INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

This thesis presents a detailed investigation on improving the performance of a Porous Radiant Burner (PRB) by the means of clustering small sized burner against a large size burner. Experimental results suggested that clustering smaller sized PRBs yield higher thermal efficiency and reduced CO and NO_x emissions. The Clustered Porous Radiant Burner (CPRB) was evaluated for its performance investigation over the stable range of power inputs and subsequently an improved CPRB was developed by changing the burner diameter. The performance investigations revealed that the CPRB with individual burner diameter 80 mm (CPRB8) was found to yield maximum thermal efficiency of 59.2% while individual burner diameter 90 mm (CPRB9) produced the lowest emissions. Subsequently a self-aspirated CPRB was developed to eliminate the requirement of compressed air. The development was carried out by design optimization of the geometrical components. Maximum thermal efficiency was obtained as 58.2% at a power input of 8 kW. Minimum CO emissions of 5 ppm were obtained at 8 kW, while the emissions of NO_x were untraceable. The self-aspirated CPRB was found to be energy saving and more environment friendly when compared to a conventional burner. Numerical investigations were carried out to study the effect of air entrainment on the combustion stability of a self-aspirated PRB. Observations revealed that at certain combinations of the orifice and the mixing tube, optimized primary aeration was obtained that resulted in stable combustion. The PRB was observed to operate under stable partially submerged combustion for orifice diameter 0.3 mm when positioned at 30 mm from the bottom of the mixing tube of diameter 29 mm.