Spray Drying and Screening of Foods, Pharmaceuticals, Nutraceuticals
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FLEMINGTON, NJ—Summit Custom Spray Drying produces spray-dried flavors, fragrances, cosmetics, nutraceuticals, and pharmaceutical-grade materials.

The GMP-compliant, FDA-registered facility, a wholly owned subsidiary of SummitReheis (www.summitreheis.com), produces powdered solid particles from solutions, slurries and emulsions, and employs a Kason vibratory screener to ensure that particle sizes meet tight tolerances.

"When fully operational, three spray dryers will produce several hundred different spray-dried powders for diverse customers," says Kevin Kimmick, Summit Custom Spray Drying Director of Process Technologies. "Runs can be small as pilot studies, to as large as 150,000 lb (68,100 kg) at the production level for a major firm."

"Our expertise in spray drying and equipment selection, as well as the specialized knowledge of our experienced staff, qualifies us to serve these sensitive industries," he says. "To eliminate any possibility of contamination, we will not accept hazardous or toxic materials such as herbicides or pesticides. And we have specifically designed our equipment to be easily and thoroughly cleaned."

Testing determines process conditions

Kimmick has 23 years of experience and is highly skilled in spray drying. "Although spray drying is based on scientific principles, our test procedures enable us to determine and control optimum conditions according to numerous variables," he says.

Before accepting an order for a new material, the company performs laboratory and pilot plant testing using raw materials and formulas supplied by the customer. "This allows us to determine whether or not we can effectively spray dry the material," he explains. "It also helps us to develop a cost estimate for the process. If the results of the tests are favorable, we then transition directly into production."

Spray dryer separates solids from liquids

A typical order begins with delivery of bulk quantities of raw materials by the customer. "Solids are stored in a warehouse in the original containers in which they were delivered. Liquids are stored in either drums, totes, or in separate holding tanks before being introduced into a mixing tank," he says. "If the mixture needs to be emulsified, it will either be pumped through a high-pressure homogenizer (up to 500 psi [35 kg sq c], or transferred to a homogenizer tank that has a fixed rotor-stator. The completed emulsion, solution or slurry is then transferred to a holding tank with continuous mixing. From there, a feed pump meters the solution or emulsion into the spray-drying chamber, where the solids and liquids are separated."
In the mixing room, an operator empties ingredients into the batching tank according to the customer's recipe.

Circular vibratory screener removes oversize particles

Once the materials have been separated and dried in the spray dryer, they are conveyed to a rotary airlock. The particles pass through a rare earth magnet and are then fed into a Kason Vibroscreen® circular vibratory screener to remove agglomerates, flakes, lumps and any sheets or layers that may have formed on the side walls of the spray dryer.

The screening chamber is suspended on rugged springs that allow it to vibrate freely while minimizing power consumption and preventing transmission of vibration to the floor. One imbalanced-weight gyratory motor creates multi-plane inertial vibration to the screen deck, controlling the flow path of material on the screen surface and maximizing the rate at which material passes through the screen. The on-size material exits through a discharge spout located at the screen's periphery. Particles smaller than the screen apertures pass through and exit through a lower discharge spout that feeds the packaging machinery.

The screener's 30 in. (76.2 cm) diameter screens are interchangeable, and range from 20 mesh (864 µm, 0.034 in.) to 60 mesh (234 µm, 0.0092 in.).

"All the action happens in the vicinity of the atomizer, whether it is a centrifugal wheel or a nozzle," Kimmick continues. "Selecting the proper equipment and determining the optimum settings and adjustments are the keys to successful spray drying. For example, various sizes and configurations of the spray nozzle can be selected to control particle size and density. When choosing process temperatures, you need to strike a fine balance between overheating the spray particles and having them stick on the wall of the dryer."

"We're currently testing an application that would require use of a 200 mesh (74 µm, 0.0029 in.) screen, and Kason is helping us explore several techniques for prevention of screen blinding," he says.

"Oversize materials removed by the screener usually amount to a few pounds, accounting for a relatively insignificant percentage of the total batch weight. This is evidence of our skill and expertise in optimizing the spray-drying process," says Kimmick.

On-size material is packaged in a variety of containers ranging from 25 lb to 200 lb (11.3 kg to 90.7 kg) boxes, bags or fiberboard drums, or bulk bags weighing as much as 2000 lb (907 kg).

Processes meet sanitary standards

Because many of the materials processed by Summit Custom Spray Drying are food or pharmaceutical ingredients, the facility operates under Good Manufacturing Practices (GMPs), is registered with FDA and USDA, and is qualified to process to Kosher standards.

A campaign can be as short as one shift or as long as one week. Between campaigns, operators clean all the spray-drying equipment, including the screeners, with hot water, followed by a cleaning agent, and then a sanitizing agent. As a result, the screeners routinely pass Hazard Analysis & Critical Control Points (HACCP) inspection.

Kimmick anticipates adding more spray dryers and screeners as demand for its services grows. "We currently serve dozens of customers and anticipate a customer base of over a hundred," he says.
Repose piles show cranberry powder, copper solution for vitamins and chlorophyll powder—several of the powders produced by Summit Custom Spray Drying.