

## Green Biologics to convert Minnesota ethanol plant to n-butanol and acetone facility

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CreGrowing demand for bio-based chemicals and the prospect of healthy returns on investment has led Green Biologics to make a significant investment in the field by converting a 20th century ethanol plant into a 21st century n-butanol and acetone facility

Green Biologics, a UK-based renewable chemicals company, has embarked on a major redevelopment process to turn a U.S. ethanol plant into an n-butanol and acetone facility to cater for the growing renewables-based paints and coatings industries.



Credit: lagreek

“Our strategy is to focus on supplying the renewable paints and coatings industry and other high value formulations markets and not fuels. We have now acquired an ethanol plant which will produce n-butanol and acetone from renewable sources,” Tim Staub, global vice president for Business Development said.

Green Biologics bought the assets of Central MN Ethanol Cooperative LLC (CMEC) on 23 December. Current management and employees have been retained, but the company has been renamed to Central MN Renewables (CMR).

Green Biologics intends to repurpose the plant, which includes a 21 million gallon per year ethanol production unit, to produce renewable n-butanol and acetone, utilising its proprietary advanced fermentation process (AFP™) technology platform.

The timeline for the retrofitting project is as follows:

- Currently at the detailed design phase, which is estimated to take about two months
- Construction to start late spring/early summer 2015, weather permitting
- Mechanical completion expected in early 2016 with commissioning to follow

“We have not chosen a contractor yet, but we have all the staff at the plant in place with tremendous knowledge about the technology. Some of the operators have been there since 1999,” said Joel Stone, president of Green Biologics Inc. and president of CMR.

## **Feedstock supply chain**

Green Biologics is developing cost-effective methods to convert the complex cellulose and hemi-cellulose carbohydrates contained in lignocellulosic biomass into C5 and C6 sugars which can then be digested for further processing.

The company works with Clostridium microbial strains, utilising both C5 and C6 sugars, which provide a unique opportunity to use a wide range of feedstocks to access lower cost sugars. In addition to lignocellulosic feedstocks, Green Biologics' platform is also designed for sugar and starch feedstocks for deployment in suitable and economically viable markets. The CMR plant will operate on corn, but could convert to lignocellulosic feedstocks in the future.

## **Technology**

Green Biologics uses a world-class technology platform, which provides the foundation for the introduction of new n-butanol derived products through synthetic chemistry, as well as generating new chemical products in addition to n-butanol and acetone.

Compared to traditional fermentation platforms, the company claims theirs can significantly reduce both production costs and capital costs of implementation.

The company's process applies synthetic biology and modern process technology to the Clostridium microbial fermentation process to provide best-in-class solutions for the development and production of new renewable bio-based products.

"Having built our demonstration facility in Emmetsburg, Iowa and met our technology milestones, we are now moving forward with the second stage – the repurposing of the CMR facility to renewable n-butanol and acetone production for start-up in 2016," said Sean Sutcliffe, CEO of Green Biologics Ltd.

## **The Clostridium Microbial Fermentation Process**

The platform the company is using is the result of more than 100 years of industry research and development. The original ABE process was developed in Manchester, U.K. in 1912, which Green Biologics has taken to the next level using an advanced genetic optimization process and their Advanced Fermentation Process (AFP™) from 2003 onward.

The Clostridium fermentation platform converts a wide range of sustainable feedstocks into high-performance green chemicals, such as n-butanol, acetone, and through chemical synthesis, derivatives of butanol and acetone used by a growing global consumer and industrial products customer base.

## **Downstream potential**

"Our downstream markets are robust and rapidly growing, with strong demand across a wide spectrum of customers in high value performance markets," Staub said.

The value of the global n-butanol market is expected to reach \$9.4 billion by 2018, with year-over-year growth exceeding 4.4%. Acetone is an important intermediate in the production of

methyl methacrylate monomers, Bisphenol-A, aldol chemicals such as methyl isobutyl ketone and other high value products. It is used extensively as a solvent in paints, coatings, adhesives, inks, cosmetics, pharmaceuticals, electronics and laboratory chemicals.

The plant is scheduled to begin production of renewable n-butanol and acetone in 2016. It will continue to produce ethanol until the repurposing is complete.

### **Challenges facing the company**

A big first hurdle the company had to overcome at the early stages of development was scaling up production from laboratory level to large scale production.

“Apart from scaling up, the two biggest challenges for us now are retrofitting the plant and building the market for sales from 2016,” Staub said.

However, Stone was hopeful that US-wide labour shortages will have a lesser impact on their project as falling oil prices may alleviate some of the pressure on the industry.

“With low oil prices now it seems labour shortages will ease. The cancellation of other projects might free up some workers. This might give us an advantage when looking for welders, pipe fitters and so on,” Stone said.

The company may also benefit from falling corn prices. Currently, about 36% of all corn produced in the US is consumed by the ethanol industry which supplies fuel-blenders. Over the past few years a correlation has developed between the two sectors, in that if fuel prices drop, corn prices follow as a large part of blended fuel is made up of ethanol.

“This is potentially good news for us as our main feedstock is corn, so over time our production costs should drop,” Staub said.

Green Biologics featured on the Global Cleantech 100 list as one of the top Cleantech companies in the world for 2014. The company was also No. 6 on the Hottest Small Companies in the Bioeconomy and No. 28 on the Hottest 30 list for Bio-based Chemicals and Materials for 2014.