



## Process Systems and Solutions Solution Description

**Application:** Multi-Fuel Power Boiler  
**Solution:** SmartProcess® Boiler

### Background

Multi-Fuel Power Boilers are used in many industries to provide cost effective steam for process use and on-site electrical generation. In addition to fossil fuels (gas, oil, and coal) it is common that these units be fed with fuels such as waste wood and shredded tires, and they are often used for disposal of sludge and non-condensable gases. In today's competitive business environment, it is critical that Multi-Fuel Boiler operation be optimized such that steam is produced for the least cost possible.

### Issues

Operation of a Multi-Fuel Boiler is more difficult by several orders of magnitude when compared to running a unit fired with only fossil fuels. Operating issues vary from site to site, but there are a number of problems that are seen in many places:

- Moisture content of incoming wood or sludge varies greatly and quickly
- Fuel handling systems are limited and subject to frequent interruption
- Wood ranges from large chunks to sawdust in short time periods
- Btu content of fuels varies significantly
- Air systems provide inadequate volume or penetration for ideal combustion
- Boiler emissions performance limits operation

### Specific Objectives

Best in class Multi-Fuel Power Boilers are run with the following performance parameters. Operation at this level is the objective of Emerson's process control and optimization efforts:

- Generate 90% of steam with Biomass fuels
- Hold Excess Oxygen at 3.0 to 3.5% to maximize unit efficiency
- Produce steam at MCR while maintaining emissions within permitted levels
- Maintain carbon in ash under 10%
- Operate boiler in Full Automatic control over 95% of time

### Emerson Holistic Solution

Emerson optimizes Multi-Fuel Boiler unit operation by addressing the physical limitations of the process and then installing the Emerson SmartProcess® Boiler optimized control solution. The Emerson approach is a holistic one. Optimized control solutions cannot work effectively if mechanical issues are too limiting and the best process equipment will not perform ideally if an optimized control strategy is not implemented. Emerson works with both and delivers the solution turnkey including design, installation, commissioning, and start-up. Emerson also trains operating personnel to run the boiler using the newly optimized equipment, firing methods, and control tools.

SmartProcess® Boiler provides full-automatic boiler control, real-time compensation for the changing fuel Btu, biomass fuel maximization, unit efficiency optimization, and header pressure control with minimal deviation.

## Process Mechanical Improvements

Working with boiler and fuel handling equipment partners, Emerson installs mechanical improvements to Multi-Fuel boiler processes when shortcomings are identified. This could include fuel conveyor changes, fuel bins and distribution equipment, overfire or undergrate air system upgrades, fan modifications, or damper improvements. Process expertise allows Emerson to deliver true improvement results.

## SmartProcess® Boiler Solution

Emerson's SmartProcess® Boiler is a product used to optimize Multi-Fuel Power Boiler processes by increasing the efficiency of the boiler and maximizing the amount of steam produced through burning of least cost fuel (typically waste wood, hog, or bark). SmartProcess® Boiler provides complete automatic control of the boiler at all times including start-up, and the system allows a Multi-Fuel Boiler to be used as a swing boiler while burning least cost fuel.

SmartProcess® Boiler incorporates control techniques that improve on traditional methods of solid-fuel firing. The system provides operators with greatly simplified interface to the boiler process and automates many functions that are often done manually. SmartProcess® Boiler makes automatic adjustments to the boiler process to compensate for changing fuel moisture and varying fuel quality.

SmartProcess® Boiler functionality includes:

- Full Automatic Boiler Control
- Separate Control Masters for Each Fuel in Boiler
- Btu Based Firing with Real-Time Adjustment for Biomass Fuel Quality
- Enhanced Operator Interface
- Only Typical Boiler Instrumentation is Used by the System

This functionality is used to accomplish the following:

- Maintain Header Pressure with Minimal Deviation Using Biomass Fuel Alone
- Maximize Efficiency by Reducing Excess Air
- Meet All Emissions Constraints
- Eliminate Need for Continuing Operator Manual Intervention

## Results and Guarantees

The bottom line is that SmartProcess® Boiler makes money for a process business. Emerson stands behind its offering by providing guarantees of boiler process performance in many cases.

- Biomass Boiler Case 1

Emerson implemented the SmartProcess® Boiler strategy on existing boiler DCS. Despite high wood moisture content, bark burning was increased dramatically. Operator intervention was reduced from 60% to 5% and the mill is saving approximately \$2500 per day.

- Biomass Boiler Case 2

Emerson installed a new DCS and the SmartProcess® Boiler strategy on a boiler. Working with a less than ideal bark handling system, bark burning was still significantly raised. Operator intervention was reduced 50% and the mill is saving approximately \$3000 per day.

Typical payback from an investment in a SmartProcess® Boiler implementation is 3 to 6 Months.