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## Diversifying Products Creates New Opportunities

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<http://advancedbiofuelsusa.info/diversifying-products-creates-new-opportunities>

The “Waste to Biogas and Clean Fuels Finance and Investment” summit provided a myriad of opportunities to get the latest intelligence on biogas and the clean fuel industry as well as on the financing options for projects in those niche industries. Organized by Infocast, the event took place on March 3-4, 2015, in Santa Clara, California. About 80 people attended this well-organized, discussion-focused event from different parts of the US and Canada.



A panel discussion at the Waste to Biogas and Clean Fuels Finance and Investment Summit (March 4, 2015, Santa Clara, California). From left to right: Stefaniya Becking (Advanced Biofuels USA), Chris Standlee (VP of Global Affairs at Abengoa Bionenergy), Nick Lumpkin (Director of BD at Clean Energy Renewable Fuels), Eric Bowen (VP of BD and Legal Affairs at Renewable Energy Group).

The conference highlighted the fact that government programs such as the Renewable Fuel Standard (RFS) at the federal level and the Low Carbon Fuel Standard (LCFS) in the state of California remain significant drivers for attracting investment in the renewable fuel industry. As noted in a number of discussions, the instability of those programs has been detrimental for growth of the clean fuel industry. The instability is created by the delays in setting annual minimum volumes of renewable fuels to be used in the supply chain of transportation fuels in the

US. As of March 2015, the Environmental Protection Agency (EPA) has not set RFS volumes for 2015 or for 2014. The lack of clarity on the RFS volumes coupled with legal challenges of LCFS shakes the foundation of the renewable fuel market, which was propelled by those policies in the first place.

For some companies in the renewable fuel industry, capturing credits offered through the RFS and LCFS programs remains a vital income source. As Kelly Sarber, CEO of Strategic Management Group, noted: “The income from RFS and LCFS programs is critical for attracting long-term financing for capital intensive projects.” Yet, some of these companies adapt by exploring ways to diversify their portfolio of products and by finding ways to use existing infrastructure to create products from renewable feedstocks.

Diversifying products as a growth strategy and as a strategy to mitigate risks associated with regulatory instability with biodiesel tax credits was illustrated by Eric Bowen, Vice President of Business Development and Legal Affairs at Renewable Energy Group (REG). REG is the largest biodiesel producer in the US, with the production capacity of 257 million gallons of biodiesel per year, which accounts for 10% of total biodiesel production capacity in the US [1]. In 2014, REG acquired LS9, a company that specialized in using microbial pathways to produce chemicals and fuels from renewable feedstocks. With the acquisition of LS9, REG also acquired a new operational by-product – biosolids composed of microbial cells. Noting new opportunities, Bowen said: “We are interested in diversifying our products as we face the instability of the biodiesel tax credit. We are evaluating economics of using biosolids to produce biogas or compost.”

For a global company like Abengoa Bioenergy, the established diversity of products and services provides a springboard for venturing into an emerging market such as the cellulosic ethanol business. Highlighting the wide range of services Abengoa Bioenergy offers, Chris Standlee, Vice President of Global Affairs at Abengoa Bioenergy, noted, “We are in transportation fuels, water treatment, electricity production, just to name a few markets... Our construction business is the most profitable.” With the opening of the cellulosic ethanol plant in the state of Kansas in September 2014, Abengoa Bioenergy has the capacity to produce 25 million gallons of cellulosic ethanol per year [2].

This is a significant milestone for Abengoa Bioenergy and for the cellulosic ethanol industry as a whole as the newly opened facility is only the second bio-refinery in the US that is capable of turning corn stover residues into ethanol at commercial scale. Responding to questions on the business viability of cellulosic ethanol, Standlee commented that “the cellulosic ethanol industry is still emerging, and economics in the fuel business, which is based on commodities such as gasoline and corn, can change overnight.” Standlee also noted that “we [Abengoa Bioenergy] are improving efficiencies and dramatically lowering costs very quickly.”

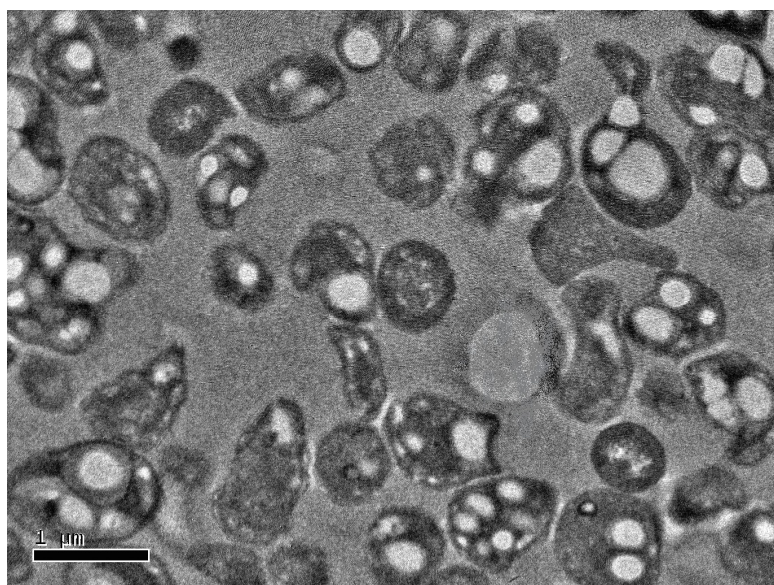
An established business such as a traditional petroleum refinery may consider diversifying feedstock beyond crude oil, when they learn it is possible to use a renewable cellulosic feedstock to produce gasoline and diesel that meet specifications without negatively impacting production lines. Dr. Robert Graham, Chairman and CEO of Ensyn, shared his experience working with the refineries to establish their capability of co-processing Ensyn’s renewable feedstock using refineries’ Fluid Catalytic Cracker (FCC) units.

Graham commented that “when an idea of co-processing renewable fuels is introduced, refineries above all are worrying about the ability to continue 24/7 operations without ‘gumming up’ the production line.” To alleviate concerns about possible production disruptions, Ensyn

provides convincing operational data on co-processing its proprietary renewable feedstock and performance studies conducted in partnership with UOP, a Honeywell company.

“Ensyn’s advanced cellulosic feedstock can be directly substituted for petroleum feedstocks in oil refineries. With the direct substitution of up to 5% in a FCC unit, the FCC performs as well as when straight petroleum feedstocks are used,” notes Graham. The large scale of the petroleum refineries in the US, on average processing 2 billion gallons of crude oil per year, provides great opportunities to use existing infrastructure [3]. Given this scale, co-processing renewable feedstocks even at only 5% with petroleum feedstocks will result in significant capacity to produce renewable gasoline and diesel.

Yet another way to diversify products through partnerships within an established industry was illustrated by Mango Materials, a start-up company based in San Francisco that specializes in producing biodegradable and bio-based plastics. Mango Materials is commercializing a technology that produces polyhydroxybutyrate (PHB) biopolymer. Non-genetically modified bacteria that use methane as a feedstock to manufacture PHB biopolymer inside their cells are at the heart of the technology. “While the type of plastic produced by Mango Materials has been around for a while, Mango Materials is poised to produce biodegradable PHB cost competitively to polypropylene plastic,” said Anne Schauer-Gimenez, Vice President of Marketing at Mango Materials.



The image is depicting bacteria that use methane gas as a food source and that synthesize PHB polymer inside their cells. PHB polymers are the white globules inside the cells. The image (courtesy of Mango Materials) is obtained using transmission electron microscopy.

Partnering with wastewater facilities is a natural fit for Mango Materials. In wastewater facilities with anaerobic digesters, bacteria in digesters use biosolids separated from the wastewater as a food source. As bacteria digest biosolids, they produce biogas, primarily consisting of methane and carbon dioxide. Mango Materials has partnered with a large wastewater treatment facility that provides the necessary feedstock from the digesters – methane gas, which in turn can be fed to the biopolymer-producing bacteria. The company is in the process of establishing more partnerships on their path to commercialization.

Diversifying products creates new business opportunities for entrepreneurs and also provides options for consumers. On the consumer side, a number of speakers at the conference expressed

appreciation for the diversity of options. In the transportation fuel industry, for instance, the diversity of options provides flexibility to fleet managers who can select a solution based on constraints for a particular application. As David Worthington, Fleet Manager at County of Sonoma, pointed out: “We need all kinds of fuels – compressed natural gas, liquefied natural gas, hydrogen, renewable diesel, ethanol blended with gasoline, electrical... – to meet the needs for a particular location and operation.” Thus, this demand will continue to fuel the diversified supply of options.

## References

- [1] Biodiesel Magazine. “USA Plants.” <http://www.biodieselmagazine.com/plants/listplants/USA/>. Web. 10 Mar. 2015.
- [2] Abengoa Bioenergy. “2G Hugoton Project.” [http://www.abengoabioenergy.com/web/en/2g\\_hugoton\\_project/](http://www.abengoabioenergy.com/web/en/2g_hugoton_project/). Web. 11 Mar. 2015.
- [3] U.S. Energy Information Administration (US EIA). “Number and Capacity of Petroleum Refineries.” [http://www.eia.gov/dnav/pet/pet\\_pnp\\_cap1\\_dcunusa.htm](http://www.eia.gov/dnav/pet/pet_pnp_cap1_dcunusa.htm). Web. 10 Mar. 2015

The annual refinery capacity to process crude oil in the US in 2014: 17,730,200 barrel/day \* 365 day \* 42 gal/barrel = 272B gal/yr. The average capacity to process crude oil per refinery in the US in 2014: 272B gal/yr / 139 operating refineries = 2.0B gal/yr.

The annual capacity is based on the “atmospheric crude oil distillation capacity for operating refineries” value for year 2014 in the US EIA data set. The number of refineries in the US is based on the “total number of operable refineries, operating” for the year 2014 in the US EIA data set.

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