



E&G Winter Powder School

—•—Evins Mill, Nashville, TN • December 7-12, 2014 —•—

Click on course title to learn more.

W1. Powder Flow I: Measuring Powder Flowability & Its Applications

Nashville, TN • December 8-9, 2014 • [Registration form](#)

An intense 2-day powder flow & handling workshop, for those involved in industrial chemical, pharmaceutical or solids processing issues in which flow properties are critical, including material handling, segregation, feeding, roll pressing and tableting. This course lays the groundwork for understanding the unique nature of powder flow properties, & its impact on processing & compaction, through team design problems & hands-on measurements by shear & permeability cell, fluidization/segregation testing, & roll press/tableting demos.

W2. Powder Flow II: Industrial Solids Handling & Mixing

Nashville, TN • December 8-9, 2014 • [Registration form](#)

By popular request, a follow-on companion workshop treating industrial solids flow principles of Powder Flow I, & commonly encountered design & operational issues of powder systems and mixing. Topics include unassisted mass/funnel flow discharge; flow promoting devices, aeration and vibration; feeders; conveying of powders; processing of segregating blends; solids blending & mixing, mixer selection and mixture quality. This course is useful for anyone optimizing current or designing future solids handling systems. It presumes a requisite knowledge of powder flow principles such as Powder Flow I, or equivalent experience.

W3. An Introduction to Powder Processing

Nashville, TN • December 10-12, 2014 • [Registration form](#)

A first powder technology workshop introducing participants to the unique attributes of powders, contrasted to more well understood liquids, and the impact of these complexities on solids processing. Topics include powder characterization; segregation & powder sampling; and an overview of key unit operations of mixing, grinding, agglomeration, classification, fluidization, & drying, as well as solids transport between operations.

W4. Granulation & Compaction Processes for Enhanced Product Performance

Nashville, TN • December 10-12, 2014 • [Registration form](#)

This agglomeration workshop is a relatively advanced course drawing heavily on the interaction between powder properties and unit-operations, covering a variety of granulation (fluid-bed, discs, pans, mixers) and compaction processes (roll pressing, tableting, extrusion) as well as formulation techniques. It emphasizes the marriage between formulation properties, characterization techniques, and engineering scale-up in controlling granule & compact quality.

Upon sufficient request: W5. Mixing & Blending Learn about workshop leaders.

Detailed course information: [Click here](#). Course questions: courses@powdernotes.com

Lodging questions: william@evinsmill.com • 615.269.3740 • www.evinsmill.com

Registration closes: Nov 17, 2014; EARLY BIRD, Oct 15, 2014. Reserve to hold room.



W1. Powder Flow I: Measuring Powder Flowability & Its Applications: A Hands-On Design-Oriented Workshop

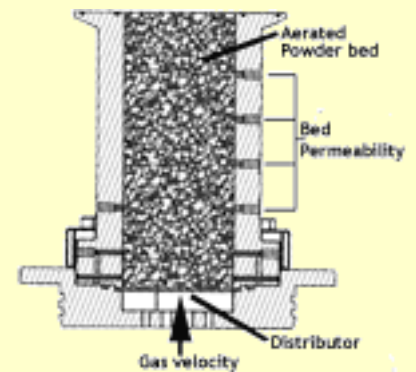
Nashville, TN • December 8-9, 2014 • [Registration form](#)

An intense 2-day powder flow & handling workshop, for those involved in solids processing issues in which flow properties are critical, including material handling, feeding operations, roll pressing and tableting. This course lays the groundwork for understanding the unique nature of powder flow properties, and its impact on processing & compaction, through team design problems and first hand lab measurements. **Typical schedule includes:**

- Day 1 morning.** Powder flow basics, flow patterns, segregation, demixing & feeding. Automated shear cell measurements of powder cohesion, friction & flow indices. Historical soil mechanics engineering basis. Physical demonstrations of representative powder behavior. Introduction to hopper & bin design to prevent arching & ratholing. **Hands-on:** Team measurements of powder flow properties by shear cell. Mass flow design problem to prevent arching. Flow indices problems and implications for powder or formulation design.
- Day 1 afternoon.** Rate of powder flow, feeding, or discharge. Fluidized-bed permeability characterization. Impact of aeration of powder flow, and deaeration times. **Hands-on:** Team measurements of aerated powder cohesion and permeability. Discharge rate experiment. Completion of flow measurements and flow design work.
- Day 1 evening.** Segregation mechanisms and connect to flow properties. Impact of segregation on NIR and process measurements. Monitoring segregation. **Hands-on:** Team measurements of hopper segregation. Shear cell & particle sizing access for client samples. Offered on first come/first serve basis w/prior arrangements.
- Day 2 morning.** Discussion of team powder flow homework problems. Impact of particle properties on bulk flowability. Particle property characterization methods of surface chemistry, hardness & particle size. Advances in particle sizing. Tableting and roll press design based on powder properties. Impact of wall and powder friction on stress transmission, die forces, and tablet ejection forces. Connection to other compaction methods such as encapsulation and ram extrusion. **Hands-on:** Tableting stress transmission & roll nip pressure team design problems. Roller compactor simulation. Measurements of particle size.
- Day 2 afternoon.** Compaction design revisited. Simulations. Additional compaction methods. Heistand indices, fracture mechanics, heckle profiles, permeability. Fluidization methods of powder cohesion. Additional powder flow and particle size measurements for client samples.

Relative flow index:

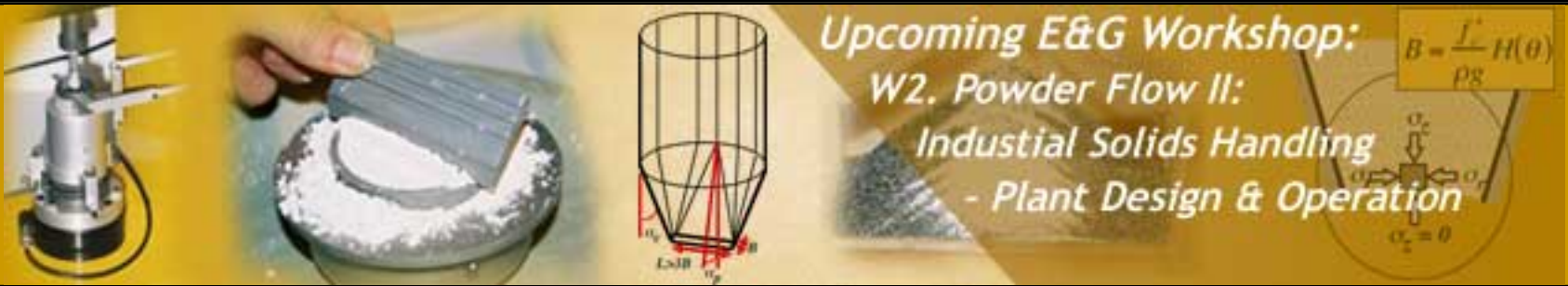
<2	Difficult to handle
1.5-4	Cohesive powders
3-6	Granules
5-10	Harder excipients
10-15	Sand
>20	If fine, floodable



Learn about workshop leader:



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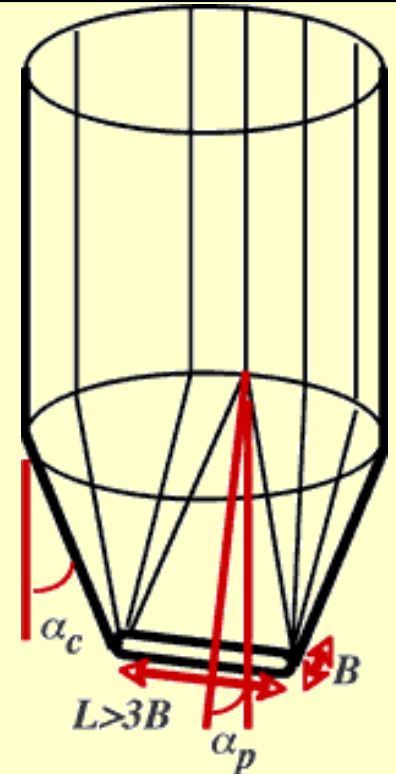


W2. Powder Flow II: Industrial Solids Handling & Mixing

Nashville, TN • December 10-12, 2014 • [Registration form](#)

Powder Flow II is a follow-on companion workshop to Powder Flow I. It treats in detail industrial applications of the solids flow principles learned in Powder Flow I, covering many of the practical considerations encountered in the design & operation of powder systems. It presumes a requisite knowledge of powder flow principles such as W1. Powder Flow I, or equivalent experience. For those without first hand powder flow characterization experience, we would recommend attending both workshops. Concepts are reinforced through attendee worked examples involving bin design to prevent arching/ratholing, flow insert placement, aeration requirements, feeder design, handling segregation, and conveying considerations. **Typical schedule includes:**

- Day 1.** Overview - Plant solids storage, transport, handling and mixing issues. Mixing and Blending – Overview of mixing quality and operation, ingredient optimization and mixer selection. Impact of ingredient properties on expected variations, scale of scrutiny and mixing model attendee practice. Segregation & demixing – Practical problems/solutions to typical segregation issues. Bin Design – Review of unassisted gravity flow bin design of mass flow and funnel flow hoppers, and practical design examples.
- Day 2.** Flow Testing - Review of solids flow testing and flow report. Design examples - Attendee worked examples, calculating critical bin dimensions for mass, funnel flow and cone-in-cone inserts. Feeders – Volumetric and gravimetric, screws, belts, rotary valves, advantages and disadvantages, and key design principles. Aeration effects – Impact on discharge rate, methods of correction. Retrofits – Wedge hoppers, liners and coatings, other. Flow aids – Passive and active, bin inserts, air blasters, vibrators, other solutions.
- Day 3.** Chutes—Do' /don'ts, appropriate angles due to material impact pressure. Modeling—Using models to understand flow issues and develop solutions. Bin pressures and mass flow vs. funnel flow loading. Conveying—Overview of mechanical and pneumatic conveying.



Click to: [Learn about workshop leaders.](#)

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W3. An Introduction to Powder Processing

Nashville, TN • December 8-9, 2014 • [Registration form](#)

A new, first powder technology workshop introducing participants to the unique attributes of powders, contrasted to more well understood liquids, and the impact of these complexities on solids processing. Topics include powder characterization; segregation & powder sampling; and an overview of key unit operations of mixing, grinding, agglomeration, classification, fluidization, and drying, as well as solids transport between operations. It is an excellent course for anyone in the field who needs to expand their knowledge of powder systems in general. It also would serve new practitioners in powder technology giving them a major head start in the field. Practical, hands-on examples and demonstrations enhance the theory. Practical tips for system improvements in plants will also be discussed, so key plant maintenance personnel may also find the course valuable. **Typical schedule includes:**

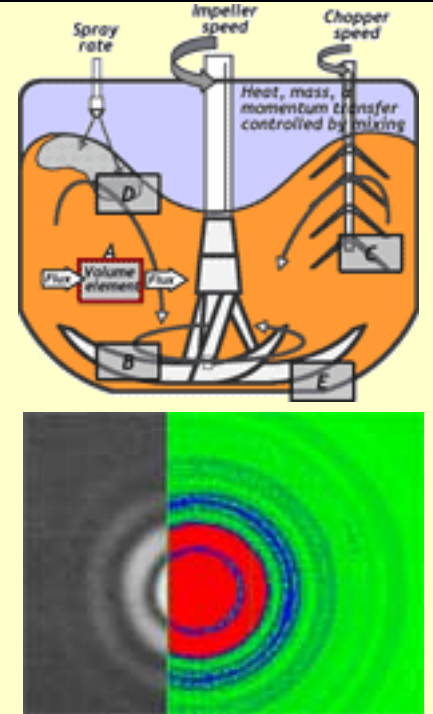
Day 1:

- Particle Characterization – Aspects of particle size distributions, methods of measuring particle size, variations of density, and tools to measure key particle characteristics. Powder flow shear cell and particle sizing demos.
- Moisture Sorption – ERH and its relation to moisture content, types of isotherms, and how to use isotherm data.
- Powder Handling – Introduction to solids handling, including bin design, causes of flooding & segregation, feeder basics, and pneumatic conveying.
- Powder Mixing – Sampling techniques, texture vs. mobility, mixer types & selection, statistics of mixing, scale-up principles.

Day 2 :

- Agglomeration - Wet granulation vs dry compaction processes, w/demos.
- Grinding and Classification – Basic grinding theory and principles, types of grinders, mechanical separation, air classification.
- Fluidization - Principles of fluidization and fluid-bed drying, w/demos.

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Learn about workshop leader:





W4. Granulation & Compaction Processes for Enhanced Product Performance

Nashville, TN • December 10-12, 2014 • [Registration form](#)

This granulation/compaction workshop is an in-depth course drawing heavily on interactions between powder properties & unit-operations, covering a variety of granulation and compaction processes. The course emphasizes the marriage between formulation properties and engineering scale-up in controlling granule/compact quality. This course is based on latest advancements in size-enlargement theory based on the work of Dr. Ennis and colleagues: Perry's Chem. Engin. Hndbk, 8th Ed, 2006; & "The Science & Engineering of Granulation Processes," 2004. **Typical schedule includes:**

- Day 1.** Overview of granulation & compaction processes, w/ identification of key controlling phenomena, illustrating interactions of feed/ formulation properties & process operating variables. Wetting - Binding fluid addition & nuclei formation, impact on final granule distribution, characterization techniques based on Washburn & IGC, & spray flux regime map. Granule coalescence & growth - Impact of feed/binder properties on agglomeration rate, granule yield properties & deformability, characterization of wet mass rheology and power, regime map of granule growth. Granule consolidation - Impact of densification on bulk density, Granule breakage & attrition - controlling fracture properties and testing. Hands-on demonstrations.
- Day 2.** Design, scale-up & operation of granulation processes. Morning: Low shear processes: Fluid-bed, drum, pan or disc. Impact of key operating variables. Non-inertial growth. Control of granule size and densification. The importance of spray flux to granule growth and bed weight to bulk density. Operational issues. Limiting granule size and population balances. Interactions between powder properties and process equipment. Afternoon: High shear mixers. Competition between growth and densification in inertial regimes of growth. Growth regime map. Wet mass rheology and uses and limitations of power. Attendee worked examples of engineering calculations. Overview of solids handling, hopper discharge and feeding.
- Day 3 .** Compaction agglomeration processes: roll presses & briquetting, tableting, and paste extrusion. Tableting and roll press design based on powder properties. Powder flow characterization. Impact of wall and powder friction on stress transmission, die forces, and tablet ejection forces. NIR chemical imaging. Simulations & die demonstrations. Additional compaction methods. Heistand indices, Heckle profiles, permeability, and flaws in compaction forms. Scale-up approaches and equipment selection for agglomeration processes, with worked examples.



Learn about workshop leader:



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W5. Solids Mixing & Blending

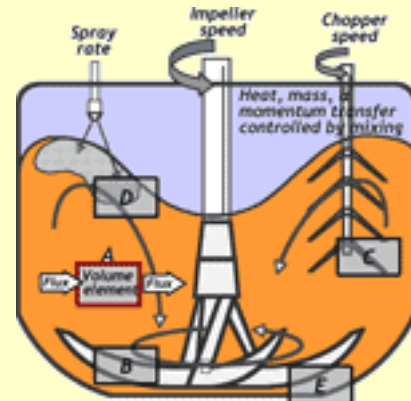
Offered upon sufficient demand • [Registration form](#)

CONTACT US TO EXPRESS INTEREST: courses@powdernotes.com

An in-depth, two-day course focusing on the mixing, blending, and subsequent handling of powders and their blends. Topics include differences of mixing free-flowing powders versus cohesive powders; the impact of powder characteristics; ordered versus random mixes; main mixer types & their selection & scale-up; mixer performance based on mix variance; proper system design to enhance and maintain a quality mix; proper sampling techniques; segregation issues and fixes in transporting blends, as well as related topics in solids handling and reblending.

Highlights include:

- Day 1: Free-flow powders, cohesive powders, powder flow characteristics as they apply to mixers, random versus segregated mixing, mixer types & selection, mixture variance, scale of scrutiny, system design.
- Day 2: Statistics of mixing, hands-on calculation examples, sampling techniques, analysis considerations, mixing scale-up. Proper sampling to understand mixer versus downstream process affects, correct downstream design, segregation and its causes, solving segregation issues, related solids handling topics.



Workshop leader:

Jim Davis is a Principal Consultant to E&G Associates, and President of Powder Processing Solutions LLC. As a previous solids handling technical leader with Procter & Gamble, he has 26 years of experience in the optimization, design & startup of powder processing/material handling systems, spanning over 20 countries and 4 continents. He offers many practical, unique insights for resolving difficult processing problems, and for minimizing design and development costs, from his experience in developing low cost systems for low income, third world markets. Jim holds a BSc in Mechanical Engineering degree from the University of Cincinnati, and a Professional Engineer's license from the State of Ohio. He has served on the Executive Committee of the International Fine Particle Research Institute, as Chairman of the ASTM subcommittee on Powder and Bulk Systems, as Chairman of the Powder Handling subcommittee of the Particle Technology Forum of AIChE, and sits on the industrial advisory board for the trade journal Powder & Bulk Engineering.



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Workshop leaders:

Dr. Bryan J. Ennis is President of E&G Associates, Inc. With three decades of experience in powder manufacturing, he has consulted for over 100 clients, including most major pharmaceutical/consumer products companies. He led agglomeration, solids handling & powder characterization programs of DuPont Engineering, and is a faculty member of Chemical Engineering at the Univ. of Tennessee at Chattanooga. He received his B.S.Ch.E. from Rensselaer Polytechnic & Ph.D. from The City College of NY. Dr. Ennis is a cofounder and previous Technical Vice-Chair of the Particle Technology Forum of the AIChE. Honors include two national AIChE awards for service to the profession, Deutscher Akademischer Austausch Dienst Award (Germany), and a Visiting Research Fellow of Delft Technical University (Netherlands). He is the author of several invited contributions on particle processing, including the *Agglomeration Advisor* column of *Powder & Bulk Engineering*, Section Editor of *Section 21: Solid-Solids Operations & Equipment* of the *Perry's Chemical Engineer's Handbook* (8th Ed.); *Theory of Granulation: An Engineering Perspective*, in *Hdbook of Pharma Granulation*, 3rd Ed., & *The Science & Engineering of Granulation Processes*, Kluwer Academic.



W1. Powder Flow I: Measuring Powder Flowability & Its Applications

W2. Powder Flow II: Industrial Solids Handling & Mixing

W4. Granulation & Compaction Processes

Jim Davis, P.E. is a Principal Consultant to E&G Associates, and President of Powder Processing Solutions LLC. As a previous solids handling technical leader with Procter & Gamble, he has 26 years of experience in the optimization, design & startup of powder processing/material handling systems, spanning over 20 countries and 4 continents. He offers many practical, unique insights for resolving difficult processing problems, and for minimizing design and development costs, from his experience in developing low cost systems for low income, third world markets. Jim holds a BSc in Mechanical Engineering degree from the University of Cincinnati, and a Professional Engineer's license from the State of Ohio. He has served on the Executive Committee of the International Fine Particle Research Institute, as Chairman of the ASTM subcommittee on Powder and Bulk Systems, as Chairman of the Powder Handling subcommittee of the Particle Technology Forum of AIChE, and sits on the industrial advisory board for the trade journal Powder & Bulk Engineering.



W2. Powder Flow II: Industrial Solids Handling & Mixing

W3. An Introduction to Powder Processing

W4. Granulation & Compaction Processes

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Participant Information
(Please print clearly)

Dr./Mr./Mrs./Ms. _____
(Please Circle One) FIRST NAME M.I. LAST NAME NICKNAME (TO APPEAR ON NAME BADGE)

COMPANY NAME POSITION TITLE

MAILING ADDRESS

CITY STATE/PROVINCE ZIP CODE COUNTRY

PHONE FAX E-MAIL

Description of process/product related issues or course objectives

Where did you hear about the course?

- Colleague E-mail notification Trade Magazine/Site Other: _____

General Information

- I would like to receive E&G's Powder Notes Newsletter. Notify me regarding future course offerings.

Registration Fees

Workshops (Please indicate course):		Mon-Tue:	Wed-Fri:
December 8-9:	<input type="checkbox"/> Mon-Tue: <input type="checkbox"/> Powder Flow I or <input type="checkbox"/> Intro to Powder Processing	<input type="checkbox"/> Powder Flow I	<input type="checkbox"/> Powder Flow/Mix II
December 10-12:	<input type="checkbox"/> Wed-Fri: <input type="checkbox"/> Powder Flow & Mixing II or <input type="checkbox"/> Granulation & Compaction	<input type="checkbox"/> Intro Powder Proc	<input type="checkbox"/> Gran & Compact

Select below as appropriate (Reserve early to ensure your room hold): **Fill-in fees as appropriate:**

Course Fees: <input type="checkbox"/> Registration course fee and notes. Payment received by November 17, 2014.	\$ 1,450.00	\$ 1,850.00
<input type="checkbox"/> Payment received after November 17, 2014. Add \$100:		

Book early to ensure room hold at the Mill.

Discounts: EARLY BIRD: Received by November 17, 2014. Less 10% (\$145 or \$185):		
OR		

NOTE: Registering for two workshops entitles attendee **Less 15% (\$218 or \$278):** to a 15% discount. DO NOT INCLUDE EARLY BIRD DISCOUNT AS WELL.

Meals: Food, all inclusive of service and tax:		
<input type="checkbox"/> 2 Day Workshop	Add fees: \$ 250.00	
Mon-Tue Workshop: Monday breakfast thru Tuesday Lunch		
<input type="checkbox"/> 3 Day Workshop	Add fees:	\$ 370.00
Wed-Fri Workshop: Wednesday breakfast thru Friday Lunch		

Contact Reed House for accommodations. \$115/night. 423-266-4121
Spouses and guests welcome. Contact E&G for arrangements.
The Read House Historic Inn: 827 Broad Street, Chattanooga, TN 37402
No walk-in registration. Driving directions available at <http://www.thereadhousehotel.com/>

Adjustments:		
Indicate arrival time & flight if known.		
Indicate any special needs or dietary requirements.		
	Total fee:	

Add fees above & pay this amount.

Payment Terms & Conditions

Payment Schedule & Cancellation Policy:
All payments received by November 17, 2014.
Cancellation & late fees apply after **November 17, 2014** as noted above & below.

Note: Rooms held till November 17, 2014.
Book early to ensure a room is held.

Refund Amount for all Fees:
Before November 17, 2014: 100%, less \$100
After November 17, 2014: 0%

Payment Method:

- Company/personal check enclosed. **\$150 fee for returned checks.**
 Credit card:

Name:	Type:
Number:	Expiration:

Payable to: E&G Associates, Inc.	Federal Tax ID#: 27-0064786
PO Box 681268	Email: workshops@powdernotes.com
Franklin, TN 37068	
Ph: (615) 469-1342	Fx: (240) 524-8482

Registration Process:

1. Fax completed and signed registration form to (240) 524-8482.
2. Contact The Read House for accommodations. \$115/night. 423-266-4121
3. Retreat location: Reed House, 827 Broad Street, Chattanooga, TN 37402

Attendee Application & Acceptance

Please sign & date below:	Company Use Only:
Date	Attendee Applicant Signature

E&G Associates, Inc. (E&G) reserves the right to modify course location, venue & accommodations; to decline any course applicant; or to cancel or reschedule course in its entirety or partially due to unforeseen circumstances. In the event of cancellation, participants will be entitled to a full refund of registration fees, with no further obligation on the part of E&G or course facilities. Final course details & schedule to be provided two weeks prior to course. E&G will invoice for any billing discrepancies. Overflow accommodation arranged as necessary. With signature, attendee accepts these terms & holds E&G & facility grounds entirely harmless from all liability involving participation at conference site.