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Corn-based plastic coming soon

The plant in Clinton will make biodegradable products in an industry dominated by petroleum.

By JERRY PERKINS
REGISTER FARM EDITOR

Biodegradable plastic made from corn-eating bacteria will start coming out of a plant being built in Clinton in about 18 months.

The effort is a joint venture between Metabolix Inc., a biotechnology company based in Cambridge, Mass., and Archer Daniels Midland Co., the agribusiness giant. Archer Daniels Midland owns and operates a wet corn milling plant in Clinton, where the corn plastic facility is now under construction.

Brian Igoe, vice president and chief brand officer for Metabolix, said Clinton was chosen as the site for the plastics plant because ADM has a wet milling corn plant there and because Iowa leads in corn production.

"It makes sense to develop the process where the feedstock is found," Igoe said. "We hope this is the first of many plants around the globe."

The plant will make 110 million pounds of the corn-based plastic a year. Globally, about 350 billion pounds of plastics are produced a year at a value of \$250 billion, Metabolix said. Almost all of those plastics are made from petroleum, and Metabolix says the industry is a significant source of greenhouse gas emissions.



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Dave Jacobsen, an employee of Weitz Industrial, directs the snorkel of a concrete pump truck as he pours a pile cap for a biodegradable plastics plant being built in Clinton. The project is a joint venture between ADM and Metabolix.

The Metabolix-ADM venture can be seen as evidence that Iowa is developing a bioeconomy, said Robert Brown, director of the Office of Biorenewables Programs at Iowa State University. Refineries can replace petroleum-based products with another carbon source like corn, Brown said.

"We need to be producing both renewable fuels and renewable sources of carbon," Brown said.

State officials have said that Iowa needs to become an attractive place for biorefineries that will create jobs, add

value to crops and help reduce U.S. consumption of petroleum and other nonrenewable fuels.

ADM officials declined to discuss the Clinton project. Last year, ADM was awarded tax benefits by the Iowa Department of Economic Development for making a \$272 million investment in a Clinton Enterprise Zone for the joint venture with Metabolix.

The IDED said the project will create 114 jobs paying an average wage of \$21.60 per hour.

Sugar made from corn starch processed at the ADM plant will be shipped next door. There it will be used as the feedstock for the bacteria that Metabolix uses to produce the biodegradable plastic.

The bio-based plastics industry includes Cargill Inc.'s NatureWorks LLC, which makes products from a different polymer in Blair, Neb., and DuPont, which makes a plastic called Sorona.

The Metabolix/ADM venture is unique because it uses bacteria to make the plastic, Brown said.

Metabolix and ADM formed their joint venture in 2004 to commercialize the process, which Metabolix says is protected by more than 130 issued and pending U.S. patents. ADM purchased \$7.5 million of Metabolix stock through a private placement in November, when the company went public and raised \$99.5 million in additional capital.

Igoe said the Clinton facility will be a green factory.

The corn plant's stalk and leaves (known as stover) will be used to supply most of the power and energy at the plant, Igoe said.

Energy that doesn't come from renewable resources will be offset by the purchase of renewable energy credits, he said.

Petroleum use at the plant will be reduced by 80 percent, Igoe said, with none used in the processing of the plastics.

"The only petroleum used will be to grow the corn and transport it to our facility," Igoe said. "We're going to walk the talk."

Metabolix plastic can be used in packaging, adhesives, coating and other applications as a substitute for petroleum-derived plastics.

Although the natural plastic products are durable, they decompose in the environment, including water, Igoe said.

"We're really unique," Igoe said. "Nobody can do what we do."

"Our plastic comes from nature and goes right back to nature. In a matter of months, it degrades - like wood does when it is in the soil or water." Metabolix is using a polymer known as PHA.

"It's a polyester, the same thing that leisure suits were made of," ISU's Brown said. "It has many applications, and it degrades pretty rapidly."

The U.S. Navy is interested in using degradable plastics for eating utensils, Brown said, because they can be thrown in the water and dissolved.

Hospitals also are interested in having surgical gowns and other uniforms that need to be destroyed made out of degradable plastics.

The waste could dissolve into virtually nothing, he said.

Brown, who is a mechanical engineer, said the Metabolix process works by mixing bacteria and sugar derived from corn starch and extracting PHA from the bacteria.

There are two other ways of making polymers, Brown said.

One way, he said, would be to insert the genetic information that produces PHA into a plant and genetically modify the plant to make the polymer. PHA could then be extracted from the plant.

Another way to make PHA is to use synthesis gas, a research project Brown is leading.

Synthesis gas can be made by heating a biomass material like corn stover in a gasifier.

Bacteria then eat the synthesis gas to produce PHA, Brown said. The only difference between these three methods, he said, is that Metabolix and ADM are ready to commercialize the process that uses corn sugar and bacteria.

PHA has been produced in Europe, Brown said, but it was relatively expensive.

"The question is, can you do it economically?" Brown asked.

Yes, we can, Igoe said. "We know it can be done economically," Igoe said. "We are doing it. Nobody else can do it like we can."

Farm Editor Jerry Perkins can be reached at (515) 284-8456 or jperkins@dmreg.com

WHAT THE PROJECT MEANS TO IOWA'S BIOECONOMY

Ethanol plants could be just the beginning, advocates for Iowa's bioeconomy say.

Building 10 biomass refineries in Iowa - which could produce ethanol, plastics and other biochemicals - would have an economic impact of \$11.6 billion over 10 years, according to a University of Northern Iowa study.

Other biorefineries in the works:

- The Penford Corp. started a \$42 million project to expand its Cedar Rapids corn refining plant into a biorefinery. The Penford plant will turn ethanol into solvents and personal care products and other value-added chemicals now made from oil.

- Broin Cos., a South Dakota ethanol producer, plans to put one of the nation's first large-scale biorefineries in Emmetsburg. The plant would use not only corn grain, but cobs and other parts of the corn plant to make ethanol.

Metabolix Inc.
HEADQUARTERS: Cambridge, Mass.
PHONE: (617) 492-0505
ON THE WEB: www.metabolix.com

Archer Daniels Midland Co.
HEADQUARTERS: Decatur, Ill.
PHONE: (800) 637-5843
ON THE WEB: www.admworld.com