

Training Courses and Seminars

Effective Operation of the HRSG and Steam Plant

This course gives attendees a comprehensive yet in-depth survey of a broad range of topics relating to the design, operation and maintenance of the HRSG and associated steam cycle systems. It is primarily intended for operators, plant engineers and maintenance staff at combined cycle power plants. It would also be of interest to personnel at process plants that use heat recovery steam generators (HRSG) or waste heat boilers.

Drawing on our field experience working at power plants throughout the world, the objective is to provide attendees with clear instruction on the operator actions and design issues that impact boiler and steam plant reliability, efficiency and long-term operating life. The course is typically presented in three days. Course instructors are all full-time consultants at Tetra Engineering with many years experience, both practical and theoretical, working on thermal power plants. If requested in advance, the duration and content can be adjusted to better meet the needs and expectations of a particular group of attendees. The course includes the following material:

Introduction and Historical Perspective

- Comparison of Different Boilers & Cycles
- Materials Used in Boiler Construction

HRSG Design Basics

- Thermodynamics & Heat Transfer Review
- Natural and Forced Circulation
- Supplemental Firing
- Basic Construction Details

HRSG Design Variations

- Types of HRSG
- Variations

Flow Path Descriptions

- Waterside Flow Paths
- Gas Side Flow Paths

Key Components

- Feedwater: Preheaters, Recirculation, Deaerators,
- Economizers: Low, High Pressure
- Evaporators & Drums
- Relief and Safety Valves
- Superheaters, Reheaters, Attemperators
- Drains, Vents
- Casing/Setting

Control and Instrumentation

- Drum Level
- Pressure and Temperature
- Spray Systems

Operations

- Startup/Shutdown and Cold/Warm/Hot Starts
- Partial Load Operation
- Operation with Different Fuels

Waterside Damage Mechanisms

- Surface Corrosion & Pitting
- Flow Accelerated Corrosion
- Corrosion Fatigue
- Other Mechanisms

Water Treatment Overview

- Fundamentals
- Impurities in Water
- Water Pre-Treatment Methods

Boiler and Feedwater Treatment

- Treatment Programs
- Purity Requirements

Steam Purity, Steam Separation, Carryover

- Turbine Purity Requirements
- Carryover

Layup

- Damage Mechanisms
- Waterside Layup
- Gas side Layup

Gas Side Damage

- Cold-End Deposition
- Gas side Corrosion
- Thermal Effects
- Distortion and Failures of Liners, Supports and Baffles
- Duct Burner and Emission Control Equipment Failure Modes
- Degradation of Expansion Joints and Penetrations

Identifying the Cause of Failure

- Root Cause Failure Analysis Methodology
- In the Field: Visual and NDE Inspection
- In the Laboratory: Chemical, Metallurgical and Fracture Testing

Power Piping

- Codes and Standards
- Review of Design Criteria
- Examples of In-Service Degradation
- Standard Maintenance Activities
- Engineering Analysis
- Pipe Hanger Types and Specifications

For more information please contact:

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