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Simulation of Droplet Generation in a Non-Newtonian Dense Granular Suspension[1] GUSTAF MRTENSSON, Chalmers University of Technology, Mycronic AB, MARTIN SVENSSON, ANDREAS MARK, FREDRIK EDELVIK, Fraunhofer-Chalmers Research Centre for Industrial Mathematics —
As with the jet printing of dyes and other low-viscosity fluids, the jetting of dense fluid suspensions is dependent on the repeatable break-off of the fluid filament into well-formed droplets. It is well known that the break-off of dense suspensions is dependent on the volume fraction of the solid phase, particle size and morphology, fluid phase viscosity et cetera, see for example van Deen et al. (2013). The purpose of this study is to propose a novel simulation framework and to show that it captures the main effects such as droplet shape, volume and speed in a cylindrical duct test configuration. The granular suspension is modelled as a mixed single phase suspension, where the local thermodynamic properties are determined by the mixture level. The simulations are performed with IBOFlow, a multiphase flow solver, coupled with LaStFEM, a large strain FEM solver. To study how the droplet generation is affected by the acceleration of the fluid, simulations are performed for a series of actuation profiles. The simulation results were compared to experimental data obtained from an industrial jetting head. The simulations exhibit qualitative agreement with the experimental data. A sensitivity to the inlet boundary condition with respect to the resulting droplet speed was observed.

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