

SmartProcess® Software First to Demonstrate 25% NOx Reductions in Cyclone Boiler

RESULTS

- Reduced average NOx emissions by 25%
- Earned more than \$2 million in annual NOx credits to date
- Improved O₂ split across boilers for more efficient operation
- Achieved return on investment within two months of installation



APPLICATION

Unit 1 is a 200 MW B&W sub-critical once-through cyclone boiler. Unit 2 is a 205 MW B&W drum cyclone boiler.

CUSTOMER

Constellation Energy, Crane Units 1 & 2 located in Baltimore, Maryland.

CHALLENGE

Ozone season in Baltimore, Maryland, which is from May through September, presented a challenge for Constellation's Crane power units. High NOx emissions and escalating NOx credits threatened the future of the units from the late 1990s through 2004. In late 1999 through early 2000, Constellation installed over-fire air/gas reburn systems in an effort to reduce Crane NOx emissions to acceptable levels. Although they achieved a 40-50% NOx reduction, the rising cost of natural gas forced the systems offline after a short year of operation in 2001-2002. With another ozone season quickly approaching for 2003, Constellation needed to find a cost-effective solution for the Crane units to be in compliance with federal NOx regulations, thus keeping them operational for remote dispatching when needed.

“We saw significant NOx reduction with a relatively small capital investment. We recouped our investment after two months of operation.”

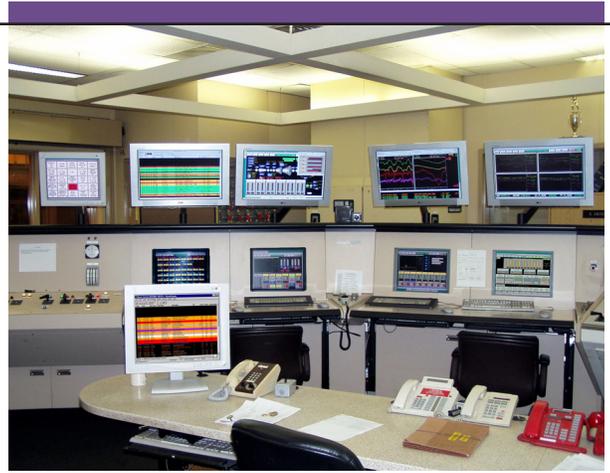
Steve Stultz
Constellation Energy
Technical Engineer



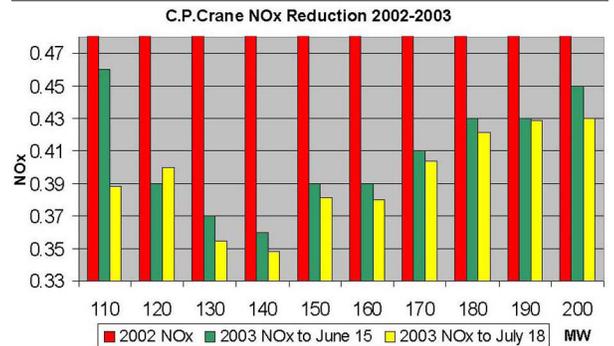
SOLUTION

SmartProcess® Optimization Software was used to implement the three-phased Crane boiler optimization project. The first and most important phase used the Cyclone Boiler Optimizer. This SmartProcess module significantly reduced NOx emissions from the Constellation Crane units, while providing increased competitiveness in the power market. Analysis of parametric testing, where multiple plant variables were manipulated, revealed that several factors — cyclone stoichiometry (a measure of the fuel-to-air ratio for the combustion process), boiler excess oxygen, boiler air duct pressure, and boiler overfire air flow — all had impact on the NOx production of the boilers. Changes to these variables brought the cyclone stoichiometry value to within the recommended operating range.

The 25% NOx reduction at Crane is just the beginning, as the Smartprocess module is self-learning and will continue to improve over time as more data is collected. Further performance enhancements will also be realized with the addition of efficiency models to the SmartProcess Cyclone Boiler Optimizer and installation of the SmartProcess Steam Temperature Optimizer during later project phases.



The Constellation Crane control room was renovated and fitted with new, flat-screen monitors.



The chart above demonstrates the magnitude of Crane’s performance results.

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