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# **Feedwater Heater Training / Operations and Maintenance**

**Presented by:**

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## **General Description of Closed Feedwater Heater Design**

- **Basic Overview**
- **Feedwater Heater Internals and Functions**
- **Heat Transfer Relationships**
- **Standards and Guidelines**

## **Operational Guidelines**

- **Placing Heater in Service**
- **Performance Parameters**
- **Allied Systems**
- **Performance Analysis and Modeling**
  - **On-line Monitoring**
  - **Off-line Modeling**
  - **Performance Testing**
- **Predictive Performance**

## **Significant Patterns of Failure & Understanding Key Problems**

- **Level Control**
- **Tube Vibration**
- **Erosion/Flow Accelerated Corrosion (Tubeside)**
- **Steam Impingement/FAC (Shellside)**
- **Other types of Corrosion**
- **Venting**
- **Principal Areas of FWH Problems**

## **Lifecycle Management Approach**

- **Routine Inspection and Testing**
  - **Visual Inspections**
  - **Leak Testing**
  - **Tube Leak Location Detection**
- **NDE**
  - **Eddy Current**
  - **UT and Others**
- **Individual Tube Hydrotesting**
- **Metallurgical Analysis**
- **Failed Tube Sampling**
- **Failure Cause Analysis- The Primary Objective**

## **Corrective Maintenance Practices**

- **Tube Plugging**
  - **Principal Problems**
  - **Essential Functions of Organized Program**
  - **Questions Related to Plugging Repair**
  - **Questions Related to Outage Conditions**
  - **Considerations in Selecting Tube Plugging Devices**
  - **Plugging Options – Pros and Cons**
- **Tube Staking/Stabilizing**
- **Tube Sleaving**
- **Custom Repairs (Tube Sheet / Shell)**

## **Replacement Heater Specifications**

- **Heater Replacement Justification**
  - **Heater Performance Factors**
  - **Economic Factors**
  - **Retube vs. Repair vs. Replace**
- **Preparing the Specification**
  - **General Design Features**
  - **Materials of Construction**
- **Selecting a Vendor**
  - **Heater Design Verification**
  - **QA / QC Inspections**

## **Discussion and Question and Answer Period (As necessary)**