Test center

Testing makes for perfect results

A test center helps a customer determine the right drying system for removing a solvent from its product.

Companies that process powders, granules, and other dry bulk solids often use multiple process steps and a variety of equipment, such as size reduction mills, classifiers, mixers, dryers, conveying systems, and baggers. As many companies have experienced, changing one piece of equipment or even an equipment setting can lead to an off-spec product. That's one reason a company needs to conduct material, process, and equipment tests when planning to make a new product, change an existing process, or add a second or larger piece of equipment to increase capacity.

Testing will help ensure a properly designed production line with accurately specified equipment operating parameters to consistently produce a finished product at the required capacity and quality. Few companies are prepared to conduct meaningful tests on their own, so most turn to a test center or an equipment supplier they plan to work with. One company that provides material and equipment testing for handling and processing very fine powders and other dry bulk solids operates a test center in Summit, N.J.

Working with the test center

The company, Hosokawa Micron Powder Systems, a division of Hosokawa Micron Intl., operates an 85,000-square-foot test center that provides research and development, material and equipment testing, contract manufacturing and pilot-scale processing, and other services for the chemical, pharmaceutical, food, and other industries. The test center recently worked with a US specialty chemical manufacturer to select a vacuum-drying system for removing a solvent from a product. The product had to contain less than 0.5 percent of the solvent at the end of the drying process.

"When we first talked with the customer, we verified that we had suitable equipment for the application and that we could do what they wanted done," says Rob Voorhees, Hosokawa vice president and general manager. "We then sent the customer a package with general inquiry forms for them to complete and send back.

The 85,000-square-foot test center can conduct a wide range of material, equipment, and process tests for companies involved with fine powder processing and fine particle size reduction and classification.

The forms help us fine-tune the tests because they ask for all the basic information about the application, such as the feed particle size, if the material is an explosion or toxic hazard, the initial and final moisture content, and the expected production capacity and drying time.

"After we got the forms back, we called the customer to quote them a price for the testing and to schedule a test date. We also requested that they send us a purchase order with an MSDS for the materials being tested."

The customer traveled to the test center to witness the drying tests, which used the center's pilot-size Vrieco Nauta vacuum-drying system. Technicians coated carrier particles with a slurry consisting of a specialty chemical and solvent and gently mixed everything together in a mixer. They then discharged the batch from the mixer into the vacuum-drying system. The customer wanted to see if this drying system could remove the solvent faster than an alternate drying technology it was currently using and that was causing production bottlenecks because of its slow drying action.

Once dried, the carrier particles were taken to the test center's analytical laboratory and analyzed for moisture level, particle shape, particle size, and coating. The analysis showed that the solvent had been successfully reduced to less than 0.5 percent in much less time than the customer's dryer typically achieved and that the carrier particles were fully coated and experienced negligible attrition.

"After completing the tests, we put together an initial test report for the customer to take back with them showing the basic test data and results," says Voorhees. "A short time later, we sent them a formalized test report in hard copy and electronic formats detailing exactly what went on during the tests, including all of the data associated with each test run, such as temperatures, drying time, moisture level, drive amperages, and bulk densities. The report also included our equipment recommendation for a full-scale production vacuum-drying system to meet their production requirements."

Based on the test results, the test center proposed an adequately sized vacuum-drying system. However, before purchasing the production dryer, the customer wanted to carry out tests using the full-scale dryer to verify that it would work properly. Since the New Jersey test center doesn't have a full-scale dryer available, the center

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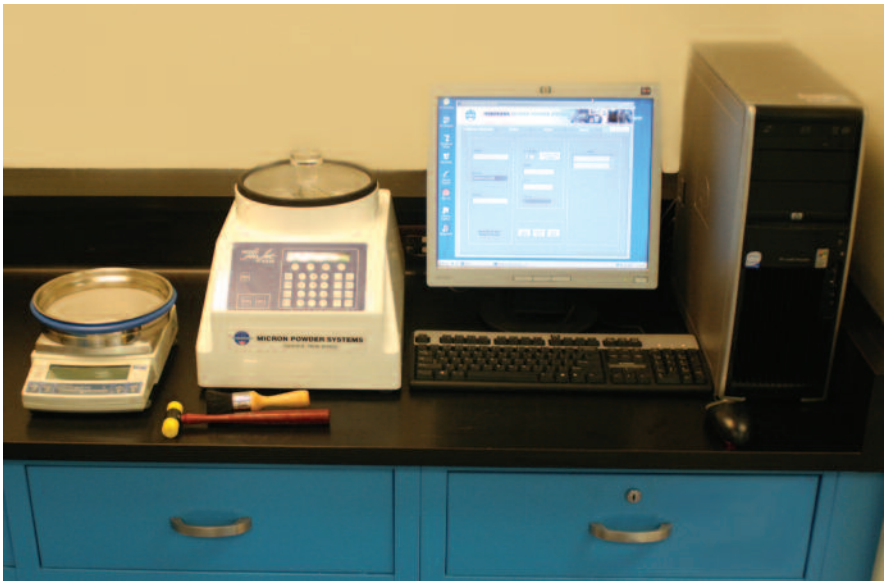

The test center's fully equipped analytical laboratory contains a variety of certified and calibrated equipment to ensure accurate and reliable test results.

made arrangements with another division of Hosokawa Micron Intl. to conduct the tests at its toll processing facility in the Netherlands.

"For the tests, we used the toll processing facility's vacuum-drying system, which, unfortunately, hadn't been scaled up for large amounts of solvent evaporation and had certain critical sub-systems that were undersized," says Voorhees. "For example, the condenser wasn't able to accept the high volume of solvent condensate that evaporated from the dryer. Also, the heat generated for the vacuum dryer was inadequate.

"Because of this, the dryer failed the first tests on multiple fronts, including drying time and particle attrition. So we redesigned and enhanced the subsystems and made some changes to the spraying-mixing-drying sequence, taking into account vapor flows and convective mixing principles."

The test center specializes in process and product development and standardizing and improving processes to achieve high-quality products efficiently and economically.

A couple of months after the first full-scale tests, the company ran a second round of full-scale tests using the modified drying system. The tests succeeded, and the customer decided to select the technology for its new project.

"We went the extra mile for our customer and conducted comprehensive full-scale tests to ensure that they got the best equipment and service possible," says Voorhees.

Touring the test center

Hosokawa Micron Powder Systems' New Jersey test center's material processing services include size reduction, cryogenic grinding, classification, mixing and blending, drying, filling and weighing, granulation, and many others. Available equipment includes many types of size reduction equipment and mills, dryers, conical screw mixers, downflow booths, filling and weighing systems, high-containment systems for pharmaceutical applications, as well as other equipment. The test center also features customer conference and work areas, a meeting room equipped with audiovisual equipment for conducting seminars, and a specialized staff of research and technical personnel.

The test center's primary focus is fine powder processing and very fine particle size reduction and classification. It specializes in process and product development and standardizing and improving processes to achieve high-quality products efficiently and economically. The test center also has experience in pharmaceutical process and validation engineering.

The test center has an analytical laboratory that provides custom particle analysis services on certified and calibrated equipment, including various particle analyzers for particles from 0.04 to 1,000 microns. The test center conducts many types of characterization tests, including bulk density, angle of repose, cohesion, moisture analysis, and others. When tests are completed, the laboratory provides a comprehensive data report tailored to the customer's needs.

Hosokawa Micron Intl., Osaka, Japan, maintains eight test centers around the world — two in the US, three in Europe, one in the UK, and two in Japan. Because the company manufactures such a wide range of process equipment, no one test center has all of it. Instead, each test center specializes in a few core areas and works closely with the other test centers for applications outside the core areas. Also, each test center has one or more analytical laboratories that are equipped to fully analyze the powders being tested. Cumulatively, the test centers total more than 500,000 square feet and have equipment valued in the tens of millions of dollars. **PBE**

Note: Find more information on this topic in articles listed under "Drying" and "Particle analysis" in *Powder and Bulk Engineering*'s comprehensive Article Index in this issue and at *PBE*'s Web site, www.powderbulk.com, and in books available through the Web site in the *PBE* Bookstore. You can also purchase copies of past *PBE* articles at www.powderbulk.com.

Hosokawa Micron Powder Systems, Summit, NJ

800-526-4491

www.hmicronpowder.com