

1983 ENGINEERING FOUNDATION CONFERENCES

MIXING IX

New England College
Henniker, New Hampshire

August 14-19, 1983

FINAL PROGRAM

Davis W. Hubbard, Chairman
Michigan Technological University

Engineering Foundation gratefully acknowledges the financial support toward the conduct of this conference provided by the following corporations:

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ENGINEERING FOUNDATION CONFERENCES

MIXING IX
New England College
Henniker, New Hampshire
August 14-19, 1983

FINAL PROGRAM

Sunday, August 14, 1983

3:00 p.m. - 9:00 p.m.

REGISTRATION AND CHECK-IN

6:00 p.m.

DINNER

Monday, August 15, 1983

8:30 a.m. - 12:00 Noon

EXPERIMENTAL TECHNIQUES USEFUL FOR MIXING RESEARCH
Chairman: Robert K. Prud'homme, Princeton Univ.

"An Automated Analysis Method for Complex Three-Dimensional Mean Flow Fields"
T. P. Chang & G. B. Tatterson, Texas A & M Univ.

"Fiber Optics Probes for Mixing Time and Drop Breakup Studies"
R. K. Prud'homme, Princeton University

"Using a Derotational Prism for Studying Gas Dispersion Processes"
A. W. Nienow, University of Birmingham, England

"Measuring Local Flow Rates in Process Units"
U. Mann, Texas Tech. University

"Concentration Fluctuations as a Measure of Reactor Segregation"
J. G. Hippler & T. R. Hanley, Rose-Hulman Inst. of Technology

"New Methods for Measurement of Impeller Hydrodynamics"
D. S. Dickey, R. R. Corpstein & R. W. Hicks, Chemineer-Kenics

*presented by
Bob Prud'homme*

2:00 p.m. - 5:00 p.m.

AD HOC SESSIONS

7:00 p.m. - 10:00 p.m.

MIXING AND TURBULENCE

Chairman: Gary K. Patterson, Univ. of Missouri-Rolla

"Laminar and Turbulent Solutions to Burgers Equation"
X. B. Reed, University of Missouri-Rolla

Monday, August 15, 1983 (continued)

"A Statistical Theory of Turbulent Transport"
J. C. Hill, Iowa State University &
C. A. Petty, Michigan State University

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C. P. Chen, Michigan State University &
P. E. Wood, McMaster University, Canada

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"Hydrodynamic Behavior of Bubble Columns"
P. Carreau, Ecole Polytechnique de Montreal

"Turbulent Spectrum Matching and Scale-Up in
Mixing Tanks"
D. W. Hubbard & M. Z. Mohyeldin, Michigan
Technological University

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Tuesday, August 16, 1983
8:30 a.m. - 12:00 Noon

MIXING WITH CHEMICAL REACTIONS

Chairman: Thomas R. Hanley, Louisiana Tech. Univ.

"Turbulent Mixing Effects on Chemical Reactions"
G. K. Patterson, Univ. of Missouri-Rolla

"Selectivity of Complex Reactions in Unpremixed
Reactors"
R. Chella & J. M. Ottino, Univ. of Massachusetts

"Effects of Impeller Type and Feed Point Location
on Product Distribution from Fast Second-Order
Reactions"
J. R. Bourne, Eidgenossische Technische Hochschule,
Zurich

"Mixing Influenced Reactions"
J. C. Middleton, Imperial Chemical Ind., England

"Application of Static Mixers for Controlling
Drop Size Distribution in Suspension Polymerization"
E. Oshima, Tokyo Inst. of Technology, Japan

2:00 p.m. - 5:00 p.m.

AD HOC SESSIONS

7:00 p.m. - 10:00 p.m.

SCALE-UP AND MIXING

Chairman: Douglas L. Bennett, Air Products &
Chemicals

"Scale-Up of a Mixer-Settler System"
S. J. Chen, University of Lowell

"Blending Scale-Up for Shear Thinning Fluids"
C. M. Garrison, Procter & Gamble Company

Tuesday, August 16, 1983 (continued)

"Fluid Forces Imposed on a Mixing Impeller Shaft"
R. J. Weetman, Mixing Equipment Company

"Scale-Up of Fluid Stress in Mixing Equipment"
J. B. Gray, Beechwood Consultants

"Scale-Up of Critical Needs in Gas-Liquid Mixing"
D. E. Leng, Dow Chemical Company

"A Problem with Scale-Up Procedures"
D. L. Bennett, Air Products and Chemicals

"Comments on Scale-Up Procedures Used at DuPont"
A. W. Etchells, E.I. duPont de Nemours & Co.

"Development of a Laboratory Scale-Up Reactor"
D. Attride, Eastman Kodak Company

Wednesday, August 17, 1983

~~9:00~~ a.m. - 12:00 Noon

8:30

MULTIPHASE MIXING I

Chairmen: R. V. Calabrese, Univ. of Maryland
L. L. Tavlarides, Syracuse University

"Breakup of Droplets in Time Dependent Flows"
D. Khakhar & J. M. Ottino, Univ. of Massachusetts

~~"Modeling of Liquid Dispersion in Spatially
Non-Homogeneous Reactors"~~

~~G. W. Smith, G. Placek & L. L. Tavlarides,
Syracuse University~~

"The Effect of Dispersed Phase Viscosity on
Drop Breakup in Agitated Liquid-Liquid Systems"
C. Y. Wang & R. V. Calabrese, Univ. of Maryland

"Mass Transfer in a Continuous Flow Stirred Tank
Reactor"
P. M. Bapat & L. L. Tavlarides, Syracuse Univ.

"A Kinematical Model for Particle Dispersion in
Mixing Layers"
P. Ceylon, T. T. Yeh, J. McMichael & G. E. Mattingly,
National Bureau of Standards

* "Solids Suspension Performance of Axial Flow
Impellers"
R. R. Corpstein & D. S. Dickey, Chemineer--Kenics, Inc.

2:00 p.m. - 5:00 p.m.

POSTER SESSION

Chairman: Davis W. Hubbard, MI Technological Univ.

Wednesday, August 17, 1983 (continued)

Papers which could not be accommodated in the regular sessions or which were received too late to be considered for the regular sessions will be presented at the poster session. The final list of papers will be available at the conference. A preliminary list is as follows:

"Liquid Flow Behavior in Bubble Columns with a Single Orifice Sparger"
A. Gomezplata, R. V. Calabrese, R. B. McFarlin & T. Gipe, University of Maryland

"The Flooding Transition with Gassed Rushton Turbines"
M. Warmoeskerken & J. M. Smith, Technische Hogeschool Delft, The Netherlands

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"Suspending with Side-Entering Agitators"
K. D. Kipke, EKATO Ruhr-und Mischtechnik, Germany

"Power Consumption in a Mixer: A Case Study"
R. L. King & G. B. Tatterson, Texas A & M Univ.

"Shear Degradation of Biological Materials in Mixed Vessels"
M. Midler, Merck & Company

"Suspension of Solids by Mechanical Agitation in Solid-Liquid and Solid-Liquid-Gas Systems"
N. Ganesh, University of Virginia

"An Experimental System for Studying Random Droplet Motion"
X. B. Reed, University of Missouri-Rolla

"NBS Plans for Developing Instruments to Measure Mixer Performance"
R. O. Voth & D. M. Ginley, Nat'l. Bureau of Standards

"Gas Mixing with Koch Static Mixing Units"
P. T. Allocca, Koch Engineering Company, Inc.

"The Benefits of Collaborative Research for the Process Industries"
R. King, BHRA Fluid Engineering

"Complete Description of a Dispersion of Fine Particles in a Plastic Matrix"
B. H. Kaye, Laurentian University

"Comparative Measurements of Velocities and Turbulence in Mixing Vessels of Different Sizes and Identical Geometry"
G. K. Patterson, University of Missouri-Rolla

Wednesday, August 17, 1983 (continued)

"In-line Polymer Mixing and Blending with
Motionless Mixers"

F. Streiff, Sulzer Brothers, Ltd. (Copy)

"Simulation of Continuous Mixers in Laminar Flow"
Lew Erwin, M.I.T.

Participants are invited to submit other papers for
the poster session. New ideas and recent results
would be appropriate. Send an abstract to the
chairman.

7:00 p.m. - 10:00 p.m.

MULTIPHASE MIXING II

Co-Chairmen: L. L. Tavlarides, Syracuse University
R. V. Calabrese, Univ. of Maryland

"Pitched Blade Turbine Performance in Gas-Liquid
Systems"

M. M. C. G. Warmoeskerken & J. M. Smith.
Technische Hogeschool Delft, The Netherlands (Copy)

"The Evaluation of Overall Gas-Liquid Mass Transfer
Factors, $K_L a$, in Stirred Tanks from Dynamic
Response Measurements"

J. C. Middleton, Imperial Chemical Ind., England (Copy)

"The Effect of Rheological Complexities on Power
Drawn and on $k_L a$ in Aerated Agitated Vessels"

A. W. Nienow, A. Hickman, K. Ailsford & R. Kuboi,
University of Birmingham, England (Copy)

"Aspects of Solid Suspensions in Gassed Agitated
Vessels"

J. J. Frijlink, M. M. C. G. Warmoeskerken &
J. M. Smith, Technische Hogeschool Delft, The
Netherlands (Copy)

"Surface Instabilities in Mixing Tanks and
Flotation Cells"

C. G. Koen, Mareil-Marly, France

Thursday, August 18, 1983

8:30 a.m. - 12:00 Noon

Selected Papers on Mixing

Chairman: ~~Uzi Mann~~, Texas Tech. University
Charles Pitt

"Comments on Off-Centering Angle of Side Entering
Agitators"

C. G. Koen, Mareil-Marly, France

Thursday, August 18, 1983 (continued)

"Modeling of the Macromixing State in Multistage Stirred Reactors"

F. Magelli, University of Bologna, Italy

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"The Effect of Polymer Additives on the Secondary Flow Structures within a Three-Inch Hydrocyclone"

C. A. Petty, Michigan State University

"Heat Transfer in Agitated Vessels"

Jean Paris

P. Carreau, Ecole Polytechnique de Montreal

"Design and Application of an Efficient Axial-Flow Propeller Suitable for Mixing"

David Erickson

R. Golobic, Joy Manufacturing Company

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"Enhancement of Strauss Secondary Flow in Thin Film Commercial Reactors"

T. O. Mensah, Corning Glass Works

Edwards - *Mining Chemical Reaction*
AD HOC SESSIONS

2:00 p.m.-5:00 p.m.

7:00 p.m.-10:00 p.m.

MIXING FROM AN INDUSTRIAL VIEWPOINT

Chairman: Ramesh R. Hemrajani, Exxon R & E Company

"Multiphase Mixing (and Unmixing) Problems in Plant Scale Reacting Systems"

G. Q. Martin, Shell Development Company

"Some Practical Problems of Scale-Up of Mechanically Agitated Gas/Liquid Reactors"

Kylee

A. W. Etchells, E. I. duPont de Nemours & Co.

"Flow Distribution in Manifolds"

L. D. Eckelman, Monsanto Company

"Energy Savings and Exotic Vessel and Impeller Design"

J. A. VonEssen, Philadelphia Mixers

"Industrial Needs for Research"

J. C. Middleton, Imperial Chemical Ind., England

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Friday, August 19, 1983

9:00 a.m.-12:00 Noon

POLYMER MIXING AND BLENDING

Chairman: Kurt Eise, Werner & Pfleiderer Corp.

"The Twin Screw Extruder as a Mixer-Reactor for Polymerization and Food Processing"

L. P. B. M. Janssen, Technische Hogeschool Delft, The Netherlands

Friday, August 19, 1983 (continued)

"Mixing in Single Screw-Extruders"

R. Chella & J. M. Ottino, Univ. of Massachusetts

"Distribution of Striation Thickness from T-Mixers"

J. R. Bourne, Eidgenossische Technische Hochschule,
Zurich

"The Influence of Visco-elasticity on Mixing
Flows in Stirred Tanks"

P. V. Bartels, Technische Hogeschool Delft,
Netherlands

"Effect of Elasticity on Power Consumption
and Mixing Time"

R. K. Prud'homme, Princeton University

"Effect of Rheological Complexity on Power
Input in Aerated Vessels"

A. W. Nienow, University of Birmingham, England

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ADJOURNMENT