



Feedstocks Testing

Greenbelt Resources Looks at Commercial-Scale Success



Greenbelt Resources has operated a small commercial-scale research and development plant in Paso Robles, CA since 2010.

By Joanna Schroeder

Greenbelt Resources Corp. has developed a feedstock testing program so potential cellulosic ethanol producers can see if their enterprise will succeed at commercial scale by processing a certain feedstock.

Darren Eng, chief executive officer of Greenbelt Resources, which is based in Paso Robles, CA (www.greenbeltresources.com), said one possible feedstock with a large potential for commercialization is food waste.

According to a report released last year by the Economic Research Service of the U.S. Department of Agriculture, food scraps accounted for more than 12% of the total municipal solid waste generated by U.S. households. Less than 3% of those food scraps were recovered, the report said.

The availability of large amounts of food waste as a potential biofuel feedstock has increased because of actions taken by some local and state governments to ban food waste from their landfills.

And that, Eng told *BioFuels Journal*,

is where biofuels enter the picture.

Increasingly, specialty food producing companies have mountains of potential biofuels feedstocks such as beet tailings, rice hulls, sweet potatoes, and coffee cherries. And, Eng stated, those specialty food companies are contacting Greenbelt Resources to find out if there is a way they can turn those food scraps into renewable fuels.

Other feedstocks that are showing promise, according to Eng, include energy crops such as switchgrass, sorghum, waste duckweed, and cassava that require less water for growth.

Feedstock Testing

To test those feedstocks for their potential commercial conversion to biofuels, Greenbelt Resources utilizes a three phase system, Eng explained.

The first phase begins with an evaluation of the different fermentation and feedstock handling techniques near commercial scale.

In the second phase, the focus is on the distillation and dehydration processing of the converted feedstock to optimize operating parameters and evaluate energy use, Eng noted.

The third and final phase provides longer-term operating data for a potential biofuel producer to assist in the final and larger-scale plant design.

“Regardless of slight technical differences, the goal of any test is to collect the necessary data to determine whether the end result is a viable commercial operation,” Eng stated. “In other words, what are the feedstock economics?”

Judging a potential feedstock for success also includes gauging its energy efficiency and how variations in processing may yield other products.

“Feedstock testing by our system helps our customers determine these

answers at commercial scale without having to build their own plant and provides the required engineering and economic data for scale-up,” Eng said.

Greenbelt Resources’ program mimics real-world applications, according to Eng. For example, he said, Greenbelt Resources transports and stores potential feedstocks onsite to help identify the most effective ways that they can be transported and stored.

Because no two companies process a product in exactly the same way, Eng said, the first testing phase of the feedstock’s fermentation and handling techniques will not be the same for every company who uses Greenbelt Resources’ testing services.

“Some feedstocks require specialized processing, equipment, or equipment configurations at the front end,” Eng explained.

In the making of beer, for example, the Greenbelt Resources’ research team has learned that there is a myriad of possible phases or steps to producing a viable beer.

While most feedstocks produce a similar beer, Eng said, some have been



CEO Darren Eng, left, and Floyd Butterfield, chief technology officer, are the two top officers of Greenbelt Resources, which is offering a feedstock testing service.



The control board for a 500,000-gallons-a-year module organic waste recycling system was set up for performance testing at Greenbelt Resources' Paso Robles, CA site prior to shipping to Australia, where a farming operation will produce fuel to run its irrigation pumps.

found to have unique properties that will require some tweaks here and there such as foam or acid control or specialized process control algorithms. "Our testing and production systems are designed with such flexibility in mind," Eng stated.

The program also looks at what other usable products can be created from the

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**- Darren Eng, CEO,
Greenbelt Resources**

feedstock. Eng said that some of the most commercially-important uses of ethanol today are as a solvent, sanitizer, and as a base for many chemicals. Co-products that have been developed from the processing technologies include fertilizer, both potable and non-potable water, and animal feed, in addition to other possible co-products.

Commercial Scale

While there are other feedstock testing programs, Eng said he believes Greenbelt Resources is uniquely qualified to judge the economic potential of feedstocks because its Paso Robles plant is a commercial-scale system and, in most cases, has just the right capacity to meet feedstock availability.

"Our testing service demonstrates that the science works at commercial scale, provides a platform to address and

test solutions for issues with scaling, and generates data from which economic viability can be determined," said Eng.

There has been a lot of interest in the program, with most of the interest coming from universities and private companies that are researching how to maximize the yield of new or existing energy crops.

The ideal client for the feedstock testing program, Eng said, has a readily available feedstock source and a need to convert that feedstock into more valuable products. On average, Greenbelt Resources can ramp-up a testing program in less than a week.

In some cases, Eng said, companies find it easier to purchase or lease Greenbelt Resources' biofuels production tech-

nology rather than developing their own.

Greenbelt Resources recently shipped its modular small-scale organic waste recycling technology to Australia, where the customer is turning wheat waste into fuel to run irrigation pumps, representing a significant cost savings.

The Future

Eng noted that the global ethanol industry has used corn and sugarcane feedstocks to produce ethanol that is an additive for, or supplement to, gasoline distributed by the existing transportation fuel distribution systems.

"The existing distribution system was built to handle large volumes of feedstocks, oil, and its by-products, found in relatively few places on earth," said Eng. "We see a future where much smaller volumes of a wide variety of feedstocks are efficiently converted to fuels and other products and utilized locally."

Although the volumes produced at each of the plants will be smaller, the number of conversion processes will multiply, Eng stated. "The distributed model of energy and other resources are already increasing throughout the world," he said. "We at Greenbelt Resources expect to be part of that future." ■



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