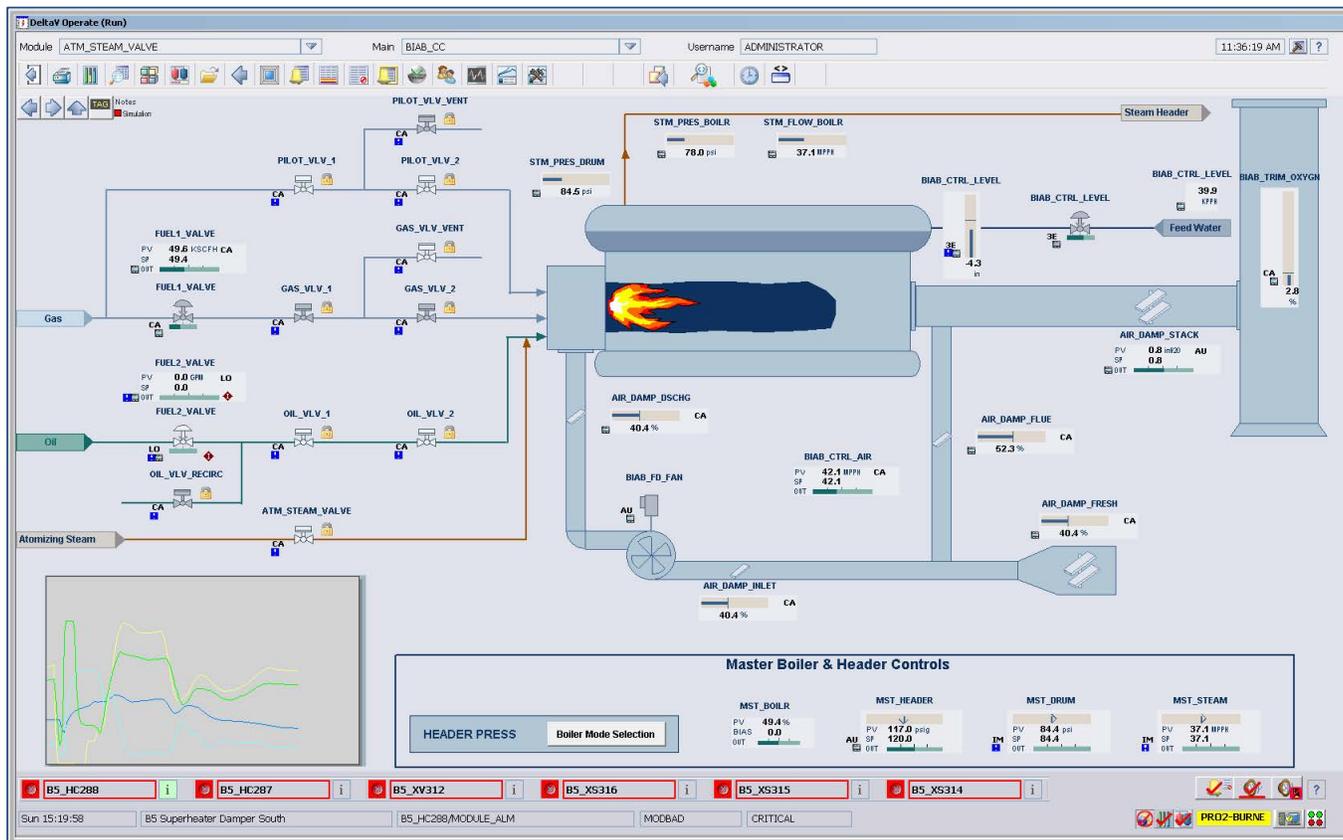


# DeltaV™ Standard Boiler Solution



*Trim Fuel Costs and Simplify Operation using Emerson's DeltaV Standard Boiler Solution*

- Improve reliability, response, and turndown
- Save fuel and lower emissions
- Increase operator confidence and operate closer to design capabilities
- Reduce control system engineering and startup costs

## Introduction

Reliable, efficient boiler control is essential for profitable plant operation, but is sometimes difficult. Steam loads change continuously with production demands such that keeping steam production in balance with large changes in demand can pose a challenge. Fuel variations, current equipment conditions, and changing constraints add to complexity, while boiler trips result in costly process upsets.

Emerson delivers a boiler control solution that improves the operation of an entire steam system in terms of reliability, responsiveness, and energy cost. Payback is generated from improved steam header pressure control and lower fuel cost.

## Benefits

**Improve reliability, response, and turndown.** Emerson's boiler combustion control configuration is designed to handle large swings in demand safely and smoothly within unit constraints and without trips in order to maintain header pressure within limits.

**Save fuel and lower emissions.** Operating closer to the optimal excess oxygen level improves the efficiency of a boiler. Emerson's combustion control strategy safely manages oxygen at the lowest safe operating point. Allocating load between boilers in real time can drive additional operating efficiency to further reduce total fuel consumption. Compared with traditional boiler controls, a 1-2% efficiency improvement is possible.

**Increase operator confidence and operate closer to design capabilities.** DeltaV Standard Boiler uses "true-Btu" combustion calculations to precisely set the proper amount of air for the required steam load based on real time fuel composition and ambient conditions. This includes an air/fuel ratio that determines stoichiometric air demand and an excess air calculation based on the desired oxygen level. This delivers tight control and minimizes required operations intervention.

**Reduce control system engineering and startup costs.** DeltaV Standard Boiler is pre-engineered, well documented, field proven, and packaged so that less time is spent in implementing the controls. Application design, configuration, testing, checkout, and commissioning time is reduced. Emerson has proven this on hundreds of boilers.

## Product Description

The Standard Boiler Control Solution provides a pre-engineered control strategy for gas-fired or oil-fired (and optionally dual fuel combination) boilers. The configuration complies with NFPA 85 - Boiler and Combustion Systems Hazards Code and uses Emerson's best engineering practices. It includes feedwater, single element and three element drum level controls, plus combustion controls with a boiler master demand, parallel metered air and fuel, and oxygen trim with dynamic excess air correction. Steam header pressure control is standard with the solution and additional boilers can be easily added.

## Firing Rate Demand Control

The plant steam header pressure master typically provides a boiler load demand target to the boiler master. In the case of multiple boilers, the plant master can optionally be equipped with dynamic gain control that can easily accommodate up to six boilers. Large changes in demand are rate-limited to maintain flame stability during load swings and to extend life of the boiler furnace.

A boiler master bias station is dedicated to each boiler for determining air and fuel demand and individual unit load biasing. Transferring from manual to auto to allow the plant master to determine load is bumpless when the first boiler is placed into automatic mode. Additional boilers are also gradually ramped over time from current to plant master demand when they are placed in auto to prevent upsets in the system.

## Combustion Control

Air and fuel flow controls use parallel metering and cross limits to ensure the air always leads the fuel in load increases and lags fuel on the decreases, which maintains the proper air-rich environment during demand swings. This allows combustion to be as optimal as possible while preventing low excess air levels when steam demand is changing.

Air and fuel are properly matched for all loads and excess air demands. O<sub>2</sub> trim is provided using flue gas oxygen analyzer input with the setpoint dynamically adapted with boiler load. In addition the operator has the ability to bias the O<sub>2</sub> trim setpoint.

## Single Element and Three Element Drum Level Control

Drum level controls allow single, dual or three-element control. Three-element control uses a cascade arrangement of drum level providing the setpoint for feedwater flow and steam flow being used as a feedforward to the output of the level control. If feedwater flow is not measured, an optional two-element drum level control strategy is available, which outputs from the level control directly to the feed water valve and includes the steam flow feedforward. Single element is automatically selected when the steam flow or feedwater flow meter fails. The system will also switch to single element control during low load conditions if it is determined that the flow meters will not provide enough turn down. In addition, the operator can choose single element control at any time. Selection of three-element control is either automatic (based on steam load) or can be chosen by the operator. Mode transitions from manual to cascade or single element to three element are bumpless using proper initialization to prevent upsets.

### Additional general control functionality

To reduce spurious boiler trips, all analog inputs used with control are monitored to detect bad status. When found, the loop automatically changes to manual mode and an alarm is generated to inform operations of the issue.

To help prevent errors, fuel flow, airflow and boiler master modes are interlocked to provide correct hierarchy during changes or equipment failures. In addition, operations is provided convenient mode switch to place all combustion controls in the proper mode for the selected mode of control.

Standard displays include one for boiler details plus one plant overview for use with maintaining the steam header (if applicable).

Basic simulation of the Standard Boiler Solution is included for use in implementation, testing and operator training. The simulation uses DeltaV modules and logic that is not included in a project distribution.

### Technical or pre-project engineering assistance

Sites with interest in improving their boiler controls but which are limited in expertise or staffing to determine their specific needs, may consider using an Emerson boiler consultant to conduct an onsite survey. These surveys vary in both depth and scope. Many require only a one-day visit with a follow-up report that explains what was observed and how controls improvements could be made to address issues. More in depth studies are available to determine economic justification or provide front end engineering services.

### System Compatibility

Standard Boiler Solution is available on DeltaV v10.3 or higher systems.

## Ordering Information

Part Number	Description
VF1060B1B1	First Boiler; Base License
VF1052E1B1	Additional Boilers; Extension license
VF1060S1	Annual Application Support for first boiler
VF1060S2	Annual Application Support for additional boilers

## Related Products

- **Fisher Control Valves and Regulators.** Control fuel supply accurately and consistently.
- **MicroMotion Density, Specific Gravity and Mass Flow Meters.** Measure mass flow for boiler fuels and heating value variability.
- **Rosemount Annubar Flowmeters and Primary Elements.** Accomplish accurate air flow measurement across a wide load range with low permanent pressure loss, a relatively low installed cost, and ability to mount in all shapes of duct.
- **Rosemount Analytical Stack Gas Analyzers.** Maintain the optimum ratio between the fuel sent to the burner and the oxygen required to burn available fuel by measuring stack oxygen and combustibles.
- **Rosemount 5300 Series Guided Wave Radar Level Measurement.** Reliably measure boiler drum level and mitigate issues with load change and shrink/swell.
- **DeltaV Standard BMS Solution.** Provides a fully code-compliant Burner Management System (BMS) with a unique user interface that fully details light-off sequence status and cause of boiler trips.

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