

HORIZONTAL SECONDARY GAS INJECTION IN FLUIDIZED BEDS: SOLIDS CONCENTRATION AND VELOCITY IN MULTIPHASE JETS

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Secondary gas injection into fluidized beds is used in many industrial applications to control the particle size (1) or to introduce a reactant gas (2). Also in fluidized bed opposed jet mills a highly expanded gas can be used to grind particles into the submicron range. To model and improve processes which use secondary gas injection, a better understanding of the multiphase flow inside the jets is indispensable.

A contribution to this is the analysis of the particle velocity via particle image velocimetry (PIV). These experiments were carried out in a semicircle fluidized bed with optical access, so that the morphology, particle acceleration and entrainment behavior can be visualized. These results can be compared to a simple model for the calculation of particle velocities in free jets and give a good agreement. Additionally, the solids concentrations in the particle laden gas jets are investigated with capacitance probes, an invasive measurement technique (3). Thus a solid concentration profile of the jet area can be determined and together with the PIV-data the solid mass flow can be estimated. This information is important for the calculation of the residence time in a reaction zone or the load condition in a jet mill. Parameters for those studies were the particle-size-distributions, the nozzle diameter, secondary gas velocity or the fluidization velocity. The measurements as well as the comparisons with calculations and models have discovered some unexpected insights in the multiphase flow of gas jets into fluidized beds and in the comminution process in fluidized bed opposed jet mills.

REFERENCES

1. J. McMillan, C. Briens, F. Berruti, and E. Chan. High velocity attrition nozzles in fluidized beds. *Powd. Techn.*, 175:133-141, 2007.
2. L. Chen, and H. Weinstein. Shape and extent of the void formed by a horizontal jet in a fluidized bed. *AIChE. Journ.*, 39(12):1901-1909, 1993.
3. M. Richtberg, R. Richter, and K.-E. Wirth. Characterization of the flow patterns in a pressurized circulating fluidized bed. *Powd. Techn.*, 155:145-152, 2005.