CFD Simulation of the Hybridization of Urea-SNCR with SCR in a Pilot-Scale Flow Reactor

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In recent years there has been a considerable growth and development in flue gas control technologies capable of reducing NO_x emissions to the low levels required by current legislation. The hybrid SNCR-SCR technology is expected to provide a cost effective method of NO_x reduction while balancing capital and operating costs. In this study, the hybridization of urea-based SNCR with SCR in a pilot-scale flow reactor is investigated through the experimentation and computational fluid dynamics (CFD) simulation. The pilot system is installed with a 150kW LPG burner. The V_2O_5-WO_3/TiO_2 monolith honeycomb is used as a catalyst in the SCR zone.

A reduced SNCR chemistry using urea-water solution is implemented into a turbulent reacting flow CFD model. The model is combined with the discrete phase model to account for the interaction between flue gas and the droplets of urea solution. An Arrhenius-type reduced model is used for the surface chemistry of SCR process. The simulation results show a good agreement with the experimental data of NO reduction and NH_3 slip obtained from the hybrid SNCR-SCR process in the pilot-scale flow reactor.