Honeywell | Connected Industrial

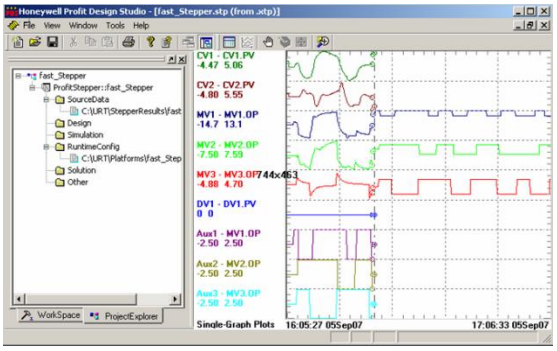
Profit Suite for Recover Boiler

Solution Note

For stabilized and synchronized boiler operation throughout the entire boiler load range

Profit Suite for the pulp mill chemical Recovery Boiler is a complete, modular application designed to stabilize and maximize the chemical recovery in the recovery boiler operation of a pulp mill. By optimizing recovery boiler combustion controls and ensuring the maximum, uniform chemical recovery and steam consumption. Robust controls included in the solution reduce polluting emissions and keep the operator in full control of the boiler.

The recovery boiler in a pulp mill is a dynamic process and sensitive to disturbances and instability caused by a variety of reasons, such as the varying quality of blackliquor, load changes, and different operating methods. The objective of the Advanced Recovery Boiler Control Solution is to stabilize boiler operations by continually monitoring the operating conditions and contrains. The solution pushes the boiler to its limits to maximize throughput of black-liquor solids. It thus reduces boiler-burn production bottlenecks and increases mill production.



The control solution includes features that increase operator confidence and improve boiler safety. The user interface with interactive logical displays provides the operator with appropriate information on boiler operations, including process information, alarms, and messages. Operators are therefore able to make better decisions, more quickly.

Honeywell' solution for the pulp mill chemical Recovery Boiler is solution powered by Profit Suite, a comprehensive collection of advanced process control and optimization offerings. These innovative solutions address increasing business complexity and profitability pressures by effectively managing all aspects of control and optimization, from improving regulatory loop control to optimizing the entire process. In the continuous digester, Profit Suite improves pulp quality, increases yield, reduces chemical usage and maximizes production, while integrating the entire pulping and chemical recovery process to drive mill-wide optimization.

BENEFITS

- Stable operations
- Increased production capacity (2% to 5%)
- Improved chemical performance (reduction degree increases 1-3 % units)
- Increased steam production (1-5%)
- Reduced excess O2 (10% - 30%)
- Emissions decrease (10 - 20 %)
- Reduced sootblowing steam (15% to 35%)

Full Range of Control Functions

The Advanced Recovery Boiler Control Solution includes advanced control modules that are based on the latest developments in sensor and algorithm technology. Its main features are Combustion Control and Sootblowing Control.

Combustion Control keeps the boiler operation in full control

Profit Suite for recovery boiler solution keeps the furnace combustion conditions at an ideal level for all boiler loads. The application calculates and controls all basic parameters for boiler loads and corrects them as necessary based on disturbances. Combustion Control coordinates the following functionality:

- Load Control
- Combustion Air Control
- O2 Control
- CO Control
- Droplet Size Control
- Bed Stabilization
- Boiler Symmetry Monitoring
- Production Rate Change Control

Load Control

Load Control stabilizes combustion conditions during load changes and under constant load, even if the liquor quality changes. Stability is achieved through the control of organic dry solids which is a function of black-liquor fl ow, temperature, density, and refractive index. The feedback of the black-liquor heat value is calculated continuously based on process measurements, and the organic dry solids flow setpoint is adjusted accordingly.

Coordinated Load Change

The control of the boiler load enables boiler load changes without causing disturbances to combustion, smelt, or emissions. When a change to the boiler load is desired, the new target is entered as the dry solids flow. The boiler load setpoint is then changed in small steps toward the new load target, with corresponding changes made to primary, secondary, and tertiary air controls. During load changes, combustion conditions and flue gas emissions are continuously monitored. If any disturbances are noticed, the load change is stopped until everything returns to normal.

Organic Dry Solids Flow Control

The heating value of black-liquor solids is derived almost entirely from the organic content. Therefore, the heat input flow can be controlled by controlling the flow of organic dry solids to the boiler. The organic dry solids flow is a sof sensor model using the following measurements in the black-liquor supply line: black-liquor flow, refractive index, black liquor temperature, and black-liquor density. The organic dry solids setpoint is calculated from the total dry solids setpoint given by the operator. The measured dry solids flow may differ from the target as the heat value stabilization and O2 control corrections alter the organic dry solids flow setpoint within preset limits. The controller output gives a remote setpoint to the liquor pressure controller, and the output pressure is continuously monitored.

Heat Value Correction

The quality of black-liquor changes when different wood species are used in cooking, and when ash as makeup salt cake is mixed into black-liquor in the mixing tank. The organic dry solids ratio in black liquor will vary, causing variations in the black-liquor heat value. The heat value of black-liquor is calculated in three ways: from the organic dry solids content based on refractive index, temperature, and density; from steam production; or from consumed air.

While the boiler is operating at a constant load, the stabilization control keeps the black-liquor organic dry solids input to the furnace constant by controlling the liquor pressure. The control principle is to maintain a constant heat input into the furnace. Stable fuel input stabilizes the entire boiler and leads to increased efficiencies. This can be compared to liquor pressure or flow control in traditional optimization control. A benefit of the continuous flow model is that disturbances in liquor burning, including plugged liquor nozzles, can be detected.

Combustion Air Control

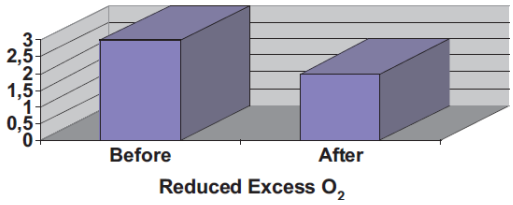
The right amount of air in the right place is the goal for Combustion Air Control. The control is based on the total air demand and distributes it to different air levels according to boiler-specific air curves. Air curves define the percentage of total air for each level for different boiler loads. Controls from O2 and CO controls are added to the setpoints of secondary and tertiary air flow.

The total combustion air requirements are controlled based on the flow of dry solids into the furnace. In addition, an air-to-liquor ratio calibration continuously corrects the total air flow based on measurements of O2, CO, TRS, NOx, and opacity. Elemental analysis of the black-liquor is also included in the calculation. By taking into account all of these variables, the O Control achieves very precise control of the combustion air requirement. The total air requirement is divided among primary, secondary, and tertiary air, taking into consideration the independent air distribution curves for different boiler loads. The air distribution curves are calculated throughout the

boiler load range. In addition, the operator can save the control parameters when the boiler is at an optimum condition.

O2 Control

O2 deviation are kept low in order to operate the boiler at lower O2 levels. The measured O2 is filtered, and the filtered value is used as a measurement value in the control strategy. Control adjusts both the O2 amount of fuel (organic dry solids) and the amount of combustion air in the control.



CO Control

The goal of CO Control is to achieve full combustion by adjusting the air distribution to the boiler.

Droplet Size Control

Droplet Size Control maintains the ideal liquor droplet size, even when liquor characteristics change. A reliable control of the droplet size is achieved by controlling the liquor temperature based on measurements from dry solids, refractive index, and liquor pressure. A boiling point calculation, based on dry solids and load, prevents excessive black-liquor temperature. The ratio of organic to inorganic content in black liquor is continuously calculated to provide accurate droplet size.

Project and Consulting Services Ensure Your Success

Honeywell's experience in evaluating and optimizing pulp chemical recovery processes ensures smooth implementation of Profit Suite for Recovery Boiler —minimizing the impact on production and quality. In addition, our pulp mill processes an control experts and service organization are available for process consulting, tuning, and troubleshooting to ensure your process operates at peak performance.

Improve Mill Performance

Profit Suite for recovery boiler is a key element of Honeywell's Pulping Solutions. These solutions are designed to improve quality and operational flexibility, reduce operating costs, and minimize environmental impact.

For More Information

Learn more about the Honeywell's Profit Suite, at our website www.honeywell.com/ps or contact your Honeywell account manager.

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