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Numerical analysis of gas distribution system in fluidized bed dryers

Swamy T Toolahalli
National University of Singapore (NUS), Singapore

Fluidized beds are extensively used for a number of applications in the chemical and process industries as they offer large contact area between fluid and solid, excellent mixing, and hence, good heat and mass transfer coefficients. One of the most common applications of fluidized beds is drying of particulate materials. The fluidized beds are considered to be the most effective way of drying the particulate materials. According to the Geldart classification, the conventional fluidized beds are best suitable for drying of Type A and B particles (particles size in the range of 50 mm to 2mm). However, some industries may need the drying of Type C (ultrafine) and Type D (larger than 2 mm) particles and the existing fluidized beds are not capable of handling these types of particles. In addition to this many applications may need handling a wide particle sizes in a single fluidized bed dryer. The use of conventional fluidization methods may also result in non-uniform drying or longer drying times. Malfunction of the air distributor would result in failure to sustain good quality fluidization as well as drying in the gas fluidized bed.

The objectives of this project are to improve the performance of fluidized bed drying using different ideas such as, new designs of the distribution plate and gas chamber, by modifying the gas injection system or by using intermittency. The goal is to carry out numerical study to understand the effect various operating parameters and geometric changes. The numerical simulations will be carried out using ANSYS Fluent.

swamy.toolahalli@gmail.com