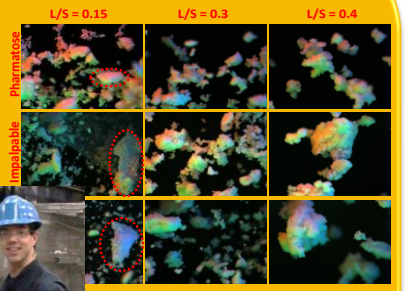
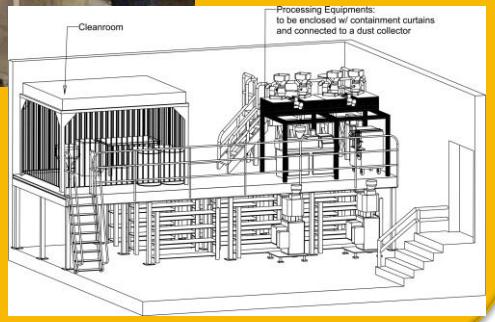
Purdue University's Center for Particulate Products and Processes cp3

Our vision is to create new functionality, improve quality, and reduce the costs of particulate-based products

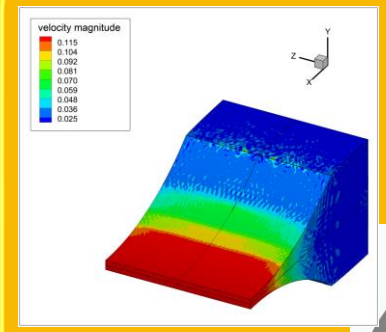
Our mission is to provide the knowledge, tools, and trained workforce needed to effectively design and manufacture particulate products

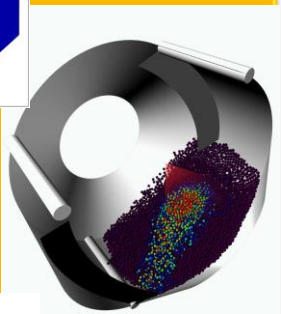
Facilities

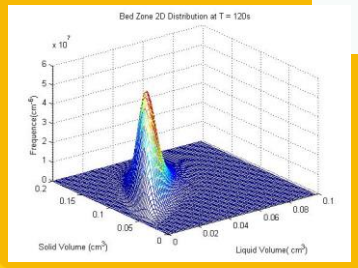




Multiscale Modeling Tools







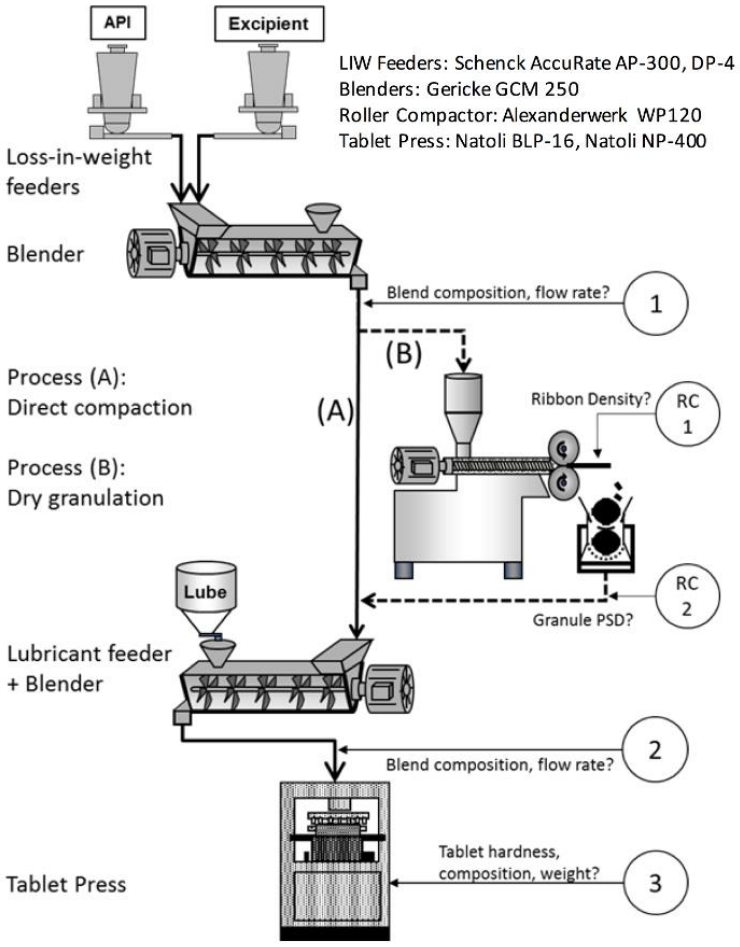
Education and Seminars

Who are we?

- To learn more, visit: https://engineering.purdue.edu/CP3
- ~30 Purdue faculty with research interests involving particulate materials
  - e.g., pharmaceuticals, agricultural materials, chemicals, consumer products, energetic materials, food products, thermal pastes, ceramics, batteries
- Center Director: Prof. Paul Mort, pmort@purdue.edu
- Characterization Lab: Prof. Kingsly Ambrose, rambrose@purdue.edu

Facilities

- Particle, Powder, and Compact Characterization Laboratory
  - e.g., sample splitting, sizing, shape, densities, flow, moisture content, strength, rheology, XRCT
- Solids Continuous Processing Pilot Plant
  - e.g., continuous unit operations, sensing, control systems
- Individual unit operations
  - e.g., feeding, blending, wet and dry granulation, milling, tableting
- Testing services available
- For a more complete listing of equipment: https://engineering.purdue.edu/CP3



CP3 Characterization Lab

Particle analysis:
- Malvern Mastersizer
- Malvern Morphologi (w/ Raman)
- JM Canty SolidSizer
- JM Canty InFlow
- Innopharma Eyecon
- Riffling & sieving

Moisture, surface, thermal:
- DVS Intrinsic Plus
- Mettler Moisture Balance
- Perkin Elmer TGA

Tomography
- Bruker Skyscan MicroCT

Mechanical Testing:
- MTS and Instron Load Frames
- Vankel Tablet Hardness
- Shimadzu microindenter

Flow, packing, permeability:
- Granutools test suite
- Freeman FT4 Rheometer
- Anton Paar MCR
- Hanson Flodex
- Shultze & Peschl rotational shear cells
- Bespoke tools for characterization of fluctuations.

FLEX Building

Lab-scale processing:
- Dry milling (Retsch ZM300)
- Wet milling (Netzsch DV1)
- Mixer granulation (Shear gap)
- Fluidized bed granulation and drying (Syntegon SL1)

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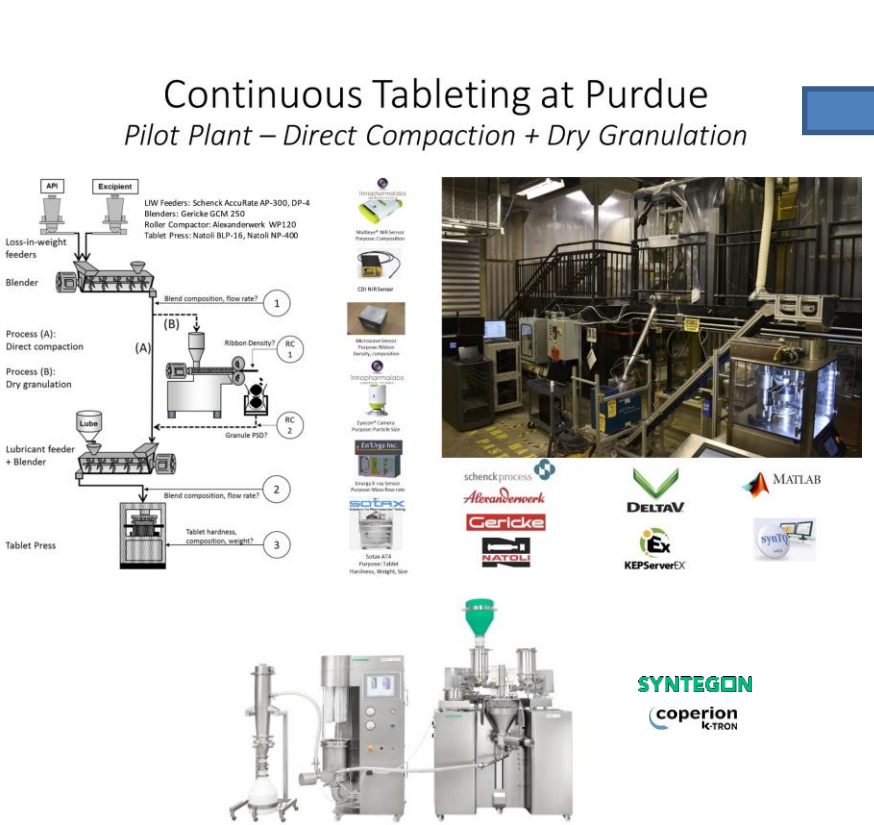
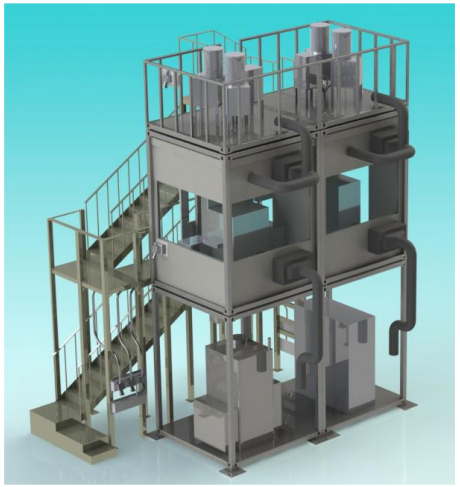
Purdue CP3 Modular Solids Process

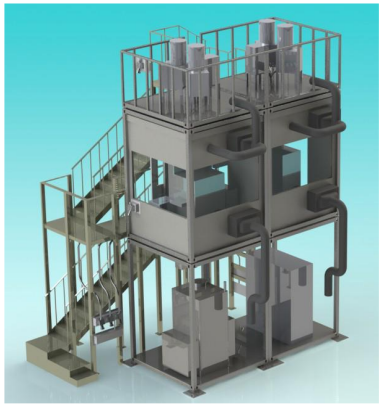


6 modules, stackable 3-high



- Process modules instrumented for remote sensing and control.
- Scope for continuous:
  - Binder granulation;
  - Drying
  - Milling
- Education, Training.
- Research, industrial outreach.

Purdue CP3 modular design



Purdue CP3 modular install in FLEX high-bay

Biologics Modular, LLC, Brownsburg, IN

FLEX building High-Bay, Purdue Discovery Park

Education

- CHE BS Concentration in Pharmaceutical Engineering
- CHE Professional Master's Programs
  - Pharmaceutical Engineering
  - Particulate Products and Processes
- For-credit courses and short courses, e.g.,
  - Material characterization (with a laboratory)
  - Unit operations (lecture and lab courses)
  - Principles of Pharmaceutical Engineering
  - Spray Applications and Theory

Education

- Courses via distance education!
  - Particle, Powder, and Compact Characterization (2 credits)
  - Unit Operations(1 credit modules)

How to engage the CP3

- Research contracts with individuals or teams of faculty
- Graduate student internships
- Testing contracts and consulting
- Attendance at CP3 short courses or in-house short courses
- Equipment and software donations

Contact

- Characterization Lab Inquiries:
  - Lab manager: Vidya Nagaraju, vkanagan@purdue.edu
  - Lab in charge: Prof. Kingsly Ambrose, rambrose@purdue.edu