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Move over bioethanol...

Date: Jan 23, 2012
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Bio-based butanol (biobutanol) looks set to knock its two carbon cousin, bioethanol, off the top spot as transport's "drop in" biofuel of choice. At the same time its green credentials mean there is demand for the material as replacement for the petrochemical based product in applications such as paints and coatings.

Companies that have been quietly developing technology and pilot scale capacity for producing biobutanol have burst onto the scene as commercial scale production nears startup and leading chemical and petroleum companies acquire technology in the scramble to become a major player in this green chemical.

The first major biobutanol news of 2012 came just three weeks into the year with Oxford, UK-based Green Biologics revealing that it had merged with US renewable chemicals and biofuels company Butylfuel Inc. The new company will be headquartered in the UK. "We are part of a truly global movement," commented Sean Sutcliffe ceo of the merged business. "This merger creates a global player in biobutanol." Green Biologics has an extensive portfolio of proprietary and engineered Clostridia strains used as biocatalysts to process starch, sugar and cellulosic feedstock. Green Biologics has a presence in China, India and Brazil. Butylfuel will provide commercial and operational skills in building and operating large scale fermentation facilities in North America.

November 2011 saw Eastman Renewable Material, a subsidiary of chemical company Eastman, acquire TetraVitae Bioscience. TetraVitae develops renewable chemicals, including bio-based butanol. Eastman has yet to disclose its plans for the new acquisition but said that it would "go a long way toward helping us meet our goals for sustainably-advantaged products."

Just one month before the Eastman deal, Rhodia announced that it was joining forces with Cobalt Technologies to develop bio n-butanol refineries throughout Latin America. The partners said that they will pursue a technical feasibility study, and anticipate that by the middle of 2012 will have established plans for the location of a pilot bio-butanol production facility in Latin America. Cobalt's technology will be used to produce n-butanol from non-food cellulosic feedstock, for the chemicals and fuels market. Rhodia was acquired by Belgium chemical company Solvay during September 2011.

Cobalt Technologies is already working with American Process Inc (API), a biorefinery technology company, to build what is said to be the world's first industrial-scale cellulosic biorefinery for producing biobutanol. Located in Alpena, Michigan, US, the biorefinery will utilise Cobalt's process technology. Ethanol production will begin in early 2012, with the switchover to biobutanol slated for the middle of the same year. Some 470 000 tonne/year of biobutanol will be sold to chemical industry partners.

As well as sustainable solutions and reducing reliance on fossil-based feedstock, demand for biobutanol has been fuelled by advantages it has over bioethanol as a gasoline blend. Biobutanol has energy content closer to that of

gasoline, and can be used in higher blend concentrations than ethanol without having to use especially adapted vehicles. According to Green Biologics the blend stock opportunity butanol exceeds $80 billion per year. In the US the Environment Protection Agency allows a blend of up to 16% butanol with gasoline, compared with 10% for ethanol.

Demand for green chemical building blocks is also driving growth. “The bio-based chemicals sector is evolving rapidly and is poised to transform the production of industrial chemicals,” said Marifaith Hackett, chemical analyst at IHS and author of a report Chemical Building Blocks from Renewables. “While demand for biofuels is driven by regulation, demand for bio-based industrial chemicals depends on economic factors and customer interest in renewably sourced materials.”

With the positive outlook for biobutanol, the push is on to move proven process technology from pilot to commercially operational output. Butamax Advanced Biofuels, the joint venture between BP and DuPont anticipates producing commercial quantities of biobutanol by 2013. The partners have developed a proprietary process for the production of bio-based isobutanol from the fermentation of sugars. The technology will be used in a new biorefinery located at BP Chemical’s site in Saltend, Hull, UK. The biorefinery, built by Vivergo Fuels, a joint venture between BP, DuPont and ABSugar, is due to become operational during the early part of 2012. It will initially produce 110 million gallons (20 million litres) of bioethanol based on animal grade wheat. By 2013 the facility will switch to biobutanol production.

Renewables company Gevo is also close to producing commercial volumes of bio-isobutanol with work to retrofit an ethanol facility in Luverne, Minnesota US, under way. Gevo expects to have the facility operational in the first half of 2012 producing some 18 million gallons per year of isobutanol.

Both Butamax Advanced Biofuels and Gevo have made significant investment in their respective iso-butanol production technologies and have extensive patent protection. But perceived similarities between some of the patents have led the companies to file lawsuits. In January 2011, Butamax Advanced Biofuels filed a complaint claiming that Gevo infringed one patent that had been assigned to Butamax relating to the production of iso-butanol. In answer to the claim Gevo said that it “Formally denies all claims of infringement, as we use Gevo’s Integrated Fermentation Technology (R)(GIFT(R)), which is covered by over 150 patent applications and is a different approach than the one described in the Butamax patent.”

When Gevo sued Butamax and DuPont for alleged patent infringement, during September 2011, Butamax Advanced Biofuels responded “Gevo’s lawsuit against Butamax is baseless and irresponsible. When Butamax makes isobutanol we do not use the technology claimed in the Gevo patents. We are so confident about this, that we offered Gevo an opportunity to independently verify that Butamax does not infringe either of these patents. Ignoring our offer to verify the facts, Gevo instead filed a lawsuit.”

The twists and turns of this disagreement show the importance that biobutanol is set to assume as companies continue to seek renewable solutions.
