

Progress towards a unified CFD Model for multiphase flow modelling in complex domains with moving boundaries.

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Abstract

Although commercial CFD tools have evolved to allow accurate simulation of increasingly complex fluid and thermal systems, more challenging flow processes involving multiple interactions between multiple fluid and solid phases and deformable and/or moving immersed solids continue to require advanced skills either to develop tailor made solutions or to customise and validate existing solutions. Emerging technologies in the field of water treatment for example are attempting to combine processing methods relying on very different working principles (e.g. cyclonic separation, membrane filtration). Significant gains in treatment performance can be achieved in this way but the very complex and interactive multiphase flow processes involved make any quantitative study to support system optimisation extremely challenging.

This seminar will introduce progress made towards building a modelling framework to allow realistic models for this type of engineering systems. The talk will include a review of models developed over the past few years to address fluid structure interaction with highly flexible membranes, transient turbulent flow with rotating boundaries and air water mixing. The numerical methods explored include a Volume of Fluid method coupled with a Level Set interface reconstruction, an immersed boundary method and DES models for scale resolved pumping applications.