STUDIES IN GAS-SOLID TAPERED FLUIDIZED BEDS

By

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Submitted

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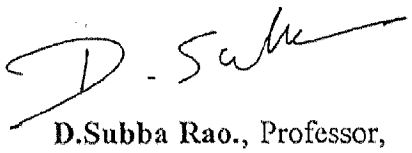
Certificate

This is to certify that the thesis entitled **"STUDIES IN GAS-SOLID TAPERED FLUIDIZED BEDS"**, being submitted by **MAKHAN LAL DAS** 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. Makhan Lal Das 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

In operations dealing with particles of large size distribution, tapered fluidized beds can offer certain advantages over conventional/ cylindrical fluidized beds. In tapered beds, higher gas velocity over the grid ensures elimination of chances of bed defluidization, while the lower velocity at the top reduces elutriation. From a designer's point of view, information on regimes of operation (packed bed, bubbling regime, turbulent regime), bed expansion, particle circulation and gas to particle mass transfer characteristics as a function of gas velocity is important. Experimental studies in 2-D and 3-D tapered beds on these parameters are reported in this thesis.

Observations in the present work are in line with the limited information available on packed bed pressure drop, minimum velocity for fluidization, bed expansion and solid circulation in tapered beds. New experimental observations on mass transfer and transition to fast fluidization regime in tapered beds are reported.

In tapered fluidized beds, the bed behavior depends on equipment variables also, in addition to system and operating variables. Models for each parameter are developed, such that, they reduce to models for cylindrical fluidized beds when apex angle is zero. With such an approach, equations/correlations are developed for minimum velocity for core fluidization, bubble hold-up, solid velocity at wall, particle to gas mass transfer and transition velocities and compared with the experimental results.

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