Solids Handling: Bins, Feeders, and Pneumatic Conveying

October 28–31, 2013
Madison, Wisconsin

Learn how to...

✓ Design effective bins, hoppers, silos, outlets, and feeders
✓ Avoid costly flow problems
✓ Choose the right pneumatic conveying system and components for your applications
✓ Troubleshoot pneumatic conveying systems

Special emphasis will be placed on reducing energy costs.

Please route this brochure to colleagues who would also benefit by attending.
Get Practical Ideas and Solutions

This course is designed to provide you with practical concepts and methods to design and troubleshoot your bins and feeders to eliminate or reduce your bin and feeder problems. You will learn:

- About flow problems, their effects, and consequences
- About flow patterns and properties
- About design principles for reliable flow
- How to design or specify reliable, problem-free bins, hoppers, silos, and feeders
- How to improve the flow of materials in your bins and feeders

You will learn strategies for:

- Avoiding or reducing flow problems through proper design
- Predicting the flow performance of your materials in your bins and hoppers
- “Assisting” gravity
- Calculating critical bin dimensions
- Improving the operation of your bins and feeders

You will learn information that you can put to work immediately to optimize YOUR existing pneumatic conveying systems or to specify reliable systems to meet your conveying requirements. You will learn:

- About the types of conveying systems available
- About the advantages and limitations of these systems
- Where to use pneumatic conveying systems
- Which materials can be successfully conveyed
- How to conduct practical energy evaluations
- How to select the proper system components

During the course, you will examine:

- Dilute phase, medium phase, and dense phase conveying systems
- Components of conveying systems
- Operational advantages and constraints of conveying systems
- Design methods for pneumatic conveying systems
- Options for troubleshooting and retrofits to meet your requirements

Upon completion of this course you will have:

- Worked several design examples
- Examined segregation mechanisms and solutions to segregation problems
- Learned about material flow properties
- Explored options available for pneumatic conveying systems
- Examined troubleshooting methods for pneumatic conveying systems

Attend and Benefit

Engineers, scientists, and production personnel who are responsible for the design, operation, selection, or specification of bulk solids handling equipment will learn practical information that they can put to work immediately to avoid or solve their solids handling problems. Process, production, and maintenance engineers and others involved in bulk solids/materials handling in the following industries will benefit by attending:

- Chemical, petrochemical, agrichemical, and specialty chemical
- Biotechnology, biochemical, and fermentation
- Pharmaceuticals and cosmetics
- Food processing
- Mining/mineral processing
- Plastics processing
- Bulk storage
- Pulp and paper
- Power

We encourage you to bring for discussion solids handling problems or issues you have encountered. This is your opportunity to discuss and explore innovative and practical solutions. Throughout the course, there will be time available to discuss your specific concerns.

Please bring a calculator for your use during the course's problem-solving and design sessions.

Your Instructors

Joseph Marinelli, a bulk materials handling expert, is a principal at Solids Handling Technologies, in Fort Mill, South Carolina. His experience is unique in the field of bulk material handling, since he has had exposure to the theoretical and practical aspects of real problems and has learned about successes and failures. During more than 23 years with Jenike & Johanson, Inc. and solids handling equipment manufacturers, he worked as an engineer, author, and consultant to the bulk handling industry. He has been active in testing bulk solids and consulting on materials handling system design. He holds a BS degree in mechanical engineering from Northeastern University.

Paul E. Solt is a principal consultant at Pneumatic Conveying Consultants, in Allentown, Pennsylvania. His diverse experience derives from more than 50 years of experience installing and troubleshooting pneumatic conveying systems. He is well-known for his column, “Pneumatic Points to Ponder,” which has been appearing in Powder and Bulk Engineering magazine three times a year for more than 20 years. The author of several patents for pneumatic conveying devices, he holds a BS degree in mechanical engineering from Lehigh University.

ENROLL ONLINE TODAY! Or visit our Web site.
Solids Handling: Bins, Feeders, and Pneumatic Conveying Systems
October 28–31, 2013, in Madison, Wisconsin

Course Outline

Welcome and Introduction
Elaine M. Bower, FAIChe
Program Director
Department of Engineering Professional Development
University of Wisconsin–Madison

Solids Handling: Problem-free Bins and Feeders
• Flow problems and their effects
  – arching
  – rat-holing
  – flooding
  – segregation
• Flow patterns
  – mass flow
  – funnel flow
  – expanded flow
• Flow properties
  – definition of 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
• Calculating critical bin dimensions
  – arching capabilities
  – rat-holing dimensions
  – hopper slopes
  – flow properties report
• Volumetric and gravimetric feeders
  – volumetric screws, belts, and rotary valves
  – gravimetric feeders
  – advantages
  – disadvantages
• Design examples
  – using flow properties to design bins
  – specific examples
• Particle segregation
  – why segregation occurs
  – solutions to segregation problem
  – segregation dos and don’ts
• Flow aid devices
  – improving flow patterns
  – air blasters
  – vibrators
  – fluidization

Solids Handling: Pneumatic Conveying
• History
  – normal and extreme applications
  – economics
  – advantages versus disadvantages
• Material characteristics
  – particle size, density, shape, abrasiveness, friability (breakage)
  – angle of repose, moisture content
  – fluidization, air retention time
  – temperature, toxicity, stickiness, corrosiveness
• Types of conveying systems
  – vacuum
  – pressure
  – combination vacuum/pressure
  – closed loop
• Flow characteristics
  – stream flow
  – two-phase flow
  – pulsed piston
    – permeable pulsed piston
    – non-permeable pulsed piston
• Theory
  – pneumatic conveying theory
  – equations
• Sample theoretical problems
• Simplified stream flow calculations
• Simplified dense phase calculations
• Pneumatic conveying components
  – air supplies
  – air/material separators
  – feeding devices
    – vacuum
    – pressure
  – conveying lines
    – materials of construction
    – line layout
    – couplings, valves, bends
• Troubleshooting pneumatic conveying systems
  – determining the optimum air volume
  – correcting air pressure problems
  – material feed problems
  – line configuration problems and plugs
  – increasing capacity/minimizing wear
  – material degradation problems
  – air-material separation problems
  – controlling forces in the conveying line

Schedule Note: Registration will begin at 8:00 a.m. on Monday, October 22, at The Madison Concourse Hotel, One West Dayton Street, Madison, WI. The course will meet from 8:15 a.m. to 5:00 p.m. on Monday, from 8:00 a.m. to 5:00 p.m. on Tuesday and Wednesday, and from 8:00 a.m. to noon on Thursday. The daily schedule will include midmorning and midafternoon refreshment breaks and lunch at noon on Monday, Tuesday, and Wednesday.

Course Text
You will receive a copy of the text, Storage and Flow of Solids, by Andrew J. Jenike, University of Utah, 1999. The course notes that accompany the lectures and this text will serve as valuable references for you back on the job.

Earn Continuing Education Credits
By participating in this course, you will earn 28 Professional Development Hours (PDH) or 2.8 Continuing Education Units (CEU).

Enroll as a Team
Attending with others from your organization will help you maximize your learning experience—and save money! You can:
• Immediately discuss how information could be applied to challenges your team faces on the job
• Further your team development process
• Jointly develop a plan for reporting back to management and colleagues about your learning experience
• Save $195 on each enrollment

If you have questions about enrolling as a team, please call Program Director Elaine Bower, at 800-462-0876, or e-mail bower@engr.wisc.edu.

ENROLL ONLINE TODAY! Or visit our Web site.
Four Easy Ways to Enroll

Internet: epd.engr.wisc.edu/webP062

Phone: 800-462-0876 or 608-262-1299 (TDD 265-2370)

Mail to: The Pyle Center
Attn: Engineering Registration
702 Langdon Street
Madison, Wisconsin 53706

Fax: 800-442-4214 or 608-265-3448

Limited Enrollment

Course Information

☐ Please enroll me in Solids Handling: Bins, Feeders, and Pneumatic Conveying Systems

Course #P062 October 28–31, 2013 in Madison, WI Fee: $1995

Team Discount: $1800 per person when two or more enroll from the same organization.

☐ I cannot attend at this time. Please send me brochures on future courses.

Personal Information (Please print clearly.)

Name ________________________________________________________________

Title _________________________________________________________________

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Future Courses

Powder and Bulk Mixing: Processes, Applications, and Equipment
September 17–19, 2013
Dallas, Texas
Course #P056

Pumps and Process Piping
September 23–24, 2013
Chicago, Illinois
Course #P057

Chemical Engineering for Non-Chemical Engineers
September 30–October 2, 2013
Chicago, Illinois
Course #P058

Laboratory Design
October 7–9, 2013
Orlando, Florida
Course #P059

Dryer Technology
October 22–23, 2013
Madison, Wisconsin
Course #P060

Atomization and Spray Technology: Focus on Spray Drying
October 24, 2013
Madison, Wisconsin
Course #P061

Pilot Plant Design, Construction, and Operation
November 4–6, 2013
Houston, Texas
Course #P062

Evaporators: Designing, Evaluating, and Operating
November 12–13, 2013
Madison, Wisconsin
Course #P063

Industrial Crystallization Operations
November 14, 2013
Madison, Wisconsin
Course #P064

Need to Know More?

Call toll free 800-462-0876 and ask for
Program Director: Elaine M. Bower
bower@engr.wisc.edu

Program Associate: Theresa Rodger
rodger@epd.engr.wisc.edu

or e-mail custserv@epd.engr.wisc.edu

General Information

Fee of $1995 Covers Course notebook, design bulletin, break refreshments, lunches, and certificate. We do not publish proceedings. Course materials are distributed only to participants.

Cancellation If you cannot attend, please notify us by October 21, and we will refund your fee. Because this course has limited enrollment, cancellations received after this date and no-shows are subject to the full course fee of $1995. You may enroll a substitute at any time before the course starts.

Location and Accommodations This course will be held at The Madison Concourse Hotel, 1 West Dayton Street, Madison, WI 53703. We have reserved a block of guest rooms ($118/single) for course participants at the Madison Concourse Hotel and Governor’s Club, the course site. To reserve a room, call 800-356-8293 or 608-257-6000 by October 5, 2013 and request Group Code 296426.