

209g Rotating Fluidized Bed an Efficient Polymerization Reactor

Azita Ahmadzadeh, Hamid Arastoopour, and Fouad Teymoour

Low-pressure gas phase polymerization is widely used for polymerization of Ethylene and Propylene in the fluidized bed reactors. In spite of the significant application of this kind of reactors, they have shown limited flexibility in achieving high gas throughput because of the possibility of slugging and the inability to provide suitable heat transfer rates. To overcome this disadvantage and enhance the efficiency of the fluidized reactors, we studied feasibility of using the rotating fluidized bed reactors for this purpose. In this phase of study, we have focused on the gas and particles flow patterns. By applying high rotational speed and creating a radial acceleration much stronger than gravity, we can achieve more gas throughput without serious formation of bubbles or slugging bed. Therefore the size of the reactor could be decreased and the heat transfer rate will be improved. The dynamic behavior of a gas-solid in a rotating fluidized bed, consisting of a cylindrical reactor with porous wall connecting to a draft tube located on the top of the reactor was studied. The solid particles initially were placed at the bottom of the reactor and gas enters the reactor from the porous wall. Polyethylene particles (200 μ m) and air were used as solid and gas phase respectively. Two dimensional, transient and isothermal flows, with no chemical reaction were considered. We used FLUENT software for gas /particle flow systems to predict particles and gas flow patterns and parameters in a rotating fluidized bed. The velocity, volume fraction and pressure drop profiles for gas and particulate phases were obtained. In this work the effect of operating pressure and particle diameter on the solid and gas flow properties and patterns was studied. Increasing the operating pressure increases the gas pressure drop in the system. Particles Reynolds number which directly proportional to gas density was increased as pressure increases. However the minimum fluidization velocity did not change significantly. This is due to the fact that minimum fluidization velocity is proportional to difference between solid and gas densities which remain relatively constant.