



Fossil Power Generation

This five-day overview course describes the portion of the sub-systems that support the plant gas turbine operation. This is a technician-level course for both operating and maintenance personnel, providing the knowledge base necessary to begin working on equipment.

I. Steam Basics

- A. Thermodynamic Fundamentals
- B. Non-Flow Processes
- C. Liquid-Vapor Systems
- D. Heat Engines
- E. Turbines
- F. Steam Power

II. Boiler Fundamentals

- A. Boiler Fundamentals
- B. Package Boilers
- C. Combustion Process
- D. Fans
- E. Fuel Supply Systems
- F. Burner Arrangements: Natural Gas Burners
- G. Oil-Fired Boilers
- H. Atomization
- I. Operation
- J. Burner Arrangements

III. Simple and Combined Cycle Overview

- A. Energy in a Simple Cycle Power Station
- B. Gas Turbine Cycle
- C. Plant Operator's Responsibilities
- D. Plant Safety
- E. Environmental Aspects
- F. Power Station Types and Comparisons
- G. Power Demand Growth
- H. Transmission System
- I. Simple Cycle Gas Turbine Plant
- J. Combined Cycle Gas Turbine Plant
- K. Major Systems and Components

IV. Heat Recovery Steam Generator (HSRG) System

- A. Flowpath Descriptions
- B. Major Equipment

V. Fossil Fuels

- A. Natural Gas
- B. Fuel Oil
- C. Liquid Fuel Characterization
- D. Fuel Oil Properties

VI. Combustion Principles

- A. Basic Combustion Reactions
- B. Products of Combustion
- C. Incomplete Combustion
- D. Undesirable Products of Combustion

VII. Air Pollution Fundamentals

- A. Fuel Dependant Air Pollutants
- B. Combustion Dependant Air Pollutants
- C. Smoke and Particulate
- D. Steam Generators
- E. Laws and Regulations
- F. Regulatory Requirements

VIII. Continuous Emission Monitoring

- A. General Classification of CEM's
- B. Components of CEM's
- C. Usage of CEM's in Utility/Industrial Boilers
- D. Sulfur Oxides
- E. Nitrogen Oxides Control Overview
- F. Control of NOx Emissions

IX. Normal Operation

- A. Maintaining Suitable Combustion Conditions
- B. Monitoring Combustion
- C. Combustion Fuel
- D. Maintaining Steam Temperature and Pressure
- E. Controlling the Steam Temperature
- F. Startup Procedures
- G. Shutdown Procedures



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X. Automatic Control Systems

- A. Automatic Analog Control System Elements
- B. Automatic Combustion Control Systems

XI. Efficiency

- A. Why Do Inefficiencies Occur?
- B. Size of Losses in a Steam System
- C. Cost of Steam
- D. Identifying Savings
- E. Definition of the Processes
- F. Steam Distribution
- G. Condensate Heat Recovery
- H. Steam Generation
- I. Measuring Performance

XII. Igniters

- A. Fuels and Fuel Characteristics
- B. Combustion
- C. Basic and Ideal Combustion
- D. Components of a Burner Port
- E. Factors Affecting Combustion
- F. Flame Characteristics

XIII. Typical Systems

- A. Fuel Oil System
- B. Pulverized Coal Burning
- C. Equipment
- D. Lighters
- E. Dual Register Burners
- F. Flame Detectors
- G. Lighter Control System
- H. Lighter Control Logic Sequence

XIV. Control

- A. Air Flow
- B. Fuel Flow
- C. Functional Description
- D. Control System Operating Modes
- E. Unit Description
- F. Purge
- G. Furnace Firing Permissives
- H. Pulverizer Group Start Sequence
- I. Maintained Lighters
- J. Pulverizer Group Operation

- K. Pulverizer Group Stop Sequence
- L. Inert and Clearing System
- M. Pulverizer Group Trips
- N. Pulverizer Group Sequence Permissives

XV. Furnace Explosions

- A. Conditions
- B. Reasons
- C. Results
- D. Case Studies

XVI. Balance of Plant Overview

- A. Auxiliary Steam System
- B. HRSG Blowdown System
- C. Circulating Water System
- D. Closed Cycle Cooling Water System
- E. Compressed Air System
- F. Compressed Gases System
- G. Condensate System
- H. Demineralized Water System
- I. Feed Water System
- J. Fire Protection System
- K. Plant Drains System
- L. Potable Water System
- M. Service Water System
- N. HP, HRH, CRH, and LP Steam Systems
- O. Condenser Air Removal System

XVII. Generator and Generator Excitation Overview

- A. Generator Theory
- B. Generator Construction

XVIII. Measurement and Testing Equipment

- A. Basic Measurement Instrumentation
- B. Basic Control Loop
- C. Control Instrumentation
- D. Testing Practices
- E. Test Equipment
- F. Results and Documentation

XIX. Environmental Awareness