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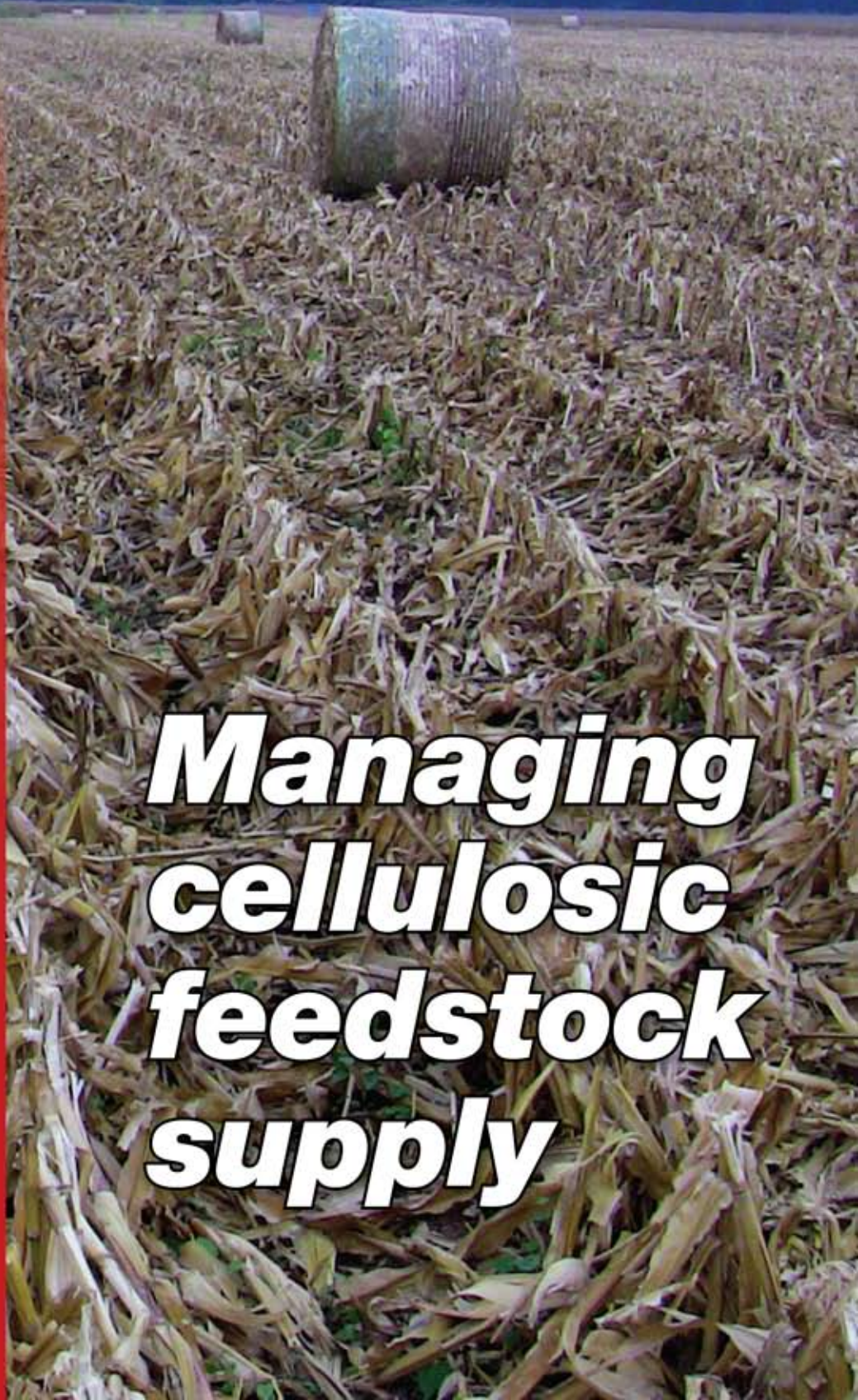


Adapting processing system applications

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Processing systems' potential grows



By Elizabeth Polsdofer

The United States has surpassed all other countries in terms of production and consumption of corn ethanol, and the numbers are expected to continue to rise. According to the U.S. Energy Information Administration, the U.S. consumed 134 billion gallons of fuel in 2011; and as demand grows, some studies predict the U.S. will produce at least 36 billion gallons of renewable fuels in 2022.

With the push toward an era dominated by renewable energy sources also comes the challenge in accommodating an emerging market. In growing a market that must become economically competitive with traditional energy sources, having efficient processing systems is vital for leaders in the renewable energy industry.

Most biomass processing systems are used to convert the material into energy, but plants designed to create biofuels

The Renewable Fuel Standard focuses on creating biofuels that can be used in everything from cars and mopeds to airplanes and cruise liners.

from biomass are appearing slowly but surely across the U.S. and companies are quick to let clients know their technology is capable of producing biofuels.

What are processing systems?

Processing systems are machines that transform

materials by altering the physical or chemical characteristics. With modern technology, scientists have to wait only weeks or months for energy sources to grow. A disadvantage of biofuels and other sources of renewable energy is that the materials need to undergo several steps before a viable final product is ready for consumption.

In terms of biofuels, two types of processing systems are required: shredders and fluidized bed reactors. Each type of processing system is required to effectively create electricity or biofuels to a standard that is acceptable for consumer use.

Shredders are machines that reduce the materials to be processed into biofuels into a size the fluidized bed reactors

Page top: Figure 1. Weima Secondary Shredding Technology offered by eFactor3.



Figure 2. Metso Pre-shredding Equipment offered by eFactor3.

can process to efficiently produce renewable energy. The push toward recycling and conservation of the natural habitat has led to an increase in the shredder's popularity. Biomass material is typically shredded to pieces that are 4" or smaller.

Besides reducing the size of the material, shredders also can be used to separate the material into different components. A key cost of creating renewable fuels is ensuring the right products are in the material before it is processed into energy, and likewise removing the materials that will lower the quality of the final product.

"If a company wants to be in the alternative fuel business they will need shredding no matter what the downstream looks like," said Hartmut Bendfeldt, founder

and president of eFactor3. "The pre-shredding process will allow mechanical separation of contaminants that can't be removed without shredding. The secondary shredding, which is typically the last step of the upstream equipment, will determine the product consistency."

Fluidized bed reactors can burn the material directly, with the combustion steam creating energy. Through a few different chemical and biological processes, biomass can be transformed into biofuels. The latter is the focus of many research groups who are interested in making renewable energy as economically viable as fossil fuels.

"What we would do is feed the biomass into our fluidized bed chamber and then burn it or gasify it," said Kent Pope, director of Business Development at Outotec Energy Products. "Typically you would generate steam in that process and run the steam through a turbine to make electricity."

Pope said that commonly fluidized bed reactors were used to create electricity. The current problem is that this process of creating biofuels is not economically viable, but the technology is still being used to create energy via electricity.

Advanced biofuel researchers are aware of the economic woes of creating biofuels from biomass and are working to reduce the commercial cost of renewable fuel production. Scientists already have the technology and scientific understanding of how to create cellulosic biofuels, but are struggling with how to increase their research to a scale the general public could benefit from greatly.

"An alternative use of that is you could gasify it and run that gas through a catalyst and then make biofuels such as ethanol or biodiesel. Not many people are doing that ... it's

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an experimental type process, not as commercially viable," Pope said. "We do the gasification systems for that, we don't do the catalysts and the conversions to biofuels. Our primary focus is to convert biomass products into energy, electricity usually."

The Renewable Fuel Standard focuses on creating biofuels that can be used in everything from cars and mopeds to airplanes and cruise liners. Named because they are vital for vehicles that transport people from Point A to Point B, these fuels are named transportation fuels. Although the economics are not quite there in making commercial production of transportation fuels from biomass viable, plants and research projects across the country are popping up to address this area.

Finding the perfect fit for processing systems

Dedicated companies maintain shredders and fluidized bed reactors, in addition to the required yearly plan inspection members of the industry must undergo.

"We've been doing this for about 40 years and they're extremely reliable. The only challenges are typical power plant challenges," Pope said about the maintenance required of Outotec's technologies. "There's nothing that biomass brings on that we haven't been handling for 40 years."

Optimally the biomass itself would be harvested from a nearby agricultural field to offset the cost of transporting biomass to the plant. To make renewable fuel as economically viable as possible, location is an important consideration.

The cost of transporting materials between the biomass processing stage and final product can be offset by housing shredders and fluidized bed reactors within the same plant.

"No alternative fuel can be produced without shredding," Bendfeldt said. "Shredders are costly pieces of equipment for the processing of alternative fuel, but they are required to produce a homogenous product that can be used as a fuel."

Investors in processing systems are able to have their shredders custom made to meet their needs. Although shredders and fluidized bed reactors are generally able to handle a large diversity of materials, eFactor3 also offers consultation to clients.

"The first step for our approach is a thorough interview with the customer that will provide us information about the input material composition, the contaminants and the requirements on the finished product, as well as the hourly/daily/yearly capacities," Bendfeldt said. "Depending on the complexity of the system, we might charge a consulting fee that allows us to do a detailed analysis of the project."

Diversity of sources

Researchers are developing processing systems and technologies to provide more versatile and robust equipment. Both shredders and fluidized bed reactors are created with the ability to handle most materials.

Bendfeldt said a strength of eFactor3 is its ability to move materials that would be decomposing in landfills and putting them to greater use by shredding them. The core mission



of eFactor3 is the design of systems for the renewable energy industry, keeping in mind the three E's: environmental, engineering and equipment.

"We are offering technology that can be used

Figure 3. Complete Turnkey Processing System offered by eFactor3.

to divert waste streams from landfilling. Most waste streams that are not recyclable in the traditional way can be thermally recycled in a form of a fuel," Bendfeldt said. "With today's technology it is possible to convert waste streams to energy instead of burying them in the ground."

Whether the material is organic or man-made, Bendfeldt expressed confidence in eFactor3's technology to meet the needs of clients who wish to have a role in recycling materials. In order to ensure customer satisfaction, eFactor3 works extensively to ensure communication with its clients.

"The portfolio of size reduction equipment that we represent allows us to offer a shredding solution for any material that can be recycled," Bendfeldt said. "The input of the customer will give us the knowledge to design a system; all of our vendors have been supplying equipment for alternative fuel from waste for many years."

Once the materials have been processed through a shredder, creating electricity or a renewable energy fuel

is possible as long as the material is appropriate for the processing system. Pope said Outotec Energy Products creates its fluidized bed chambers to ensure the system is able to process a diversity of sources.

"It's pretty much a fit for all. Definitely wood waste or any kind of woody byproduct, just a standard that everyone thinks about when they think about biomass. We handle agricultural waste, tree trimmings, cotton stalks, straws, cow manure," Pope said. "Just about anything you can think of that is organic, we can convert that to electricity."

Pope said the fluidized bed reactors also have strong fuel flexibility.


"We can handle multiple fuels in one system and we've handled over 250 different biomass materials," he said. "We're bankable, we've done 110 of these systems and we have a good name in the industry."

Looking forward

While electricity continues to be the end product of many fluidized bed chamber reactions, the technology available in processing systems is there to produce biofuels from biomass. Shredders create the appropriate size of biomass to be processed while filtering the biomass sample for quality management.

The requirements set by the Renewable Fuel Standard leaves an ambitious road for the renewable energy industry to walk by 2022, but companies who create processing systems appear ready to meet the demand. Policy makers in Washington have acknowledged an economy that rests on non-renewable fuels for the future is not an option, even if present renewable fuel sources are commercially and economically unviable.

Companies interested in the business of creating biofuels from biomass have a variety of well-established experts in developing process systems to meet their specialized needs. Regardless of the progress of research in laboratories, the technology is available to those interested in investing in biomass and as a source of renewable fuel.

"It's a very good use of biomass," Pope said. 

Elizabeth Polsdofer is a senior at Iowa State University, studying physics with a minor in journalism. She is currently the managing editor of digital platforms for the Iowa State Daily and has served as a communications intern for the Iowa NSF EPSCoR program. You may contact her by e-mailing bpteditorial@woodwardbizmedia.com.

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