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COURSE BROCHURE

Boiler Systems Engineering Training Course

jupiterprime.uk

info@jupiterprime.uk

Registered in the United Kingdom and Saudi Arabia

Boiler Systems Engineering Training Course

Boiler Systems Engineering is a 1-week training course for mechanical and process engineers who specify, assess and troubleshoot steam generators, and it ends with a boiler performance and tube failure dossier for one of their own units. Rising fuel cost, stricter emissions limits and ageing pressure parts mean engineering judgement on heat transfer and tube condition now decides boiler availability. The course is delivered by Jupiter Prime Training.

Why Boiler Systems Engineering Matters Now

Many industrial boilers are running past their original design life while being asked to burn different fuels and follow faster load changes. Each change shifts heat flux, metal temperature and gas-side fouling, so tube failures that were rare become recurring. Owners and insurers expect engineers to explain a failure from evidence, not replace tubes and hope. A site that calculates efficiency losses and reads failure mechanisms correctly cuts forced outages and fuel use together. The course applies EN 13306 for failure terminology and ISO 55001 for life-cycle decisions on pressure parts.

Who Gains Most from Boiler Systems Engineering

- Mechanical engineers who assess pressure part condition and approve tube repairs
- Process engineers who size steam supply and evaluate boiler efficiency
- Reliability engineers who investigate repeat tube leaks and set inspection scope
- Project engineers who specify new or replacement boilers and auxiliaries
- Energy engineers who quantify stack and radiation losses

The greatest return comes when the mechanical, process and reliability engineers who share one utility plant attend together and agree one failure investigation method.

Boiler Systems Engineering Capabilities

Participants move from the heat balance of a boiler to the metallurgy of a burst tube, connecting each loss to a design or operating cause.

- Calculate boiler efficiency by direct and indirect methods — ranking the largest heat losses
- Assess furnace, superheater and economiser heat transfer — explaining shifts in steam temperature
- Specify forced and induced draft fan duty — matching air supply to firing range
- Diagnose tube failure mechanisms from fracture appearance — directing the correct repair
- Weigh repair, replacement or life extension of pressure parts — informing outage budgets
- Communicate failure findings to operations and maintenance — preventing recurrence

Key Boiler Systems Engineering Terms

- Heat flux — the rate of heat transferred per unit area of tube surface, governing metal temperature.
- Circulation ratio — the mass of water circulated through risers divided by the steam produced.
- Long-term overheating — creep damage from tube metal running above its design temperature for extended periods.
- Waterside deposits — scale and corrosion products that insulate tubes and raise metal temperature.
- Indirect efficiency method — calculating efficiency by subtracting each measured loss from the heat input.
- Acid dew point — the flue gas temperature below which sulphuric acid condenses on cold surfaces.

Boiler Systems Engineering Day by Day

Day 1: Boiler Design and Circulation

- Fire-Tube, Water-Tube and Waste Heat Boiler Designs — Choosing for Duty
- Natural and Forced Circulation — Securing Tube Cooling at Every Load
- Drum Internals and Steam Separation — Controlling Steam Purity
- Pressure Part Materials and Design Temperature — Setting Metal Limits
- EN 13306 Failure Terminology — Classifying Pressure Part Defects

Day 2: Heat Transfer Surfaces and Thermal Performance

- Furnace Radiant Heat Absorption — Predicting Exit Gas Temperature
- Superheater and Reheater Arrangement — Controlling Steam Temperature With Attemperation
- Economiser and Air Heater Duty — Recovering Flue Gas Heat
- Gas-Side Fouling and Sootblowing — Restoring Heat Transfer
- Direct and Indirect Efficiency Calculation — Quantifying Each Loss

Day 3: Draft Systems and Auxiliary Equipment

- Forced, Induced and Balanced Draft — Selecting the Fan Arrangement
- Fan Curves and System Resistance — Sizing Margin for Fouling
- Feedwater Pumps and Deaerator Sizing — Securing Supply at Peak Load
- Stack Design and Acid Dew Point — Avoiding Cold-End Corrosion
- Case Studies From Refineries and Paper Mills — Lessons From Auxiliary Failures

Day 4: Tube Failure Mechanisms and Diagnosis

- Short-Term and Long-Term Overheating — Reading Fish-Mouth and Creep Ruptures
- Hydrogen Damage and Caustic Gouging — Linking Failures to Water Chemistry
- Fireside Erosion and Corrosion — Tracing Ash and Sootblower Effects
- Thermal and Corrosion Fatigue — Connecting Cracks to Cycling
- Ultrasonic Thickness and Oxide Scale Measurement — Estimating Remaining Life

Day 5: Practising the Boiler Performance and Tube Failure Dossier

- Efficiency Test Data Exercise — Applying Day 2 Loss Calculations
- Fan Capacity Check Exercise — Applying Day 3 Draft Curves
- Failed Tube Sample Exercise — Applying Day 4 Mechanism Diagnosis
- ISO 55001 Life-Cycle Options — Choosing Repair, Replacement or Life Extension
- Boiler Performance and Tube Failure Dossier — Completing Findings and Actions

Applying Boiler Systems Engineering After the Course

- Run an indirect efficiency calculation on one boiler from current flue gas and fuel data and rank its losses.
- Re-examine the last tube failure on site against the mechanisms covered and confirm or correct its root cause.

Boiler Systems Engineering Questions FAQ

What is boiler systems engineering and why does it matter now?

It is the engineering of boiler design, heat transfer, draft and auxiliaries, and the diagnosis of pressure part failures. Ageing units, fuel changes and faster cycling make evidence-based efficiency and failure analysis essential.

Which roles gain most from boiler systems engineering?

Mechanical and process engineers gain most. Reliability, project and energy engineers who investigate failures or specify boilers also benefit.

How does boiler systems engineering differ from a boiler operations course?

This course works at engineering depth: heat balances, fan sizing and failure metallurgy. An operations course concentrates on shift routines, start-up and water treatment practice.

What do you bring back from boiler systems engineering?

You bring back a performance and tube failure dossier for one of your own boilers. You also return able to calculate losses and name failure mechanisms from evidence.

Boiler Systems Engineering: The Way Forward

The boiler performance and tube failure dossier first informs the scope of the next outage: which tubes to inspect, replace or monitor. Mechanical engineers own it, with process engineers adding efficiency data. After its first outage cycle, revisit the remaining life estimates against new thickness readings, because measured wear shows whether the assumed mechanism was right.