



# 2015 NETL Workshop on Multiphase Flow Science

**Wednesday, August 12, 2015 – Governors' Ballroom, Lakeview Resort**

- 7:00 – 8:00 AM      **Registration (Ballroom Foyer)**  
**Continental Breakfast (Governors' Ballroom)**
- 8:00 – 8:05 AM      **Welcome and Introduction (Governors' Ballroom)**  
*William Rogers, Lead – Multiphase Flow Science Team*  
U.S. Department of Energy, National Energy Technology Laboratory
- 8:05 – 8:20 AM      **NETL Multiphase Flow Research Overview**  
*Madhava Syamlal, Focus Area Leader – Computational and Basic Science Focus Area*  
U.S. Department of Energy, National Energy Technology Laboratory
- 8:20 – 9:00 AM      **Keynote Presentation: Multiscale Simulation of Biomass Gasification**  
*Ahmed Ghoniem, Massachusetts Institute of Technology*
- 9:00 – 9:20 AM      **Modeling and Validation of Coal Combustion in a Circulating Fluidized Bed Using Eulerian-Lagrangian Approach**  
*Haining Gao, Allan Runstedtler, Patrick Boisvert, Natural Resources Canada, CanmetENERGY*
- 9:20 – 9:40 AM      **3-D Multiphase Gas/Particle Flow Modeling for Reactor-Scale Biomass Conversion and Upgrading Simulations: Heat Transfer, Mixing, and Basic Deactivation Modeling in Fixed, Bubbling, and Fluidized Bed Reactors**  
*Jack Ziegler, National Renewable Energy Laboratory*
- 9:40 – 10:00 AM      **Numerical Simulation of Biomass Gasification in a Steam-Blown Bubbling Fluidized Bed**  
*Christos Altantzis, Addison Stark, Richard Bates, Akhilesh Bakshi, Rajesh Sridhar, Ahmed Ghoniem, Massachusetts Institute of Technology*
- 10:00 – 10:20 AM      **Break and Posters (Ballroom Foyer)**
- 10:20 – 10:40 AM      **Modeling the Impact of Bubbling Bed Hydrodynamic Oscillations on the Yield and Composition of Biomass Fast Pyrolysis Oil**  
*Qingang Xiong, Emilio Ramirez, Sreekanth Pannala, C. Stuart Daw, Oak Ridge National Laboratory*



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- 10:40 – 11:00 AM **High Parallel Computing of Reactive Particulate Flows in Complex Geometries**  
*P. Fede<sup>1,2</sup>, L. Bennani<sup>1,2</sup>, H. Neau<sup>1,2</sup>, C. Baudry<sup>3</sup>, J. Laviéville<sup>3</sup>, O. Simonin<sup>1,2,1</sup>*,<sup>1</sup>Université de Toulouse, <sup>2</sup>CNRS Institut de Mécanique des Fluides de Toulouse, <sup>3</sup>EDF R&D
- 11:00 – 11:20 AM **A Coupling Algorithm for Eulerian-Lagrangian Simulation of Dense Gas-Solid Reacting Flows on Unstructured Mesh**  
*Jian Cai*, University of Wyoming
- 11:20 – 11:40 AM **Simulations of Heat Transfer to Solid Particles Flowing through an Enclosed Solar Receiver**  
*A. B. Morris<sup>1</sup>, Z. Ma<sup>2</sup>, S. Pannala<sup>3</sup>, C. M. Hrenya<sup>1</sup>*, <sup>1</sup>University of Colorado at Boulder, <sup>2</sup>SABIC Americas, <sup>3</sup>National Renewable Energy Laboratory
- 11:40 AM – 12:00 PM **LES-DEM Simulations of Sediment Transport**  
*Husam Elghannay, Danesh Tafti*, Virginia Polytechnic Institute and State University
- 12:00 – 1:00 PM **Lunch (Governors' Ballroom) and Posters (Ballroom Foyer)**
- 1:00 – 1:20 PM **Real Residence Time Distribution of Solids from Lagrangian Simulation in OpenFOAM<sup>R</sup>**  
*Yujian Sun, Milorad Dudukovic*, Washington University in St. Louis
- 1:20 – 1:40 PM **Hydrodynamics of Gas-Solids Flow in a Bubbling Fluidized Bed with Immersed Vertical U-Tube Banks**  
*Vikrant Verma, Tingwen Li, Jeff Dietiker, William Rogers*, National Energy Technology Laboratory
- 1:40 – 2:00 PM **2-D TFM Model Validation of a Fluidization Unit Scale Laboratory**  
*David A. Fiorillo<sup>1</sup>, Lucas Antônio S. Silva<sup>2</sup>, Adriana M. M. Mata<sup>2</sup>, and Thiara Paula M. Mattos<sup>2</sup>*, <sup>1</sup>University of Brasilia, <sup>2</sup>Faculty of Centro Leste, Universidade do Centro Leste
- 2:00 – 2:20 PM **Numerical Simulations of Particle-Laden Turbulent Flow through an Elbow and T-junction**  
*R. Venters, B. Helenbrook, G. Ahmadi*, Clarkson University
- 2:20 – 2:40 PM **DNS Assisted Modeling of Bubbly Flows in Vertical Channels**  
*Gretar Tryggvason, Ming Ma, Jiakai Lu*, University of Notre Dame



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- 2:40 – 3:00 PM      **Euler-Euler Anisotropic Gaussian Mesoscale Direct Numerical Simulation of Homogeneous Cluster-Induced Gas-Particle Turbulence**  
*Bo Kong<sup>1</sup>, Heng Feng<sup>2</sup>, Jesse Capecelatro<sup>3</sup>, Olivier Desjardins<sup>4</sup>, Rodney O. Fox<sup>1</sup>, <sup>1</sup>Iowa State University, <sup>2</sup>Tsinghua University, <sup>3</sup>University of Illinois at Urbana-Champaign, <sup>4</sup>Cornell University*
- 3:00 – 3:20 PM      **Break and Posters (Ballroom Foyer)**
- 3:20 – 3:40 PM      **Turbulence Modelling for Gas-Particle Flows**  
*Mohit Tandon<sup>1</sup>, Meera Gupta<sup>2</sup>, Aditya Karnik<sup>1</sup>, <sup>1</sup>CD-Adapco, <sup>2</sup>Indian Institute of Technology–Delhi*
- 3:40 – 4:00 PM      **Spherical and Non-Spherical Particle Transport and Deposition in Turbulent Flows**  
*Goodarz Ahmadi, Clarkson University*
- 4:00 – 4:20 PM      **Development and Validation of a New History Force Model with Collision Treatment**  
*Husam Elghannay, Danesh Tafti, Virginia Polytechnic Institute and State University*
- 4:20 – 4:40 PM      **Bayesian Calibration of Model Parameters in Reacting Multiphase Flow Simulations for Advanced Coal Gasifier Technology Development**  
*Aytakin Gel<sup>1,2</sup>, Mehrdad Shahnami<sup>2</sup>, Jordan Musser<sup>2</sup>, Jean-Francois Dietiker<sup>2,3</sup>, Arun Subramanian<sup>4</sup>, <sup>1</sup>ALPEMI Consulting, <sup>2</sup>National Energy Technology Laboratory, <sup>3</sup>West Virginia University, <sup>4</sup>GE Global Research Center*
- 4:40 – 5:00 PM      **An Update on the Magnetic Particle Tracking Technique for Evaluating Solids Flow**  
*Jack Halow, Separation Design Group*
- 5:00 PM              **Adjourn for the day**



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- 7:00 – 7:50 AM **Continental Breakfast (Governors' Ballroom)**
- 7:50 – 8:00 AM **Reconvene and Introduction (Governors' Ballroom)**
- 8:00 – 8:40 AM **Keynote Presentation: Validation CFD Models for Fluidization Applications**  
*Ray Cocco, PSRI Inc.*
- 8:40 – 9:00 AM **Driving for High Density Operation for both CFB Riser and Downer**  
*Jesse Zhu, Tracy Wang, University of Western Ontario*
- 9:00 – 9:20 AM **Rheological Measurements of Liquid-Solid Flows with Inertia and Particle Settling**  
*E.Linares, M. Hunt, R. Zenit, California Institute of Technology*
- 9:20 – 9:40 AM **Doppler Sensing of Particle Velocity and Density in Mixed-Phase Flows**  
*David Greve, Carnegie Mellon University*
- 9:40 – 10:00 AM **Break and Posters (Ballroom Foyer)**
- 10:00 – 10:20 AM **Two-Phase Turbulent Flow through an Elbow and Tee at High Particle Loading Using Refractive Index Matching**  
*Andrew Bluestein, Douglas Bohl, Clarkson University*
- 10:20 – 10:40 AM **Electrical Capacitance Volume Tomography (ECVT) Imaging of Gas-Liquid Multiphase Flows**  
*Aining Wang<sup>1</sup>, Qussai Marshdeh<sup>2</sup>, Liang-Shih Fan<sup>1</sup>,<sup>1</sup>The Ohio State University, <sup>2</sup>Tech4Imaging LLC*
- 10:40 – 11:20 AM **Determining the Discharge Rate from a Submerged Oil Leak Using ROV Video**  
*Frank Shaffer<sup>1</sup>, Mehrdad Shahnami<sup>1</sup>, Pankaj Saha<sup>1</sup>, Ömer Savaş<sup>2</sup>, Dave DeVites<sup>3</sup>, Timothy Steffek<sup>4</sup>, <sup>1</sup>National Energy Technology Laboratory, <sup>2</sup>University of California–Berkeley, <sup>3</sup>OHMSETT Mar Inc., <sup>4</sup>DOI Bureau of Safety and Environmental Enforcement*
- 11:20 – 11:40 AM **Three-Phase Imaging Using Electrical Capacitance Volume Tomography and Multiphase Flow Decomposition**  
*Qussai Marshdeh<sup>1</sup>, Liang-Shih Fan<sup>2</sup>, <sup>1</sup>Tech4Imaging LLC, <sup>2</sup>The Ohio State University*



# 2015 NETL Workshop on Multiphase Flow Science

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- 11:40 – 12:00 PM     **Recent Developments and Accomplishments in C3M**  
*Dirk VanEssendelft*, National Energy Technology Laboratory
- 12:00 – 1:00 PM     **Lunch (Governors' Ballroom) and Posters (Ballroom Foyer)**
- 1:00 – 1:20 PM     **Numerical Simulation of Countercurrent Gas-Liquid Film Flow Over an Inclined Plate**  
*Rajesh Singh, Janine Galvin*, National Energy Technology Laboratory
- 1:20 – 1:40 PM     **Understanding Particulate Flow Physics by Means of Large Simulation Data Sets**  
*Jessica Torres<sup>1,2</sup>, Juray de Wilde<sup>1,3</sup>, Sofiane Benyahia<sup>1</sup>*, <sup>1</sup>National Energy Technology Laboratory, <sup>2</sup>Massachusetts Institute of Technology, <sup>3</sup>Université Catholique de Louvain
- 1:40 – 2:00 PM     **Updates: MFIX with Trilinos for High Fidelity Multiphase Computational Fluid Dynamics Simulations**  
*V. Kumar<sup>1</sup>, William Spotz<sup>2</sup>*, <sup>1</sup>University of Texas – El Paso, <sup>2</sup>Sandia National Laboratory
- 2:00 – 2:20 PM     **Investigation of the Operation of a Gas-Solid Cyclone during an Upset Event**  
*Arthur Konan, Justin Weber, James Spenik, David Huckaby, Douglas Straub*, National Energy Technology Laboratory
- 2:20 – 2:40 PM     **Meeting Wrap-Up, Adjourn**



# 2015 NETL Workshop on Multiphase Flow Science

## Posters

**A Numerical Investigation Using Pressure Measurements to Develop Methods That Can Detect the Slugging Transition in Fluidized Beds**

*Emilio Ramirez, Qingang Xiong, Sreekanth Pannala, C. Stuart Daw, Oak Ridge National Laboratory*

**Application of MFI-X-DEM to Study Solids Flow Characteristics of a Calcium-Based Thermochemical Heat Storage Material**

*A. Gipperich, M. Kappes, W. Krumm, University of Siegen*

**A Study of the Influence of Numerical Diffusion on Gas-Solid Flow Dynamics in Fluidized Beds**

*Ronak Ghandriz, M. Reza H. Sheikhi, Northeastern University*

**Application of Representative Particle Model to Sediment Transport Simulations**

*Husam Elghannay, Danesh Tafti, Virginia Polytechnic Institute and State University*