



## Industrial Energy Application Description

**Application:** Chemical Recovery Boiler  
**Product:** SmartProcess® Recovery

### Background

The Chemical Recovery Boiler is a major component of the liquor cycle in a pulp mill and an important key to overall mill economic performance. Strong Black Liquor is burned in Recovery Boilers to generate smelt for further processing by the Reausticizing Process. At the same time, steam is produced for use by other parts of the mill.

### Issues

Chemical Recovery Boilers are some of the more complicated combustion processes commonly being used in industry today. Several issues add to the importance and complexity of Recovery Boiler operations. Some of these are:

- Variation in Btu content of Black Liquor
- Continuous production rate changes
- Emissions restrictions
- Carryover and plugging
- Safety

### Specific Objectives

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

- Maintain Excess Oxygen at 1.5% to maximize unit efficiency
- Maximize liquor throughput to permit or steaming limits
- Stabilize combustion to minimize fouling (1 water wash per year)
- Operate within permitted emissions levels
- Control boiler in Full Automatic over 95% of time (including load changes)

### Emerson Holistic Solution

Emerson optimizes Recovery Boiler unit operation by addressing the physical limitations of the process and then installing the Emerson SmartProcess® Recovery 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® Recovery provides full-automatic boiler control, real-time compensation for the changing fuel Btu, liquor throughput maximization, and unit efficiency optimization.

## SmartProcess® Recovery Solution

Emerson's SmartProcess® Recovery is a product used to optimize Recovery Boiler processes by increasing the efficiency of the boiler and maximizing the amount of liquor processed. SmartProcess® Recovery provides complete automatic control of the boiler at all times including start-up, and stabilizes combustion to maximize Green Liquor reduction and minimize fouling of the upper boiler.

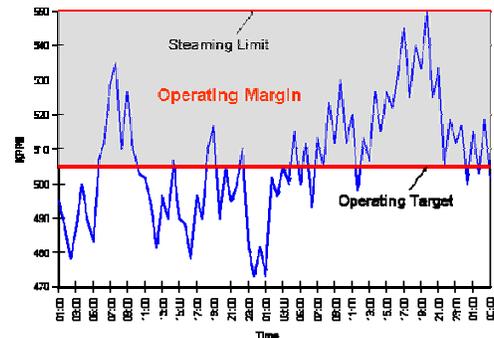
SmartProcess® Recovery incorporates control techniques that improve on traditional methods of liquor firing. The system provides operators with greatly simplified interface to the boiler process and automates many functions that are often done manually. SmartProcess® Recovery makes automatic adjustments to the boiler process to compensate for changing liquor Btu.

SmartProcess® Recovery functionality includes:

- Full Automatic Boiler Control
- Constant Btu Liquor Firing
- Coordinated Load Change with Single Input
- Automatic Air Split Adjustment
- Temperature Profile
- Bed Size Control
- Blackout Detection And Prevention Logic
- Boiler Efficiency Calculation
- Sootblowing Control (Optional)
- Enhanced Operator Interface
- Typical Boiler Instrumentation Only is Used by the System

This functionality is used to accomplish the following:

- 5-15% Throughput Increase
- 1-2% Thermal Efficiency Increase
- Improved Reduction Consistency
- Reduced Water Wash Frequency
- Meet All Emissions Constraints
- Eliminate Continuing Operator Manual Intervention



The figures above show how SmartProcess® Recovery is used to reduce variability in boiler process parameters such that additional liquor throughput can be accomplished.

## Results and Guarantees

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

- Recovery Boiler Case 1

Emerson implemented the SmartProcess® Recovery strategy at a major Southern US mill. With this implementation average Thermal Efficiency was increased 1.25%, water wash frequency was decreased 50%, and Green Liquor reduction variability was reduced 60%.

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