

RENEWABLE Energy

FROM WASTE

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Collaborative **DIVERSION**

Midwest Fiber Recycling and Data Management Services have combined forces to provide commercial customers with a range of landfill alternatives for discarded materials.



BY BRIAN TAYLOR

CUT TO FIT

Cost-effective size reduction is a necessary first step in the preparation of solid wastes and residuals used as energy feedstock.

Converting discarded and residual products into an energy feedstock can involve a considerable amount of processing and preparation. For investors in most such waste-to-energy or waste-to-fuel projects, this entails necessary capital investments in size-reduction and size-classification equipment that will need to be deployed before the first gallon of fuel or kilowatt-hour of electricity is produced.

Project planners have much to consider when buying size reduction and accompanying screening equipment and, fortunately, a full stable of established equipment makers with varying technologies from which to choose.

Those shopping for equipment that will comprise a waste and residual feedstock preparation system have sev-

eral priorities in mind, including the reliability, energy-efficiency and cost-effectiveness of the shredders, grinders and screens they purchase.

THE RIGHT FIT

The Process Development Center (PDC) at the University of Maine conducts research on a contract basis on a test or pilot scale, historically serving the pulp and paper industry.

In recent years the PDC, located in Orono, Maine, has expanded its scope into bioplastics, solid and liquid biofuels, nanomaterials and other technologies, all while it continues to operate a virtual miniature paper mill.

The considerable scope of the research conducted by the PDC's 12 employees has led to its need to house a broad range of processing machinery,

including size reduction equipment.

"Most of our work is by word-of-mouth from paper and chemical companies who have a problem and need to address their process," says Mark Paradis, the PDC's group leader of engineering. "Our equipment is flexible and can be adapted in order to provide these companies with a proof of concept." Lately, many of these concepts tie into alternative energy and the use of discarded materials including wood, carpet and plastics.

In order for the PDC to be equipped to work with a range of raw materials that can include wood, bark, agricultural residuals and herbaceous crops, the lab requires efficient size reduction capabilities to downsize materials into uniform particles.

At the outset, the lab used a hammer

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mill, but PDC staff eventually deemed it inefficient at producing consistently sized particles because of its crushing and pulverizing action. Working with equipment dealer Armac Inc., Lynnfield, Mass., the PDC replaced its hammer mill with a screen classifying cutter model SCC-10 made by Munson Machinery, Utica, N.Y.

“We specified that unit because it efficiently reduces materials into uniform particle size with a lower energy requirement than the hammer mill,” says Paradis. The small unit has a feed throat opening of just 10 inches by 11 inches and a footprint suited for laboratory or pilot applications. (Munson also makes larger size reduction equipment.)

The SCC cutter is configured with cutter tips along the entire shaft, with no gaps between tips, making total contact with the feedstock product. This differs from the configurations of some other units that contain a small number of angled rotor blades that slice materials into strips in scissor-like fashion.

As a result of the plentiful cutter tips, the material is cut into uniform particles with minimal fines or imperfections, and with little to no heat generation, according to Paradis.

Munson Machinery says the rotor design can generate six times greater force per inch with each cut than conventional knife-type cutters of equivalent horsepower, contributing not only to uniform size reduction but also to reduced energy use.

The PDC in Maine leased the screen classifying cutter for two years before purchasing it. It says the unit has proven effective at cutting hard, soft and fibrous materials.

One recent application has involved processing excess hay and grass bales being pelletized to make compressed biofuel pellets. For the project, funded by the Maine Technology Asset Fund, the cutter reduces the baled material to one-eighth-inch (3.2 mm) particles. The bales are typically broken into quarters so they can be fed into the 10-inch by 11-inch SCC throat opening.

SCALING UP

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Shredding technologies from Munson Machinery (top) and Vecoplan (bottom) help fuel producers achieve desired results.

larger investments in bigger size reduction machines must be made to outfit a project that will process a steady stream of waste or residual materials.

The purchasing and operations decisions of project and plant managers can make or break an energy-from-waste project. One plant manager, who wished to remain anonymous, said size reduction and screening equipment details are "touching on a lot of the issues that are critical to our production processes. I consider these to be the trade secrets that we have paid a considerable price to learn." He adds, "The costs to learn the answers to these questions are several of the key barriers to entry into this market."

Thus, for project planners, vendors with first-hand project experience become a vital source of information. One vendor with experience

equipping large-scale projects is Germany's Vecoplan AG, whose U.S. subsidiary, Vecoplan LLC, is based in High Point, N.C.

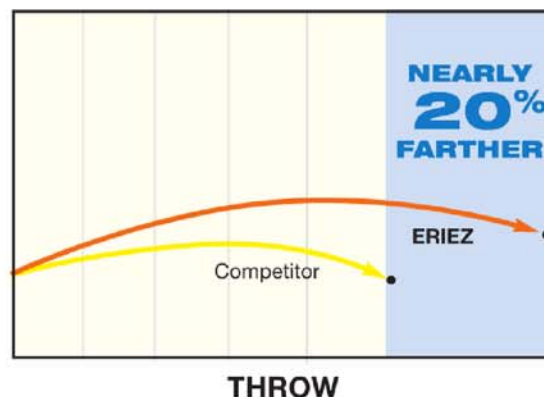
The company has recently produced an overview of its findings, based on its completed projects, of what works best in terms of size reduction steps required to produce optimal refuse-derived fuel (RDF).

Many of its installations start with what the company calls a pre-shredding stage equipped with either a single-shaft or dual-shaft shredder. These units may have rotors up to 10 feet in length and can have a torque range of up to 55,000 newton meters.

Buyers of dual-shaft shredders should look for durable, "extreme-duty," models, says Vecoplan. Regarding production, some dual-shaft units can deliver throughputs of up to 100 metric tons per hour.

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A single-shaft preshredder can be suitable in certain applications, including some that require less throughput. These units may rely on a hydraulic ram that can consistently feed material into the chamber to help it operate at maximum throughput capacity. Some Vecoplan models also contain a “floating” counter knife feature designed so the machine’s critical components can better absorb impacts.

Flooring and carpet maker Shaw Industries Group, Dalton, Ga., has installed a system at one of its north Georgia manufacturing sites to convert production scrap and discarded carpet into energy to help power the plant. The company shreds and processes material at this Reclaim to Energy (Re2E) site as well as at off-site carpet collection locations.

“In our various carpet shredding operations we utilize both single-

and dual-shaft shredders, depending on the throughput and size reduction desired,” says Shaw Industries Director of Operations Support Jay Henry.

Many RDF applications then include a second shredding or “re-shredding” stage, according to Vecoplan’s findings. As with the preshredders, these units may be either single-shaft or dual-shaft models.

Henry says “Each processing line at Re2E utilizes two stages of shredding—a coarse grind and then a finer grind to achieve the optimal size reduction needed for final processing into the engineered carpet fuel.”

For RDF production, a single-shaft model equipped with a hydraulic ram, a floating counter knife and a high-torque, variable frequency drive has been used in several Vecoplan installations.

Henry says Shaw Industries, a

Vecoplan customer, “selected shredding technologies that would achieve the optimal particle size at an acceptable throughput rate. Ultimately, we selected technologies that would give us both. However, we started with pursuing the optimal particle size.”

Among the desirable qualities shredding equipment buyers should seek are “maximum throughput capacity, an energy-saving shredding process and easily accessible maintenance,” according to Vecoplan. ^e

The author is editor of *Renewable Energy from Waste* and can be contacted at btaylor@gie.net.



Fueling decisions

To learn more about what goes in to Shaw Industries’ shredding equipment decisions, visit www.REWmag.com/rew0414/shaw-shred.aspx.



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