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THE LEADING TRAINING PROVIDER

Mechanical Engineering

Thermal Power Plant Efficiency & Manpower Utilization on Production Strategy

Course Introduction

Thermal Plant efficiency is a key economic issue in operation of thermal power plants. The efficient utilization of fuel in Electric Power Production is the main target of this course. Only by calculating and monitoring the efficiency we can determine whether it is cost effective to continue operating or the plant is requiring cleaning, or maintenance. In addition, different plant losses must be identified and understood and traditional and innovative methods to decrease these losses taken. In as much as productivity is concerned in the development of any society, place or industry.

Golden age

We are all towing towards that direction of effective and efficient productivity. Productivity as the case may be is the effective use of all factors of production; or each factors of production which is defined as output to input. Recent years have seen widespread discussion of productivity, and for good reason. It appears that labour productivity growth has improved sharply, perhaps approaching the pace of the “golden age” of the new millennium. To put the importance of this recent change in perspective, consider the direct impact of productivity in machine and human effort. If labour productivity were to grow at 2.5% be output per hour will rise by 35% after 5 years. Clearly, the rate of productivity growth or the rate of productivity increase can have an enormous effect on real output and standard of living.

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

- Learn the meaning and difference between Plant efficiency and Heat Rate in Power Plants.
- Calculate the Overall Plant Efficiency and understand Factors affecting its Performance.
- Calculate Different Thermal Plant Component Efficiencies under Different Operating and Environmental Conditions.
- Learn What Cycle Parameters affect Efficiency
- Calculate Part Load Efficiency.
- Illustrate the Financial Benefits of increasing Efficiency
- Illustrate efficiency improvement Options
- Learn about innovative methods in minimizing heat losses.
- Be skilled on dealing with difficult situations and people as they arise.
- Main factors which are direct Impact of Productivity in Machine and Human Effort.
- The manpower Distribution and Manpower Utilization to reach to Optimization Conditions Always in the Plant.

Course Outline

- **01 DAY ONE**

  Module (01) Power Plants & Calculations of Efficiency

  - 1.1 Types of Power Plants (GT, ST,CC & Cogeneration)

- 1.2 The Heat Engine and Energy Conversion Process
- 1.3 Definition of Efficiency and Heat Rate
- 1.4 Gas Turbine Plant Efficiency Calculations
- 1.5 Combined Cycle Plant Efficiency Calculations
- 1.6 Steam Power Plant Efficiency Calculations
- 1.7 Cogeneration Thermal Plants Efficiency Calculations

• **02 DAY TWO**

Module (02) Factors Affecting the Efficiency (GT, HRSG)

- 2.1 Defining ISO Power and ISO Heat Rate and Efficiency.
- 2.2 Correcting for Ambient Temperature, Altitude, Humidity, Inlet and Exhaust Pressure Losses, and Mechanical Transmission Losses
- 2.3 Methods of Increasing Power Output and efficiency
- 2.4 Performance Evaluation of Different Inlet Air Cooling
- 2.5 Effect of Fouling on Compressor Performance
- 2.6 Compression Ratio
- 2.7 Inlet Firing Temperature
- 2.8 Turbine Exit Temperature

Module (03) Factors Affecting the Efficiency (Steam Plant)

- 3.1 Steam cycles for Thermal Power Plants
- 3.2 Effect of increasing Pressure on Efficiency
- 3.3 Effect of increasing Steam Temperature
- 3.4 Effect of changing condenser pressure
- 3.5 Economic Case Study
- 3.6 Effect of Parameters Deviation on Heat Rate & Efficiency
- 3.7 Effect of out of Service Feed Heater on Plant Heat Rate

• **03 DAY THREE**

Module (04) Effect of Steam Turbine Losses on Efficiency

- 4.1 Classification and components of turbines
- 4.2 Principle of Operation
- 4.3 Fluid Friction Losses
- 4.4 Leakage Losses
- 4.5 Techniques in minimizing Leakage and Case Study
- 4.6 Moisture loss, Leaving loss and Profile Losses
- 4.7 Blade path deterioration: steam turbine blade path Audit.
- 4.8 Performance improvement from Polishing of Turbine Blading.

Module (05) Boiler Efficiency Calculations/Improvements

- 5.1 Boiler Efficiency
- 5.2 Direct and Indirect method of calculating efficiency
- 5.3 Boiler Flue Gases Losses and methods of reduction.
- 5.4 Deterioration of burners and Repair
- 5.5 Blow down requirements as function of water quality
- 5.6 Blowdown losses, Heat recovery options, economics.
- 5.7 Casing losses and thermography monitoring.

• **04 DAY FOUR**

Module (06) HRSG Efficiency Calculations/Improvements

- 6.1 Efficiency and Effectiveness Definitions
- 6.2 Effect of Pinch Point
- 6.3 Higher Gas Inlet Temperature
- 6.4 Effect of approach
- 6.5 Effect of steam temperature and pressure
- 6.6 Options to improve HRSG efficiency
- 6.7 Multiple pressure steam generation
- 6.8 HRSG performance at different loads

Module (07) Effect of Condenser Operating Conditions

- 7.1 Steam Surface Condenser
- 7.2 Adverse consequences and operating concerns caused by low condenser vacuum
- 7.3 Effect of a change in condenser vacuum on the Turbine Steam Flow and Generator Output
- 7.4 Diagnosis of the actual causes of Poor Vacuum
- 7.5 Fouling Factors, Overall Coefficient of Heat Transfer
- 7.6 Which condenser design produce Highest Thermal efficiency of the plant.
- 7.7 Problems, Limitations in Condenser Cooling System.
- 7.8 Effect of inlet Cooling Water Temperature on Thermal Efficiency.

• **05 DAY FIVE**

Module (08) Optimum Utilization of Manpower Energy

- 8.1 Potential Capacity / Committed Capacity
- 8.2 Labor Productivity and Total Productivity
- 8.3 Manpower Distribution/ Utilization
- 8.4 Productivity and Optimization Conditions
- 8.5 Total Resource Productivity (TRP)

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 26, 2025	May 30, 2025	5 days	4250.00 $	UAE - Dubai
Sept. 1, 2025	Sept. 5, 2025	5 days	4250.00 $	UAE - Abu Dhabi