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Formation number of particle-laden starting jets NIRANJAN GHAISAS, DINESH SHETTY, STEVEN FRANKEL, School of Mechanical Engineering, Purdue University — The dynamics of a starting jet is studied under conditions where the injected fluid is laden with small spherical particles. The pinch-off process and its associated time scale, the formation number, are studied via a series of two-way coupled particle-laden, large eddy simulations with Lagrangian tracking of the order of 10^5 particles. The particles are small enough for the point-particle approximation to be valid, and inter-particle forces are neglected since the particle to injected fluid volume fraction is smaller than 10^{-3}. Forces acting on the particle include drag force and gravitational force. The numerical code is validated by reproducing formation numbers for pure as well as positively and negatively buoyant starting jets. A systematic study is carried out to investigate the effect of particle size and density on the formation number. Results at Re=5000 indicate that the presence of particles 10 times heavier than the fluid results in significantly enhanced total and head vortex circulations, leading to formation numbers distinct from the pure starting jet case. A particle-laden injection is thus shown to behave similar to an injection of a fluid heavier than the ambient.

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