INTEGRATED OPTIMIZATION OF COMBUSTION AND POST-COMBUSTION SYSTEMS FOR COAL-FIRED BOILERS

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Summary

This paper addresses three different approaches to the optimization of post-combustion systems (SCR and SNCR) for coal-fired boilers. These approaches -- distinguished by their scope and the systems addressed -- have been applied through NeuCo's ProcessLink™ optimization technology to three different boiler projects. The relevant system interactions are explained in the context of a "first principles" chemical engineering framework NeuCo has developed to understand and properly address the relevant system interactions.

The first project is Unit 2 of LG&E's Roanoke Valley Energy Facility (ROVA). This is one of the newest coal-fired plants in the US and the winner of awards for design, operations and environmental performance. The unit is equipped with both an SNCR and NeuCo's combustion optimization system, CombustionOpt™, but since the SNCR is not currently controlled through the DCS, the SNCR optimization results to-date are purely those obtained as a by-product of combustion optimization.

The second project is Elmer Smith Unit 2, a 265 MW tangentially-fired boiler owned and operated by Owensboro Municipal Utilities, which is now being equipped with an SNCR. The project involves the application of NeuCo's commercially available CombustionOpt™ system and a beta version of SNCROpt™, which uses similar inductive technologies including neural networks, fuzzy logic, and direct search algorithms to optimize the SNCR in a manner coordinated with combustion optimization to minimize urea flows and heat rate while controlling CO and other important operating constraints, such as steam temperature.

The third project involves the demonstration of a fully-integrated optimization system at the host site for NeuCo's Clean Coal Power Initiative project with the Department of Energy at Dynegy Midwest Generation's Baldwin Energy Complex. The part of the project to be addressed in this paper involves the two 600 MW coal-fired cyclone boilers, both of which are equipped with SCRs, which will be explicitly optimized in a coordinated fashion along with combustion, sootblowing, unit thermal performance, and plant-wide financial performance.

All projects harness NeuCo's ProcessLink™ technology to integrate existing controls, control systems, sensors and computer hardware with advanced optimization techniques in a proprietary software environment to reduce emissions, increase efficiency, and increase availability. ProcessLink's core technology literally learns on-line the interrelationships between important process control settings and real-time performance, constantly searching for overall performance improvements and make adjustments automatically and in real-time.

The OMU Elmer Smith project will be of interest to the increasing number of generators using the shorter lead-time, less capital-intensive SNCR technology to address medium-size units and build flexibility into their overall NOx compliance strategies. The CCPI project at Baldwin will be of interest not only to owners and operators of cyclones and units relying on SCRs for NOx compliance; but also all fossil-steam units with an interest in understanding the total benefits associated with broader integrated optimization technology that helps coordinate the operations of all boiler, post-combustion, and balance-of-plant systems toward global economic and environmental goals.

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