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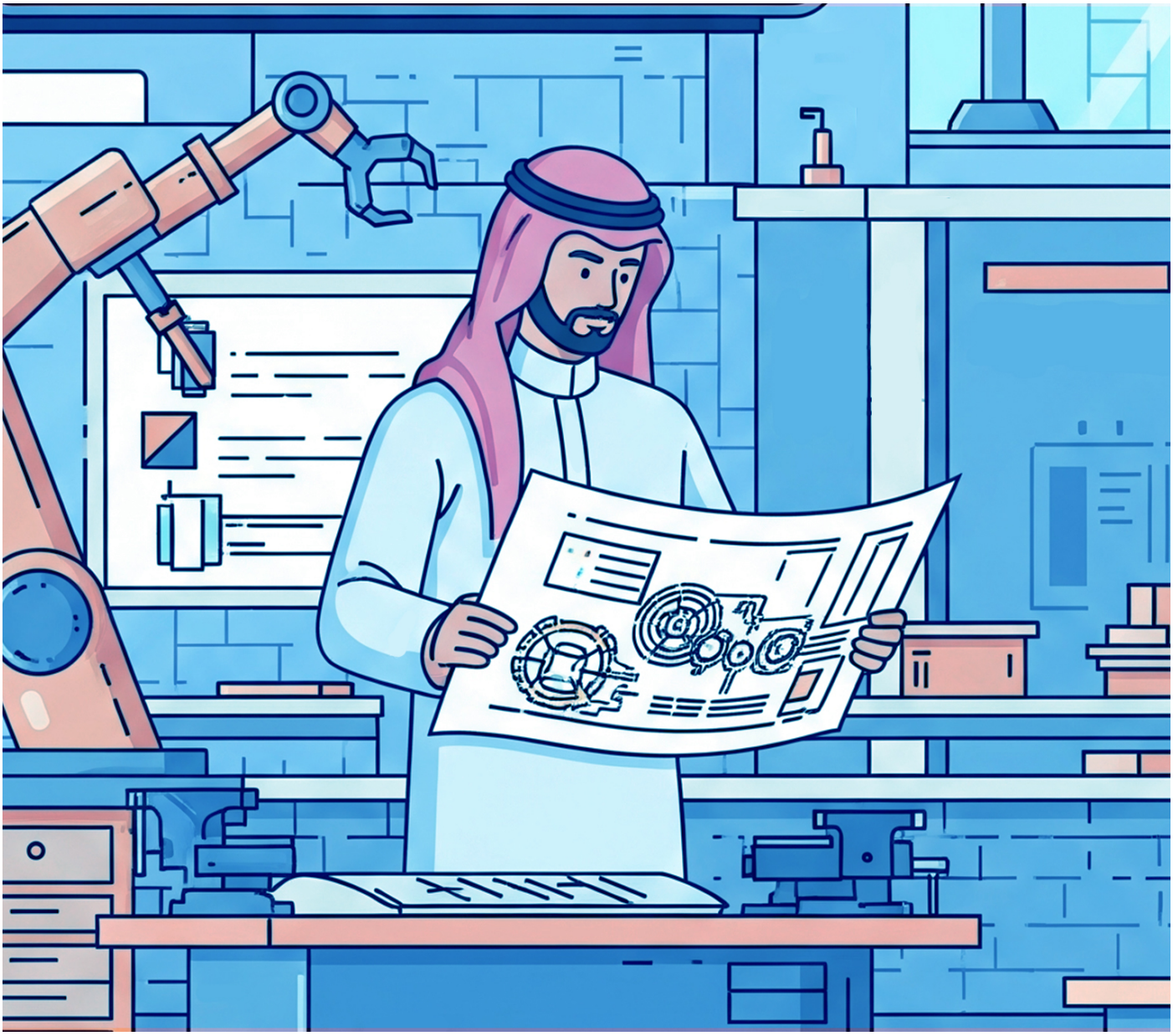

Mechanical Engineering

Performance Calculations and Efficiency for power plant

Course Introduction

In order to improve the performance of a thermal power plant, it is necessarily 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 is 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 study methods of calculations and illustrating international codes used for this purpose.

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

Learning Objectives

- Illustrate how efficiency of CCPP can be calculated
- Learn what cycle parameters affect efficiency
- Illustrate the importance of 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

Course Outline

- **01 DAY ONE**

  Module (01) Types of Power Plants

  - 1.1 Gas Turbine Power Plants.
  - 1.2 Combined Cycle Power Plants.
  - 1.3 Cogeneration Plants.
  - 1.4 Comparison between Different Plants.

  Module (02) Combined Cycle Plant Components (CCPP)

  - 2.1 Gas Turbine components.
  - 2.2 Heat recovery boiler
  - 2.3 Steam Turbine components and details
  - 2.4 Condenser
- **02 DAY TWO**

  Module (03) 3.1 Establishing tasks dependencies

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

• **03 DAY THREE**

Module (04) Performance calculations of Gas Turbine Unit

- 4.1 Different gas turbine cycles
- 4.2 Determining ISO Power and ISO Heat Rate
- 4.3 Correcting for Ambient Temperature, Altitude, Humidity, Inlet and Exhaust Pressure Losses, Mechanical Transmission Losses and Turbine Deterioration.
- 4.4 Part load heat rate
- 4.5 Methods of Increasing Power Output
- 4.6 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
- 4.7 Performance Evaluation of Different Inlet Air Cooling Systems:
- 4.8 Capital Cost Comparisons of Inlet Cooling Systems
- 4.9 Effect of Fouling on compressor Performance

• **04 DAY FOUR**

Module (05) Performance calculations of HRSG

- 5.1 Single, double, triple pressure HRSG
- 5.2 Arrangement of coils and Evaporator pinch design.
- 5.3 Energy balance of HRSG between gases and water
- 5.4 Flue gases losses
- 5.5 Blowdown losses
- 5.6 Casing losses and thermography monitoring.
- 5.7 Piping losses and steam leak losses.
- 5.8 Impact of boiler efficiency on total plant efficiency.

• **05 DAY FIVE**

Module (06) Performance of Steam Turbine

- 6.1 Effect of increasing pressure on power output
- 6.2 Effect of increasing steam temperature on power output
- 6.3 Effect of increasing steam pressure & temperature on power output
- 6.4 Effect of changing condenser exhaust pressure on power output
- 6.5 Case study
- 6.6 Effect of parameters deviation on heat rate.
- 6.7 Fluid friction
- 6.8 Leakage and new techniques to minimize leakage
- 6.9 Moisture, Leaving and Profile losses
- 6.10 Blade path deterioration: steam turbine blade path Audit.
- 6.11 Performance improvement from polishing of turbine blading

Module (07) 7.1 Performance of steam Condenser

- 7.2 Cooling water flow rate effect on Overall CCPP efficiency
- 7.3 Cooling water temperature
- 7.4 Fouling in tubes
- 7.5 Condensate level problems and its effect on performance

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 12, 2025	May 16, 2025	5 days	5950.00 $	switzerland - Geneva
Aug. 11, 2025	Aug. 15, 2025	5 days	4250.00 $	UAE - Dubai
Nov. 23, 2025	Nov. 27, 2025	5 days	4250.00 $	Bahrain - Manama