Abstract Submitted
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Numerical study of cavitation and pinning effects due to gas injection through a bed of particles: application to a radial-flow moving-bed reactor. GUILLAUME VINAY, FELAURYS VASQUEZ, FLORENCE RICHARD, IFP Energies nouvelles, APPLIED MECHANICS TEAM — In the petroleum and chemical industries, radial-flow moving-bed reactors are used to carry out chemical reactions such as catalytic reforming. Radial-flow reactors provide high capacity without increased pressure drop or greatly increased vessel dimensions. This is done by holding the catalyst in a basket forming an annular bed, and causing the gas to flow radially between the outer annulus and the central tube. Catalyst enter the top of the reactor, move through the vessel by gravity to the bottom where it is removed and then regenerated. Within the catalytic bed, the combined effects of particles motion and radial injection of the gas may lead to cavitation and pinning phenomenon that may clearly damage the reactor. We study both cavitation and pinning effects using an in-house numerical software, named PeliGRIFF (www.peligriff.com/), designed to simulate particulate flows at different scales; from the particle scale, where fluid/particle interactions are directly solved, to the particles suspension scale where the fluid/solid interactions are modeled. In the past, theoretical and experimental studies have already been conducted in order to understand the way cavitation and pinning occur. Here, we performed simulations involving a few thousands of particles aiming at reproducing experimental experiments. We will present comparisons between our numerical results and experimental results in terms of pressure drop, velocity, porosity.

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