Contribution ID: **240** Type: **Oral**

Investigation of the Multiple Side Injections on Hydrodynamics of the Gas-Solids Fluidized Bed Using Radiotracer Based Techniques

Thursday, 27 April 2017 11:30 (15 minutes)

Introduction
Fluidized bed reactors are the core of the chemical industries. The contact between fluid and solid phase plays an important role in the overall yield and performance. The liquid injection of the reactants has tremendous application in the various industries such as polypropylene production, catalytic cracking, coating and drying etc. These processes are occurred in the fluidized bed reactors in which precursors are added to the reactor in atomized form through side injections. The jetting phenomena affect the system locally as well as globally and may change the solid recirculation profile in the reactors. These recirculation profiles contribute to the solid mixing and hence the quality of fluidization. The present works emphasis on the effect of the multiple injection(s) on the solid distribution and velocity field via radiotracer based techniques.

Experimental Methodology
The experiments are carried out at three different air inlet velocities, which correspond to 1.5, 2 and 3 Umf. For each air inlet velocities, experiments are performed with secondary gas injection through single and two side nozzles (placed at the same and different planes) operated at three different nozzle flow rates (80,100,120 LPM). Glass beads of 660 micron size and density 2500 kg/m3 is used in all the experiments. The solid distribution and solid velocity profiles are estimated using the gamma ray densitometry and radioactive particle tracking (RPT) technique respectively. Densitometry provides line averaged attenuation measurement for each radial location. The term "densitometry"refers to measurement of the density of a material by determining the degree to which that material attenuates radiation of a given energy. By using Beer-Lambert's law, the phase holdup can be calculated along the chord length in which the attenuation in the radiation is measured. In RPT motion of a single radioactive particle, which has same size, shape and density as of the other particles, is tracked by using NaI(Tl) scintillation detectors. In current experiments Sc-46 embedded in glass beads is used as a tracer particle.

Results and Discussions

Densitometry and RPT experiments are performed for different nozzle configurations and flow rates. The time average radial solid distribution profile is estimated at different axial planes. Figure 1 shows the comparison of solid volume fraction at the nozzle injection plane. The bed is operated at 3 Umf at different nozzle injection velocities. Results indicate that compared to without nozzle case with nozzle injection cases show higher fraction of solids Similarly, The other experimental finding will be addressed in full paper.

Conclusions
It was observed that most of the injected gas flow near the injection wall even at the higher flow rate and resulting in the low solid fraction at the wall in the case of single nozzle injection. The multiple nozzle injection (their location and configurations) have significant impact and depending upon injection velocity the second nozzle may increase or decrease these effects.

Country/Organization invited to participate

India

Primary author: Mr RAWAT, Jitendra Singh (Indian Institute of Technology-Guwahati, India)

Co-authors: Mr PANT, Harish J (BARC, India); Mr TIWARI, Pankaj (Indian Institute of Technology-Guwahati, India); Mr UPADHYAY, Rajesh Kumar (Indian Institute of Technology-Guwahati, India)

Presenter: Mr RAWAT, Jitendra Singh (Indian Institute of Technology-Guwahati, India)

Session Classification: B12

Track Classification: RADIATION TECHNOLOGIES FOR MEASUREMENT