

Prospects for Expansion of the Soy-based Biodiesel Industry in Minnesota

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Executive Summary

Background

The biodiesel industry in the United States could be characterized as being in transition from its infancy to its adolescence. Production in 1999 was a mere 500,000 gallons. In 2006 it will be at least 200 million gallons, a 400-fold increase in seven years. Yet at this level it represents only two-fifths of one percent of annual diesel fuel consumption in the United States.

Demand drivers

Demand drivers in the infancy years were:

- The need for lubricity-enhancing agents in low sulfur content diesel fuel
- "Good neighbor" policies by public institutions
- The Energy Policy Act of 1992, which established Alternative Fuel Vehicle (AFV) requirements for government fleets

Today, two additional biodiesel demand drivers have arisen:

- Public policy at both the federal and state levels
- A sharp increase in the price of petroleum

At the federal level, the American JOBS Creation Act of 2004 introduced a blender's credit of \$1/gallon, effective January 1, 2005, for each gallon of biodiesel blended with petrodiesel, if the biodiesel is made from "first use" feedstock, such as soybean oil from a processor or tallow or lard from a renderer, and \$0.50/gallon if it is made from used feedstock, such as recycled grease. The Energy Policy Act of 2005 extended the blender's credit through December 31, 2008.

At the state level, Minnesota was the first state to mandate incorporation of biodiesel with its 2% (B2) mandate that took effect September 29, 2005, a month after the start-ups of the SoyMor biodiesel plant at Glenville and the Minnesota Soybean Processors (MnSP) biodiesel plant at Brewster. Since then a few other states have followed suit. In addition, several states have established loan and/or grant programs to encourage biodiesel production.

The price of petroleum itself became a driver for biodiesel demand as the price began escalating sharply in late 2003. In July of this year petroleum reached a peak of \$78/barrel. Since then the price has declined to around \$60/barrel, but with finite petroleum resources and "peak production" just around the corner, if not already here, the odds are good that the price of petroleum will be high enough in the future for biodiesel to be competitive on the basis of price, which is the ultimate demand driver.

Production capacity

As of mid September, the National Biodiesel Board (NBB) listed the following biodiesel plants:

	Operating	Under construction	Total
Soybean oil feedstock			
Stand-alone	36 plants; 257 mg/y	29 plants; 428 mg/y	65 plants; 696 mg/y
<u>Co-located w/crush</u>	<u>4 plants; 95 mg/y</u>	<u>7 plants; 266 mg/y</u>	<u>11 plants; 361 mg/y</u>
Total soybean oil	40 plants; 352 mg/y	36 plants; 704 mg/y	76 plants; 1,056 mg/y
Other feedstock			
Stand-alone	46 plants; 200 mg/y	40 plants; 488 mg/y	86 plants; 688 mg/y
<u>Co-located w/crush</u>	<u>none</u>	<u>2 plants; 115 mg/y</u>	<u>2 plants; 115 mg/y</u>
Total other	46 plants; 200 mg/y	42 plants; 603 mg/y	88 plants; 803 mg/y
Total all feedstock	86 plants; 552 mg/y	78 plants; 1,307 mg/y	164 plants; 1,859 mg/y

NBB estimates that total capacity, operating and under construction, including plants which choose not to report their capacity, is 1.98 billion gallons/year as of mid September. In addition, there is capacity of about 1 billion gallons/year that has been announced but is not yet under construction. Once all the plants which are under construction and announced are operating, biodiesel production capacity will be 3 billion gallons/year. It is likely that not all plants that have been announced will be built, but it is still easy to imagine that there will be at least 2.5 billion gallons/year of capacity in place by the end of 2008. This would equal 5% of diesel fuel consumption in the United States.

Recently oilseed crushers have begun to build biodiesel plants that are co-located with their crush plants. This gives them a sure supply of feedstock and better logistic and quality control. It eliminates the freight cost that stand-alone biodiesel plants incur to get their feedstock. This trend is likely to continue and some stand-alone plants could have difficulty obtaining enough feedstock.

The biodiesel industry in Minnesota

Minnesota has been a leader in the biodiesel industry, both in the state mandate to incorporate biodiesel in diesel fuel sold at the pump (the first state with such a mandate) and in biodiesel production.

Minnesota consumes about 800-900 mg/y of diesel fuel. Therefore, the B2 mandate requires only 16-18 mg/y. This compares with 63 mg/y of capacity at the state's four existing biodiesel plants, which are:

- FUMPA BioFuels at Redwood Falls: 3 mg/y, multi feedstock
- Green Range Renewable Energy at Ironton: 150,000 gallon/year, recycled cooking oil feedstock
- MnSP at Brewster: 30 mg/y, soybean oil feedstock, co-located with crush plant
- SoyMor at Glenville: 30 mg/y, soybean oil feedstock, affiliated with Renewable Energy Group (REG)

In addition to the four operating biodiesel plants in Minnesota, there is one under construction and two are in the "pre-construction" (business planning) stage:

- Midwest Renewable at Menahga—4 mg/y under construction; to use soybean oil as feedstock
- Northstar BioEnergy at Hallock—30 mg/y planned; to use canola oil from co-located canola expeller crush plant as feedstock
- Liquid Renewable Fuels 30-60 mg/y plant at Winnebago; to use soybean oil as feedstock

If all these plants were operating Minnesota would have 127 mg/y of biodiesel production capacity. To consume this much biodiesel within the state would require a 15% blend. Therefore, more markets outside the state will be needed to operate the industry at capacity, but Minnesota is not very well located to serve markets in other states, and there is a good deal of production capacity being built in all the surrounding states as well.

The largest concentrations of population and diesel consumption are in the Northeast, the East Coast, the Southeast, Texas, California and Illinois. Currently Illinois accounts for over half the biodiesel consumed in the United States, due to waiver of the state's 6.25% sales tax on blends of B11 or greater. Illinois is not far from Minnesota but there is a good deal of biodiesel production capacity, either operating, under construction or planned, in Illinois, eastern Iowa, northern Indiana and southern Wisconsin that is nearer the Illinois market than is Minnesota.

Business models for new biodiesel plants in Minnesota

- Co-located with a new solvent crush plant
 - Minnesota produces enough soybeans to supply another large solvent crush plant but the existing crushers already produce more than twice as much meal as is consumed within the state and margins have been under pressure since the CHS plant at Fairmont and the MnSP plant at Brewster started up in late 2003, since Minnesota is not well located to ship meal to other states and the traditionally lower protein content of Minnesota soybeans/meal puts Minnesota crushers at a further disadvantage. Another solvent plant would just add to this meal oversupply situation.

- Therefore, building a biodiesel plant co-located with a new solvent crush plant is not seen as a viable business model for Minnesota at this time.
- Co-located with a new expeller crush plant
 - Expeller crush plants are much smaller than solvent crush plants and they can produce a type of meal, high bypass protein soybean meal (HBPSM), which is used extensively in dairy rations and which does not compete directly with conventional soybean meal.
 - An expeller crush plant located in southeast Minnesota would be well located to serve the dairy industry there and in Wisconsin. If technology can be found that is capable of making biodiesel that meets ATSM standards on a small scale, this business model could be worth further investigation.
- Stand-alone plant or co-located with an existing crush plant
 - A stand-alone biodiesel plant would need to obtain its feedstock from existing crushers. Much of the soybean oil produced in Minnesota already is spoken for by food companies or existing biodiesel plants. AGP at Dawson does not have a refinery or biodiesel plant and may be a good source of crude oil for a biodiesel plant with feedstock pre-treatment capability.
 - Anyone contemplating building a stand-alone biodiesel plant in Minnesota should be sure to have long-term feedstock supply agreements, since lack of reliable feedstock supply is one of the greatest risks for a stand-alone plant. It may or may not be possible to make such agreements with the crushers within Minnesota.
 - Affiliation with REG, like SoyMor at Glenville, would be another means for a stand-alone biodiesel plant to ensure itself of feedstock supply and also have marketing services for its finished product.
 - It also might be possible to co-locate a new biodiesel plant with one of the existing crush plants, but under separate or overlapping ownership. A long-term supply agreement would assure the biodiesel plant of feedstock and the cost of transporting feedstock to the plant would be eliminated.

Challenges facing the biodiesel industry

Any new industry faces challenges. The biodiesel industry is no different. Some of the main challenges facing it are:

- Feedstock supply
 - There could be 1.5 billion gallons/year of soybean oil-based biodiesel production capacity in place in the United States by the end of 2008. This would require half the soybean oil that is now produced in the country annually, most of which is used for food.
 - There could be 3 billion gallons of biodiesel production capacity from all feedstocks in place in the United States by the end of 2008. This would require 75% of all soybean oil, canola oil, tallow, grease, lard and poultry fat produced in the country annually.
 - The United States exports very little of these potential biodiesel feedstocks so there is little to divert into the domestic market.
 - The United States exports about a third of its soybean crop annually. Crushing these soybeans domestically would produce enough soybean oil to produce 1.5 billion gallons of biodiesel, but this would produce two-thirds as much meal as is currently being consumed domestically and three times as much as is currently being exported.
 - Increasing the oil component of soybeans is a long-term solution to the feedstock supply challenge which will take several years to develop.
 - Increased imports of feedstocks, particularly palm oil, are likely. This will help the overall biodiesel industry but not the soybean oil-based industry in Minnesota.
- Feedstock price volatility

The price of soybean oil fluctuates widely. It has been as low as \$0.15/pound (= \$47/barrel) and as high as \$0.34/pound (= \$107/barrel) in the past five years. Its price relative to petroleum also fluctuates widely as the two markets are not directly related.
- Food versus fuel debate

This issue has begun to be raised in the context of using so much of our corn crop for the production of ethanol, but the same logic applies to biodiesel and could come into play if vegetable oil prices and related food prices get too high.

- Quality concerns
 - With so many biodiesel plants it is difficult to ensure that all of them make a product that meets ASTM specifications. NBB has a quality certification process in place to deal with this concern. Quality problems like Minnesota experienced last winter do potential damage to an emerging industry.
- Imports of biodiesel
 - A year ago some shipments of palm oil-based biodiesel from Ecuador entered the United States. If U.S. markets remain open to imported biodiesel, and if imported biodiesel receives the same favorable tax treatment as domestically produced biodiesel, there could be more biodiesel entering the country, especially as Malaysia and Indonesia gear up their palm oil-based biodiesel industries.
- Oversupply of glycerin
 - Glycerin is a by-product of biodiesel production that is used primarily in personal care products. Prior to the expansion of the biodiesel industry, crude glycerin was worth about \$0.10/pound. But with so much crude glycerin now being produced by the biodiesel industry, prices have fallen to near zero. It is possible that biodiesel producers eventually will have to pay to have someone dispose of their glycerin.
 - Efforts are underway to develop new uses of glycerin, including as a feed ingredient and as a boiler fuel.
 - Margins for biodiesel producers will be reduced if more markets for glycerin aren't developed.
- Termination of subsidies and/or mandates
 - It is a fact that the biodiesel industry today in the United States relies heavily of the \$1/gallon tax credit and state mandates. The mood is still one of expansion of government policies to help the fledgling industry, due to the unstable political situation surrounding world petroleum supplies. Being less reliant on foreign oil should continue to play well politically for years to come. But if food costs escalate too much it could call into question the fact that government policies are encouraging the use of traditional food products for biofuel production.
 - Tax credits also contribute to already strained government finances at every level. The \$1/gallon tax credit expires at the end of 2008. Whether or not it will be extended will be very important to the biodiesel industry.
- Overcapacity
 - NBB's figures show that there will be nearly 2 billion gallons/year of capacity in place by the end of 2007—only 14 months from now. This doesn't even count the roughly 1 billion gallons/year of capacity that has been announced but is not yet under construction. Yet consumption is predicted to be far less than this for many years.
 - The American Soybean Association announced in September that it expects biodiesel production from soybean oil to be in the range of 500-600 mg/y by 2015. This was a surprisingly conservative forecast coming from an organization that has done much to promote biodiesel. This is only about a third of the soy-based biodiesel production capacity that could be in place by the end of 2008.
 - On the other hand, Soyatech recently released a biofuels report that anticipates biodiesel production to reach 2.15 mg/y by 2015. If half of it were made from soybean oil, that would be 1 billion gallons/year of soy-based biodiesel. This is certainly more optimistic than ASA's projection.
 - The biodiesel industry is following a typical pattern for new "glamour" industries. Everyone seems to want to get into the game. In this type of environment, there are almost certain to be a good number of failures, followed by consolidation within the industry.
- Domination by crushers

Oilseed crushers have just recently begun to enter the biodiesel industry in a significant way. It is the crushers who control the feedstock on the side of the biodiesel industry that uses vegetable oil. Crushers already have taken over the refining segment of the oilseed industry, with upwards of 90% of refined soybean oil being produced by crushers at refineries that are co-located with their crush plants. Since refined or semi-refined oil is the feedstock for biodiesel, it only stands to reason that crushers who choose to enter the biodiesel industry will have a great advantage over stand-alone biodiesel plants, which, in essence, will have to obtain their feedstock from their competitors, if it is available at all, and incur freight costs to get the feedstock to their plants.

Conclusion

Of the business models examined in this study, the one that is most likely to be successful is a small biodiesel plant, in the range of 2-3 mg/y, co-located with a new expeller soybean crush plant that produces HBPSM for the dairy industry, and thus would not compete directly with existing crush plants in the greatly oversupplied "commodity" soybean meal market in the state. Locating this plant in southeast Minnesota would allow it to serve the high concentration of dairy cattle in that area as well as in Wisconsin.

The business model next most likely to be successful would be a large biodiesel plant that purchases its soybean oil feedstock from existing crushers. It would need to assure itself of a long-term supply of feedstock. One way to do this would be to affiliate itself with REG. Another would be to co-locate with one of the existing crush plants, under separate or overlapping ownership. AGP at Dawson would be a good candidate for such an arrangement, since that crush plant does not currently have its own refinery or biodiesel plant.

The business model least likely to be successful would be a large biodiesel plant co-located with a new solvent soybean crush plant, since Minnesota already has excessive crushing capacity relative to the size of the soybean meal market within the state and in-state crushers are at freight and meal protein content disadvantages when needing to ship meal outside the state.