What’s Mitsubishi Up to in Renewable Chemicals?

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One of the lesser-discussed companies in Digestville — and it’s a mystery why this is — is Mitsubishi. There must be a bioenergy or green chemical conference every week somewhere around the globe — ask yourself the last time you saw Mitsubishi making a keynote speech or flooding the floor with eager delegates. Not, ahem, their style.

But active they are and growing ever more so.

A Couple of Notes to Start

One, there’s Mitsubishi, and then there’s Mitsubishi. Generally, they all exist within a single Mitsubishi universe — known as a keiretsu — and there is loose coordination within the 25 or so major Mitsubishi units, but Mitsubishi Heavy Industries, Mitsubishi Bank, Mitsubishi Chemical — and so on — are different entities that haven’t been under one vertically controlled family ownership since the days of the Big Four zaibatsu.

Two, we are going to look across the Mitsubishi group of brands, but the focus will be Mitsubishi Chemical, which has been the most active of late.

Back in 2008 — CO2 & Algae on Mitsubishi’s Mind

It started with CO2. In September 2008, the Digest highlighted a series [1] of seaweed developments in Japan, Australia and Argentina. Seaweed, in the form of sargassum raised on the seabed floor as a biofuel feedstock, was originally the

subject of a 3,860-square-mile underwater biofuel farm proposed in 2007 for the Yamotai seabed off the coast of Japan. NEC Toshiba, Mitsubishi Electric, IHI, Sumitomo Electric, Shimizu, Toa, Kanto Natural Gas Development and the Japan Agency for Marine-Earth Science and Technology had announced participation by 2009. By spring 2010, a unit of Mitsubishi had joined a UCLA-led effort to produce ethanol from microalgae.

2010 & a Move toward CO2 Sequestration

Throughout the 2000s, fears had continued to grow at corporations that, absent a means to sequester CO2, heavy fines and controls would descend on major emitters. But why not turn a problem into a profit center? It made sense, figuring out ways to profitably sequester CO2 emissions, went the thinking.

In no way a surprise, a lot of the panic subsided with the global financial crisis and governments turned to efforts to reindustrialize the industrial democracies as a bulwark against recession and depression — and put emissions on the backburner.

But the EU still clung to its CO2 targets, and there were fears that CO2 control efforts would return with prosperity. So, a push was on to prove viable means of recovering and sequestering flue gas from power plant raw gas streams, generally using DOE grants and stimulus funding for technologies provided by companies to include Alstrom (a refrigerated process with a high energy demand). Companies offered their versions of proprietary flue gas recovery processes [2] — Fluor, UOP, Mitsubishi Heavy Industries, and Air Products and Chemicals, to name a few.

2011 Marks Progress in Celluosic Biofuels; Growing Outside Investment by Mitsubishi Chemicals

By spring of last year, Mitsubishi Heavy Industries was touting that it had developed technology [3] for ethanol production from rice and barley straw below the target price of $1.10 per liter. Verification of the technology has been conducted as a joint project involving the government, academia, and the agricultural and industrial sectors in Hyogo Prefecture, supported by the Ministry of Agriculture, Forestry and Fisheries (MAFF), to study effective utilization of lignocellulose.

But that was a sideshow compared to the activity with Genomatica [4]. By spring of last year — as it prepared for its eventually abandoned initial public offering (IPO), Genomatica said that it had raised $84 million from investors and that Mitsubishi was amongst them. Other investors included Alloy Ventures, Bright Capital, Draper Fisher Jurvetson, Mitsubishi Chemical, Mohr Davidow Ventures, TPG Biotech, VantagePoint Venture Partners and Waste Management.

So we saw the classic formula — a strategic investor for upstream (Waste Management) and a strategic investor for downstream (Mitsubishi) with a lot of venture capitalists (VCs) in the middle.

Mitsubishi's focal point with Genomatica was the technology, for sure, but butanediol (BDO) for absolutely sure. Demand is strong in Asia. The two partners

would come back to this in 2012 and strengthen their partnership, as we shall see.

Mitsubishi Partners within the Mitsui World via BioAmber

You don't see Mitsui and Mitsubishi in a love-fest every day of the week — so it was news in the spring of last year when BioAmber raised $45 million dollars in a Series B financing [5] that would accelerate the commercialization of succinic acid and modified polybutylene succinate (PBS), a renewable biodegradable polymer. The investors included NAXOS Capital Partners, Mitsui & Co., Sofinnova Partners and the Cliffton Group.

It was notable that the work funded in the round would also support the second generation organism being developed with Cargill, the technology licensed from DuPont that converts succinic acid to 1,4-butanediol (BDO).

Why is this notable in the case of Mitsubishi? BioAmber has partnerships with Cargill, DuPont Applied Biosciences, Mitsui & Co. and Mitsubishi Chemical.

Back to Algae Again, then a Big Bombshell in Succinic Acid

Later in the summer, attention shifted to Indonesia, when Mitsubishi and the Sarawak Biodiversity Centre (SBC) announced [6] that they would collaborate in exploring algal biodiversity as a possible source of renewable energy. SBC's work has expanded over the last six years from long-term pharmaceutical projects to shorter term projects in areas such as biotechnology.

But it was only a few weeks later that PTT Group and Mitsubishi Chemical formed a 50/50 joint venture in Thailand [7], PTT MCC Biochem, to produce both bio-succinic acid and polybutylene succinate (PBS) from sugar. Construction was planned to start this year (2012) with production to start in late 2014 with a production capacity of 20,000 tons of PBS and 30,000 tons of succinic acid per year. It is the first bio-based PBS bioplastic plant in the world.

2012 — Mitsubishi Expands with Genomatica

This past spring, the Genomatica relationship deepened when the two partners announced [8] a $3.5 million upfront payment to Genomatica from Mitsubishi Chemical. The agreement calls for the two companies to exclusively negotiate definitive agreements for a joint commercial operation in Asia for the production of BDO using Genomatica's process technology.

The payment was made while the two companies continued to work toward completing their definitive agreements, some or all of which may be repaid upon certain conditions. The agreement continued until prior to June 30, 2012, or the date the companies executed a definitive agreement.

And then, radio silence. We haven't heard yet if the partnership will go forward — and the agreement (in a public sense) has not been renewed or extended.

The Bottom Line: What Have We Learned?

For sure, Mitsubishi is all over it when it comes to succinic acid, PBS and BDO. Now its partnerships with BioAmber and Genomatica have to be described as "emerging" for, strong though they are, they are clearly conditional on the two companies getting to commercial scale with their technologies, and as early-stage companies they are in the same capital-raising mode that every early-stage company is.

The PTT joint venture? That's got two real balance sheets behind it and firmer timelines. It's proof positive that Misibushi's interests are developing, strengthening and real. But there's little doubt that the company would prefer to date earlier-stage technologies rather than marry them.

Other conclusions? The company is not adverse to joint ventures. Mitsubishi seeks technologies globally and its goals are specific without being restrictive (i.e. the interest in converting succinic to BDO). The company also has an interest in new feedstocks, as well as processing technologies.

In short, a robust partner, but one with high standards — far more active than is generally known.

What's your take? Please feel free to comment below! Copyright 2012; Biofuels Digest [9]

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