

PRACTICAL BOILER CONTROL AND INSTRUMENTATION FOR ENGINEERS AND TECHNICIANS



YOU WILL LEARN HOW TO:

- Understand the objectives of the principal boiler control functions
- Recognise and understand typical boiler control diagrams and their design intentions
- Contribute to the setting up and tuning of boiler control loops
- Identify principles and design concepts governing:
 - Boiler feed water control
 - Furnace draft measurement and control
 - Steam demand and firing rate control
 - Main steam and reheat steam temperature control
 - Flue gas analysis and fuel combustion trimming controls
- Importance of boiler safety control and start-up interlocks
- Explore advanced control strategies for improved boiler plant efficiency

WHO SHOULD ATTEND:

- Senior boiler plant operators, repairers and installers
- Control system engineers
- Instrumentation engineers and technicians
- Boiler plant commissioning engineers
- Mechanical engineers and technicians
- Operation, maintenance, inspection and repair specialists
- Design engineers
- Consulting engineers



The Workshop

This 2-day workshop introduces the basic practices of controls systems and safety controls for industrial steam generating boilers. It focuses on the control and safety requirements applicable to most types of boilers from small gas-fired units to large multi-fuel installations. The workshop will provide training in how control and instrumentation is designed to manage the main variables such as drum water level, furnace draft, combustion fuel and air conditions. Burner management systems are introduced with their principal features including flame safety systems. The essential safety requirements for boilers and burners are identified and the corresponding safety interlocks are explained as practical solutions in accordance with the latest safety standards.

Pre-requisites

Fundamental knowledge of basic boiler plant and operation thereof and some understanding of control systems.

Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

The Program

ESSENTIALS OF BOILER PROCESSES

- Objective of boiler controls
- Overview of boiler types
- Boiler processes in block diagrams to show keys inputs and output variables
- Hazards of boiler operations
- The main control functions in boiler furnaces

REVIEW OF PROCESS CONTROL AND INSTRUMENTATION RELEVANT TO BOILERS

- Principles of sensors and transmitters with examples of boilers
- Closed loop control principles including feedback, feedforward, ratio and limiting.
- Control system hardware and software tools.
- Safety instrumented controls and the impact of IEC 61511
- Instrumentation diagrams and symbols per ISA and SAMA
- Distributed control systems and the separation of safety systems

FEEDWATER AND DRUM LEVEL CONTROL

- Performance requirements: Level, quality, stability
- Characteristic responses of drum level
- Level control solutions, 1,2 and 3 element types
- Level measurement problems and practices
- Drum level safety systems

FURNACE AIR AND DRAFT CONTROLS

- Performance requirements; pressures and temperatures
- Characteristic responses and means of control
- Pressure measurement methods and the pressure profile
- Temperature control and the impact of dew point
- Protection against implosion

COMBUSTION CONTROLS

- The combustion process and its requirements for efficiency and safety
- Coal, oil and gas firing types
- Stoichiometric air and excess air requirements
- Fuel-air ratio control and its measurements
- Firing rate controls and cross limiters for improving dynamic response
- Methods for measurements of boiler efficiency using analysers
- Application of optimising controllers

BURNER MANAGEMENT SYSTEMS

- Safety and performance requirements of pulverisers, burners and igniters
- Furnace safety standards and regulations
- Flame monitors and flame failure detection
- Start up protection and sequencing
- Furnace supervisory controls and shutdown systems

STEAM TEMPERATURE CONTROL

- Superheater and attemperator arrangements
- Essential control requirements
- De-superheater controls

STEAM PRESSURE AND BOILER LOAD CONTROLS

- Pressure and flow response characteristics
- Single boiler load control
- Multiple boiler installations and load sharing controls

SUMMARY, OPEN FORUM AND CLOSING