A NUMERICAL SOLUTION FOR THE SATURATED WAVE REGIME IN FLUIDISED BEDS

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Abstract. Fluidised beds are systems in which a set of particles is suspended by an upward fluid that flows through them. The particles in these flows are modelled as a continuum so that the system can be described by a set of averaged equations composed of continuity and momentum equations for both the fluid and the particles [1]. In a 1D scenario, saturated waves can be observed in experiments, propagating upwards in the flow [2]. In this work, we study these saturated waves by considering the one-dimensional version of the governing equations and recasting them into a nonlinear ODE in the frame moving with the (unknown) velocity of the saturated waves [3]. The boundary value problem defined on the (unknown) wavelength of the saturated wave is solved by an iterative algorithm that finds the concentration profile, the wavelength and the propagation velocity of the waves simultaneously. Different particle pressure models are proposed in order to fit the results to the experimental data available in [2]. We show that a pice-wise particle pressure fucntion that takes into account the the compression and expansion phases of the wave can correctly describe the observations.

Keywords: fluidized beds, saturated waves, particle pressure, eigenvalue problem

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