SOLID DOSAGE PROCESSING

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In the pharmaceutical industry, a solid dose is a dosage form, such as a tablet or capsule or powder which is ingested orally and generally consists of a mixture of active pharmaceutical ingredients (or APIs, the drugs being delivered) along with a combination of binders, fillers and other excipients designed to imbue the finished drug with specific characteristics. Processing methods for individual pharmaceutical drugs can vary widely depending on the type or types of drugs being manufactured, the dosage form (solid dosage vs. liquid) the intended route of administration, and the necessary duration of the API’s release into the human body to achieve the pharmacological effects of the drug.

Two solid dosage forms, tablets and capsules, are among the most common drug dosage forms for consumers. Formulating the fill for capsules is generally easier than for tablets, but they are both manufactured using similar processes.

**ONLINE RESOURCES**
For more information on equipment for solid dosage processing, visit fluidairinc.com.
Fluid Air is a division of Spraying Systems Co. specializing in solid dosage processing equipment for the pharmaceutical industry, including fluid bed dryers/granulators, Wurster coaters, high-shear granulators, size reduction systems, tablet coating optimization systems, electrostatic spray dryers, and process control software for batch-type equipment.

Available in a full range of sizes from R&D to production scale, Fluid Air systems are designed to provide superior performance and batch uniformity for solid dosage processing applications while maintaining important process parameters from one size system to the next, making it easy for users to predict scale-up results. Configurable with a wide variety of optional features, each system is completely customizable to fit your exact specifications and process requirements, ensuring the perfect fit--no matter how challenging the application.
MAGNAFLO® & MAGNACOATER®
FLUID BED SYSTEMS

PRODUCT OVERVIEW

MAGNAFLO fluid bed dryer/granulators and MAGNACOATER Wurster coaters are completely customizable fluid bed systems designed to provide superior performance for solid dosage processing applications from R&D to production scale.

R&D SCALE
MODELS 0002, 0005
R&D or laboratory-scale units provide effective drying, coating or granulation for small batches.

PILOT SCALE
Models 0010 - 0120
Pilot systems offer a wide range of options for processing larger batches intended for clinical trial or small-scale production.

PRODUCTION SCALE
MODELS 0300 - 1200
Production scale fluid bed systems for processing of very large batches (up to 1200 Liters).

FEATURES AND BENEFITS

- Tapered expansion chamber improves granulation and reduces process time
- Agitator rake in bowl bottom ensures bed homogeneity
- Conidur and Turboflo bed plates provide uniform air distribution
- Specific geometry maintains critical scale-up factors
- Adjustable “shutter” plate allows for precise, user-controlled coating (MAGNACOATER Only)

ONLINE RESOURCES

- Literature
  Bulletin FA 100A - MAGNAFLO/MAGNACOATER

- Videos
  Model 0002 Fluid Bed System

- Specification Sheets
  R&D Scale Units
  Pilot Scale Units
## SPECIFICATIONS — MAGNAFLO® & MAGNACOATER® FLUID BED SYSTEMS

<table>
<thead>
<tr>
<th>Model Number</th>
<th>0002</th>
<th>0005</th>
<th>0010</th>
<th>0020</th>
<th>0050</th>
<th>0120</th>
<th>0300</th>
<th>0500</th>
<th>0800</th>
<th>1000</th>
<th>1200</th>
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<tbody>
<tr>
<td>Standard bowl volume (L)</td>
<td>2.0</td>
<td>13</td>
<td>20</td>
<td>46</td>
<td>57</td>
<td>148</td>
<td>346</td>
<td>617</td>
<td>967</td>
<td>1205</td>
<td>1437</td>
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<tr>
<td>Max. granulating capacity (L)</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>34</td>
<td>51</td>
<td>133</td>
<td>311</td>
<td>555</td>
<td>870</td>
<td>1084</td>
<td>1293</td>
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<tr>
<td>Max. coating capacity (L)</td>
<td>1.8</td>
<td>6</td>
<td>10</td>
<td>31</td>
<td>46</td>
<td>124</td>
<td>193</td>
<td>477</td>
<td>720</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>Extended bowl volume (L)</td>
<td>*</td>
<td>*</td>
<td>n/a</td>
<td>72</td>
<td>207</td>
<td>482</td>
<td>860</td>
<td>1346</td>
<td>1645</td>
<td>1961</td>
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<tr>
<td>Reduced volume bowls (L)</td>
<td>0.5</td>
<td>2</td>
<td>2.5</td>
<td>5, 10</td>
<td>5, 46</td>
<td>46, 72, 57, 97</td>
<td>148</td>
<td>346, 148</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>System height (inches/mm)</td>
<td>72/1829</td>
<td>74/1880</td>
<td>80/2032</td>
<td>105/2667</td>
<td>130/3302</td>
<td>138/3505</td>
<td>160/4064</td>
<td>148/3670</td>
<td>174/4420</td>
<td>185/4699</td>
<td>192/4877</td>
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<tr>
<td>System width (inches/mm)</td>
<td>32/813</td>
<td>76/1930</td>
<td>78/1981</td>
<td>36/1981</td>
<td>48/1220</td>
<td>46/1168</td>
<td>72/1829</td>
<td>84/2134</td>
<td>96/2538</td>
<td>105/2667</td>
<td>114/2896</td>
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</tbody>
</table>

### MAGNALIFT® BIN & BOWL ELEVATORS

#### PRODUCT OVERVIEW

MAGNALIFT bin and bowl elevators elevate, invert, or rotate to blend fluid bed bowls or bins for sanitary discharge into a tablet press, drum, or other process equipment. With options ranging from height, material use, movement, and more, each MAGNALIFT is fully customized to meet your specific process needs.

#### FEATURES AND BENEFITS

- Safe and robust construction
- GMP design for use in washdown environments
- Custom configured for each special application to meet loading and unloading requirements
- Pivoting or stationary posts with floor and ceiling or floor only support
- Inverting and/or lift only configurations
- Hydraulically driven for efficient movement, safety, and speed
MODEL 0002 FLUID BED SYSTEM WITH ULTRASONIC AIR ATOMIZING LANCE

PRODUCT OVERVIEW

The Model 0002 fluid bed system for R&D applications is now available with integrated ultrasonic spray technology for superior performance in fluid bed coating, granulation, fluid bed drying and spray drying.

FEATURES & BENEFITS – MODEL 0002 FLUID BED SYSTEM

- Conidur plates ensure uniform air distribution through the bed
- Unique Wurster plate design ensures proper flow of material
- Easy-to-use controls, adjustable touch screen and data logging
- Spraying Systems Co. nozzles provide superior spray distribution
- High-retention filter system reduces product waste
- Precise, in-process air flow and temperature controls for improved batch accuracy

ULTRASONIC AIR ATOMIZING LANCE

- Patent-pending design provides superior accuracy in spray pattern formation
- Gentle Wurster coating of fine particles 30 microns or smaller
- Ultra-fine Ultrasonic spray prevents agglomeration
- Adjustable shaping air pressure allows users to achieve the desired liquid droplet velocity
- Flow rates range from 0.5 cc/min to 10 cc/min

ONLINE RESOURCES

Literature
Bulletin FA 104 - Model 0002 Fluid Bed System
Bulletin FA 106 - Model 0002 with Ultrasonic

Website
Fluidairinc.com > Ultrasonic Fluid Bed Systems
**SPECIFICATIONS — MAGNAFLO® & MAGNACOATER® FLUID BED SYSTEMS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Ultrasonic bowl volume (L)</td>
<td>1/2</td>
</tr>
<tr>
<td>Ultrasonic bowl volume (mL)</td>
<td>72 / 1829</td>
</tr>
<tr>
<td>System width (inches / mm)</td>
<td>32 / 813</td>
</tr>
</tbody>
</table>

**ULTRASONIC AIR ATOMIZING LANCE**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Nozzle orifice diameter</td>
<td>0.03” (0.762 mm)</td>
</tr>
<tr>
<td>Droplet size range</td>
<td>10-90µm</td>
</tr>
<tr>
<td>1/8” NPTF connections (shaping/cooling air inlets and exhaust)</td>
<td></td>
</tr>
<tr>
<td>1/2” hygienic liquid inlet connection</td>
<td></td>
</tr>
<tr>
<td>316SS lance with titanium ultrasonic horn</td>
<td></td>
</tr>
<tr>
<td>Choice of FDA VITON or EPDM elastomers</td>
<td></td>
</tr>
</tbody>
</table>

**SPRAY TIP: ACHIEVE MICRON-LEVEL COATING PRECISION WITH INTEGRATED ULTRASONIC TECHNOLOGY**

Ultrasonic spray technology delivers the precise, uniform spray required for delicate, complex fluid bed coating processes—such as Wurster (fluid bed) coating—while providing a high level of control over the spray, allowing users to make fine adjustments on the fly. Fluid Air will work with you to integrate Ultrasonic spray technology into your customized fluid bed processor.
**PHARMX® HIGH-SHEAR GRANULATORS**

**PRODUCT OVERVIEW**

PHARMX high-shear granulators are fully customizable bottom-driven mixing systems engineered to provide homogeneous mixing and efficient granulation across a range of available R&D, pilot, and production size models.

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**R&D SCALE**
PX1

R&D or laboratory-scale units provide effective high-shear granulation for small batches.

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**PILOT SCALE**
PX25 - PX150

Pilot systems offer a wide range of options for processing larger batches intended for clinical trial or small-scale production.

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**PRODUCTION SCALE**
PX250 - PX1250

Production scale systems for granulating very large batches (up to 1250 Liters).

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**FEATURES AND BENEFITS**

- Optimized bowl geometry allows for efficient mixing at up to 90% capacity
- Hydraulic drive system
- Bottom-driven mixing impeller and high-speed chopper ensure uniform mixing
- One-pot processing models available (mixing/drying)
- Water jacketing, vacuum loading/drying and nitrogen inerting options

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**ONLINE RESOURCES**

- Literature
  - Bulletin FA 101A - PHARMX
- Specification Sheets
  - R&D Scale Units
  - Pilot Scale Units
**SPECIFICATIONS — PHARMX® HIGH-SHEAR GRANULATORS**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>PX1</th>
<th>PX25</th>
<th>PX50</th>
<th>PX100</th>
<th>PX150</th>
<th>PX250</th>
<th>PX400</th>
<th>PX600</th>
<th>PX800</th>
<th>PX1000</th>
<th>PX1250</th>
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<tbody>
<tr>
<td>Total bowl volume (L)</td>
<td>1, 2, 4, 6, 8, 4</td>
<td>31</td>
<td>58</td>
<td>119</td>
<td>167</td>
<td>274</td>
<td>432</td>
<td>633</td>
<td>864</td>
<td>1050</td>
<td>1286</td>
</tr>
<tr>
<td>Charge- max. liters @ light bulk, 0.3 - 0.5</td>
<td>0.9 - 7.5</td>
<td>28</td>
<td>58</td>
<td>107</td>
<td>150</td>
<td>246</td>
<td>389</td>
<td>569</td>
<td>778</td>
<td>945</td>
<td>1157</td>
</tr>
<tr>
<td>Charge- min. liters</td>
<td>0.3 - 2.5</td>
<td>8</td>
<td>15</td>
<td>30</td>
<td>42</td>
<td>69</td>
<td>109</td>
<td>159</td>
<td>218</td>
<td>265</td>
<td>324</td>
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<tr>
<td>Impeller speed range (RPM)</td>
<td>5 - 1107</td>
<td>37 - 318</td>
<td>29 - 260</td>
<td>14 - 205</td>
<td>12 - 185</td>
<td>10 - 172</td>
<td>1 - 148</td>
<td>1 - 127</td>
<td>1 - 118</td>
<td>1 - 110</td>
<td>1 - 103</td>
</tr>
<tr>
<td>Impeller power (HP)</td>
<td>0.5 - 1</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>40</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>125</td>
<td>150</td>
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<tr>
<td>Chopper speed range (RPM)</td>
<td>1500 - 9750</td>
<td>500 - 4000</td>
<td>500 - 4000</td>
<td>500 - 4000</td>
<td>500 - 4000</td>
<td>500 - 3000</td>
<td>500 - 3000</td>
<td>500 - 3000</td>
<td>500 - 3000</td>
<td>500 - 3000</td>
<td></td>
</tr>
<tr>
<td>Chopper power (HP)</td>
<td>0.25</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>7.5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>40</td>
</tr>
</tbody>
</table>

**SPRAY TIP: PROCESS HAZARDOUS COMPOUNDS SAFELY WITH INTERCHANGEABLE BOWLS**

For processing potent compounds requiring total containment, we are able to provide customized interchangeable bowls. The bowls can be removed from the console and placed in a glove box / flexible containment structure without any dusting of product from the bowl. Charging and discharging from the mixer bowl is completely contained.
GRANUMILL® SIZE REDUCTION SYSTEMS

PRODUCT OVERVIEW

GRANUMILL size reduction systems are wet and dry mill systems designed for precision particle size reduction and de-agglomeration applications, available in R&D, pilot, and production scale sizes.

FEATURES AND BENEFITS

• Variable speed rotor allows for both high-speed fine grinding and low speed de-agglomeration
• Quick-release housing allows mill to be broken down in minutes for cleaning or inspection
• Robust rotor design available in three different shapes – square/flat, round, and knife
• Water jacketed housing available for temperature-sensitive products
• Quiet operation
• Multiple feed and discharge options available to suit your process

ONLINE RESOURCES

Literature
Bulletin FA 102A - GRANUMILL
Bulletin FA 105 - GRANUMILL Jr.

Specification Sheets
GRANUMILL Jr.
GRANUMILL 007 & 014
### Specifications — Granumill® Size Reduction Systems

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Granumill Jr.*</th>
<th>Granumill 007*</th>
<th>Granumill 014*</th>
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<tbody>
<tr>
<td>Speed (RPM)</td>
<td>500 - 10000</td>
<td>500 - 5000</td>
<td>600 - 3600</td>
</tr>
<tr>
<td>Throughput (lbs/kg)/hour</td>
<td>0.2 - 60 / 0.1 - 25</td>
<td>2 - 2250 / 1 - 1000</td>
<td>4 - 3860 / 2 - 1750</td>
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<tr>
<td>System Height (inches/mm)</td>
<td>25 - 635</td>
<td>80 / 2032</td>
<td>80 / 2032</td>
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<tr>
<td>System Width (inches/mm)</td>
<td>12 / 304</td>
<td>32 / 813</td>
<td>40 / 1016</td>
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<tr>
<td>System Length (inches/mm)</td>
<td>15 / 381</td>
<td>60 / 1524</td>
<td>68 / 1727</td>
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<tr>
<td>Screen Width (inches/mm)</td>
<td>4 / 102</td>
<td>7 / 178</td>
<td>14 / 356</td>
</tr>
</tbody>
</table>

### Spray Tip: Save Time and Money with Flexible Containment Enclosures

In cooperation with ILC-Dover, we are able to provide custom-designed, flexible containment systems for GRANUMILL Jr. size reduction systems. The flexible enclosure set-up allows for use in both containment and non-containment applications, eliminating the need to purchase a second machine solely for containment use.
POLARDRY®
ELECTROSTATIC SPRAY DRY SYSTEMS

PRODUCT OVERVIEW

The patent-pending PolarDry® Electrostatic Spray Dryer utilizes revolutionary electrostatic technology, which drives water or solvent to the shell and active to the core, lowering the required evaporation temperature and eliminating active ingredient loss, degradation, or denaturalization. Harnessing the electrostatic effect, the dispersed active driven into the core is microencapsulated, virtually eliminating surface active, resulting in stunning encapsulation efficiency.

FEATURES AND BENEFITS

• Low operating temperature allows for greater encapsulation efficiency for high-volatile components
• SAFE - Nitrogen Inerted
• Inner liner makes for easy clean-up/changeover
• Process products with low glass transition temperature (Tg)
• Recycled process gas with negligible emissions virtually eliminates regulatory issues
• The ability to agglomerate the powder as it is being dried

FEASIBILITY SCALE
MODELS 0.1 & 001

Portable PLC controlled once-through design intended for a laboratory environment. These GMP designed machines are the best option for feasibility checks.

R&D SCALE
Model 004

A semi-portable PLC controlled recirculating system for R&D Environments. This unit uses the same nozzle as Model 032 for easy scale-up. This model includes portable access stairs with a work platform.

PILOT SCALE
MODELS 032 & 050+

Model 032 is a modular design, PLC controlled system for Pilot Environments. Choose from Batch Architect™ or Batch Architect Pro™ with CFR21 PART11 Compliant Data Logging to control this intermediate system. This model includes access stairs with a work platform.

ONLINE RESOURCES

Literature
Bulletin FA 111A - PolarDry
Bulletin FA 114 - PolarDry Model 0.1
**ELECTROSTATIC SPRAY DRY SYSTEMS**

**SPECIFICATIONS — POLARDRY® ELECTROSTATIC SPRAY SYSTEMS**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>001</th>
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<th>032</th>
<th>050</th>
<th>100</th>
<th>200</th>
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<td>Nominal Evaporation Rate (kg/hr)</td>
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<td>4</td>
<td>30</td>
<td>50</td>
<td>100</td>
<td>200</td>
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<td>Min Drying Temp. (°C)</td>
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<td>10</td>
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<td>Max Drying Temp. (°C)</td>
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<td>140</td>
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<td>Max Drying Gas Flow (m3/hr)</td>
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<td>1020</td>
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<td>Max Atomizing Gas Flow (m3/hr)</td>
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<td>68</td>
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<td>Collection Volume (liters)</td>
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<td>14**</td>
<td>20**</td>
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<td>Drying Gas Heater</td>
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<td>Indirect Gas</td>
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<td>Gas Handling</td>
<td>Once Through</td>
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<td>Feed Stock Pump</td>
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<td>Nozzle Clog Monitoring</td>
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<td>WIP Nozzles Included</td>
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<tr>
<td>Filter System</td>
<td>Patented Reverse Pulse Bag</td>
<td>Patented Reverse Pulse Bag</td>
<td>Reverse Pulse Cartridge</td>
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<td>Reverse Pulse Cartridge</td>
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<td>Controls</td>
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</table>

*Dependent on inlet gas supply temperature  **Pneumatic or Cable Conveyor Available   **Batch Architect Pro™ Available for CFR21 Part 11 Compliance

**SPRAY TIP: REDUCE POST-PROCESSING WITH CONTROLLED AGGLOMERATION**

By controlling the voltage applied to the spray droplet as it is being atomized, some particles form an outer shell readily while others develop their shell gradually resulting in a wet or tacky particle. As these two types of particles collide, they bond forming an agglomerated particle. This results in a finished product with larger particles and fewer fines which flow freely.
PRODUCT OVERVIEW
Replacing a costly tablet coater or coating pan is not the only way to improve coating results. Designed to upgrade only the core components of your existing coater, the new TABCOATER system is a flexible solution for improving the performance of aging coating equipment.

PACKAGE FLEXIBILITY: CHOOSE COMPLETE SYSTEM OR INDIVIDUAL UPGRADES
The complete TABCOATER system consists of a manifold, spray nozzles, a fluid delivery skid, and process controls. Whether you’re looking to change your entire coating system or just need to replace a worn out spray nozzle, Spraying Systems and Fluid Air will work with you to customize a solution that fits your requirements.

FEATURES & BENEFITS
MANIFOLD WITH VMAU SPRAY NOZZLES
• Patent-pending internal recirculating guns
• Prevents tablet entrapment
• Anti-bearding nozzles reduce product build-up

BATCH ARCHITECT™ PROCESS CONTROLS
• Automates fluid delivery skid or entire pan operation
• Phase or recipe-based controls

CUSTOMIZED FLUID DELIVERY SKIDS
• Custom GMP design configured for process area
• Closed-loop solution/liquid delivery metering using loss-in-weight, mass flow sensing, and totalizing
• Precise, low-pulsation peristaltic pumps eliminate "dead-leg" liquid distribution
• Liquid flow shut-off with optional recirculation
• Nozzle liquid feed pressure sensors detect clogging
• Nozzle clearing circuit, line clearing and purge system
• Atomizing and fan air pressure control with flow

ONLINE RESOURCES
Literature
Bulletin FA 107 - TABCOATER ➤
Website
Fluidairinc.com > Tablet Coating Systems ➤
DIMENSIONS — TABCOATER® TABLET COATING OPTIMIZATION SYSTEM

SPRAY TIP: SAVE MONEY WITH INDIVIDUAL UPGRADES

The complete TABCOATER system consists of a manifold, spray nozzles, a fluid delivery skid, and process controls. Whether you’re looking to change your entire coating system or just need to replace a worn out spray nozzle, Fluid Air will work with you to customize a solution that fits your requirements.

For more information on TABCOATER systems, visit fluidairinc.com.
BATCH ARCHITECT™
PROCESS CONTROL SOFTWARE

PRODUCT OVERVIEW

Fluid Air systems run on Batch Architect process control software, a flexible solution for controlling virtually any batch-type equipment. The easy-to-use software allows users to control complex pharmaceutical processing equipment with little to no training, and is available in either standard or Pro versions.

FEATURES AND BENEFITS

- Provides direct access to manual machine control and optional features for increased automation
- Equipped with a graphical user interface which provides current status information of critical machine functions through animation and text
- Runs on FactoryTalk® HMI platform and Allen-Bradley Logix™ series processors
- Recipe control feature allows batches to be easily created, stored, and reproduced
- 21 CFR Part 11 Capability (Pro Version Only)
- Offers convenient electronic batch record data logging and report creation services
- Increased product lifecycle through virtualization technology

ONLINE RESOURCES

Videos
Process Control Software

Website
Fluidairinc.com > Process Control Software

SPRAY TIP: REDUCE COSTS WITH SOFTWARE VIRTUALIZATION TECHNOLOGY

As software development teams move through the software development lifecycle and new software versions are created to improve the product, the use of “virtual machines” can now store a simple file containing the entire operating system configuration. Systems running on Batch Architect Pro can use these virtual machine files to save time and considerable cost during set-up, also reducing the need for spare legacy hardware.
RETROFIT SERVICES AND MORE

SERVICE OVERVIEW

In addition to new equipment, Fluid Air offers a range of services to make your used machines feel like new again. Update your process with the latest in spray technology, process controls, retrofit services and more provided by our global network of trained sales and support personnel.

FEATURES AND BENEFITS

• Upgrade almost any type and brand of pharmaceutical batch-type processing equipment

• Convert equipment to perform new functions, like fluid bed granulating or Wurster coating

• Add new features to existing equipment such as humidification, modern filter systems, solvent recovery systems and more

• Update your existing control system to robust, recipe-driven Batch Architect™ process control software

ONLINE RESOURCES

Literature
Bulletin FA 103 - Retrofit Services ➤
Bulletin FA 108 - Remote Service & Support ➤

SPRAY TIP: REVITALIZE YOUR EXISTING EQUIPMENT WITHOUT REPLACING IT

Replace your worn or existing factory-supplied nozzles with new, state-of-the art fluid bed nozzles from Spraying Systems Co. Intended to fit either new or existing Fluid Air fluid bed systems as well as competitor systems, our line of customizable nozzles and lances for Wurster coating and top-spray granulation are designed to help you get the most out of your machine.