

# DEVELOPMENTS IN THE CONTROL OF PACKAGED BOILERS

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## Historical Perspective

- Lower energy and operating costs
  - Multiple boilers running at reduced loads
  - Pneumatic combustion control
  - Electromechanical BMS
  - High operator attendance
- Today, higher utility costs
  - Minimum number of boilers on line
  - Running at high, most efficient loads
  - Minimize operator attendance required

## Combustion Control Strategies

- Single Point Positioning
  - One control output, one actuator
- Parallel Positioning
  - Two control outputs, two actuators
- Metered, cross limited
  - Two control outputs, two actuators
  - Fuel and air flow meters for feedback

## Oxygen Trim

- Excess O<sub>2</sub> is a measure of excess air
- Ideal excess air varies with firing rate
- Excess air varies with air density
- O<sub>2</sub> trim varies air/fuel ratio for ideal excess air
- Two methods are used: (a) air trim (b) fuel trim

## Control Architectures

- Architectures tend to follow the strategies
- Single packaged systems
- Single loop controllers with separate burner management systems
- Programmable logic controllers
- Distributed control systems
- Supervisory systems

## Packaged Systems

- Proprietary combined combustion control and burner management systems
- Combustion controls with separate burner management systems using standard control components
- Proprietary combustion controls with separate burner management systems

## **Proprietary Control Shortfalls**

- Non-standard signal transmission ranges
- Spare parts availability
- Lack of ease of software modification
- Inability to integrate standard industrial level instrumentation
- Communication issues
  - with supervisory systems
  - with other in plant systems

## **Single Loop Controllers**

- All combustion control accomplished in the controllers without external computational devices
- All hardware is the same, applications are defined by software
- Built in operator interface
- Separate burner management system

## **Programmable Logic Controllers**

- All combustion control accomplished in the PLC without external computational devices
- Requires additional operator interface
- Good spare parts availability
- Easy to expand
- Good communications support

## **Distributed Control Systems**

- Similar to PLC architecture
- integrated database
- Standard redundancy
- Good communications capability
- Relative high cost
- Typically used on boilers installed in a facility using DCS for process control

## **Supervisory Systems**

- Used for trending, remote monitoring, generating logs, and reports
- PCs running application specific software
- Building management systems
- Internet
- Paging

## **Problem Common to All**

- Relatively short product life
  - quickly evolving hardware and software
  - competitive market
- Pick hardware from a major controls company
- Use an integrator who knows boiler controls
- Insist on complete documentation