

Test center

Passing a screen test

When a materials manufacturer wanted to engineer ultrafine rubber powders from whole tire rubber and other scrap rubbers, a test center proved that screening the product into fine size fractions was possible.

Entrepreneurs come up with hundreds of new ideas every year, but only a few of them ever make it to market. Most simply aren't practical. In the solids handling field, a test center can help a manufacturer find out if these new ideas will work.

Minox/Elcan screens dry bulk materials. The company markets Minox tumbling and vibratory screeners from its headquarters in New Rochelle, N.Y. To help demonstrate the products to customers, the company also operates a test center at the same location. Company president Bob Grotto said the company's test center houses the company's full line of tumbling and vibratory screeners. Grotto said the tumbling screeners have helped customers separate hard-to-screen particles into fine size fractions.

In many industries, manufacturers are requiring more bulk materials that are ground and screened to very fine levels, Grotto said. And as demands for more finely ground materials continue to grow, the demand for equipment capable of screening these very fine size fractions grows as well.

Some entrepreneurs have decided to meet the demand for these finely ground materials. But before they can set up shop, they need to determine whether it's even possible to screen the desired material to very fine levels. The Minox/Elcan test center has helped entrepreneurs break into the marketplace by testing a few of these new ideas.

Creating fine and ultrafine powders

Environmental Processing Systems (EPS) is in the business of manufacturing fine powders from recycled rubber. EPS formed Santee River Co. to develop a state-of-the-art manufacturing facility in South Carolina.

EPS (through its subsidiaries, Santee River Rubber Co. and Precision Polymer Resources) engineers fine rubber powders from waste tires and other scrap rubber. As an alternative to more expensive virgin and synthetic materials, these powders improve product performance while reducing product costs — significant advantages in today's new age of global commerce.

Larger particles of crumb rubber, above 40 mesh in size, are used in running tracks, playground mats, and asphalt. Applications for finely ground rubber powder include the manufacture of tires and automotive, industrial, and consumer products. In addition, such rubber powders are increasingly being used in paints, coatings, adhesives, and sealants.

Because of the fineness of its reengineered materials, EPS's PolyDyne family of powders has opened up many new applications in a variety of consumer, industrial, and construction products. EPS's proprietary system employs breakthrough technology to engineer powders to customers' specific requirements.

When Santee River faced the challenge of providing fine and ultrafine rubber powders to customers, they turned to Minox/Elcan for support. The Santee River engineers wanted to break the particle-size barrier to make their fine powders applicable to paints, coatings, and adhesives markets. In these applications, particle size is of paramount importance to compounders seeking performance characteristics such as flowability, dispersion, stability, and suspension.

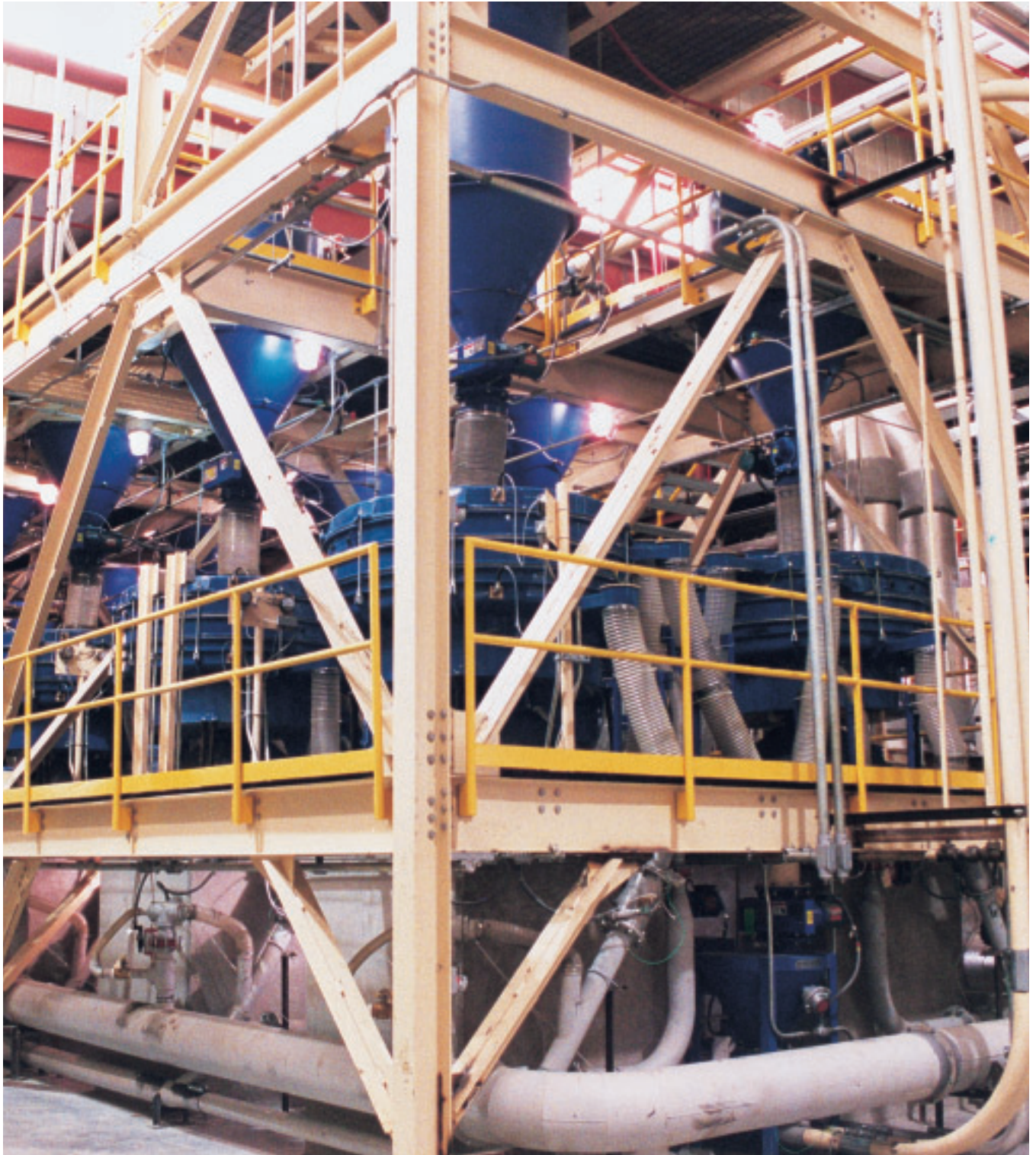
EPS approached Minox/Elcan with the initial goal of screening materials finer than 50 mesh. At that point they had researched many different manufacturers' screeners, but these entrepreneurs did not discover any that

could successfully meet their stringent screening requirements until they discovered Minox/Elcan. These two companies partnered to break the screening barrier and support Santee River's critical production needs.

"Shooting hoops"

For the first set of screening tests, Santee River supplied 150 pounds of ground rubber in 55-gallon drums. Before any screening tests were con-

ducted, Minox/Elcan test center operators did sieve analysis to determine the ground rubber's particle distribution. This told the operators what percentage of fine particles would be available to separate into fine size



Inside Environmental Processing Systems' Santee River plant, tumbling screeners separate extremely fine rubber powder.

fractions during screening tests. Grotto said that test center operators also examined the rubber particles under a microscope, looking at their shapes and other characteristics for clues about how the particles might respond in a screener.

For screening tests, the operators decided to run the rubber powder sample through a 24-inch Minox Tumbler Screener, which has 24-inch-diameter circular screens. Production-size screeners can accommodate up to five screen decks. For testing, this screener was fitted with two screens.

Unlike a vibratory model, which has a two-dimensional motion, the tumbling screener's motion is three-dimensional and transfers product across the screen without forcing it into the apertures. The tumbling screener's horizontal and vertical movement can be adjusted, allowing the product to move over the screen at any speed.

For testing, the screener was fitted with an air cleaning system, which blows air upward through the screen bottom to keep product flowing. In other applications the screener can be fitted with other devices to prevent screen buildup. These include roller brushes under the screen, a combination of roller brushes and air, and a bouncing ball system that uses abrasion-resistant spheres. The screener can also be equipped with a straining attachment that breaks large particles by pushing them through the screen.

Test center operators conducted screening tests using the 150 pounds of rubber powder on the 24-inch tumbling screener. The first sample was successfully screened into 40- and 80-mesh fractions. These results were encouraging.

"The customer's next objective," Grotto said, "was to determine if they were able to make another separation at 140 mesh."

The rubber recycler sent a 5,000-pound sample to Minox/Elcan for production-scale screening tests. Grotto said the 5,000-pound sample proved to be a challenge for test center operators right from the start.

"After being packed in drums, the pulverized rubber came out of the drums like bowling balls — big, huge lumps," Grotto said. "So first we had to break down the rubber to mimic the product that would be coming out of Santee River's process."

Once the lumps were broken apart, the rubber powder still tended to agglomerate. "The rubber particle has an affinity for itself," Grotto said. "It loves itself. It sticks together like little glue balls."

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This posed special problems for the operators as they tried to screen the rubber particles on a 48-inch tumbling screener. The operators used the air cleaning system to blow air up through the screen bottom and keep the particles flowing. "We had to attack the fact that this product wants to agglomerate on itself," Grotto said.

But there was a catch to putting the particles in motion to keep them from agglomerating: When the particles were in motion, they were difficult to screen.

"One of the keys was the liveliness of a rubber particle," Grotto said. "Trying to get it to pass through a screen hole is very similar to playing basketball. If you went outside and shot hoops in your backyard, you'd get maybe 40 to 50 percent of them in. Now try it over at the county fair, where they have the same size or slightly bigger ball with a much smaller rim. Most of the shots just



For initial qualification tests, Minox/Elcan's test center operators use two tumbling screeners (above left and right) capable of running one to five decks and any screen size.

bounce off the rim. It's a rare ball that goes through the hoop."

"Trying to get the pulverized rubber particles to go through the screen apertures was the same thing," Grotto said. "The stuff wasn't going through the holes. It was getting discharged as an over when in actuality it should have passed through the screen."

In addition, as the rubber particles were screened to finer levels below 140 mesh, they were more likely to lodge in the screen apertures.

To combat the lively motion of the particles, Grotto said, test center operators adjusted the three-dimensional movement of the screener "so that [the particles] wouldn't be bouncing all over like crazy and would pass through the screen."

The operators also applied suction through the fines outlet (the screener's bottom outlet) to pull rubber particles through the screen. The suction made a difference. "We would have run a lot less efficiently without it," Grotto said.

But the suction would not have worked without the aid of the air cleaning system. "If that suction is just one-directional, product will lock up on the screen. It'll plate over," Grotto said. "It's like taking a piece of paper and sticking it on your vacuum cleaner. You have to break that vac-



For scaling up and full processing runs, the test center uses the Minox MTS 1200 Tumbler Screener, shown in the lighted alcove above. The doorway to the left is the entrance to the lab, which features the MSL 200 airjet sieve and other equipment.

uum. One-directional airflow is impossible to work with.”

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During the tests, the air cleaning system served two functions: It freed the screen of lodged particles and unlocked the vacuum created by the applied suction, keeping the rubber from “plating over” the screens, Grotto said.

By making these adjustments, test center operators were able to separate a 140-mesh fraction from the 5,000-pound sample of pulverized rubber.

Positive test results and an even larger challenge

Over the 2-week course of screening tests, Santee River learned that their rubber could be screened to the finest levels. They asked Minox/Elcan to screen 30,000 pounds of crumb rubber for toll screening. For this large

amount of material, test center operators used the 74-inch Minox Tumbler Screener.

When it came time to conduct the large production-scale screening runs, Grotto said, the combined efforts of the customer and the test center operators had already figured out the rubber. The same handling characteristics that were evident during tests with the 48-inch tumbling screeners were seen on the 74-inch machines.

“The principles of the machines and the mechanics are the same for the 24-inch, 48-inch, and 74-inch screeners,” Grotto said. “The same airflows apply. The only thing that you’ve got to worry about is there’s more material and air.”

“And further, instead of just screening it to 140 mesh,” Grotto said, “we were able to screen it to a 200-mesh — 74-micron — product by applying all of our experience and knowledge.”

This time the screening process went much faster. Test center operators were able to process the entire 30,000-pound quantity within a week. As a result of the three successful test runs, Santee River ordered several Minox Tumbler Screeners.

Facts about the test center

Depending on the test complexity, Minox/Elcan typically can perform two tests a week at its 3,500-square-foot test center at the company’s New Rochelle, N.Y., headquarters. The test center conducts tests on its screening equipment, including the 24-inch, 48-inch, 60-inch, and 74-inch tumbling screeners, as well as 36-inch and 48-inch Minox vibratory screeners. The test center also has drying ovens, various equipment for sieve testing, and microscopes for particle analysis.

A full-time staff of three conducts roughly 100 tests each year in the test center. Grotto said the company’s largest groups of customers are from the pharmaceutical and chemical

industries and likely have tried other screening equipment before coming to the test center.

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“We do our work when everybody else can’t — when other equipment fails,” Grotto said. “Our equipment is new. It’s different. And when other screeners just aren’t able to do the job, that’s when customers come to us.”

In a typical test, a customer sends a product sample to the test center, along with screening expectations. Test center operators also ask the customer to complete a questionnaire, which asks the customer about the equipment currently being used and problems encountered.

“That will be half the game right there,” Grotto said. “If we know what they’re doing and why they’re failing, we usually know how to fix it.”

The test center’s staff conducts preliminary sieve tests to get an idea about the particle distribution of the product that is to be screened. Preliminary testing also gives test center operators clues about what equipment to use and what test procedures to follow. Grotto said that a minimum of 100 pounds of material should be supplied to the test center for screening tests.

“But to be certain of meeting production goals, if the customer wants to screen 5,000 pounds an hour, we’ve got to run an hour,” Grotto said. “So if the customer really needs to see that quantity, then we need 5,000 pounds. It’s not that you can’t mix a sample back together and send it through the

screeners again, but you can't expect it to be the same [as a raw sample]. Once a product is screened, it changes."

Customers are encouraged to witness the testing procedures, Grotto said, after test center operators "have had a day or so to play with it and have done all of the head-scratching to figure out what to do with it." Once the tests are completed, the screened product is packaged in drums or bulk bags and returned to the customers. The customers are also given a report of the work that was completed and the data collected during the test runs. If customers are unable to witness the tests, videotapes of the work being conducted are available on request.

The test center has proven to be a real boon to Minox/Elcan, Grotto said, because it allows customers to witness the company's screeners in action. Of all the tests completed in the lab, he said, nearly 30 percent lead to sales of new equipment. "We've made a sale more than 70 percent of the time when a customer has come back in for a second run on larger production-scale machines. A 24-inch screener test with 150 pounds of product is one thing, but when customers see that we have the larger machine, they want to see the test on a production scale."

PBE

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