



Consulting and Training | Reach New Heights

Course Name

Performance Calculations and Efficiency for power plant

Sector Name

Mechanical Engineering

Document Type

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Performance Calculations and Efficiency for power plant

Course Introduction

In order to improve the performance of a thermal power plant, it is necessary to be able to calculate the efficiency and to monitor the performance. The efficient utilization of fuel in Electric Power Production and desalination plants is the main target of this course. Only by monitoring the performance we can determine whether it is cost-effective to continue operating the plant or alterations of operating conditions or maintenance are necessary. In addition, to improve heat rate, different plant losses must be identified and understood, and innovative methods to decrease these losses taken. This course is devoted to studying methods of calculation and illustrating international codes used for this purpose.

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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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Performance Calculations and Efficiency for power plant

Learning Objectives

- ✓ Illustrate how the efficiency of CCPP can be calculated
- ✓ Learn what cycle parameters affect efficiency
- ✓ Illustrate the importance of the Plant heat rate
- ✓ Calculation of Cost Due to Heat Rate Deviations
- ✓ Learn methods for improving gas turbine heat rate
- ✓ What to consider for improved HRSG performance.
- ✓ What to consider for improved Steam Turbine performance
- ✓ Quantified Benefits of Implementing Recommendations

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Course Outline

✓ **01 DAY ONE**

Module (01) Types of Power Plants

- ✓ Gas Turbine Power Plants.
- ✓ Combined Cycle Power Plants.
- ✓ Cogeneration Plants.
- ✓ Comparison between Different Plants.

Module (02) Combined Cycle Plant Components (CCPP)

- ✓ Gas Turbine components.
- ✓ Heat recovery boiler
- ✓ Steam Turbine components and details
- ✓ Condenser

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Course Outline

✓ 02 DAY TWO

Module (03) Establishing task dependencies

- ✓ Heat balance of a combined cycle.
- ✓ Case study.
- ✓ How to calculate the efficiency of a combined cycle plant.
- ✓ What are the operating factors that influence the efficiency?
- ✓ How would environmental conditions influence efficiency?
- ✓ Overall Plant Performance ASME PTC 46 – 201X.
- ✓ Dependence of overall CCPP efficiency on individual component performance and efficiency
- ✓ What is Heat Rate?
- ✓ Cost of Heat Rate Deviations
- ✓ Financial Loss of increased heat rate for specific power operating power plants.
- ✓ Technology impact on the Improvements of newly built plants compared to previously built plants.

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Course Outline

✓ 03 DAY THREE

Module (04) Performance calculations of Gas Turbine Unit

- ✓ Different gas turbine cycles
- ✓ Determining ISO Power and ISO Heat Rate
- ✓ Correcting for Ambient Temperature, Altitude, Humidity, Inlet and Exhaust Pressure Losses, Mechanical Transmission Losses, and Turbine Deterioration.
- ✓ Part load heat rate
- ✓ Methods of Increasing Power Output
- ✓ Gas Turbine Inlet Air Cooling • Evaporative cooler
- ✓ Fogging system • Mechanical refrigeration system (direct type)
- ✓ Mechanical refrigeration system (indirect type)
- ✓ Mechanical refrigeration with ice storage
- ✓ Mechanical refrigeration system with chilled water storage
- ✓ Single-stage Lithium Bromide Absorption chiller
- ✓ Two-stage Lithium Bromide Absorption chiller
- ✓ Performance Evaluation of Different Inlet Air Cooling Systems:
- ✓ Capital Cost Comparisons of Inlet Cooling Systems
- ✓ Effect of Fouling on Compressor Performance

Performance Calculations and Efficiency for power plant

Course Outline

✓ **04 DAY FOUR**

Module (05) Performance calculations of HRSG

- ✓ Single, double, triple pressure HRSG
- ✓ Arrangement of coils and Evaporator pinch design.
- ✓ Energy balance of HRSG between gases and water
- ✓ Flue gases losses
- ✓ Blowdown losses
- ✓ Casing losses and thermography monitoring.
- ✓ Piping losses and steam leak losses.
- ✓ Impact of boiler efficiency on total plant efficiency.

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Course Outline

✓ 05 DAY FIVE

Module (06) Performance of Steam Turbine

- ✓ Effect of increasing pressure on power output
- ✓ Effect of increasing steam temperature on power output
- ✓ Effect of increasing steam pressure & temperature on power output
- ✓ Effect of changing condenser exhaust pressure on power output
- ✓ Case study
- ✓ Effect of parameter deviation on heat rate.
- ✓ Fluid friction
- ✓ Leakage and new techniques to minimize leakage
- ✓ Moisture, Leaving, and Profile losses
- ✓ Blade path deterioration: steam turbine blade path Audit.
- ✓ Performance improvement from the polishing of turbine blading

Module (07) Performance of Steam Condenser

- ✓ Cooling water flow rate effect on Overall CCPP efficiency
- ✓ Cooling water temperature
- ✓ Fouling in tubes
- ✓ Condensate level problems and their effect on performance

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Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 24, 2027	May 28, 2027	5 days	4250.00 \$	switzerland , Geneva
Aug. 23, 2027	Aug. 27, 2027	5 days	4250.00 \$	UAE , Dubai
Nov. 29, 2026	Dec. 3, 2026	5 days	4250.00 \$	Bahrain , Manama
April 5, 2027	April 9, 2027	5 days	5950.00 \$	USA , Texas

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