faculty:

This course will be conducted by renowned experts with vast experience in Gas Turbine. Course faculty are:



**Mr. Paresh Haribhakti**  
MD, TCR Advanced

- He has over two decades of experience in the field of metallography and microstructure examination and has solved more than 3000 industrial problems. He is pioneer in promoting in situ-metallography.
- Solved materials engineering 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. S. R. Singh

- He has more than 43 years of Research & Development experience in the area of phase transformation, electron microscopy, deformation behaviour, alloy development, nanocrystal line functional materials and failure analysis & remaining life assessment / life extension of engineering components
- He has been actively engaged in development of advanced & functional material, i.e., shape memory alloy, damping alloy, Nano-materials, various types of steels, irradiation resistant material by Nano-coating, titanium aluminides, high temperature oxidation resistant coating and rejuvenation technology for hot gas path components of gas turbines & aero engines
- He has published 65 research papers in international journals and one book entitled "Failure Analysis". He also holds two patents and more than 130 confidential investigation reports of failure analysis of engineering components.



## Mr. M. N. Patel

Ex. Associate Professor  
Metallurgy & Materials Engg Dept.  
M. S. University of Vadodara



- He has 33 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 weld ability of steels, corrosion of steels, sensitization of stainless steels and failure analysis.
- He is the Life Member of Indian Institute of Metals, Indian Institute of Welding & Indian Society for Technical Education.

## Mr. Ketan Upadhyay

GM – Reliability Engineering  
TCR Advanced

- He has experience of 23 years in the field of NDE, Acoustic emission techniques, Vibration measurement and signature analysis, Failure Investigations, microstructure interpretation, Scanning electron microscopy and digital imaging system
- He is a qualified level II for Acoustic Emission testing (IISC Bangalore), Vibration Analyst VT-II (Entec IRD) and Ultrasonic Flaw Detection (EEC Mumbai) techniques
- He is actively involved in Plant Reliability Engineering and risk based inspection projects for different components such as heater piping, reactors and static equipment of petrochemical and refinery industries.

