STUDIES IN CIRCULATING FLUIDIZED BEDS

By

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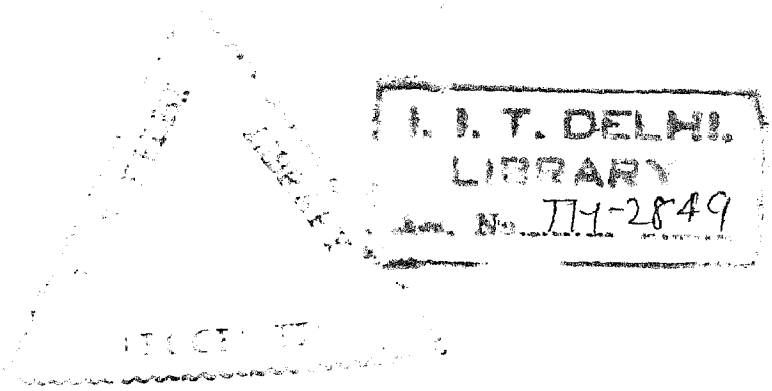
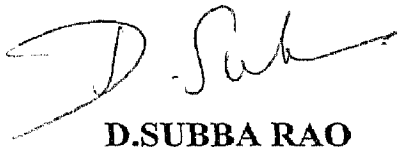


CERTIFICATE

This is to certify that the thesis entitled **"STUDIES IN CIRCULATING FLUIDIZED BEDS"**, being submitted by **SANJAY GAMBHIR** to Indian Institute of Technology, Delhi, for the award of Degree of Doctor of Philosophy in Chemical Engineering, is a record of bonafide research work carried out by him. Sanjay Gambhir has worked under my guidance and supervision and has fulfilled the requirements for the submission of thesis.

The results contained in this thesis have not been submitted in part or in full to any other university or institute for the award of any degree or diploma.



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ABSTRACT

High velocity fluidized beds have received great attention in the recent times. Information on hydrodynamic parameters such as region of operationality (choking), axial solid holdup and gas to particle mass transfer as a function of operating parameters (in the risers of high velocity fluidized beds) are needed. Studies on these parameters are reported in this thesis.

Effects of superficial air velocity, particle diameter and riser diameter on the saturation carrying capacity are studied. A model is developed considering that choking takes place when gas velocity is equal or lesser than the cluster terminal velocity and is compared with the present data as well as literature data. The concept of particles flowing in the form of clusters is able to explain the choking phenomenon.

Effects of riser height, superficial air velocity, solid circulation rate, particle diameter, particle density and riser diameter on axial solid holdup are investigated in the dilute transport regime. Solids enter at the bottom of riser and get accelerated upward from zero velocity to a final constant velocity ("accelerating region") and move further with that velocity upto the exit of riser ("terminal region"). A model is developed to estimate the axial solid holdup in both the regions considering that particles move upward in the form of clusters in the riser.

Gas to particle mass transfer is investigated in the riser of a circulating fluidized bed in the dilute transport regime. Effects of solid circulation rate, superficial gas velocity and particle diameter are studied. Gas to particle mass transfer coefficient in the form of Sherwood number is correlated with the parameter ($W/\rho_p u_o$). This parameter is related to cluster size.

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