

2012 Merger mania gets underway: Green Biologics, Butylfuel merge : Biofuels Digest

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Aim is major player in the global biobutanol market. Is this biobutanol's year?



In the UK, Green Biologics Limited announced the merger between GBL and butylfuel Inc., a US-based renewable chemicals and biofuels company. The new company will operate under the Green Biologics name and continue to be head-quartered in Abingdon, UK with a strong operational presence and commercial focus in the US contributed by butylfuel Inc., which will become Green Biologics, Inc.

“Biobutanol is the place to be, and the US is ready,” Green Biologics CEO Sean Sutcliffe told the Digest. “This merger creates a truly global leader in biobutanol. Our goal? To be the lowest-cost producer, with deep understanding of fermentation, plus Joel and his team offer that deep understanding of the engineering. We are combining GBL’s acknowledged technology leadership and commercialization expertise in China, India and Brazil with the scale up, operational process experience, and North American business building capabilities of butylfuel.

“With China, India, Brazil and the US, you’ve got the four key markets,” Sutcliffe said.

Joel Stone, President, North America and Global VP of Engineering, formerly CEO of butylfuel Inc. offers, “This is a near perfect fit of a remarkable industrial biotechnology company in GBL with an experienced bioprocessing and commercial scale-up company in butylfuel Inc.”

The merged GBL will be a globally managed company focused on the production of C4 chemicals and advanced fuels from renewable feedstocks, primarily from waste and by-product agricultural sources.

Rewind: Digest predictions for 2012

Earlier this month, we listed “Merger-Mania” and “Ethanol producers begin switch to biobutanol and chemicals en masse,” [as two of our predictions for 2012](#). At the time, we wrote:

Merger-Mania. 200 companies can’t all continue to march forward, developing advanced bioenergy projects. Projects that have completed pilots are going to be ripe for merger and acquisition as they search high and low for expansion capital and find that the well is getting quite dry, as many oil and chemical giants will have already placed their bets. Look for projects to attempt to tap feedstock providers next – absent that, the projects seeking \$100M+ for commercial-scale expansion will be looking to make themselves more attractive to investors by issuing so much equity to investors that it will feel like a merger even if the projects remains technically independent.

Ethanol producers begin switch to biobutanol and chemicals en masse. If last year was the year of the IPO, as 2009 was the summer of algae, 2012 will be the year that ethanol producers begin to switch over to higher-value molecules, such as butanol or various organic acids. For ethanol producers, it’s the path of least resistance in getting around the ethanol blend wall. For the high priests developing the new technologies and magic bugs, it’s an opportunity to partner with companies that have feedstock, infrastructure, 90 percent of the required steel in the ground, and existing markets for co-products.

Green Biologics expectations for 2012

This year, expect GBL to commence signing up of ethanol plants for conversion, with a focus on US opportunities. Already, through the merger with Butylfuel, the company has a pilot plant in Columbus, Ohio, where it will be moving in equipment associated with the GBL technology. Initially, the company will focus on

dry mill corn plants, then move on to cellulosic opportunities.

The chemical markets for biobutanol

Butanol and its derivatives are key intermediates in the production of paints, coatings, adhesives and inks, an \$85 billion global market. Butyl acrylates are also used in the \$700 billion global plastics and polymers market.

The worldwide market for n-butanol is around 4.5 million tonnes per year valued at over \$10 billion, and growing at a rate of 3.2 % per year through 2025. Global demand is split between the U.S., Europe and Asia (driven largely by China). Major global producers include Dow Chemical, BASF, Oxea and Eastman Chemical. Butanol is a building block chemical in the \$85 billion paints and coatings market, and as acrylates, is used in the \$700 billion polymers and plastics market. Butanol is used to produce key derivatives, including acrylates, acetates and glycol ethers.

Acetone is another global market of 6.5 million tonnes with an estimated value of \$5 billion. For every 3 pounds of biobutanol, Green Biologics generates 1 pound of acetone co-product. Major global producers include Dow, Shell, Ineos, and Sunoco. Acetone is currently produced from fossil fuel-derived cumene, which is made from propylene.

Butyric acid is a niche product used in a range of high value applications in animal health and nutrition to promote gut health in swine, poultry, beef and dairy. It is also used in polymers as cellulose acetate butyrate, a high value resin for blister packaging, tool handles, signage sheet goods and safety equipment. Butyric acid has many smaller applications in food and flavors, fragrances, pharmaceutical encapsulation (to improve timed release), and a myriad of other niche uses.

The fuel markets

Longer term, butanol is a superior “drop in” biofuel and can directly replace gasoline as a fuel. It is a superior blend stock as well, and can be blended with diesel as well as other biofuels, such as biodiesel, ethanol and isobutanol. The blend stock opportunity for butanol exceeds \$80 billion per year. Butanol also has the potential to be upgraded to aviation jet fuel, a \$50 billion market driven by increasing global interest on reduction of carbon emissions.

GBL’s technology and progress to date

GBL has a portfolio of proprietary and engineered Clostridia strains used as biocatalysts to process a wide range of starch, sugar and cellulosic feedstocks. In China, GBL has three projects underway on molasses and corn by-product feedstocks, with Laihe Chemicals, Lianhua Chemicals, and Jin Yuan Alcohols. One of these projects is based on cellulosic feedstocks, which we believe will provide us opportunities in other markets in North America and Brazil. In India and Brazil, where Green Biologics maintains satellite offices, GBL’s focus is molasses, cane and bagasse. In North America, the focus is on both starch-based and cellulosic feedstocks.

The cellulosic options

Like Cobalt, Green Biologics is working with cellulosic feedstocks as well as starches and first-gen plant sugars. Like POET, they expect to see as much as a 25 percent boost in potential capacity, per ethanol plant, when cellulosic feedstocks are aggregated. But Sutcliffe cautions, “we’ll focus on the existing feedstocks initially, while we seek to understand the economics of collecting cobs. It’s not just a technological breakthrough to use that cellulosic biomass, and it won’t happen overnight, while we study the opportunities on a project-by-project basis.”

The ethanol plant conversion process

Like Butamax, Gevo and Cobalt, Green Biologics operates on the capital-light basis of converting existing ethanol plants over to production of the higher-density, higher-value molecule. Now, the question for the existing producer – is this a conversion, where the entire plant has to shut down for some period or weeks, or is this a true bolt-on, where no down-time is expected in conversion.

“This is a true bolt-on,” commented Sutcliffe. “In our case, we expect to be able to add 10-20 percent to the income stream without a shut-down period.”

The business model

Green Biologics is pursuing a model in which itself and the ethanol producer will co-invest in the project, and both earn off the increased revenue flow from the sale of biobutanol into higher-value markets. Green Biologics offers the sales & marketing for n-butanol. Payback is expected to be within three years for the ethanol plant partner.

N-butanol vs isobutanol

The butanol players divide neatly into a pair of producers pursuing isobutanol – Gevo and Butamax, with two pursuing n-butanol, Cobalt and Green Biologics. Now, you can isomerize a normal butanol, but you can't normalize an isobutanol, which gives some advantages in flexibility to n-butanol, but primarily the difference between the two molecules is that n-butanol is used in a larger set of markets on the chemicals side, for paints, and lacquers, for example – where a linear molecular chain is needed. Isobutanol is used, for example in synthetic rubber, and is no tiny market itself, but it is smaller than the n-butanol market.

The Four Horseman: Gevo, Butamax, Cobalt, Green Biologics

“This is a global movement,” commented Sutcliffe. “It's not like there's going to be a Microsoft that gets a monopoly. This merger has put us head-and-shoulders ahead in the n-biobutanol space, and we think as the lowest-cost producer. But there's room for a range of companies.”

More about biobutanol

Industry consultant Sam Nejame gave a good overview of biobutanol at a 2010 NREL meeting. [You can download his presentation online, here.](#)

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