Multiphase Flow with Interphase eXchange (MFIX) – A New Approach to Computational Fluid Dynamics

Motivation/Challenges

- Multiphase flows present in many industrial processes
- System design expensive and time consuming

Technology/Capability Overview

- Open source MFIX software for describing three-dimensional distribution of pressure, velocity and temperature and species mass fractions in reacting fluid-solid systems
- Multiscale modeling environment for describing the hydrodynamics, heat transfer and chemical reactions in fluid-solid systems
- Scalable technology from nanometer sized mesopore modeling within single particle to particle scale micro-modeling to macro-scale continuum solids model. Allows scaling from lab to industrial scale systems
- Use of modern massively parallel computer architectures for fast turnaround and time-to-solution

Industry Significance

- MFIX is free open source software. 2600 users from 70 countries
- On-line MFIX support
- Applications to coal and biomass gasification; pre- and post-combustion CO_2 capture; manufacturing processes; petroleum refinement
- System design and parametric tests of bubbling, recirculating and spouted fluidized beds from lab-to-plant scale. Savings of millions of dollars in development costs
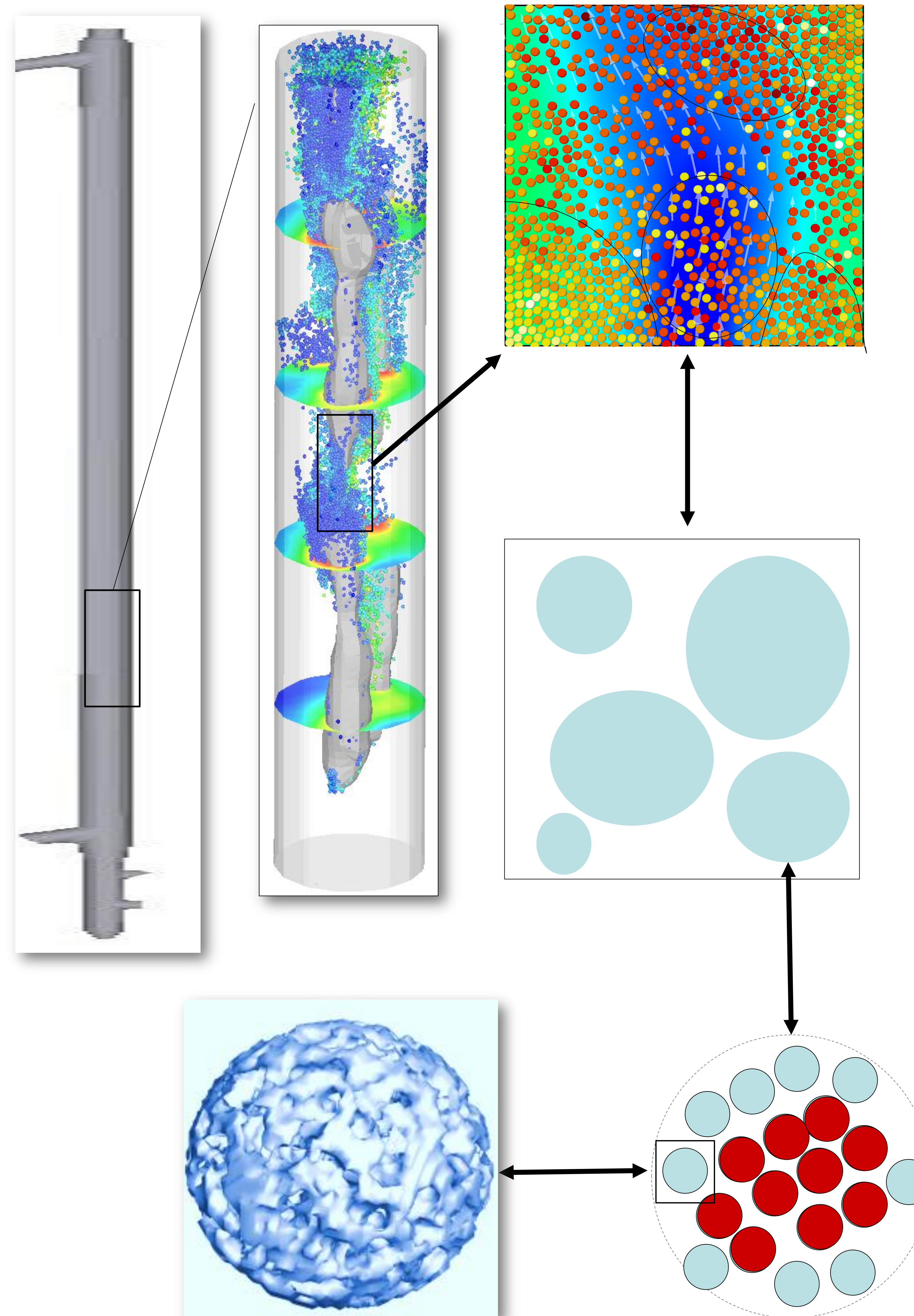
Benefits to Partner

- MFIX is the only open source software for fluid-solid systems
- Active R&D MFIX community
- Fully supported MFIX help
- Over 20 years of multiphase flow science R&D activities
- State-of-the-art experimental facilities for model verification and validation.
- Access to research expertise of NETL-RUA
- Access to high performance computational facilities

Opportunity

- Opportunity for collaborative industry-federal lab-academia partnerships through the RUA for industry specific grand challenge multiphase flow solutions.
- Ongoing MFIX and multiscale interdisciplinary R&D (engineering, mathematics, computer science, physics, chemistry, etc..)

Development Status

- https://mfix.netl.doe.gov/
- New version of MFIX (**MFIX2012-1**)
- Continuum, discrete, and reduced order models

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