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Abstract

Polydisperse multiphase flows occur broadly in industry and in our environment. In such flows, the disperse phase elements (particles, drops or bubbles) have to be differentiated by some of their intrinsic properties as size, shape, energy or composition, among others. These are the so-called internal variables upon which the particle number density is distributed. The resulting mean particle number density distribution function (NDF) can, in principle, be used to calculate all relevant mean properties of the particle population at a given point of the space-time domain, including its interaction with the continuous phase.

The evolution of the NDF is given by the solution of the population balance equation (PBE), whose solution can be couple to a CFD solution of a multifluid model (MFM) to describe the polydisperse multiphase flow, originating the so-called PB-CFD simulations. The main issue in this mesoscale model is the solution of the PBE, which is an integral-differential equation. There are a myriad of numerical methods to solve the PBE for homogeneous problems but only a few has been successfully extended to the inhomogeneous problems. We focus at these latter methods.

Presently, the quadrature-base method of moments (QBMM) are the most successful ones to solve PBE-MFM models, even though the method of classes have already being used for PB-CFD simulations. Here we briefly review the basic characteristics of the QBMM (MOM, QMOM, DQMOM, EQMOM, etc) and some of its extensions for bivariate problems (CQMOM, TPM, etc). Issues regarding the realizability of the moment set and the reconstruction of the NDF are also reviewed. Finally, results of some PB-CFD simulations developed at LTFD are presented.