**Post-doc position at IFP Energies nouvelles (IFPEN)**
Mechanical Engineering, Computational Fluid Dynamics

# Meso scale Euler/Lagrange modelling of reactive particulate flow in complex geometry : Multi-scale analysis and applications

Many industrial processes like coal combustion, catalytic cracking, gas phase polymerization reactors and more recently biomass gasification and chemical looping involve two-phase reactive flows in which the continuous phase is a fluid and the dispersed phase consists of rigid particles. Improving both the design and the operating conditions of these processes represents a major scientific and industrial challenge in a context of markedly rising energy cost and sustainable development. Thus, it is above all important to better understand the coupling of hydrodynamic, chemical and thermal phenomena in those flows in order to be able to predict them reliably. The current post-doc position is offered in the framework of the MORE4LESS collaborative project supported by ANR (French National Research Foundation). The aim of MORE4LESS is to build up a multi-scale modelling approach of reactive particulate flows and to focus on the development of a mesoscopic-scale Euler/Lagrange (MSEL) model including heat and mass transfers and chemical reactions for the prediction of particle-laden flows in dense and dilute regimes. This new modelling will be implemented in a massively parallel numerical code that will enable us to take a step towards the enhanced design of semi-industrial processes.

The goal of the post-doc work is to validate our novel meso-scale numerical tool as well as fulfil the full multiscale analysis by comparison with experimental data. The first-step validation of the new numerical tool will be to compare results from the 3D unsteady Euler/Lagrangian simulations against experimental data from the non-reactive isothermal fluidized bed pilot at Birmingham (Fede et al., 2009, 2011). The second-step validation of the new tool will be to compare results from Euler/Lagrangian numerical simulations against experimental data from the reactive fluidized bed pilot at Toulouse (LGC, Laboratoire de Genie Chimique, UMR 5503 INPT/CNRS/UPS).

This new tool will open up new perspectives in the comprehension of the dynamics of fluidized beds and we forecast to perform unprecedented simulations. This will give us strong opportunities to publish this work both in Multiphase Flow and High Performance Computing journals.

**Keywords**: Reactive particulate flow, Multi-scale, Numerical simulation, mass and heat transfer

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| **Academic supervisor** | Dr. Masi Enrica at IMFT |
| **IFPEN supervisor** | Dr. Hammouti Abdelkader |
| **Post-doc location** | Solaize, France |
| **Duration and start date** | 1 year, starting from September 2017 |
| **Employer** | IFP Energies nouvelles, Solaize, France |
| **Academic requirements** | PhD in Multiphase Fluid Mechanics and numerical code development |
| **Language requirements** | Fluency in English, knowledge of French appreciated but not mandatory |
| **Other requirements** | Strong experience in mass and heat transfer, hydrodynamics and thermodynamics |

For more information or to submit an application, please contact abdelkader.hammouti@ifpen.fr

## About IFP Energies nouvelles

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