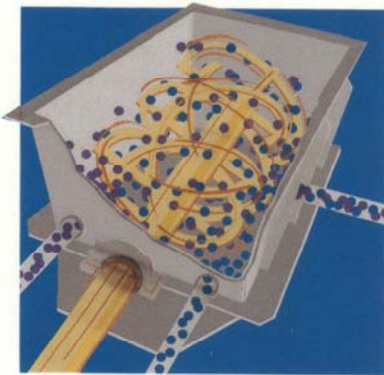


Powder and Bulk Engineering

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Test center

Expanding into new markets doesn't have to be a grind

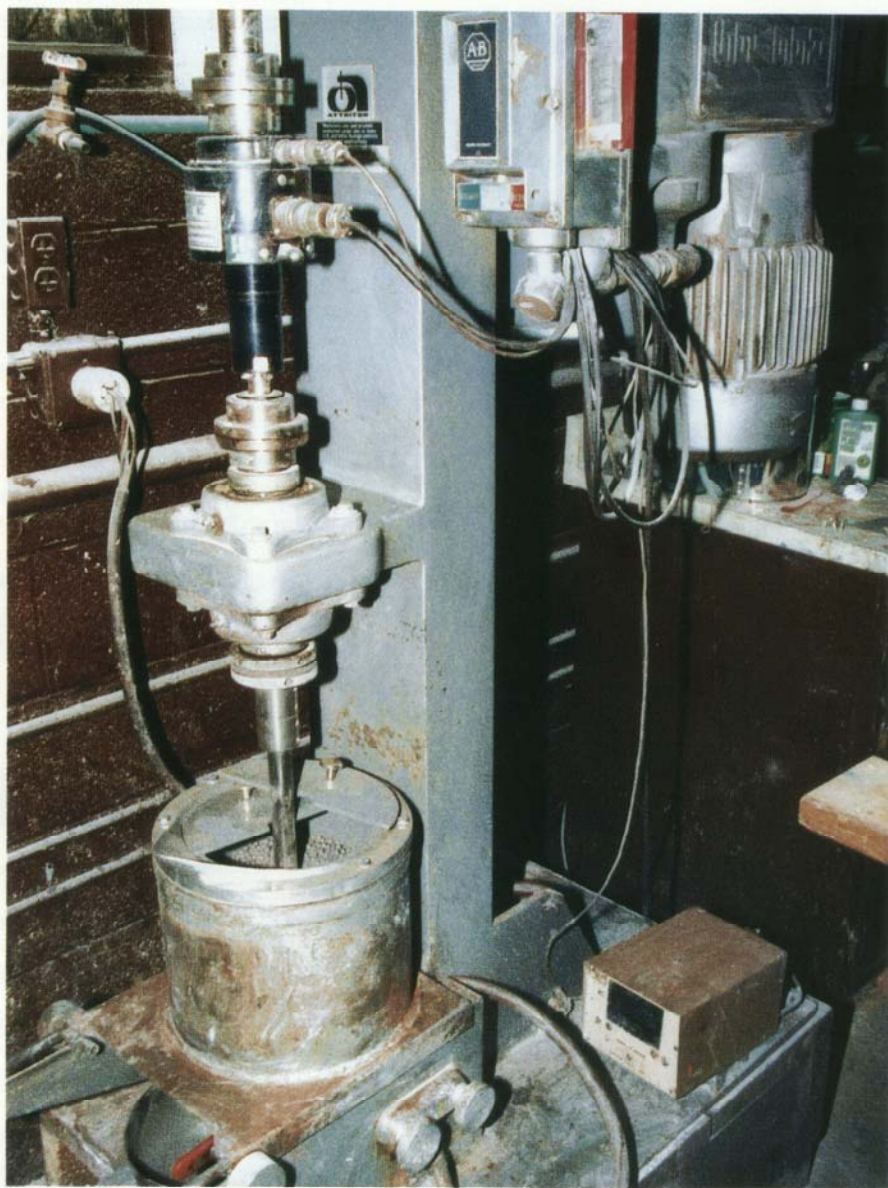
Union Process' test center and pilot plant help a chemical company reach a market niche in the glass and ceramics industries.

Union Process, Inc., of Akron, Ohio, manufactures attritors — fine-grinding and dispersing mills used in many industries, including chemicals, plastics, pharmaceuticals, cosmetics, ceramics, and candy manufacturing. Union Process also conducts grinding tests and does contract grinding at its test center and pilot plant.

In 1986, Margaret Yang, technical director at Union Process, got a call from J.R. Hwang, manager of research and devel-

opment for Hall Chemical Company, Wickliffe, Ohio. The company manufactures cobalt, nickel, manganese, and cadmium chemicals, and had spotted an opportunity to supply the glass and ceramics industries with a fine chemical powder for use as a pigment.

The market niche was there, Hwang told Yang, but the company faced two problems: First, its existing vibratory mill could not dry grind the chemical powder to a fine enough particle size. Second, Hall



Hall Chemical's initial grinding tests were done on this laboratory batch attritor. A torque meter (cylinder with attached wires mounted on attritor shaft) monitors energy consumption.

Chemical wanted to be sure that the market volume for the reduced chemical powder would justify purchasing new grinding equipment — a capital investment of \$50,000 or more.

Hwang wanted to know if an attritor could reduce the chemical powder from 8 microns to 1 micron. Yang suggested testing the chemical powder at the Union Process test center.

Hwang filled out a test information sheet provided by the test center — the sheet asked for information on the grinding media to be used, the initial and end size of the product, the expected production rate, and the current processing methods. The test center also requested a Material Safety Data Sheet, which Hwang provided along with additional information on the chemical powder's characteristics. From this information, the test center staff determined that the chemical powder could be safely ground.

Next, Hwang sent approximately 40 pounds of chemical powder to the test center. The test center staff then used a Fisher

subsieve sizer to determine the powder's initial particle size, which was greater than 8 microns.

Hwang travelled to Akron to witness the tests, which were performed on a laboratory batch attritor. An attritor mill uses a rotating vertical shaft with arms to agitate a mixture of material and grinding media. It works fast and produces very fine powders with narrow particle size distributions.

Based on their knowledge of the chemical powder, the test center staff chose 3/16-inch stainless steel balls as the grinding media. (Other grinding media include flintstones and ceramic or steel balls in a variety of sizes.) The first test was run at a machine speed of 350 rpm; a second test at 450 rpm produced the desired particle size of 1 micron.

Pleased with the successful lab tests, Hwang asked that scale-up tests be performed on a production attritor at a later date. Over the course of several scale-up tests, the test center staff changed the media volume from 25 to 30 gallons, raised

the machine speed from 110 to 150 rpm, and tried four different process rates — 1.5, 2.5, 4.5, and 6.5 lb/min. These changes were made to obtain the desired particle size distribution. Each time a change was made, Yang and her staff analyzed the results, then sent the reduced chemical powder to Hall Chemical's research and development lab. There, Hwang and his staff double-checked the size results and ran further tests on the reduced powder. In this way, both Union Process and Hall Chemical could be certain the reduced powder would meet the needs of Hall Chemical's customers.

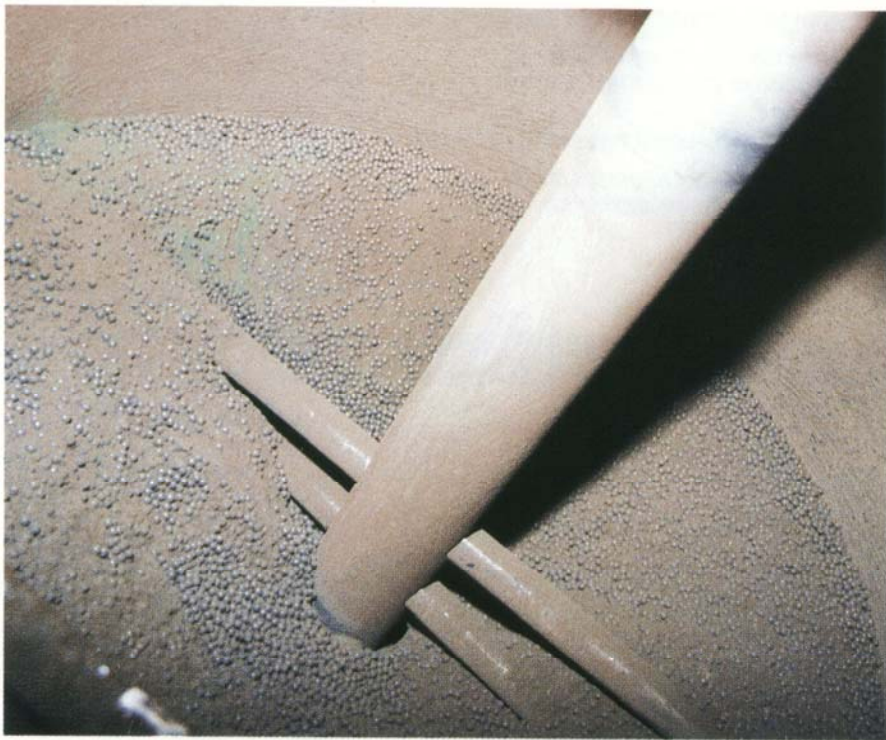
Hall Chemical uses pilot plant as interim production facility

The test center solved Hall Chemical's first problem by proving that an attritor could reduce the chemical powder to the required size. But Hall Chemical still wanted to test market the reduced powder before purchasing an attritor. Union Process' pilot plant program makes this possible by acting as a temporary production facility.

Hall Chemical ships 30-gallon steel drums of chemical powder to Union Process, where a production attritor grinds the powder to the required micron size at a rate of 270 lb/h. The attritor is equipped with a torque meter to monitor the process. It has a 52-gallon capacity, which includes 30 gallons of grinding media — in this case, the same 3/16-inch stainless steel balls used in the tests. The unit is also equipped with a screw feeder for continuous operation. Once grinding is complete, the reduced powder is packaged in plastic-lined, 100-pound fiber drums and returned to Hall Chemical for shipment to its customers.

Hall Chemical now ready to buy its own attritor

The pilot plant program has given Hall Chemical time to build sales volume and justify the purchase of its own grinding equipment. In 1987, Union Process produced 79,500 pounds of reduced powder for Hall Chemical. In the first half of 1988 the volume had already exceeded 100,000 pounds. "The market for the reduced powder is now big enough that we're preparing to buy a production attritor and do our own grinding in-house," says Hwang.



In both the tests and production runs, 3/16-inch stainless steel balls were used as the grinding media. The attritor's vertical shaft has arms to agitate the mixture of grinding media and chemical powder.



This production attritor was used to perform the scale-up tests and is currently reducing Hall Chemical's powder in the pilot plant program. The unit is equipped with a screw feeder for continuous operation.

Facts about Union Process' test center and pilot plant

The Union Process test center and pilot plant are located in Akron, Ohio. The test center occupies 5,500 square feet; the pilot plant takes up 2,000 square feet. The two facilities share a staff of 10 technicians. The test center conducts two or three tests per day; the pilot plant generally works on one or two long-term projects every day.

Unless circumstances require complex procedures, initial testing is done for free. More extensive testing is available on a cost-per-day basis. Union Process will keep all test information and results confidential.

A Material Safety Data Sheet is required for all materials tested. The test center will not work with radioactive, explosive, poisonous, or severely corrosive materials.

To analyze particle size and characteristics before and after tests, the lab staff uses high-power microscopes, grind gauges, a Microtrac® laser-beam particle analyzer, or test sieves. For some materials, the lab also analyzes physical and chemical properties, such as pH factors and temperature sensitivity.

In addition to the laboratory batch attritor, the test center is equipped with a smaller, heavy-duty batch attritor; a circulation attritor; and two continuous attritors. The test attritors can also be equipped with torque and rpm sensors to measure power consumption during tests.

After the initial tests are completed, the test center staff gives the customer a lab report that includes information on the machinery used to test and analyze the material, the particle size before and after testing, the grinding media used, and any other information pertinent to that particular test. Processing recommendations and estimated production rates are also included. At this stage, the customer may decide to use Union Process' pilot plant facility for scaleup tests or temporary production. Currently, six companies in addition to Hall Chemical are using the pilot plant for contract production.

The production attritor used in the Hall Chemical operation is just one of six at the pilot plant. The others are a batch attritor with a ceramic-lined tank for wet and dry grinding, a high-speed attritor, a batch attritor with a torque meter, a continuous attritor with a torque meter, and a circulation attritor for wet grinding. **PBE**

For more information on our full line of grinding and dispersing equipment, as well as laboratory testing and custom toll grinding services, contact the experts at Union Process.



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