Case history

Rotary cutter successfully reduces trim scrap

A producer of calendered film buys screen-classifying rotary cutters to reduce trim scrap to regrind more efficiently.

A northeastern US company that specializes in producing specialty calendered film operates plants throughout the country. One of the company's plants operates multiple production lines to produce the calendered film. This plant was using two different size reduction machines on each production line to reduce film trim scrap to 3/16-inch regrind for remelting and reusing in the production process. The plant manager was convinced that there was a more efficient way to do the necessary size reduction.

Making the calendered film

To make the calendered film, the company plasticizes the feed material, then runs it through a calender, which is a series of hardened-steel, heated rollers. As the material zigzags its way through the rollers, the rollers flatten the material to the proper thickness. The film sheet discharges from the calender and moves through a pair of trimmers that cut it to the appropriate width. (For example, if the calender produces a 4-foot-wide film sheet and the customer wants a 3½-foot-wide

The screen-classifying rotary cutter is installed inside a sound enclosure to minimize operating noise levels.

film sheet, the company sets the trimmers to cut off 3 inches from each side of the film sheet.) After passing through the trimmers, the properly sized film sheet is rolled onto a large spool and shipped to the customer. During a production run, the company continuously runs a production line for days, sometimes producing a miles-long film sheet and trim scrap.

In the past, the company fed a production line's continuous trim scrap pieces into a mechanical cutter located near the trimmers and reduced it to 1-inch squares, which were blown into a nearby bin. A forklift moved the full bin to the plant's grinding facility, where the square trim pieces were fed into another size reduction machine and reduced to 5/16-inch regrind. The regrind was collected in another bin, and a forklift moved the full bin from the grinding facility to the production lines' feed system. An operator discharged the regrind from the bin into the feed system, and the regrind was melted and reused in the production of film.

Extra step causes problems

Using two different size reduction machines to reduce the trim scrap created some problems for the company. "It was very inefficient," says the plant manager. "It took extra time and extra labor and increased our energy

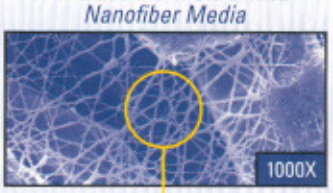
Two pieces of trim scrap are continuously conveyed into the rotary cutter at the same time, where they're reduced to 5/16-inch regrind.

Exhibit A:

ULTRA-WEB®

- Genuine nanofiber filter media
- Nanofiber captures submicron (0.3 micron) dust particles
- Nanofiber traps dust on the surface of media
- Solves premature filter plugging
- Dust is easier to pulse off
- Higher efficiency and longer filter life

Donaldson Torit Ultra-Web Nanofiber Media



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Operating at 2,600 rpm, the rotor's 40 tungsten-carbide-tipped cutter heads easily reduce the trim scrap to regrind.

costs because we had to run two machines per production line. Also, there was the possibility of getting contaminants mixed in with the material during the process of moving it from a production line to the grinding facility and from the grinding facility to the feed system."

The plant manager conducted an operation assessment and compiled a report showing company management where and why the production lines were inefficient. He wanted to find a more efficient way to make the regrind. He envisioned using only one size reduction machine in each production line, installing it near where the trim scrap discharges from the trimmers.

Company-wide search yields solution

After gaining approval for the project, the plant manager called the company's other plants to find out how they had solved similar production line problems. He learned that the other plants had installed screen-classifying rotary cutters manufactured by Munson Machinery Co., Utica, N.Y., a supplier of size reduction, dry-blending, and metal-finishing equipment. "I was told that the supplier's cutters work great in the other plants' production lines, which are similar to ours," says the plant manager, "and that the cutters are relatively easy to maintain and last a long time."

Toward the end of 2002, the plant manager called the supplier and talked with Steve Knauth, the supplier's national sales manager, and set up a time to conduct material tests at the supplier's test facility. He also sent one gaylord box full of trim scrap to the test facility. Based on the company's line speeds, initial trim scrap dimensions, and required finished particle size, the supplier decided to use a model SCC 10 rotary cutter with a pneumatic conveying system connected to the cutter's discharge.

"For the tests, the supplier entered the trim scrap into the rotary cutter by hand and pneumatically conveyed away the properly sized pieces," says the plant manager. "The test results showed that the cutter would meet our size reduction needs for reducing the trim scrap to the specified regrind particle size, so we decided to purchase one cutter for each production line."

The screen-classifying rotary cutter

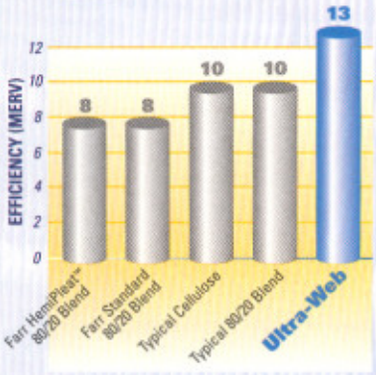
The model SCC 10 rotary cutter can reduce trim scrap, fiberglass, plastics, chemicals, pharmaceuticals, powdered metals, pigments, paper, wood, wax, herbs and spices, and other materials. Its 15-inch-long, 15-inch-wide, 18-inch-tall carbon-steel housing houses a 10-inch-long, 10½-inch-diameter rotor. Multiple rows of parallelogram-shaped cutter-head holders are mounted on the rotor in a helical pattern. Each of the rotor's 20 cutter-head holders holds two diametrically opposed, chisel-shaped, ½-inch tungsten-carbide-tipped cutter heads. Two hardened tool steel bed knives are mounted halfway up on the housing's interior near the rotor's midpoint. The easily resharpened and replaceable bed knives provide a sharp surface for the cutter heads to cut material against and help create the cutter's half-cut, half-impact action. An integral sizing screen located in the cutter's bottom allows only

Exhibit B:

ULTRA-WEB®

Higher Efficiency = Cleaner Air

- Higher MERV rating means higher efficiency
- Independent tests rate Ultra-Web® at MERV 13
- Cellulose & 80/20 blend media have lower MERV ratings
- Ultra-Web is the only MERV 13 rated filter to come standard in a cartridge collector
- Higher efficiency cleans the air better



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properly sized particles to discharge from the cutter.

The cutter's V-belt drive system consists of a 7.5-horsepower single-speed electric drive motor, a drive belt, and a bearing-mounted drive shaft. The drive shaft is connected to the rotor and extends from the housing's side wall, and the drive belt attaches the drive shaft to the drive motor. The drive motor rotates the rotor at 2,600 rpm. As the rotor rotates, the rows of cutter heads disperse the material inside the cutter over the entire screen area for efficient material size reduction and discharge.

The custom-designed cutter is mounted on a flat plate to maintain a low profile and minimize floor space requirements. The cutter has two 3-inch-diameter entry ports built into the housing's face, allowing the trim to be fed in through the cutter's front rather than through its top. The ports are positioned so that the trim enters the cutter at its pinch point (the point where the cutter heads meet the bed knives). The company simultaneously feeds trim scrap from both trimmers through the entry ports. The cutter's bottom cones down to a 3-inch-diameter discharge port. Below the discharge port, a cyclone unit draws air through the cutter and pulls the properly sized pieces through the screen and discharge port and into a bin.

One less step eliminates many problems

The company installed each cutter next to a production line's trimmers, so that the trim scrap moves directly into a cutter after it's cut. (To eliminate the need for the operators to wear heavy-duty ear protection, the company installed each cutter inside a sound enclosure.) The trim scrap moves through a cutter's entry ports and is continuously reduced by the cutter heads and bed knives. The properly sized pieces discharge from the cutter into a bin. An operator monitors the bins and, when one becomes full, briefly shuts off the appropriate cutter and uses a forklift to move the full bin. The operator then places an empty bin beneath the cutter, restarts the cutter, and hand-feeds the trim scrap that has accumulated on the floor during the shutdown into the cutter's entry ports along with the trim scrap being generated by the trimmers. After hand-feeding the trim scrap into the cutter, the operator forklifts the full bin to the production lines' feed system and discharges the regrind into the feed system for reuse.

Since installing the new cutters, the company has reduced its labor costs. "We no longer have to pay an operator to grind the trim squares in the grinding facility, which took eight hours a day," says the plant manager. "We've also reduced our maintenance costs because there's only one cutter per production line to worry about instead of two size reduction machines per production line. Additionally, we've decreased the amount of rejected material caused by contaminants because we're not handling and moving the material as often. It goes directly from a production line to the feed system, rather than from a production line to the regrind facility to the feed system. This has also helped lower our material-handling costs."

He adds that the cutters have decreased the company's production costs, "because the increased product quality control they provide allows us to reuse more material." Because the cutters perform so well and are so easy for the operators to use, the company is considering buying one of the supplier's larger rotary cutters to size-reduce some of the incoming raw materials to ⅞ of an inch for feeding into the feed system. **PBE**

Note: To find other articles on this topic, look under "Size reduction" in *Powder and Bulk Engineering*'s Article Index at www.powderbulk.com or in the December 2004 issue.

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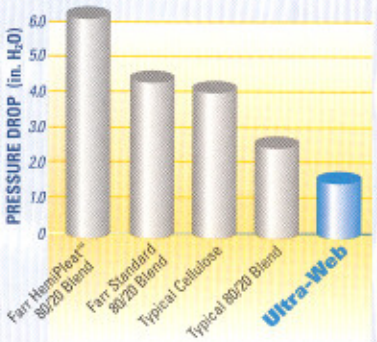
Exhibit C:

ULTRA-WEB®

Lower Pressure Drop = Longer Filter Life

- Lab tests show Ultra-Web® has lowest operating pressure drop
- Cellulose and 80/20 blend media have higher operating pressure drop
- Lower pressure drop leads to longer filter life
- Longer lasting filters save time and money



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