ROOT CAUSE ANALYSIS FOR BOILER & STEAM CYCLE FAILURES

12 – 13 MARCH 2018, MANILA, PHILIPPINES

TOPICS COVERED

- Review of Steam Cycle Damage Mechanisms
- Steam Cycle Components and Failure Modes
- Collecting Evidence and Identifying the Failure Mechanism
- Root Cause Analysis Methods
- Sample Case Histories and Discussion

Expert Course Faculty Leader
James W. Malloy

SGD 2400 for 2 Participants or More
ROOT CAUSE ANALYSIS FOR **BOILER & STEAM CYCLE FAILURES**
12 – 13 MARCH 2018, MANILA, PHILIPPINES

**About This Training Course**

This training course is primarily intended for experienced O&M staff working in thermal power and process plants as well engineering and management staff at the corporate level. The objective is to give attendees all the essentials for effective determination of the root cause of failures that can occur in the boiler or associated steam balance-of-plant. The principal failure modes are reviewed, with focus on those occurring in the boiler, critical piping and other key components such as pressure vessels and condensers.

Major emphasis is placed on analyzing how upstream events in the steam cycle process can lead to failures in downstream components. Several actual failure case histories treated by Tetra Engineering staff at plants around the world are presented, providing attendees with practical application of the presented concepts.

**Course Learning Outcome**

- Gain an overview of the most common damage mechanisms, either on the waterside or fire/gas/air-side, that can affect components in the steam cycle
- Understand how to define the problem, collect the evidence and then identify the component failure mechanism, which is not the same as the failure root cause.
- Acquire insight into the various root cause analysis methods, their respective merits and how several were applied in some actual case studies

**Who Should Attend**

Engineers of all disciplines, managers, technicians, design, maintenance and operations personnel, and other technical individuals who need a comprehensive introduction to practical optimization, operation and design considerations of a major combined cycle power plant.

**Unique Features with powerEDGE Training**

- Pre-Course Questionnaire to help us focus on your learning objectives
- Detailed Course & Reference Manual for Continuous Learning and Sharing
- Practical Exercises & Case Examples to better understand the principles
- Limited class size to ensure One-to-One Interactivity
- Assessment at the end of the course to help you develop a Personal Action Plan
2 Day Course Outline

Review of Steam Cycle Damage Mechanisms
Gain an overview of the most common damage mechanisms, either on the waterside or fire/gas/air-side, that can affect components in the steam cycle
- General Surface Corrosion
- Pitting Corrosion
- Flow Accelerated Corrosion, Cavitation and Fluid Erosion
- Underdeposit Attack
- Fatigue and Corrosion Fatigue
- Creep, Creep Fatigue and other Heat Damage
- Fire or Gas Side Erosion or Attack
- Gas and Waterside Fouling
- Hydrogen Embrittlement
- Stress-Corrosion Cracking

Steam Cycle Components and Failure Modes
A summary of failure modes and mechanisms most frequently observed in various steam cycle components
- Boiler Tubes and Internal Pressure Parts
- Boiler Gas Path and Exterior
- Power Piping (Condensate, Feedwater and Steam)
- Valves and Pumps a (Summary with Focus on Major Items)
- Condensers and Other Heat Exchangers
- Pressure Vessels

Collecting Evidence and Identifying the Failure Mechanism
The key first step is to define the problem, collect the evidence and then identify the component failure mechanism. It’s important to remember that this is usually not the same as the failure root cause.

Root Cause Analysis Methods
There are several methods or approaches to determining the root cause, these are presented in summary fashion here as background. Despite their differences, all follow a similar overall strategy and aim to achieve the same goal. Whatever the method chosen, it is important to remember that the ultimate objective is to find a solution that prevents further failures.
- Defining the Investigation Scope
- Collecting the Field Evidence: Visual, NDE and Destructive Samples
- Process Data Collection
- Overview of Laboratory Analytical Techniques
- Getting the Most Out of Metallurgy
- Effective Reporting

Sample Case Histories and Discussion
Examples from recent projects performed by Tetra staff are presented, covering failure analyses on a variety of steam cycle pressure part components
- Steam Turbine Corrosion
- HRSG Casing Vibration
- Superheater Tube Cracking Failure 1
- Superheater Tube Burst Failure
- HRSG LP Evaporator Tube Burst Failure
- Boiler Tube Fouling
- Others......
Your Expert Faculty – James W. Malloy

James is Principal Engineer and Partner at Tetra Engineering, a leading engineering and inspection consultancy in the thermal power generation sector. Their services assist clients in assuring the performance and integrity of their steam cycle. His areas of specialization are thermal process modeling and analyzing degradation and failure modes in pressure part components. He originally trained and worked as a nuclear engineer and in the machine control sector before joining Tetra in 1991.

Lead Engineer, worked on the design and development of real-time systems for controlling diesel generators and turbines.

Raytheon Company, Development Laboratory, Sudbury, MA. USA 1983-1987
Performed engineering and analyses to improve the resistance of defense electronic systems to spatial environments and effects of nuclear radiation.

Combustion Engineering Inc., Nuclear Division, Windsor CT. USA 1980-1982
Worked in the reactor physics group designing nuclear fuel reloads for US commercial power reactors.
**CANCELLATIONS & SUBSTITUTIONS**

Payment is due in full at the time of registration. Full payment is mandatory for event attendance. I agree to PowerEdge Pte Ltd. payment terms.

**PAYMENT METHODS**

- **By Cheque/ Bank Draft:** Make Payable to PowerEdge Pte Ltd.
- **By Telegraphic Transfer:** Please quote AE1 with the remittance advise

**PAYMENT POLICY**

All bank charges and any local applicable taxes to be borne by payer.

**ATTENDEE DETAILS**

Name .............................. Job title ..........................................................
Tel ......................... Department .......................................................... Email ..........................................................

**COMPANY DETAILS**

Organisation name .......................................................... Industry ..........................................................
Postcode .......................................................... Country ..........................................................
Tel .......................................................... Fax ..........................................................

**ENERGY INSTITUTE**

By Cheque/ Bank Draft: Make Payable to PowerEdge Pte Ltd.
By Telegraphic Transfer: Please quote AE1 with the remittance advise
Account Name: PowerEdge Pte Ltd.
Bank Address: 65 Chulia Street OCBC Centre, Singapore 049513
All bank charges and any local applicable taxes to be borne by payer. Please ensure that PowerEdge Pte Ltd receive the full invoiced amount.

**PAYMENT TERMS**

Payment is due in full at the time of registration. Full payment is mandatory for event attendance. I agree to PowerEdge Pte Ltd. payment terms.

* GST: Exclusive price is only applicable for overseas corporate customers subject to qualifying conditions.

You may substitute delegates at any time. POWEREDGE PTE LTD does not provide refunds for cancellations. For cancellations received in writing more than seven (7) days prior to the training course you will receive a 100% credit to be used at another POWEREDGE PTE LTD training course for up to one year from the date of issuance. For cancellations received seven (7) days or less prior to an event (including day 7), no credits will be issued. In the event that POWEREDGE PTE LTD cancels an event, delegate payments at the date of cancellation will be credited to a future POWEREDGE PTE LTD event. This credit will be available for up to one year from the date of issuance. In the event that POWEREDGE PTE LTD postpones an event, delegate payments at the postponement date will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit.

**OTHER TRAINING**

- EPC Contract Management for Power & Utilities
- Electrical Generators & Excitation Systems
- Ultra Supercritical Power Plants
- The 4 Pillars of Transformer Condition Monitoring

**ON SITE TRAINING**

Can’t make it for the Course? We’ll make the course come to you!!

Simply let us know your preferred time and dates and we will meet you at your schedule and venue.

With a host of highly trained experts, we will be happy to customize your programme with your needs 100% fulfilled.

Contact us today at

info@poweredgeasia.com

(65) 6741 9927

(65) 67478737

www.poweredgeasia.com