The reduction of noxious emissions using urea based on selective non-catalytic reduction in small scale bio fuel combustion system

Abstract:

Selective Non-Catalytic Reduction (SNCR) of oxides of nitrogen (NOx) was studied experimentally by injecting different concentrations of aqueous urea solution in a pilot-scale Bio-fuel fired tunnel furnace at 3-4 % excess oxygen level and with low ppm of baseline NOx ranging from 65 to 75 ppm within the investigated temperature range. The furnace simulated small-scale combustion systems where the operating temperatures are usually in the range of about 973 to 1323 K and NOx emission level remains below 100 ppm. NOx reductions were studied with the variation of different parameters such as injection temperature, residence time, Normalized Stoichiometric Ratio (NSR) of the reagent, carrier gas pressure, etc. A significant amount of NOx reduction was achieved which was not pronounced by the previous researchers with urea SNCR for this low ppm of NOx. With 5% plain urea solution, at an NSR of 4 as much as 54% reduction was achieved at 1128 K, whilst in the additive case the NOx reduction was improved to as much as 69% at 1093 K.