ProcessLink®

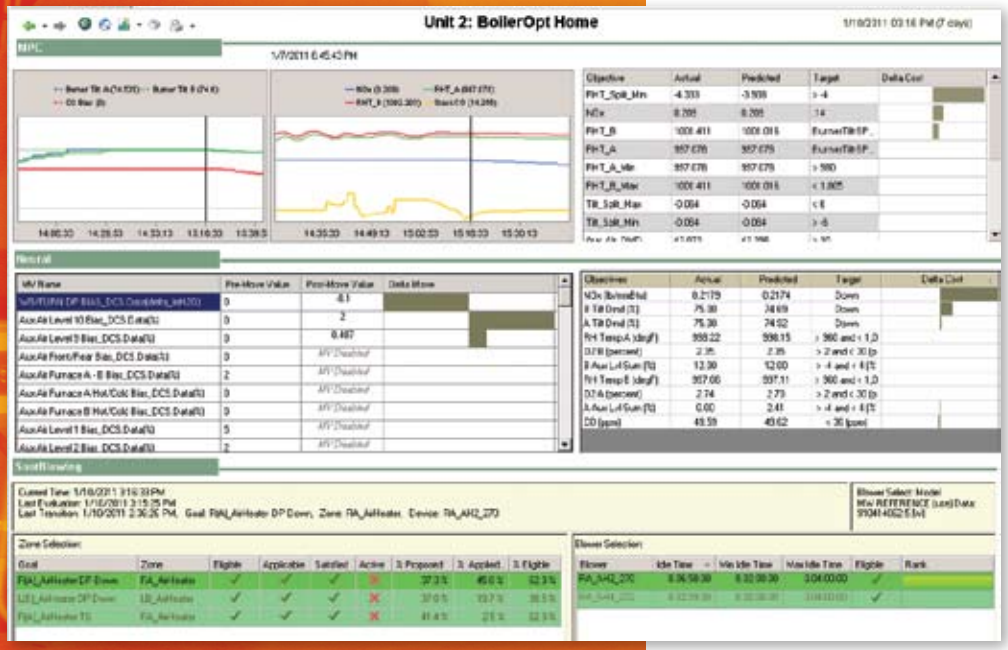
BoilerOpt®

Integrated Combustion and Sootblowing Optimization

Key BoilerOpt® Benefits

- Reduces forced outages by minimizing tube erosion and excessive thermal shocking
- Reduces NO_X and other emissions
- Avoids slagging, plugging and fouling events
- Improves heat rate and thereby reduces CO_2 emissions
- Minimizes attemperation sprays and exit gas temperatures
- Improves reheat and superheat steam temperature control
- Minimizes reagent consumption if an SCR or SNCR is in place
- Maintains Opacity and CO limits and reduces LOI
- Improves operational consistency

The Optimizer Home Pages explain the most recent moves by the Optimizers, alert users to ways to improve performance and provide performance benchmarks.



Why BoilerOpt?

The boiler is the heart of steam turbine-driven electricity production and home to many complex process interactions. Combustion quality, fuel and air mixing, gas and steam temperatures, fouling and slagging, tube erosion and emissions control are just a few of the interrelated variables that must be continually managed for successful boiler operations. Fluctuating constraints and changing objectives add to the complexity.

BoilerOpt is NeuCo's total boiler optimization software solution that optimizes electric power plant boiler performance in closed loop to achieve overall unit availability, efficiency and emissions goals. BoilerOpt integrates the functions of NeuCo's CombustionOpt® and SootOpt® products and manages tradeoffs between the combustion and heat transfer processes.

SootOpt® SootOpt is a sootblowing optimization software system that determines the effect of sootblowing activity on heat transfer throughout the furnace and backpass. It directs sootblowing actions to improve availability and efficiency and avoid boiler over- and under-cleaning. Using expert rules and neural networks, SootOpt determines the appropriate boiler zones to clean and blowers to activate in order to balance the unit's goals of reducing boiler tube erosion and excessive thermal shocking while improving steam temperatures and sprays and minimizing fouling, plugging and slagging events. It works in conjunction with existing sootblowing controls to drive closed-loop actions.

CombustionOpt® uses neural networks, model predictive control (MPC) and other technologies to extract knowledge about the combustion process and determine the optimal balance of fuel and air mixing in the furnace to reduce NO_X emissions and improve boiler efficiency and unit operations. It optimizes fuel-to-air ratios in real-time by biasing DCS set-points to adjust dampers, burner tilts, pulverizer settings, over-fire air and other controllable parameters to their optimal levels for a given set of conditions, objectives and constraints.

High Model Fidelity. The top screen shows a NO_X model that includes both CombustionOpt and SootOpt variables as inputs. The trend displays actual NO_X in green and model-predicted NO_X in blue. The fidelity of this model is higher than the model using only CombustionOpt biases (bottom screen). The better a model's ability to accurately predict, the better it will perform.

BoilerOpt: An Integrated Approach

Independently optimizing the combustion and soot-blowing processes can leave operational and economic benefits on the table. For example, boiler cleanliness significantly impacts combustion processes, and combustion stoichiometry and temperatures affect ash build-up, fouling, and slag formation. BoilerOpt addresses these complex interactions to consistently achieve the best boiler performance under changing operating conditions.

This level of integration is made possible by NeuCo's ProcessLink® technology platform, which contains process modeling, optimization and analysis tools along with a reusable set of components that are shared across all NeuCo products. By integrating disparate data sources and knowledge, ProcessLink enables CombustionOpt and SootOpt to share an understanding of process characteristics, make performance comparisons and tradeoffs, and align combustion and sootblowing actions towards achieving production objectives.

Hybrid Technologies for Superior Results

BoilerOpt maximizes the benefits it delivers by employing multiple optimization methodologies coordinated through a common underlying platform. Model Predictive Control technology supports the rapid response times often required for steam temperature and CO control in fast ramping situations, while adaptive neural networks address the constantly-changing relationships between air biases, fuel biases, and NO_X. Unit-specific expert rules are seamlessly combined with adaptive neural models to consistently execute appropriate baseline soot cleaning procedures while optimizing toward unit objectives.

Adaptability for Sustainable Benefits

Key to the success of the BoilerOpt products is their adaptability. ProcessLink's flexibility enables BoilerOpt's goals and constraints to be easily modified to incorporate new controls and objectives, or to address additional optimization challenges. Machine Learning components, e.g. neural networks, use online learning algorithms to ensure models remain accurate over time by automatically learning from and adapting to changes in boiler operations. Expert rules are designed to be opportunistically adapted, e.g. SootOpt's rules knowledge base can be easily enhanced and expanded over time by modifying rules to reflect the latest available instrumentation and wisdom.

Transparency & Insight

The actions of closed loop Optimizers are not always intuitive, since the systems are used to achieve multiple and sometimes conflicting goals within a set of constraints. With the products' Demystifier Views, the recent moves an Optimizer made, the reasons for these moves, and the constraints under which it was acting are all displayed so users can have confidence that it is pursuing its objectives.

BoilerOpt provides key process insights that support improved situational awareness and better decision making. For example, SootOpt provides information about how effectively unit sootblowing equipment is operating and provides alerts when it notices an issue that needs attention. It also displays analysis related to changes in sootblowing patterns, equipment that may need maintenance, and performance differences between operator shifts and summary analysis of expert rule behavior.

NeuCo
The Optimization Standard™

33 Union Street, 4th Floor
Boston, MA 02108-2414
617-587-3100
www.neuco.net