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Agricultural Versus Industrial Waste for Energy

Feedstock availability, consistency and the hype surrounding alternative fuels are all challenges to the development of waste-to-energy projects.

by Jessica Ebert

Any conversation about the challenges of converting waste into energy regardless of the source of the feedstock whether agricultural or industrial, and regardless of the end products—solid or liquid fuel or electricity—comes down to an issue of feedstock availability. “I don’t care what technology you have. If you don’t have the feedstocks you don’t have anything,” says Steve Flick, a Missouri farmer and chairman of the Show Me Energy Cooperative board of directors. “We say it’s like having the prettiest girl ask you to the dance. If you can’t dance then you might as well not embarrass yourself.” The cooperative, which is made up of more than 400 farmers, is just now stepping out on the renewable energy dance floor with a flexible business model betting it will garner admiration rather than embarrassment.

Show Me Energy has its origins in west-central Missouri where a group of farmers and producers with a vision of using cellulose for energy production began meeting monthly until 2004 when they officially organized under the state’s New Generation Cooperative law. At that time, the group sanctioned a feasibility study, which in turn determined that the model the group envisioned would be a good fit for producers in western Missouri and eastern Kansas. “Missouri was a prime state because we have all these dichotomies of scale,” says Flick, a seed-company owner and farmer who will be planting six acres of miscanthus this spring. “We have corn farmers in the north, grass-seed farmers in the south, wheat farmers in the west and soybean farmers in the central part of the state. It’s a really good fit.”

At the center of the cooperative’s model is technology developed in-house that converts agricultural residues into biomass fuel pellets. The farmers who invest in the cooperative sign a market agreement committing them to produce a certain amount of biomass each year. In addition, co-op members must adhere to high standards of environmental stewardship, Flick says. For corn stover, producers must leave about 30 percent of the residue on their fields. For native grasses, farmers must harvest in the late fall after a killing frost and leave rows around waterways and tributaries. “We are adamant about making this business model not only profitable but realistically environmentally friendly,” he says.

The farmers that abide by these rules collect and store the residue on their farms in round bales, which are eventually trucked to the cooperative’s new pellet-production facility in Centerview, Mo. This is the main drawback to using agricultural residues as an energy feedstock: they are bulky and transporting them becomes economically disadvantageous after a certain distance.

Show Me Energy pays each farmer a certain amount per ton for residue and also pays for the hauling costs within a 100-mile radius of the plant. Farmers outside this area aren’t discouraged from participating but they must pay the transportation fee for any additional distance (anything over 100 miles). The pellet-production facility will produce 100,000 tons of biomass pellets each year. This fuel source will be cofired at a local utility; five pounds of pellets will be cofired with every 100 pounds of coal burned.

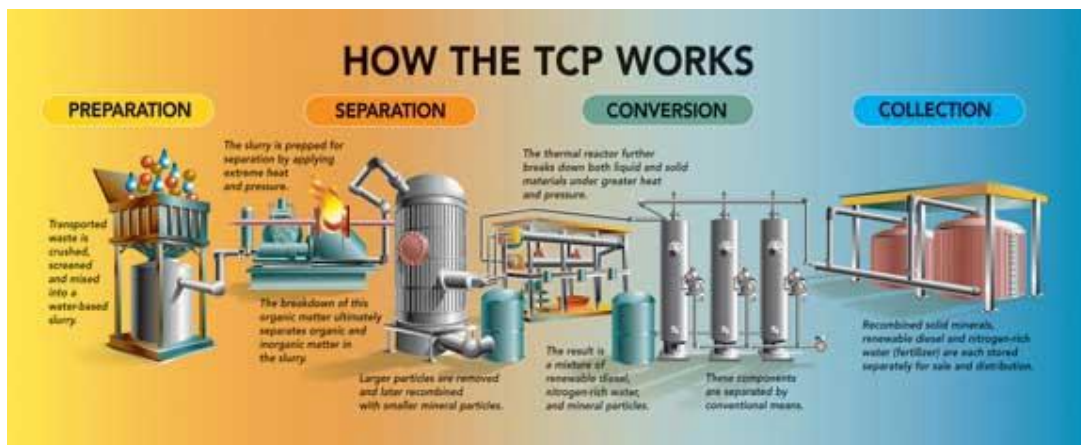
But that’s just phase one of the cooperative’s vision. In phase two, Show Me Energy has teamed with Clean Energy Technologies LLC, a Black and Veatch Corp. company, to build a biomass-to-liquid fuel facility next door to the Centerview plant. This second plant would demonstrate the gasification of biomass pellets for the production of liquid fuels such as ethanol, methanol, synthetic diesel, aviation or other fuels. The team is currently waiting to hear how they fared on a U.S. DOE grant application before moving forward with the project.

Flick hopes other producer groups will embrace the basic tenets of the co-op: sustainability, flexibility and availability. "We've always felt that our model is a very economically adaptable model because it's the farmers who work really hard to make it work," he says. "It's better than the 'contract-production' model that some people have been deciding to do, where they go out and have a technology and contract the feedstock. We feed the cow [the cooperative] with home-grown energy produced on local farms."

Feedstocks that Fit

Another way to think about this is: use a feedstock that makes sense for your locale and process. For rural producers like those of Show Me Energy, that's agricultural residues. For those in urban settings, a more fitting feedstock is industrial waste, which could take the form of plastic, rubber, process heat, municipal solid waste or food processing debris.

These are the feedstocks targeted by Changing World Technologies Inc., a New-York based technology developer that aims to identify and commercialize energy-efficient and eco-friendly emerging technologies. The company's thermal conversion process technology converts wastes ranging from mixed plastics to post-consumer tires, food processing waste and municipal solid waste, to solids, renewable diesel and specialty chemicals.



Changing World Technologies' TCP process

Source: *changing world technologies inc.*

In terms of agricultural residues, the company has done some work with manure and corn stover and a combination of those types of wastes. The company hasn't finished any kind of demonstration plant design for that material because it's been focusing on food processing wastes. However, it has generated lots of good data and it will be something they will build on in the future, says Brian Appel, chairman and chief executive officer of CWT. The key will be finding a "champion" to shepherd the projects forward. Appel points to the company's success in processing food wastes to define what he means by a champion. "When we developed the food processing technology, ConAgra Foods was one of the larger food slaughter houses in the world and they aggressively were trying to find an alternative to feeding animals back to animals," Appel explains. "ConAgra was the champion. Instead of taking this nasty material and turning it back into animal feed it was diverted away from the food chain so we would minimize any transmittable diseases like BSE (bovine spongiform encephalopathy). BSE is more commonly known as mad cow disease.

When it comes to the agricultural side of things, those champions are a little harder to find, Appel says. "A lot of these are still individual family farmers and it's much harder to get someone who wants to be the champion of just that area. It has to be someone who understands the big picture in agriculture and has the resources to go from pilot-plant to a commercial-demonstration facility."

In terms of industrial waste, which Appel classifies as a subset of municipal solid waste, the biggest challenge is not so much finding a champion as finding consistent feedstocks. "With municipal solid waste you never know what you're going to get," he says. "It's always changing as consumer and manufacturing habits change and as efforts to recycle intensify."

To circumvent this inconsistency, CWT is working with large industrial shredder companies, also referred to as metal recyclers, to design a demonstration plant for the conversion of shredder residue to fuel.

"Shredder residue is a more consistent feedstock," Appel explains. "If you take a refrigerator or a car and send it through a giant shredder, those companies collect the metal and the glass." The stuff leftover—plastic and rubber from the tires or the hoses under the hood, or the vinyl seats and the stuffing in the cushions—that's the material that CWT is focusing on because it's more identifiable, he says.

In addition to identifying a consistent source of feedstock, another challenge to overcome is the hype, Appel says. "Alternative fuels have been hyped worldwide. One of the biggest challenges that we've had is coming behind other additives and other alternative fuels," he says. Therefore, fixed-energy markets are the first target for CWT. "We've been a proponent of making fixed energy as the place to learn how to use these fuels because it's a logical progression to then go into transportation." BIO

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