

BOILER AND STEAM GENERATION SYSTEMS

Course Objectives

To understand the history of combustion and the theory of boiler control and operational safety. Boiler and Steam Generation theory will be covered as an underpinning knowledge and this will be built upon with a more detailed insight into the technologies used.

Course Description

This course covers both the history of combustion and the theory of boiler control. This includes the associated safeguarding system and operational procedures to ensure safety of equipment and personnel.

Who Should Attend

The course is for operators, from junior level to supervisors who require an understanding of combustion and control systems as part of their duties in a large petroleum plant such as a refinery. It would also be of use to those concerned with boiler maintenance such as mechanical and instrument technicians.

Pre-Requisites

All Attendees should have a sound power generation background.

Course Outcome

Upon successful completion of the course the candidate will be familiar with:

- Boiler and Steam Generators
- Technologies involved
- Control and Safety systems
- Course Outline

Day 1

- Introduction
- Heat Exchanger Theory and Operation
- Heat Transfer Media
- Boiler Feedwater
- The Formation of Steam
- The use of Steam
- Basic design of Steam Boilers
- Boiler Auxiliaries
- Process Steam Distribution

Day 2

Types of Boilers

- Fire Tube Boilers
- Cornices and Lancashire
- The Economic Boiler
- Oil/ Gas Fired Boilers
- Electrical Boilers
- Immersion Element Boilers
- Electrode Boiler
- Water Tube Boilers
- Low Water Content Coil Boilers
- Superheaters

Types of Burners

- Oil and Gas Burners
- Pressure Jet Atomizers
- Two Fluid Atomizers
- Spinning Cup or Rotary Atomizers
- Emulsifying Atomizers
- Steam or Assisted Pressure Jets
- Coal Burners

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Day 3

Boilers Ancillary Plant
Safety Valves
High and Low Alarms
Water Gauges
Blowdown Systems
Automatic Blowdown
Scot Blowers
Pressurisation Systems
Avoiding Corrosion in Boilers
Combustion Theory
Types of Control System used for Fuel efficient Systems
Control of Emissions
Control of Oxygen, Carbon monoxide and Carbon Dioxide Emissions

Day 4

Types of Boiler Control Systems
Overcoming the Reverse Process Reaction Curve
A cascade Control System
Fuel Control System for a Boiler
A Ratio Control
Air Fuel Ratio Control
Minimum Fuel Flow Limitations
A Mechanical Minimum Stop
Burner Control for a System with a Mechanical Minimum Stop
Pneumatic Minimum Stop
Minimum Stop Adjustment
Other Types of Burner
Non-return Pressure Atomized Burner
Steam Atomized Burners
Fuel Gas Burners

Day 5

Boiler Control System

Fuel Leading Control System
Compensating for Fuel Gas Density Variations
Basic fired Equipment Safety Demand
Matching the Fuel and air Proportions
The Airflow Controller
Protecting Against Boiler Drum Excessive Fuel Usage
Boiler Drum Level Control
Boiler Drum Pressure Control
Steam Temperature Control

Safeguarding Systems

Prevention of Unsafe Situations
Practical Control Systems
Test
Certificate Issue

Course Review and Feedback