

*Edward Deery*

ENGINEERING FOUNDATION CONFERENCES

MIXING X  
New England College  
Henniker, New Hampshire  
August 4-9, 1985

FINAL PROGRAM

Sunday, August 4, 1985

3:00 p.m.-9:00 p.m. REGISTRATION AND CHECK-IN

6:00 p.m. DINNER

8:30 p.m.-10:30 p.m. SOCIAL HOUR

Monday, August 5, 1985

7:30 a.m. BREAKFAST

MULTI-PHASE MIXING

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

8:30 a.m.-10:30 a.m. "A Simulation Method for Scale-Up of Non-Homogeneous Liquid-Liquid Dispersions Using a Two-Scale Model"  
G. W. Smith, University of Nebraska and  
L. L. Tavlarides, Syracuse University

✓ "Drop Breakup in Mixing Operations"  
J. Collias and R. K. Prud'homme, Princeton University

"Coalescence Frequencies in Agitated Dispersions"  
P. K. Das and R. Kumar, Indian Institute of Science, Bangalore and D. Ramkrishna, Purdue University

✓ "Minimum Agitation Requirements for Liquid-Liquid Dispersion with Turbine Impellers in Practical Systems"  
G. W. Steidtman, S. C. Johnson & Son, Inc.

"Drop Size Distributions Produced by Static Mixers"  
P. D. Berkman and R. V. Calabrese, University of Maryland

10:30 a.m.-10:45 a.m. COFFEE BREAK

10:45 a.m.-12:00 NOON POSTER SESSION

✓ "Inverse Problems in Agglomeration"  
R. Muralidar and D. Ramkrishna, Purdue University

Monday, August 5, 1985 (continued)

- ✓ "A Facility to Study Drop Breakup in the Vicinity of Simulated Mixer Elements"  
N. P. Bryner and R. V. Calabrese, University of Maryland
  - ✓ "An Ultrasonic Technique for the Measurement of Dispersed Phase Holdup in Agitated Extraction Units"  
J. C. Bonnet and L. L. Tavlarides, Syracuse University
  - "Suspension of Large Objects in Agitated Tanks"  
M. Tay, W. Duetschlander, P. H. Yang and G. B. Tatterson, Texas A&M University
  - "Influence of Suspended Solids on Gas-Liquid Interfacial Area and Coalescence Frequency in Stirred Tanks"  
N. Nagaraj and D. J. Gray, University of Rhode Island
  - "Formation of Bubbles in Shear Flow from a Gas Filled Cavity"  
K. I. Yuk and J. J. Ulbrecht, National Bureau of Standards
  - "The Flooding Transition of Gas-Liquid Agitators"  
M. M. C. B. Warmoeskerken and J. M. Smith, Delft University of Technology and A. W. Nienow, University of Birmingham
  - "Gas Dispersions with Pitched Blade Agitators"  
J. J. Frijlink and J. M. Smith, Delft University of Technology
  - "An Experimental Investigation and Analysis of Tine-Grid Aerations"  
J. R. Weske and C. H. Marks, University of Maryland
- 12:00 NOON LUNCH
- 2:00 p.m.-5:00 p.m. AD HOC SESSIONS
- 6:00 p.m. DINNER
- 7:15 p.m.-9:45 p.m. REGULAR PAPER PRESENTATIONS
- "Suspended Solids in Three Phase Reactors"  
J. M. Smith and J. J. Frijlink, Delft University of Technology
  - ✓ "Effect of Mixtures of Solid Particle Sizes on Process Requirement as a Function of Settling Velocity"  
J. Y. Oldshue, Mixing Equipment Co.

Monday, August 5, 1985 (continued)

✓ "Mass Transfer and Hold-Up in an Aerated Agitated Rheologically Complex Liquid"  
A. W. Nienow and A. Hickman, University of Birmingham

"Simultaneous Measurement of Gas Phase and Liquid Phase Residence Time Distributions in a Stirred Tank"  
D. W. Hubbard and B. C. Hoag, Michigan Technological University

"Bubble Formation from Submerged Orifices in Flowing Liquids"  
A. K. Ghosh and J. J. Ulbrecht, National Bureau of Standards

"Efficiency in Flocculant Mixing"  
C. G. Koen, Consultant, France

10:00 p.m.-11:00 p.m. SOCIAL HOUR

Tuesday, August 6, 1985

7:30 a.m. BREAKFAST

8:30 a.m.-10:30 a.m.

TURBULENCE

Chairman: X. B. Reed, University of Missouri, Rolla

"Computation of Statistical Properties from Large Ensembles of Exact Random Solutions of Burger's Equation at High Reynolds Numbers"  
S. Keleti & X. B. Reed, University of Missouri, Rolla

"Computation of Spectra of Reactants in Homogeneous Turbulence"  
E. E. O'Brian, SUNY Stony Brook

"Simple Irreversible Chemical Reactions in 2-D and 3-D Homogeneous Turbulence. I. Results"  
J. C. Hill, Iowa State University

✓ "Turbulence Measurements from Mixing Impellers"  
R. J. Weetman, Mixing Equipment Co.

"A Turbulent Cascade Model of Droplet-Eddy Interactions for K-E Calculations of Droplet Suspension Mixing"  
J. Lavalley, L. L. Tavlarides, C. Jairazbhoy, Syracuse University

10:30 a.m.-12:00 NOON

POSTER SESSION (SELECTED & TURBULENCE)

"Modeling of Evolution of Homogeneous Turbulent Chemical Reactions Using Single Point PDF's"  
E. E. O'Brian, SUNY Stony Brook

Tuesday, August 6, 1985 (continued)

"Simple Irreversible Chemical Reactions in 2-D and 3-D Homogeneous Turbulence. II Methods of Simulation"  
J. C. Hill, Iowa State University

"Burgerlent Convection and I-D Molecular Diffusion of A Chemically Reactive Passive Additive"  
X. B. Reed, University of Missouri, Rolla

"Heat Transfer Between a Bubble and the Surrounding Fluid"  
J. Smith & G. VanLokren, Delft Technical University

✓ "Multi-Stage Agitated Column as a Gas-Liquid Contacting Device"  
S. Kumar & R. N. Sharma, Indian Institute of Technology

"Mixing Characterization by Stochastic Methods"  
Uzi Mann & M. Rubinovitch, Texas Tech.

"Development of New Eddy Diffusion Correlation for Liquid Mixing on Distillation Sieve Trays"  
H. J. Grimm & D. L. Bennett, Air Products & Chemicals

12:00 NOON

LUNCH

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

AD HOC SESSIONS

5:00 p.m.-6:00 p.m.

SOCIAL HOUR

6:00 p.m.

DINNER

7:15 p.m.-9:45 p.m.

SCALE-UP

Chairman: S. Derrickson, Denver Equipment Division  
Joy Manufacturing

✓ "A Theory and Application of Velocity of Solids Suspension in an Agitator"  
H. Barari & S. Derrickson, Joy Manufacturing

✓ "Scale-up of Processes Involving Macro-Scale and Micro-Scale Mixing Phenomena"  
J. Oldshue, MIXCO

"Flooding and Critical Impeller Speed for Gas Dispersion in Aerated Turbine-Agitated Vessels"  
W. M. Lu & H. Chen, National Taiwan University

✓ "The Evidence, Arguments and Correlation for a Particle Property Dependent Variable Scale-Up Exponent in Solids Suspension Mixing Applications"  
R. Corpstein, Chemineer, Inc.

Tuesday, August 6, 1985 (continued)

✓ "Effects of Scale-up of Mixed Reactors on Yield"  
G. K. Patterson, University of Arizona

10:00 p.m.-11:00 p.m. SOCIAL HOUR

Wednesday, August 7, 1985

7:30 a.m. BREAKFAST

8:30 a.m.-10:30 a.m.

EXPERIMENTAL TECHNIQUES

Chairman: R. V. Edwards

Case Western Reserve University

Regular Paper Presentations

"The Relative Efficiency of Static Mixers in the  
Turbulent Pipeline Mixing of Ionic and Polymer  
Solutions"

P. V. Bartels, Technische Hogeschool Delft,  
Laboratorium voor Fysische Technologie, Netherlands

"Fluorescence Probes of Mixing Effectiveness"

J. Collias and R. K. Prud'homme, Princeton University

"The Use of Radiotracer Techniques in Industrial  
Mixing Processes"

Veikko J. Kamarainen, Reactorlaboratory, Technical  
Research Centre of Finland

"Sound Spectra and Temperature Measurement in  
Agitated Tanks"

Randolph Hsi, Michael Tay, Dragomir Bukur &  
Gary Tatterson, Texas A&M University

"Laser Doppler Measurements of the Turbulent Flow  
in Stirred Vessels"

H. D. Laufhutte & A. B. Mersmann, Technische-Universitat  
Munchen, Federal Republic of Germany

10:30 a.m.-10:45 a.m. COFFEE BREAK

10:45 a.m.-12:00 Noon POSTER SESSION

✓ "Conductivity Probe Test Procedure for a Batch  
Mixing System"

Douglas Ginley, National Bureau of Standards

"Evaluation of the Effect of System Parameters on  
Gas-Liquid Mass Transfer by Ozone Absorption"

Darin Ridgway & Thomas R. Hanley, Louisiana Tech  
University

Wednesday, August 7, 1985 (continued)

"The Use of The Frequency and Variance of the Signal from a Conductivity Probe to Determine Micromixing in a CSTR"

C. Kurt Svihla & Thomas R. Hanley  
Louisiana Tech University

"Influence of Carbon Particles on  $K_{La}$  in Mixing"  
J. Tinge, University of Groningen

"Spectrophotometric Studies of Simultaneous Mixing and Chemical Reaction"

R. J. Adler, Y. C. Lin and R. V. Edwards, Case Western Reserve University

"Color/Temperature Calibration for Temperature Sensitive Tracer Particles"

N. A. Wilcox, A. T. Watson and G. B. Tatterson  
Texas A & M University

12:00 NOON

LUNCH

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

AD HOC SESSIONS

*Equipment Testing Procedures Committee*

5:00 p.m. -6:00 p.m.

SOCIAL HOUR

6:00 p.m.

DINNER

7:15 p.m. -9:45 p.m.

VISCOUS MIXING

Chairman: J. J. Ulbrecht, National Bureau of Standards

"Polymer in Polymer Microdispersions and Interpenetrating Networks"

E. B. Naumann, Rensselaer Polytech Institute

✓ "Interzone Mixing in Viscous Newtonian and Non-Newtonian Liquids"

A. W. Nienow & R. Kuboi, University of Birmingham

"Streamlines and Chaotic Mixing in Cavity Flows"

W-L Chien and J. M. Ottino, University of Massachusetts

"Extraction from Viscous Polymer Solutions-Process Design and Scale-up"

G. Q. Martin, Shell Development Co.

"Mixing in Twin Screw Extruders"

D. B. Todd, Baker Perkins Inc.

"Power Consumption of Partially Filled Twin-Screw Extruders"

R. M. Secor, Dupont

10:00 p.m. -11:00 p.m.

SOCIAL HOUR

Thursday, August 8, 1985

7:30 a.m.

BREAKFAST

8:30 a.m.-10:30 a.m.

MIXING WITH CHEMICAL REACTIONS

Chairman: G. B. Tatterson  
Texas A&M University

REGULAR PAPER PRESENTATIONS

"Micromixing in the Core of Turbulent Pipe Flow"  
J. R. Bourne, ETH, Zurich

✓ "A Stretching Laminae Model for Mixing and Chemical  
Reaction in Continuous Flow Reactors"  
J. G. Hippler, R. J. Adler & R. V. Edwards, Case  
Western Reserve University

"A Shrinking-Aggregate Two-Environment Mixing Model"  
K. J. Liekhus & T. R. Hanley, Louisiana Tech University

"Polymerization in Unpremixed Polymer Reactors"  
S. D. Fields and J. M. Ottino, University of  
Massachusetts

"The Use of Chemical Indicators as Mixing Probes"  
H. L. Toor & K. T. Li, Carnegie-Mellon University

"Evaluation of Model of Mixing and Chemical Reaction  
with a Turbulence Analogy"  
R. V. Mehta & J. M. Tarbell, Pennsylvania State  
University

"A Study of Micro-Mixing in T-Mixers"  
G. Tosun, E. I. DuPont

10:45 a.m.-12:00 NOON

POSTER SESSION

"Micromixing in a Centrifugal Pump"  
J. R. Bourne, ETH, Zurich

"Effect of Mixing on Yield of Series-Parallel  
Reactions"  
H. L. Toor & K. T. Li, Carnegie-Mellon University

✓ "Impeller Fluidized Beds"  
M. J. Petrik, Helipump Corporation, & R. J. Adler,  
Case Western Reserve University

"Measurement and Evaluation of Closed Vessel Mixing  
Performance Using Inert and Reactive Tracers Detected  
by an Optrode"  
Peter Knysh & Reginald Mann, UMIST, Manchester

Thursday, August 8, 1985 (continued)

"Mass Transfer Coefficients in Organic Oxidations Under Reacting Conditions"

A. K. Suresh, T. Sridhar & O. E. Potter, Monash University, Clayton, Australia

"Simultaneous Mixing and Chemical Reaction Experiments in Batch Reactors"

P. T. Palepu, R. J. Adler and R. V. Edwards, Case Western Reserve University

"The Effect of Turbulent Mixing on Second Order Reactions"

C. A. Petty and S. Penix, Michigan State University

12:00 NOON

LUNCH

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

AD HOC SESSIONS

5:00 p.m.-6:00 p.m.

SOCIAL HOUR

6:00 p.m.

DINNER

+ 7:30 p.m.-10:00 p.m.

FOOD AND BIOCHEMICAL MIXING

Chairman: M. Midler, Merck, Sharp & Dohme

"Starch Derivatisation and Mixing Problems".

L. Janssen, University of Groningen, Netherlands

"Micromixing in Yeast Fermentations"

E. H. Dunlop and B. J. Beard, Washington University, St. Louis

✓ "Gas Dispersion with High Efficiency Hydrofoil Impellers"

J. A. Von Essen and J. R. Connolly, Philadelphia Mixers

✓ "The Evaluation of Hydrofoil Impellers in Viscous Mycelial Fermentations"

K. Gbewonyo, G. Hunt, V. Santamarina, K. Glazomitsky and B. Buckland, Merck Sharp and Dohme Research Laboratories

✓ "Applications of Hydrofoil Impellers to Large Scale Fermentation"

J. E. Tyler, J. Park and W. Henry, Lederle Laboratories

✓ "Comparison of Mixers Types in Large Scale Fermentation"

L. K. Krone, R. W. Stieber and A. Kirpekar, Merck Chemical Manufacturing Division

10:00 p.m.-11:00 p.m.

SOCIAL HOUR



Friday, August 9, 1985

7:30 a.m.

BREAKFAST

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

SELECTED PAPERS

Chairman: C. M. Garrison, Procter & Gamble

"Simulation of Flow of Gas-Liquid Dispersions in Agitated Systems"

I. Fort and V. Rogalewicz, Prague Institute of Chemical Technology

"Scale-up of Batch Reactors-Consecutive, Competitive Reactions"

J. M. Cohen & E. L. Paul, Merck, Sharp and Dohme & C. Hilber, E.T.H., Zurich

✓ "Solids Concentration Profiles in Mechanically-Stirred Column Slurry Reactors"

D. Fajner, F. Magelli, M. Nocentini, G. Pasquali, University of Bologna

"Characteristics of a Novel Gas-Liquid Reactor"

L. Litz, Union Carbide Linde Division

"Economic Effects of Incorrect Data for Scale Up"

R. Coble, Union Carbide

10:30 a.m.

COFFEE BREAK

✓ "Imbalance Hydraulic Loads on Agitator Impellers"

J. Fasano, Chemineer

✓ "Flow Induced Vibration of Mixing Vessel Internals"

R. King, BHRA

✓ "Prediction of Mixing in Stirred Vessels by Computational Fluid Dynamics"

~~J. C. Middleton, I.C.I.~~

LUNCH

ADJOURNMENT