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The Changing Status of Renewable Fuels

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While it may be way too early to declare a final winner in the race to find replacement renewable liquid fuels for the jet fuel and diesel that power so many of the vehicles in the world, there are some indications as to the technology that just might end up coming out ahead.

The results starting to appear also show that sometimes there is a disconnect between what the Government wants and considers possible, and the real world. The concern over climate change (not peak oil) led many governments around the world to mandate that propulsion fuels include a growing percentage generated from a renewable source. Six years ago I was in St Louis for the Renewable Energy Conference with its great emphasis on cellulosic ethanol. President Bush came to bless the endeavor, and much was made of it being the time to start building plants. A short while thereafter, I started looking into the generation of biodiesel from algae, and brought up the logical suggestion, to me, of growing it underground. (That idea still gains me the occasional pat on the head). Some of the early reviews of the technology were not good, but nevertheless, the Defense Advances Research Projects Agency began funding the development of algae, particularly as a source for jet fuel.

Time passed, and the development of the new fuels took quite different paths. In order to encourage the change to renewable fuels, the EPA mandated that motor fuel include 100 million gallons of cellulosic ethanol in 2009, 250 million in 2010, and 500 million by 2013. (This is on the way to a target of around 2 mbd by 2022.) Some of the original companies to seize on this opportunity started out with too great an ambition. Range Fuels, after some $156 million of Government loans from the Bush Administration, closed its doors this past year, unable to make the product it had promised. When it became obvious that the initial targets would not be met the mandated volumes were lowered, so that this year, for example, the industry target is 8.5 million gallons. But still the Government will fine companies, for not using a fuel that doesn't yet exist in the volumes needed to meet those quotas.

Two firms say that they will be able, in time, to produce significant volumes; POET is beginning construction of a plant in Emmetsburg, Iowa that is targeted to produce 25 million gallons a year from 700 tons a day of the left-over material from corn fields after the corn is removed. They have currently stockpiled 61,000 tons of stover for use this year. There is some concern however over the long-term Biomass Crop Assistance Program, which is supposed to help with funding. (DOE is to provide a $105 million loan). However, the Scotland S.D. pilot plant can only handle a ton a day of material (turning it into 80 gallons of ethanol at a cost of around $3 a gallon), and so the rest is to be burned as a fuel at the ethanol plant in Chancellor, S.D. (This is a corn ethanol plant.)

A second plant will be built at Kinross in Michigan by Mascoma, following an agreement with Valero, and the award of $80 million from the Department of Energy. The plant is intended to

generate an annual flow of 20 million gallons (1,300 barrels/day) of cellulosic ethanol from hardwood pulp. The process is based on the use of engineered micro-organisms to produce the necessary saccharolytic enzymes and then converting the sugars released by those enzymes into the desired end-products. The process is known as Consolidated BioProcessing (CBP). In the meanwhile, they are also licensing a technology for improving the performance of corn ethanol plants. To date, therefore, the promise of cellulosic ethanol has not been met.

Other sources for liquid fuels have been also been tested, and some – particularly the use of vegetable oils, either pre or post use in fast food chains – have found some niche in the market. Alaskan Airways are using an 80% conventional 20% cooking oil derived mix. At the moment, the cooking oil derivative is six times the cost of conventional fuel and Dynamic Fuels is the only commercial source with the plant having a capacity of 75 million gallons per year. They are now working with Solazyme to meet a target delivered volume of 450,000 gallons of renewable fuel, and that brings the focus back to biodiesel from algae.

By 2010, DARPA was already claiming that the contractors it was working with had shown the promise of producing algal biodiesel at a price of $2 a gallon. Following that step, the US Navy has begun trials with oil made from algae. In the set of agreements that have flowed out of the initial success and led to the 450,000 gallon agreement, the U.S. Navy has taken delivery of roughly 75,000 gallons of biodiesel for testing in the fleet. And while the US Air Force is continuing trials of jet fuel made from camelina as the search for replacement renewable fuels continues. Beyond camelina (which has some problems finding a suitable home for large volume growth) commercial airlines are looking at algae sourced alternatives, with a United Continental flight having used a 60% conventional 40% algal sourced mix on a flight from Houston to Chicago. The algae-based fuel comes from Solazyme, which went public last spring and the company and has signed a non-binding letter of intent with the airline to sell them 20 million gallons of bio-sourced jet fuel starting in 2014. Interestingly the plant uses "indirect photosynthesis" to grow the algae, rather than open ponds. Robert Rapier has described the technology that they use. By using algae that do not require sunlight, they can generate the fuel in bioreactors where the process can be better controlled. Gail Tverberg first wrote about the company in 2008.

Despite the opportunities that the fuel market presents, it does not, however, at the present time, provide much profit to a company, since it is costing about as much to produce a product as the market price will bear (around $3 a gallon). Thus it is still more profitable for the company to use the algal product in an earlier form as a triglyceride that can then be used in cosmetics and other chemical stocks. But, in contrast to the problems that cellulosic ethanol continue to have, I must admit to a quiet smile as I see the success that algal-derived fuels are starting to achieve.

Now if I could just get them interested in nice, constant temperature locations for their plants, with much of the infrastructure, walls, roof and floor already in place, and relatively little cost for development, my original projections just might . . . .

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