Technical Program

Mixing XIX

19TH BIENNIAL CONFERENCE ON MIXING

JUNE 15-20, 2003
HILTON LAKE PLACID RESORT
LAKE PLACID, NEW YORK, USA

Sponsored by
North American Mixing Forum
American Institute of Chemical Engineers

Chair: Julian B. Fasano, Chemineer, Inc.

Sunday, June 15, 2003

3:00 p.m. to 8:00 p.m. Check-in - Front Desk
Conference Registration - JC Room

3:00 p.m. to 5:30 p.m. NAMF Executive Council Meeting
Terrace Room 3

6:00 p.m. to 7:30 p.m. Dinner
Terrace Room 1, 2, and 4
Sunday, June 15, 2003, cont’d.

8:00 p.m. to 9:00 p.m. Speakers and Session Chairs Meeting Dancing Bears Lounge

9:00 p.m. to 11:00 p.m. Welcome Reception Dancing Bears Lounge

Monday, June 16, 2003

7:00 a.m. to 8:30 a.m. Breakfast Terrace Room 1, 2, and 4

8:30 a.m. to Noon Technical Session Medallion Ballroom

8:30-8:40 a.m. Greeting and Introduction Julian B. Fasano, Chemineer, Inc.


8:40-9:10 a.m. 1.1 Alternate Feed Strategies for Stirred Tank Reactors, Sujit Bhattacharya and Suzanne M. Kresta, University of Alberta, and Ron Weetman, Lightnin

9:10-9:40 a.m. 1.2 Macro-instability Uncovered in a Rushton Turbine Stirred Tank by Means of LES, Hugo Hartmann, J. J. Derksen and H. E. A. van den Akker, Delft University of Technology

9:40-10:10 a.m. 1.4 Design of Horizontal Vessels Operated as CSTR - Basic Mixing Tasks, RTD, Productivity, Peter Forschner, David Houlton, Ron Klepper, EKATO Corporation

10:10-10:40 a.m. Break Promenade

10:40-11:10 a.m. 1.5 Effects of Inlet and Tab Design on Mixing Performance in HEV Static Mixers, Miney Liu, DuPont, Richard LaRoche, Fluent, Arthur Etchells, Retired from DuPont
Monday, June 16, 2003, cont’d.

11:10-11:35 a. m.  1.6 Quantitative Study on the Relative Importance of Macromixing and Micromixing in Biological Reactions, Mario M. Alvarez, Centro de Biotecnologia Instituto Tecnologico y de Estudios Superiores de Monterey

11:35-noon  1.7 Application of Oscillatory Flow Mixing for Rapid Mixing, Yanmin Zhang, Sarah Moore, Andrew Wetherill and Martin Tillotson, Yorkshire Water Services Limited

Noon to 1:00 p.m.   Lunch
Terrace Room 1, 2, and 4

5:00 p.m. to 6:00 p.m.   Social Hour
Promenade

6:00 p.m. to 7:30 p.m.   Dinner
Terrace Room 1, 2, and 4

7:30 p.m. to 10:05 p.m.   Technical Session
Medallion Ballroom

7:30-10:05 p. m.  2 Blending, Reactive Mixing & Flow Patterns, II
Chairs: Ramesh Hemrajani, ExxonMobil, Suzanne Kresta, University of Alberta

7:30-7:55 p. m.  2.1 CFD Modelling of Glass-Lined Reactors, David Dickey, Mixtech, Kevin Bittorf and Keith Johnson, Dantec Dynamics, and Chris Ramsey, Applied Process Technology

7:55-8:20 p. m.  2.2 Optimization of Mixing Protocol in Three-Dimensional Periodic Flows, A. J. S. Rodrigo, J. P. B. Mota, Universidade Nova de Lisboa

8:20-8:45 p. m.  2.3 Using CFD to Understand How Power Law Fluid Rheology Effects Heat Transfer at Helical Cooling Coils Using Axial Flow Impellers in the Transitional Flow Regime, William J. Kelly, Eric Ricci, Villanova University

8:45-9:15 p. m.  Break
Promenade

9:15-9:40 p. m.  2.4 3D CFD Simulations of Non-Newtonian Mixing with Off-Centered Impellers, Philippe A. Tanguy, Gabriel Ascanio, Christian Rivera, Mourad Heniche, and Teodoro Espinosa-Solares, Ecole Polytechnique
Monday, June 16, 2003, cont’d.

9:40-10:05 p.m. 2.5 Achieving Mixing via Twin Screw Extruders, David B. Todd, Polymer Processing Institute NJIT

10:05-11:30 p.m. Social Promenade

Tuesday, June 17, 2003

7:00 a.m. to 8:30 a.m. Breakfast Terrace Room 1, 2, and 4

8:30 a.m. to Noon Technical Session Medallion Ballroom

8:30 a.m.- Noon 3 Gas-Liquid Mixing

8:30-9:00 a.m. 3.1 Power Characteristics and Liquid Phase Mixing Times in Sparged and Boiling Reactors with Multiple-Impeller Agitators, D. Zhao, N. F. Kirby, H. Juller-Steinhagen and J. M. Smith, University of Surrey

9:00-9:30 a.m. 3.2 Evaluation of Shallow and Deep Tank Areas in Aeration of Waste Liquors, James Y. Oldshue, Oldshue Technologies International

9:30-10:00 a.m. 3.3 Mixing Studies Related to the Cleaning of Molten Aluminum, M. Kimata, Yamagata University, W. Bujalski, J. Song and M. R. Jolly, University of Birmingham

10:00-10:30 a.m. Break Promenade

10:30-11:00 a.m. 3.4 Experimental and Computational Analysis of Mass Transfer and Blending Performance in a 2.4 m Bioreactor Model, Bernd Gigas, Paul Kubera, Lightnin, and Kumar M. Dhanasekharan, Fluent

11:00-11:30 a.m. 3.5 Distribution of Air Bubbles and Castor Oil Drops in a Simulated Fermentation System as a Function of Viscosity of the Aqueous Phase, Ma Soledad Cordova-Aguilar and Enrique Galindo, National University of Mexico

11:30 a.m. - noon 3.6 An Experimental Study on Gas Dispersion in a Mixing Tank, Jie Wu, Nabil Noui and Y. Zhu, CSIRO Div. of Manufacturing and Infrastructure
Tuesday, June 17, 2003, cont’d.

12:00 Noon to 1:00 p.m. Lunch
Terrace Room 1, 2, and 4

5:00 p.m. to 6:00 p.m. Social Hour
Promenade

6:00 p.m. to 7:30 p.m. Dinner
Terrace Room 1, 2, and 4

7:30 p.m. to 10:00 p.m. Technical Session
Medallion Ballroom

7:30-10:05 p.m. 4 New Mixers and Processes
Chairs: Chad Bennington, University of British Columbia, Arthur Etchells, retired DuPont

7:30-7:55 p.m. 4.1 A New Approach to Hermetically Sealed Mixing, Mark Reeder, AFIT, Julian Fasano and Eric Janz, Chemineer, Inc.

7:55-8:20 4.2 A Novel Gas-Liquid Contacting and Mixing System Design, Prakash Balan and John McWhirter, m²t Technologies

8:20-8:45 4.3 New Surface Aerator Impellers with Increased Oxygen Transfer Efficiencies, Ronald J. Weetman, Lightnin

8:45-9:15 Break
Promenade

9:15-940 4.4 Mixing Characteristics of Large Paddle Type Impeller MAXBLEND, Ryuichi Yatomi, Mamoru Mishima, Masafumi Kuratsu, and Shoji Morinaga, Sumitomo Heavy Industries

9:40-10:05 4.5 The Hyperboloid Mixer/Aerator - Functional Principle, Characterization and Applications in Wastewater Treatment, Marcus Höfken, Walter Steidl and Torsten Frey, Invent

10:00 p.m. to 11:30 p.m. Social Hour
Independence Room
Wednesday, June 18, 2003

7:00 a.m. to 8:30 a.m. Breakfast
Terrace Room 1, 2, and 4

8:30 a.m. to Noon Technical Session
Medallion Ballroom

8:30 a.m. - Noon 5 Experimental Techniques
Chairs: E. Bruce Nauman, Rensselaer Polytechnic, W. Roy Penney, University of Arkansas


8:55-9:15 a.m. 5.2 A Comparison Between Computational Fluid Dynamics and Electrical Tomography Results for Stirred Tanks and Packed Bed Reactors, K. M. Primrose and G.T. Bolton, Industrial Tomography Systems, A. Rose, Rose Consulting Engineers.

9:15-9:35 a.m. 5.3 Power Draw and Flow Characteristics of Reciprocating Agitators, Eric E. Janz and Julian B. Fasano, Chemineer, Inc., Mark F. Reeder, AFIT


9:55-10:20 a.m. Break
Promenade

10:20-10:45 a.m. 5.5 Numerical Prediction of KU Viscosity for Newtonian and Non-Newtonian Fluids, May Y. M. Wu, Midey Chang-Mateu, Rohm and Haas Company

10:45-11:10 a.m. 5.6 Measurement of Solids Concentration in the Presence of Bubbles Using Acoustic Monitoring Techniques, Lawrence L. Tavlarides, A. Shcherbakov, and E. Dievendorf, Syracuse University

11:10-11:35 a.m. 5.7 Experimental Techniques for Contacting of Solids with Heavy Hydrocarbon Liquids for High Temperature Conversion in Co-Rotating Twin Screw Mixers, Ramesh R. Hemrajani, ExxonMobil Research and Engineering Company
Wednesday, June 18, 2003, cont’d.

11:35-noon  5.8  Scale-Up of a Multi-Impeller Stirred Vessel Polymerizer Using CFD, John C. Middleton, S. E. Leefe and D. Wei, BHRG

12:00 Noon to 1:00 p.m.  Lunch
Terrace Room 1, 2, and 4

5:00 p.m. to 6:00 p.m.  Social Hour
Promenade

6:00 p.m. to 7:30 p.m.  Dinner
Terrace Room 1, 2, and 4

7:30 p.m. to 10:05 p.m.  Technical Session
Medallion Ballroom

7:30-10:05 p.m.  6  Student Contest Papers and Nano-scale Mixing

7:30-8:00 p.m.  6.1  Study of oil and fungal biomass dispersion and distribution of air bubbles in a stirred tank containing a simulated fermentation broth, Soledad Córdova-Aguilar, Leobardo Serrano-Carreón, Patricia Larralde and Enrique Galindo Depto. Ingeniería Celular y Biocatálisis Instituto de Biotecnología - UNAM

8:00-8:30 p.m.  6.2  Measurements of Particle Mean Velocity Profiles in a Stirred Vessel at Just-Suspended Impeller Speed, Chandavimol, Maethee and Patterson, Gary, Department of Chemical and Biochemical Engineering, University of Missouri-Rolla

8:30-8:50 p.m.  Discussion on NAMF’s Mixing Handbook by editors Suzanne Kresta, Ed Paul and Victor Atiemo-Obeng

8:50-9:05 p.m.  Break
Promenade

9:05-9:35 p.m.  6.3  Mixing in Sub-Micron Ducts, E. Bruce Nauman and Ashish Nigam, Rensselaer Polytechnic Institute

9:35-10:05 p.m.  6.4  Mixing in Microchannels, Abe Stroock, Cornell University

10:05 p.m. to 11:30 p.m.  Social Hour
Promenade
**Thursday, June 19, 2003**

7:00 a.m. to 8:30 a.m.  
**Breakfast**  
Terrace Room 1, 2, and 4

8:30 a.m. to Noon  
**Technical Session**  
Medallion Ballroom

8:30 a.m. - Noon  7  
**Mixing Fundamentals and Industrial Mixing**  
Chairs: David S. Dickey, Mixtech, Edward L. Paul, retired Merck

8:30-9:00 a.m.  
7.1 **The Versatility of Up-Pumping, Hydrofoil Agitators**, Alvin W. Nienow, University of Birmingham

9:00-9:30 a.m.  

9:30-10:00 a.m.  
7.3 **A Floating Confined Agitator for Oxygenation in the Vicinity of the Liquid Surface**, R. Sardeing, M. Poux, J. Bertrand, and C. Xuereb, Laboratoire de Genie Chimique UMR CNRS, P. Avrillier, Air Liquide

10:00-10:30 a.m.  
**Break**  
Promenade

10:30-11:00 a.m.  

11:00-11:30 a.m.  
7.5 **Static Mixing with Minimized Space Requirement**, Markus Fleischii, Marcel Suhner, Sulzer Chemtech Ltd.

11:30 a.m. - Noon 7.6 **Computer Simulation of Mixing in Uranium Storage and Blending Tanks**, Neguib M. Hassan, Westinghouse Savannah River Co., L. J. Forney and A. G. Gjiorges, Georgia Institute of Technology

12:00 Noon to 1:00 p.m.  
**Lunch**  
Terrace Room 1, 2, and 4

5:00 p.m. to 6:00 p.m.  
**Social Hour**  
Promenade

6:00 p.m. to 8:00 p.m.  
**Awards Dinner**  
Terrace Room 1, 2, and 4

8:00 p.m. to 10:00 p.m.  
**Technical Session**  
Medallion Ballroom
Thursday, June 19, 2003, cont’d.

8:00-10:05 p.m. 8 Solid-Liquid Mixing
Chairs: Tom Post, Consultant, Piero M. Armenante, New Jersey Institute of Technology

8:00-8:20 p.m. 8.1 Solids Suspension in Stirred Tanks: A Comparison of CFD models to Experimental Data, Liz Marshall and Christine Wolf, Fluent Inc.

8:20-8:40 p.m. 8.2 Vortex Depths in Partially Baffled Vessels - An Experimental and Correlational Study, W. Roy Penney, Gabriele S. Spanel, and James F. Butler, University of Arkansas

8:40-9:00 p.m. 8.3 Unsteady Behavior of Continuous Stirred Vessels with Slurries - Some Unusual Results, Keisha Wilson, Richard Grenville, Carmon J. Ramone, and Kenneth H. McCourt, DuPont Company, Arthur Etchells, DuPont Company Retired

9:00-9:20 p.m. 8.4 Use of Characteristic Times in Correlating Yields in Solid-Liquid Reaction Systems, Gary K. Patterson, University of Missouri-Rolla

9:20-9:40 p.m. 8.5 Some Comments on Scale-Up Criteria for Equal Solids Distribution in Slurry Reactors, G. Montante, D. Pinelli, F. Magelli, University of Bologna

9:40-10:00 p.m. 8.6 Influence of Particle Properties on the Yield and Selectivity of Fast Heterogeneously Catalyzed Gas-Liquid Reactions, Jodi Raffensberger, Ben Glasser, and Johannes Khinast, Rutgers University (Note: Johannes Khinast is the winner of the 2nd NAMF Start-up Grant in Mixing)

10:00 p.m. to 11:30 p.m. Social Hour
Promenade

Friday, June 20, 2003

7:00 a.m. to 8:30 a.m. Breakfast
Terrace Room 1, 2, and 4

8:30 a.m. to Noon Technical Session
Medallion Ballroom

8:30 a.m. - Noon 9 Liquid-Liquid Mixing, Mixing with Mass Transfer, and Solids-Liquid Mixing
Chairs: Alvin Nienow, University of Birmingham, Shaffiq A. Jaffer, Procter and Gamble
Friday, June 20, 2003, cont’d.

8:30-9:00 a.m. 9.1 Liquid-Liquid Mixing in Stirred Tanks with Different Height-to-Tank Diameter Ratios, Sunil Mehta and Piero Armenante, New Jersey Institute of Technology

9:00-9:30 a.m. 9.2 Development and Testing of a Liquid-Liquid Noncoalescing System in Agitated Vessels, Sarah A. Priddy and Thomas R. Hanley, University of Louisville

9:30-10:00 a.m. 9.3 Modern Dispersion Technology: The Right Spin, Stewart Rissley, Morehouse-COWLES

10:00-10:30 a.m. Break
Promenade

10:30-11:00 a.m. 9.4 Simulation of Liquid-Liquid Dispersion in Turbine Stirred Vessels, Kumar M. Dhanasekharan and Ahmed Haidari, Fluent Inc., Richard V. Calabrese, University of Maryland

11:00-11:30 a.m. 9.5 Euler/Lagrange Large-Eddy Simulations of Solids Suspension in a Stirred Tank, Jos Derksen, Hugo Hartmann, Harrie van den Akker, Delft University

11:30 a.m. - Noon 9.6 Oxygen Transfer and Fluid Flow Simulations of a Spinner Flask Bioreactor, Yinkun Wan, Mohammad Shafie and Thomas Hanley, University of Louisville

12:00 Noon to 1:00 p.m. Lunch
Terrace Room 1, 2, and 4
10 Poster Papers

10.1 A Case for Mixer Thrust, Laars Uby, ITT Flygt

10.2 Pin Mixers, Turbulators and Their Power Equations, Gary B. Tatterson, North Carolina A&T

10.3 Experimental Study of Non-Newtonian Mixing with Off-Centered Impellers, Gabriel Ascanio, Philippe A. Tanguy, and Maritrini Jimenez Garza, Ecole Polytechnique and Mario Alvarez, ITESM

10.4 Assessment of CFD Models for Particle Distribution in Newtonian and Pseudoplastic Fluids in Stirred Vessels, G. Mantante and F. Magelli, University of Bologna

10.5 Rheological Property Determination of corn Stover Suspensions Using a Helical Impeller, Natalia V. Pimenova and Thomas R. Hanley, University of Louisville


10.8 Gas-Gas Mixing and How It Applies Specifically to SCR Systems for DeNOx, Mughis Naqvi, Sulzer Chemtech USA, Inc.

10.9 About the Design of Mixing Systems for Anaerobic and Anoxic Basins for Large Wastewater Treatment Plants, Marcus Höfken, Walter Steidl, Peter Huber, INVENT