126a A Successful Sncr Design with CFD Applications in a Gas Fired Co Boiler

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Selective non-catalytic reduction (SNCR) is an effective and economic method of reducing NO_X. However, SNCR performance is sensitive to temperature and CO concentration at locations where the nitrogen containing reagents are injected. It is widely known that the SNCR process is only effective in a narrow temperature window, around 1,700 – 1,800ºF, and its effectiveness is deteriorated when CO concentration in the window is high. Therefore, it is critical to understand the flow field, temperature field and species concentration distributions in order to design an effective SNCR injection system. In addition, good mixing of the reagent with the furnace gases is another important factor for maximizing the NO_X reduction.

Over the past few years, GE Energy and Environmental Research Corporation (GE EER) has developed a reduced SNCR chemistry and integrated the model into the computational fluid dynamics (CFD) simulation tool. The SNCR CFD model has been recently applied successfully in the process design of a commercial SNCR system for a gas-fired CO boiler. A full-scale three-dimensional CFD model was developed to predict flow field, temperature distribution and CO concentration profiles near the potential reagent injection locations. The SNCR chemistry in the CFD model was then used to predict the NO_X reduction and ammonia slip for several nitrogen stoichiometric ratio (NSR) and boiler load conditions. The system design was optimized based on the CFD observations, and the guarantees on NO_X and ammonia slip were provided based on the predictions. The completed field installation and testing demonstrated well over 30% NO_X reduction and less than 10 ppm slip which satisfies guarantees.

This paper will present the CFD studies on the SNCR system and its performance for the CO boiler. The field-testing data and their comparison with CFD predictions will also be analyzed and discussed at the end of the paper.