Other - Enabling Process Innovation Through Computation (EPIC)

The Next-Generation Predictive Tools For Multiphase Flows

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Patrick Taylor Hall 1106
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Abstract:

The ability to predict the behaviour of multiphase flows accurately, reliably, and efficiently addresses a major challenge of tremendous economic, scientific, and societal benefit. These flows are central to micro-fluidics, virtually every processing and manufacturing technology, oil-and-gas and nuclear applications, and biomedical applications such as lithotripsy and laser-surgery cavitation. Significant advances have been made in developing numerical procedures to simulate these complex flows, however, there remains a large gap between what is achievable computationally and 'real-life' systems; the latt er are beyond what can be addressed with current methods. As a result, the use of empirical correlations to bridge this gap remains the norm. We will outline the framework that we are currently developing as part of the Multi-scale Examination of MultiPH ase physIcs in flowS (MEMPHIS , htt p://www.memphis-multiphase.org/) programme, funded by the Engineering and Physical Sciences Research Council, UK , to minimise the use of correlations and shift towards the use of numerical simulations as a truly predictive tool that can be used as a sound basis for design. This involves a transparent linkage between input and prediction, allowing systematic error-source identification, and optimal, model-driven experimentation, to maximise prediction accuracy; optimal selection of massively-parallelisable numerical methods, capable of running efficiently on 105-106 core supercomputers, optimally-adaptive, three-dimensional resolution, and sophisticated multi-scale physical models. The talk will discuss progress made on several of the above areas using as examples bubbly flow, and slug flows.

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Speaker's Bio:

Prof. O. K. Matar (OKM) is an Exxon-Mobil Fellow and Professor of Fluid Mechanics at Imperial College London. OKM 's current research interests are in multiphase flows with applications in oil-and-gas flow-assurance, crude-oil processing, enhanced oil recovery, process intensification, coating flow technology, and manufacturing. OKM has reviewed the field of thin films in Rev. Mod. Phys. (impact factor 51). OKM has received £11M funding from the Engineering and Physical Sciences Research Council, UK , and is the director of the EPSRC Programme Grant (£5M), MEMPHIS. He is also the director of the Transient Multiphase Flow consortium, which comprises a number of oil-and-gas operators, design- and software-houses (http://multiphase.tech.cranfield.ac.uk/). He has co-authored 130 articles (h-index 27), and is Editor-in-Chief of Multiphase Sci. and Tech., an Associate Executive Editor of J. Eng. Math, and on the editorial board of Int. J. Multiphase Flow.

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