Fuel injection modeling and simulation for combustion CFD: recent works around high order moment methods for sprays.

Stéphane de Chaisemartin (IFPEN)

Two-phase flows are at the core of many industrial applications, for example in injection processes taking place in automotive, aeronautics or spatial engines. For now several years, IFPEN is involved in a research action about two-phase flows modeling and simulation, in association with academic partners as Ecole Centrale Paris, Maison de la Simulation and more recently Ecole Polytechnique. Two-phase flow modeling suffers from the difficult mix between two different forms of the flow, rather incompatible:

* The dense zone of the flow, close to the injection nozzle, where distinct gas and liquid phases are separated by a complex interface;
* The dilute zone or spray, where liquid droplets are dispersed and evaporated within the gas.

Obviously, a continuum of states may be encountered between these extremes, and they may cohabit in the same zone of the combustion chamber.

We propose to raise in this talk the recent advances of this joint-work around moment methods for sprays. The evolution of the moment method formulations to increase their capacity of coupling with diffuse interface models will be presented as well as the associated numerical methods.

The strategy to prepare industrialization of such new models at IFPEN will also be touched on.