

Analysis of Hydrate Agglomeration with Particle-Scale Models

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The formation of gas hydrates impacts oil/gas production in subsea pipelines at low temperature and high pressure conditions. Hydrate particle agglomeration can lead to pipeline plugs that are difficult and even dangerous to remove. This hydrate agglomeration phenomena is studied at the particle-scale using discrete element method with computational fluid dynamics (DEM-CFD). The DEM simulation technique solves for hydrate particle-particle and particle-pipe contacts using a force model and Newton's laws, while the computational fluid dynamics solves for the fluid motion and cell-averaged particle-fluid interactions. Agglomerate size is analyzed as a function of oil velocity and density, hydrate volume fraction, hydrate particle interaction and size. This novel, physics-based approach to study hydrate agglomeration phenomena may improve current agglomeration models and elucidate the fundamentals of hydrate particle physics.