# 2014 NETL Workshop on Multiphase Flow Science

## Tuesday, August 5, 2014 – Governors Ballroom, Lakeview Resort

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| 7:00 – 8:00 AM | **Registration (*Grand Ballroom Foyer*)**<br>**Continental Breakfast (*Governor Ballroom 4-6*)** |
| 8:00 – 8:05 AM | **Welcome and Introduction (Governors Ballroom 1-3)**<br>*William Rogers,* Leader - Multiphase Flow Team<br>U.S. Department of Energy, National Energy Technology Laboratory |
| 8:05 – 8:30 AM | **NETL Multiphase Flow Research Overview**<br>*Madhava Syamlal,* Focus Area Leader – Computational and Basic Science Focus Area, U.S. Department of Energy, National Energy Technology Laboratory |
| 8:30 – 9:00 AM | **A New Drag Law for the Accurate Prediction of the Pressure Drop in a Bubbling Fluidized Bed**<br>*Oladapo Ayeni[1], C.L. Wu[1,2], J.B. Joshi[3], K. Nandakumar[1],* [1]Louisiana State University, [2]ANSYS, Inc., [3]Homi Bhabha National Institute |
| 9:00 – 9:30 AM | **Estimating the Specularity Coefficient for the Accurate Simulation of Fluidized Beds of Different Surface-to-Volume Ratios**<br>*Akhilesh Bakshi, Christos Altantzis, Richard Bates, and Ahmed Ghoniem,* Massachusetts Institute of Technology |
| 9:30 – 10:00 AM | **Development of a Two-fluid Drag Law for Clustered Particles Using Direct Numerical Simulation and Validation through Experiments**<br>*Ahmad Baharanchi, Seckin Gokaltun, and George Dulikravich,* Florida International University |
| 10:00 – 10:30 AM | **Break (*Grand Ballroom Foyer*) and Posters** |
| 10:30 – 11:00 AM | **A Multiphase Turbulence Theory for Gas-Solids Flows using Favre-Averaging**<br>*Thomas O'Brien,* Research Scientist Emeritus, NETL |
| 11:00 – 11:30 AM | **An Adaptive Filter Strategy for Extracting Multiphase Flow Statistics From Euler-Lagrange Simulations**<br>*Olivier Dejardins[1], Jesse Capecelatro[1], and Rodney Fox[2],* [1]Cornell University, [2]Iowa State University |
| 11:30 – 12:00 PM | **Reduced Order Model Development for Fluidized Bed Biomass Gasification: Capturing Bubble Bypassing and Devolatilization Particle Segregation with CFD**<br>*Addison Stark, Richard Bates, Christos Altantzis and Ahmed Ghoniem*, Massachusetts Institute of Technology |
| 12:00 – 12:55 PM | **Lunch (*Governor Ballroom 4-6*) and Posters (Foyer)** |
| 12:55 – 1:00 PM | **Reconvene and Afternoon Introduction (*Governors Ballroom 1-3*)** |

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1:00 – 1:30 PM **Four-Phase Flow in Dusty Plasma**
*Mark Koepke,* West Virginia University

1:30 – 2:00 PM **Numerical Investigation and Modeling of Reacting Gas-Solid Flows In the Presence of Clusters**
*Olivier Desjardins, Jesse Capecelatro, and Perrine Pepiot,* Cornell University

2:00 – 2:30 PM **The Dynamics of Unlocking (Fluidization) and Mixing in Particle-Rich, Viscous Mixtures: MFIX-DEM Applications to Hawaiian Volcanoes**
*Jillian Schleicher and George Bergantz*, University of Washington

2:30 – 3:00 PM **Modeling of Dry Flue Gas Desulfurization Systems at the Industrial Scale**
*James Parker, Peter Blaser, Ken Williams*, CPFD Software, LLC

3:00 – 3:30 PM **Break (Grand Ballroom Foyer) and Posters**

3:30 – 4:00 PM **Assessment of Discrete Bubble Models Using Two-Fluid Simulations Of Thin Rectangular Fluidized Beds**
*Richard Bates, Christos Altantzis, and Ahmed Ghoniem,* Massachusetts Institute of Technology

4:00 – 4:30 PM **Validation of Gas-Particle Flows in Vertical Risers**
*Mohit Tandon[1], Aditya Karnik[1], and Gaurav Katuria[2],* [1]CD-Adapco, [2]Indian Institute of Technology, Delhi

4:30 – 5:00 PM **Non-Intrusive Uncertainty Quantification for Reacting Multiphase Flows In Coal Gasifiers**
*Aytekin Gel[1], Mehrdad Shahnam[2], Arun Subramaniyan[3], Jordan Musser[2] and Jean-Francois Dietiker[2]*, [1]NETL/ALPEMI Consulting, [2]NETL, [3]GE Global Research Center

5:00 – 5:30 PM **Numerical Simulation of Polydisperse Gas-Particle Flow in a Vertical Riser with a Size-Velocity Quadrature-Based Moment Method**
*Bo Kong, Rodney O. Fox,* Iowa State University

# 2014 NETL Workshop on Multiphase Flow Science

## Wednesday, August 6, 2014 – Governors Ballroom, Lakeview Resort

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|---|---|
| 7:00 – 8:00 AM | **Continental Breakfast (*Governor Ballroom 4-6*)** |
| 8:00 – 8:05 AM | **Reconvene and Introduction (*Governors Ballroom 1-3*)** |
| 8:05 – 8:45 AM | **MFIX Update**<br>*Jordan Musser, Janine Carney, Jeff Dietiker, Rahul Garg, Mark Meredith, Justin Weber,* NETL |
| 8:45 – 9:00 AM | **State of the Art in C3M**<br>*Dirk Van Essendelft, Terry Jordan, Philip Nicoletti, Tingwen Li,* NETL |
| 9:00 – 9:30 AM | **Accelerating MFIX-DEM Code on the Intel Xeon Phi**<br>*Handan Liu and Danesh Tafti*, Virginia Tech |
| 9:30 – 10:00 AM | **Investigating Trilinos Integration with MFIX**<br>*Vinod Kumar,* University of Texas at El Paso |
| 10:00 – 10:30 AM | **Break (*Grand Ballroom Foyer*) and Posters** |
| 10:30 – 11:00 AM | **Numerical Simulation of Film Flow Over an Inclined Plate: Effects of Solvent Properties and Contact Angle**<br>*Rajesh Singh and Janine Carney,* NETL |
| 11:00 – 11:30 AM | **A Study of Resident Time Distributions in Riser Reactors for Upgrading Biomass Pyrolysis Vapors**<br>*Jack Ziegler[1], Sreekanth Pannala[2], Ray Grout[1], David Robichaud[1], Mark Nimlos[1], and Thomas Foust[1]*, [1]National Renewable Energy Laboratory, [2]Oak Ridge National Laboratory |
| 11:30 – 12:00 PM | **Trickle Bed Reactor Experiment Using Electrical Capacitance Volume Tomography**<br>*Qussai Marashdeh[1], Liang-Shih Fan[2],* [1]Tech4Imaging LLC, [2]Ohio State University |
| 12:00 – 12:55 PM | **Lunch (Governor *Ballroom 4-6*) & Posters (Foyer)** |
| 12:55 – 1:00 PM | **Reconvene and Afternoon Introduction (*Governors Ballroom 1-3*)** |
| 1:00 – 1:20 PM | **Alstom Limestone Chemical Looping System: Experiments and Isothermal Simulations**<br>*David Sloan, Herb Andrus, and Paul Chapman*, Alstom Power |
| 1:20 – 1:50 PM | **CFD Modeling, Simulation, and Analysis of Laboratory-Scale Fluidized Bed Systems for Chemical Looping**<br>*N'dri A. Konan, Justin Weber, E. David Huckaby,* NETL |

## Wednesday, August 6, 2014 – Governors Ballroom, Lakeview Resort

1:50 – 2:20 PM **Application of Multiphase Computational Fluid Dynamics to Real Process Challenges: Thien Cyclone**
*Justin Weber, Dirk Van Essendelft, Douglas Straub,* NETL

2:20 – 2:50 PM **CFD Model Development for Multiphase Flows in a Spherical Particle Packed-Bed Reactor**
*Li Yang,* Center for Applied Energy Research, University of Kentucky

2:50 – 3:00 PM **Meeting Wrap Up and Adjourn**

### Posters (*Governor Ballroom Foyer*)

**Characterization of the Physical Properties for Granular Materials**
*Jonathan Tucker, Lawrence Shadle, Sofiane Benyahia, Joseph Mei, and Chris Guenther,* NETL

**NETL Small Scale Challenge Problem**
*Balaji Gopalan*, NETL

**Modeling of Foamed Cement with MFIX**
*Surya Deb, William Rogers,* NETL

**Electrostatic Charging in Gas-Solid Systems**
*Jonathan Tucker, Lawrence Shadle, Sofiane Benyahia, Mark Koepke, and Chris Guenther,* NETL

**Microwave Flow Sensor Development**
*Benjamin Chorpening,* NETL