



Consulting and Training | Reach New Heights

Course Name

Improving & Maximizing Boiler Efficiency & Performance

Sector Name

Mechanical Engineering

Document Type

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Improving & Maximizing Boiler Efficiency & Performance

Course Introduction

The continuous performance monitoring of the boiler is the key issue in the safe and efficient operation and maximizing investments. The yearly fuel cost can account for several multiples of the cost of the boiler. Consequently, a difference of just a few percentage points in boiler efficiency can translate into substantial savings.

This course presents the key measures, which can be readily followed and implemented to improve efficiency, save money, and limit environmental impacts. This course attempts to provide simple facts and energy efficiency opportunities in the areas of combustion management, makeup & feedwater management, blowdown system, waste heat recovery, and steam distribution

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Target Audience

- ✓ Automotive Engineer
- ✓ Boiler Engineer
- ✓ Ceramics Engineer
- ✓ Equipment Engineer
- ✓ High-Pressure Engineer
- ✓ Marine Engineer
- ✓ Mechanical Design Engineer
- ✓ Mechanical Engineer
- ✓ Naval Architect
- ✓ Pipeline Engineer
- ✓ Power Engineer
- ✓ Rotating Equipment Engineer
- ✓ Senior Mechanical Engineer
- ✓ Turbine Engineer
- ✓ Validation Engineer

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Learning Objectives

- ✓ Different definitions of boiler efficiency.
- ✓ Direct and indirect methods for evaluating boiler efficiencies
- ✓ ASME standards in boiler performance calculations
- ✓ Sources of errors in calculations
- ✓ Establishing a list of energy losses in a boiler system
- ✓ Combustion analysis; Excess air control and Air-Fuel mix
- ✓ Automation using burner controls and oxygen trims
- ✓ Heat recovery systems (economizers, preheaters, flue gas condensing, etc).
- ✓ Waterside and fireside problems.
- ✓ Blowdown optimization and waste heat recovery using flash tanks/ heat exchangers
- ✓ Energy efficiency in steam distribution
- ✓ Monitoring performance indices leading to more efficient and safe operation.

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Course Outline

✓ **01 DAY ONE**

Module 1:

- ✓ Introduction, objective, and scope
- ✓ Boiler types and parts
- ✓ Boiler Auxiliaries

Module 2:

- ✓ Definitions of efficiency: Combustion efficiency, steam-to-fuel efficiency, and in-service efficiency.
- ✓ Boiler heat balance
- ✓ Losses and Credits
- ✓ Key Factors in Understanding Efficiency Calculations
- ✓ Efficiency calculations by the input and output method
- ✓ Efficiency calculations by the loss method.
- ✓ Comparison between the two methods.
- ✓ Errors in Boiler Efficiency.
- ✓ Typical Uncertainty and tolerances for Efficiency.

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Course Outline

✓ 02 DAY TWO

Module 3

- ✓ Combustion basics, flame temperature
- ✓ Types of Burners: oil-fired, gas-fired, and combined burners
- ✓ Forced draft burner, Comparison between Natural & Forced Draft burners.
- ✓ Burner troubleshooting.
- ✓ Flue gas losses and air fuel ratio
- ✓ Dry flue gas loss
- ✓ Loss due to moisture from the combustion of hydrogen
- ✓ Combustion efficiency of the burner as a function of exhaust temperature
- ✓ Minimum exit flue gas temperature for different fuels

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Course Outline

✓ **03 DAY THREE**

Module 4

- ✓ Combustion Management.
- ✓ Firing control: Fuel gas/Fuel oil pressure, Excess air, Draft in the furnace
- ✓ Typical Excess Air Values for Liquid and Gaseous Fuel Firing
- ✓ Exhaust gas analyzers (dry and wet analyzers)
- ✓ Effects of Air Properties on Oxygen Content
- ✓ Optimized Burner operation.
- ✓ Oxygen trim for optimizing air air-fuel ratio
- ✓ Compu-NOx technology for energy efficiency.
- ✓ Saving from the Air fuel ratio control
- ✓ Saving from the exit gas temperature
- ✓ Saving from replacing burners with new, efficient burners

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Course Outline

✓ 04 DAY FOUR

Module 5:

- ✓ Water quality and requirements of the boiler.
- ✓ ABMA standards.
- ✓ Outside and inside water treatment
- ✓ Energy Losses From Scale Deposits:
- ✓ Blowdown losses.
- ✓ The blowdown rate equation
- ✓ Blowdown charts and calculations.
- ✓ Blowdown Separators.
- ✓ Blowdown Control
- ✓ Blowdown heat recovery
- ✓ Energy recovery from blowdown
- ✓ Flash Steam.
- ✓ Estimating Savings with different cases.

Module 6

- ✓ Casing losses and thermography monitoring.
- ✓ Casing losses estimation.
- ✓ Unaccounted losses
- ✓ More thermal loss sources: failed Valves, steam Leaks, etc
- ✓ Supply Lines and Condensate

✓ Thermal insulation.

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Course Outline

✓ **05 DAY FIVE**

Module 7

- ✓ Net efficiency and effect of Auxiliaries: Forced, Induced, and Recirculating air fans, Soot blowers, Control devices, Fuel pumps, and Auxiliary boilers
- ✓ Energy Recovery Components
- ✓ Preheating combustion air
- ✓ Thermal Insulation
- ✓ Energy conservation projects
- ✓ Typical Flash Recovery System
- ✓ Flue Gas Condensers
- ✓ General Recommendations

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Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
Jan. 18, 2027	Jan. 22, 2027	5 days	4250.00 \$	UAE , Abu Dhabi
June 28, 2027	July 2, 2027	5 days	5950.00 \$	switzerland , Geneva
Aug. 31, 2026	Sept. 4, 2026	5 days	4250.00 \$	UAE , Dubai
Dec. 7, 2026	Dec. 11, 2026	5 days	4250.00 \$	UAE , Dubai

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