

Pneumatic Conveying/ Bin Flow for Bulk Solids

Fall 2002 - Spring 2003

Bin Flow for Bulk Solids

- September 9, 2002 (Hartford, CT)
- October 7, 2002 (Toledo, OH)
- November 11, 2002 (Dallas, TX)
- February 24, 2003 (Jacksonville, FL)
- March 10, 2003 (Richmond, VA)

Pneumatic Conveying for Bulk Solids

- September 10-12, 2002 (Hartford, CT)
- October 8-10, 2002 (Toledo, OH)
- November 12-14, 2002 (Dallas, TX)
- February 25-27, 2003 (Jacksonville, FL)
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Learn more about the design and practical applications of pneumatic conveying systems with this seminar designed specifically for Managers and Staff Engineers, Industrial Engineers and Purchasing Engineers.



Presented by

**THE UNIVERSITY OF
TOLEDO**
Division of Continuing Education

In cooperation with
**Pneumatic Conveying
Consultants**
and



Bin Flow and Feeder Design for Bulk Solids (1-day seminar)

Seminar Overview

This session is offered to enhance “Pneumatic Conveying for Bulk Solids.” Handling bulk solids through bins and feeders prior to and after pneumatically conveying them is critical to reliable system design.

This seminar is designed to provide you with practical concepts and methods to design and troubleshoot your bins and feeders. You will learn how to avoid flow problems through proper design technique. You will also learn how flow properties are scientifically measured in order to predict their flow behavior in your bins and feeders.

Seminar Benefits

This session will provide practical information that will allow you to:

- avoid flow stoppages due to bridging and rat-holing
- predict the flow properties of your materials using a proven scientific approach
- design effective, practical bins, hoppers and feeders
- avoid segregation problems
- determine if a flow aid device is right for your application

Who Should Attend

Process/production engineers and operators, managers, process chemists, and research scientists and engineers in the following industries will benefit by attending: chemical, petrochemical, agri-chemical, and specialty chemical, biotechnology, pharmaceuticals and cosmetics, food processing, mining/mineral processing, plastics processing, bulk storage, pulp and paper.

About the Instructor

Joseph Marinelli, President of Solids Handling Technologies, Inc. in Fort Mill, SC is a solids handling expert who has taught more than 75 highly acclaimed engineering seminars. Since 1972, he has been active in testing bulk solids and consulting on materials handling systems design. He lectures frequently, teaching courses on solids flow principles and flow property testing, and has authored several papers and an encyclopedia section on the subject. He is also a columnist (“Ask Joe”) for the website, www.powderandbulk.com. He holds a B.S. in mechanical engineering from Northeastern University in Boston, MA.

Seminar Agenda

Flow Problems and Their Effects

- Arching
- Rat-holing
- Flooding
- Segregation

Flow Patterns

- Mass flow
- Funnel flow
- Expanded flow

Flow Properties

- Definition of flow properties
- Variables affecting properties
- Shear testing
- Cohesive properties
- Wall friction properties
- Compressibility properties

Design Principles for Reliable Flow

- Wall yield loci
- Yield loci
- Flow functions
- Bin pressure distribution
- Flow/No-flow criterion
- Flow factors

Calculation of Critical Bin Dimensions

- Arching capabilities
- Rat-holing dimensions
- Hopper slopes
- Bulk density – pressure relationship
- Flow properties report
- Using flow properties to design bins
- Specific examples

Volumetric and Gravimetric Feeders

- Volumetric screws, belts, rotary valves
- Gravimetric feeders
- Advantages
- Disadvantages
- Typical applications

Segregation

- Mechanisms that cause segregation
- Solutions to segregation problems
- Segregation do's and don'ts

Bin Inserts and Other Flow Aid Devices

- Improving flow patterns

Open Question and Answer*

**We encourage you to bring your bin and feeder problems or issues you have encountered for discussion during the course. This is your opportunity to discuss and explore innovative and practical solutions.*

Pneumatic Conveying for Bulk Solids (3-day seminar)

Seminar Overview

This course serves as a guide for those who work on pneumatic conveying projects and for those who seek more information about practical applications of these types of systems.

Key points to be covered include:

- A thorough review of the most common systems in use
- Practical exercises in system design and equipment application
- Analysis of the working principles, operation and maintenance of individual pieces of pneumatic conveying hardware
- A description and explanation of methods used to minimize particle degradation and erosion from abrasive materials

Seminar Benefits

- Gain an understanding of the 7 basic modes in which bulk solids are conveyed and of at least 15 system configurations of basic equipment.
- Learn about the numerous characteristics of bulk materials and how they affect the design and operation of systems.
- Understand the mathematical theory upon which the design of systems is based.
- Discuss where and how pneumatic conveying is applied in industry.
- Determine how the principal components of systems are designed, selected, operated and maintained, and how systems are configured for closed loop operation and explosion protection.

Who Should Attend

This seminar is designed for Managers and Staff Engineers, Industrial Engineers, and Purchasing Engineers from industries such as chemical, agricultural, cement, plastics, food, and those individuals responsible for the handling of dry powder or granular material who are involved with pneumatic conveying projects and material handling.

About the Instructor

Paul Solt, B.S.M.E., has been involved in pneumatic conveying since 1950. Currently he is consulting with Pneumatic Conveying Consultants. Formerly he was employed by Fuller Company where he held positions in the service, sales and research departments, and has had much experience in both installation and troubleshooting of conveying systems. His experience includes all aspects of the conveying field, including design, components, and control logic. Mr. Solt brings a unique balance of both practical and theoretical approaches to solving conveying problems. He frequently presents in-plant training seminars for engineers and process, production, and maintenance personnel. Mr. Solt edits a quarterly column, "Pneumatic Points to Ponder," for *Powder and Bulk Engineering* and is on the Editorial Advisory Board of the magazine.

Seminar Agenda

Overview

- Applications and limitations of pneumatic conveying
- Discussion of pneumatic conveying use in a variety of industries

Fundamentals

- Material characterization
- Fluidization
- Relationship among pressure differential, gas density, volume flow, and velocity
- The several modes by which solid particulates are moved through pipelines

System Configurations

- Pressure, vacuum, pull-push, closed loop
- Low pressure, medium pressure, high pressure
- Options for air mover and material feed device
- Matching the pneumatic conveying problem to the appropriate system type

System Design Theory

- A longhand design procedure to select pipe size and determine air volume flow, velocities, and system pressure

Practical System Design

- Shorter methods of designing systems in the principal conveying modes

Dense Phase Conveying

- The various systems for very low velocity piston conveying
- Principles of operation and applications

Components of Pneumatic Conveying Systems

- Blowers, feeders, receivers, filters, pipelines, valves and controls
- Principles of operation
- Design features
- Proper selection and application

Feedback from Bin Flow and Feeder Design seminar past participants:

“This course is well balanced and covers all angles regarding fundamental principles of hopper and feeder design.”

“I enjoyed the practical information. Joe was an excellent speaker and very willing to answer all questions.”

Feedback from Pneumatic Conveying seminar past participants:

“Almost all subjects discussed are dealt with in our plant. I feel I can troubleshoot problems.”

“Good speaker, good knowledge, very good course.”

“Too many benefits to list them all.”

“I have a better understanding of systems functions and design.”

“I gained knowledge that can immediately be used at the plant. Concepts were presented very clearly. My understanding of conveying is much improved.”

“A lot of practical information. Good balance of practical and theoretical. Provided the “root” reason for why to do or not to do.”

Seminar Locations

Seminar participants are responsible for making their own hotel reservations. When making your room reservation at the seminar hotel, please identify yourself as a registrant for The University of Toledo seminar to receive the appropriate discounted rate.

Hartford, Connecticut	Bin Flow - Sept. 9, 2002 Program Code: 2297
Farmington Inn 827 Farmington Ave. Farmington, CT 06032 Ph: 800-648-9804 Guest Rooms: \$119 while available before August 24, 2002	Pneumatic Conveying - Sept. 10-12, 2002 Program Code: 2292
Toledo, Ohio	Bin Flow - Oct. 7, 2002 Program Code: 2298
Radisson Hotel - Toledo 101 North Summit St. Toledo, OH 43604 Ph: 419-241-3000 www.radisson.com Guest Rooms: \$79 while available	Pneumatic Conveying - Oct. 8-10, 2002 Program Code: 2293
Dallas, Texas	Bin Flow - Nov. 11, 2002 Program Code: 2299
Westin Park Central Hotel 12720 Merit Drive Dallas, TX 75251 Ph: 800-937-8461 Guest Rooms: \$139 while available before October 20, 2002	Pneumatic Conveying - Nov. 12-14, 2002 Program Code: 2294
Jacksonville, Florida	Bin Flow - Feb. 24, 2003 Program Code: 2300
The Jacksonville Marriott 4670 Salisbury Road Jacksonville, FL 32256 Ph: 800-584-2842 Guest Rooms: \$99 while available before February 2, 2003	Pneumatic Conveying - Feb. 25-27, 2003 Program Code: 2295
Richmond, Virginia	Bin Flow - Mar. 10, 2003 Program Code: 2301
Crowne Plaza Hotels & Resorts 555 E. Canal Street Richmond, VA 23219-3842 Ph: 804-788-0900 Guest Rooms: \$89 while available before February 7, 2003	Pneumatic Conveying - Mar. 11-13, 2003 Program Code: 2296

Other Technical Seminars

The University of Toledo, Division of Continuing Education also offers many other technical seminars and certificate programs including: Maintenance Management, The 2002 National Electrical Code, Project Management, Telecommunications Installation and more. For a complete list of programs, visit our website at www.learningjourney.cc.

Registration Information for Pneumatic Conveying / Bin Flow for Bulk Solids

- 3 QUICK WAYS TO REGISTER:** (1) BY PHONE - Call (419) 321-5139, 8:30 a.m. - 4:30 p.m. EST; (2) BY FAX - (419) 321-5112, 24 hours a day; (3) BY MAIL - Return completed form with check or purchase order to The University of Toledo - SeaGate Campus, University College, Division of Continuing Education, 401 Jefferson Avenue, Toledo, OH 43604-1005. For phone or fax registration, please provide MasterCard, VISA or company purchase order information.
 - REGISTRATION** may be limited and will be accepted on a first-come first-serve basis. Confirmation will be sent upon receipt of your registration and payment.
 - FEE:** Registration fee includes course materials and a light lunch.
 - DISCOUNT:** for both the Pneumatic Conveying and Bin Flow seminars in the same city and save \$25 per person per seminar for single registrations or \$25 per person/per seminar for groups of 3 or more.
 - PROGRAM SCHEDULE:** Check-in begins at 7:30 a.m. The seminar is scheduled from 8:00 a.m. to 5:00 p.m.
 - HOTEL RESERVATION/SEMINAR LOCATION:** This seminar will be held at the locations specified on the inside of this brochure. Participants are responsible for their hotel reservations and payments.
 - CONTINUING EDUCATION UNITS:** Participants receive 0.1 CEU for each hour of class. Certification for specific organizations may be available.
 - CANCELLATION POLICY:** Cancellations received by 5 business days prior to the start of the program are entitled to a full refund. Cancellations received less than 5 business days are entitled to 50% refund of the course fee to cover expenses for which we have guaranteed payment. You may send a substitute but please advise us in advance. No fees will be refunded after a program begins. The University of Toledo reserves the right to change schedules or facilities and cancel any classes due to limited enrollment or circumstances beyond our control. Registered students will be notified of any changes prior to the first day of class.
 - IN-HOUSE TRAINING PROGRAM:** For additional information please contact Regina Collins at 419-321-5138 or rcollin3@utnet.utoledo.edu.
 - FOR FURTHER INFORMATION, PLEASE CALL** the Seminar Registrar at (419) 321-5139.
- The University of Toledo is committed to a policy of equal opportunity in education, employment, membership and contracts, and no differentiation will be made based on race, color, religion, sex, age, national origin, sexual orientation, veteran status or the presence of a disability. The University will take affirmative action as required by federal or state law.*

Loans Available for Professional and Personal Development Training

In cooperation with Key Bank, educational financing is now available for UT's Continuing Education IT and certification courses. The minimum loan amount is \$1,000 with an annual maximum loan amount of \$15,000. For more information on the eligibility requirements, interest rates and fees, repayment and deferment requirements and application process, contact Key Bank in one of the following easy ways:

By Internet: Key.com/IT

By Phone: 1-800-828-3509 or 1-800-KEY-LEND

By Fax: 1-617-426-3089

By Mail: Key CareerLoan, Key Education Resources, P.O. Box 9569, Boston, MA 02205-9569.

After you have completed your loan application form, simply fax your registration form to us and indicate Key CareerLoan® as the payment process. You will receive your registration confirmation from us as soon as we receive notification your loan application has been approved.

REGISTRATION FORM – Pneumatic Conveying / Bin Flow for Bulk Solids

Register now by phone at (419) 321-5139 or fax this form to (419) 321-5112.

Or, to register by mail, return this form and payment to:

The University of Toledo - SeaGate Campus
Division of Continuing Education
401 Jefferson Avenue
Toledo, OH 43604-1005

For group registrations,
please copy this
form as needed.

Name (Mr., Mrs., Ms.) _____

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Address _____

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Daytime Phone _____ Evening Phone _____

Fax _____ E-Mail _____

Please register me for:

Code	Seminar	Date	Location	Fee 1 person	Fee/per person Groups 3 or more
<input type="checkbox"/> 2292	Pneumatic Conveying	Sept. 10-12, 2002	Hartford, CT	\$895	\$795
<input type="checkbox"/> 2293	Pneumatic Conveying	Oct. 8-10, 2002	Toledo, OH	\$895	\$795
<input type="checkbox"/> 2294	Pneumatic Conveying	Nov. 12-14, 2002	Dallas, TX	\$895	\$795
<input type="checkbox"/> 2295	Pneumatic Conveying	Feb. 25-27, 2003	Jacksonville, FL	\$895	\$795
<input type="checkbox"/> 2296	Pneumatic Conveying	Mar. 11-13, 2003	Richmond, VA	\$895	\$795
<input type="checkbox"/> 2297	Bin Flow	Sept. 9, 2002	Hartford, CT	\$325	\$295
<input type="checkbox"/> 2298	Bin Flow	Oct. 7, 2002	Toledo, OH	\$325	\$295
<input type="checkbox"/> 2299	Bin Flow	Nov. 11, 2002	Dallas, TX	\$325	\$295
<input type="checkbox"/> 2300	Bin Flow	Feb. 24, 2003	Jacksonville, FL	\$325	\$295
<input type="checkbox"/> 2301	Bin Flow	Mar. 10, 2003	Richmond, VA	\$325	\$295

Discount for registering for both Pneumatic Conveying and Bin Flow seminars in the same city (\$25 per person/ per seminar or total of \$50 per person)

(Total price for both seminars for 1 person: \$1,170; total price for both seminars for groups of 3 or more: \$1,040 per person)

Payment:

Check enclosed for \$ _____ (make check payable to The University of Toledo)

Purchase Order enclosed P.O. # _____

Bill my credit card: Master Card VISA

Card # _____ Exp. Date _____

***In order to comply with the Hope Scholarship and Lifetime Learning Tax Credit legislation introduced with the Taxpayer Relief Act of 1997, which is designed to benefit the taxpayer. The University of Toledo now requires all credit and non-credit students to supply their social security number at the time of registration. Fact sheets summarizing the benefits of these tax credits will be mailed to you with your confirmation letter upon request.*

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These programs can also be arranged on-site, customized for your organization. For more details, please contact Regina Collins at: 419-321-5138.

For information on other Continuing Education programs, please call us at 419-321-5139 or visit our website : www.learningjourney.cc