

Processing Pathway

EPA Approves Edeniq's Cellulosic Technology at 6 Plants

Mid America Agri Products/Wheatland, LLC (MAAP/W) in Madrid, NE has become the sixth ethanol plant to have the U.S. Environmental Protection Agency (EPA) approve its use of Edeniq Inc.'s Pathway technology to produce cellulosic ethanol that qualify for D3 renewable identification numbers (RINs).

Bob Lundeen, MAAP/W's CEO, told *BioFuels Journal* in a telephone interview that the plant used Edeniq's Pathway technology to produce 96,000 gallons of cellulosic ethanol during the last three weeks of December, which earned the plant \$185,000 in additional revenue from the sale of the cellulosic ethanol and the D3 RINs it generated.

Lundeen said MAAP/W is selling its cellulosic ethanol production to markets in Colorado.

"Initially, we installed an earlier version of the Edeniq technology that



wasn't the Pathway technology as a way to optimize our production," Lundeen said. "We had a capex (capital expenditure) of approximately \$2 million, so we wanted to make as much additional revenue as we could."

MAAP/W is owned by Mid America Bio Energy and Commodities (MABC). It began production in 2007 as a 44-million-gallon-a-year (MMGY) plant but has pushed its production to 50 MMGY by increasing efficiencies and adding cellulosic ethanol production with the Edeniq Pathway technology, which has increased MAAP/W's total ethanol pro-



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duction by 2%, Lundeen said. "We look forward to producing cellulosic ethanol from this point on," he said.

Plants Approved by EPA

Other plants that have received the EPA's approval for the Edeniq cellulosic pathway are Flint Hills Resources' plants in Iowa Falls and Shell Rock, IA; Pacific Ethanol's plant in Stockton, CA; Little Sioux Corn Processors' plant in Marcus, IA; and Siouxland Energy Cooperative's plant in Sioux Center, IA.

Edeniq was founded in 2008. It is headquartered in Visalia, CA and has a field office in Omaha, NE (www.edeniq.com).

Brian Thome, CEO of Edeniq, said that, in addition to the six ethanol plants that have been approved by the EPA to generate D3 RINs, three more plants are currently awaiting EPA approval. Six more plants will begin the cellulosic ethanol registration process soon.

"Edeniq's customers

generated more than three million gallons of cellulosic ethanol in 2017," Thome said. In 2018, Edeniq's existing customer plants have the potential to produce 30 to 40 MMGY of cellulosic ethanol, he noted, and new customers using the Edeniq process could bring that total to 80 million MMGY, depending on how long it takes the EPA to approve the plants' registration. "EPA is doing a pretty good job for us," Thome said. "The EPA staff is trying very hard to work with our industry."

The EPA's approval process for cellulosic ethanol registration has been made easier, Thome remarked, by the fact that

Edeniq has all of the data from previous registrations, which helps independent engineering firms prepare the registration applications.

Thome said that Edeniq's vision is for corn kernel fiber conversion to cellulosic ethanol to become the norm at ethanol plants, which will enable every plant to produce more than three



Brian Thome



Edeniq employees at its Visalia, CA lab assess and measure samples for cellulosic ethanol content. Edeniq photo.

gallons of ethanol for every bushel of corn processed.

Approximately 10% of the corn kernel is made up of fiber, Thome explained, which is not converted to ethanol in a conventional starch-based plant.

Additional Value

If all ethanol plants produced D3 RINs that represented 2.5% of their annual production, the additional value earned by the ethanol industry would total more than \$1 billion, according to Thome.

“The highest-performing customers using the Edeniq Pathway are currently generating D3 RINs on more than 2.5% of their production,” Thome stated. “That means they are getting an extra 2.5% of ethanol from the same number of bushels of corn. Some of our plants are getting more of an increase than 2.5%. We’re working with our customers to boost their yields.”

Originally, Thome said, Edeniq worked for several years to develop a lower-capital cost technology that had separate process trains for cellulosic ethanol and starch-based ethanol. However, he said, the company eventually developed a zero-capital solution: processing corn kernel fiber within the starch-based processing system.

Thome said that Edeniq’s Pathway technology is a proprietary, integrated platform that can produce cellulosic ethanol in existing corn ethanol plants using the corn kernel fiber already in the plant.

Enzymes are provided by third-party companies and have been specifically designed to extract sugars from the corn kernel fiber in the slurry, which releases cellulosic sugars into the fermentation process in an integrated manner. Third-party enzyme providers include Novozymes, which supplies the enzymes for MAAP/W’s cellulosic ethanol production.

Another important breakthrough came when Edeniq developed a method to determine how much cellulosic ethanol is produced using the Pathway technology so that ethanol plants can claim D3 RINs and earn a premium for their cellulosic ethanol, Thome remarked.

“We spent a few years working on ways to the measure the increase in cellulosic ethanol,” Thome noted. “We can go into a plant and tell managers and plant personnel how much cel-



Samples from customers’ ethanol plants are sent to Edeniq’s Visalia, CA lab to measure cellulosic ethanol output. Edeniq photo.

lulosic ethanol they will be able to make, which is what the EPA requires for registration of D3 RINs.”

For years, Edeniq ran cellulosic production trials at MAAP/W and other ethanol plants, Thome said, and analyzed the results at its laboratory in Visalia, CA. “It was a slow process,” he said, “but now, we’re reaping the benefits from it.”

Jerry Perkins, editor

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