Biodiesel Industry Analysis

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Biodiesel As A Product

Biodiesel is a substitute for diesel fuel. It is made from animal fats, restaurant grease, and vegetable oils. The NAICS code for a biodiesel production facility is 31125 (fat and oil refining and blending). Biodiesel is used primarily for on-road transportation, mining, and for marine watercraft.

Diesel fuel made from plant and animal oils can be blended with petroleum-derived fuel to reduce CO, CO_2, SO_x, and particulate matter emissions. Plant breeders are evaluating the potential to improve NO_x emissions, cold flow, and oxidative stability traits of biofuels through genetic engineering of oilseed crops.[1] Common feed stocks for biodiesel production include soybeans, corn, cottonseed, sunflower seed, canola, peanuts, flaxseed, safflower, rapeseed, and various grades of animal fat.

One of the most important characteristics of diesel fuel is its ability to auto-ignite. Auto-ignition is indicated by a cetane rating, with higher numbers meaning that the fuel ignites more quickly. U.S. petroleum diesel typically has a cetane index in the low 40s. An analysis of U.S. biodiesel samples derived from soybean methyl esters suggests that cetane numbers for domestic biodiesel range from 45.8 to 56.9.[2]

Lubricity is another important diesel fuel trait. Biodiesel has better lubricity than current low-sulfur petroleum diesel. As U.S. diesel standards move toward ultra-low sulfur grades, petroleum-based diesel quality is expected to decline. Blending biodiesel with diesel corrects this problem. Improved lubricity is attributed to fatty acids and other impurities that are found as components of biodiesel. The same effect can be achieved by blending other less expensive lubricity additives.

Number 2 diesel and biodiesel differ in oxygen content. The oxygen content of petroleum diesel is zero, while biodiesel contains 10 to 12% oxygen by weight. This lowers particulate emissions. Bio-diesel is also sulfur-free; another desirable environmental quality attribute.[3]

With regards to temperature effects on product performance, D-2 has a lower freezing point. There is a direct relationship between freezing point and cold flow traits. It is more expensive to prepare biodiesel for use in cold climates. Preparation involves use of fuel additives. Within biodiesel derived from different feed stocks there are differences in freezing point and cold flow attributes.

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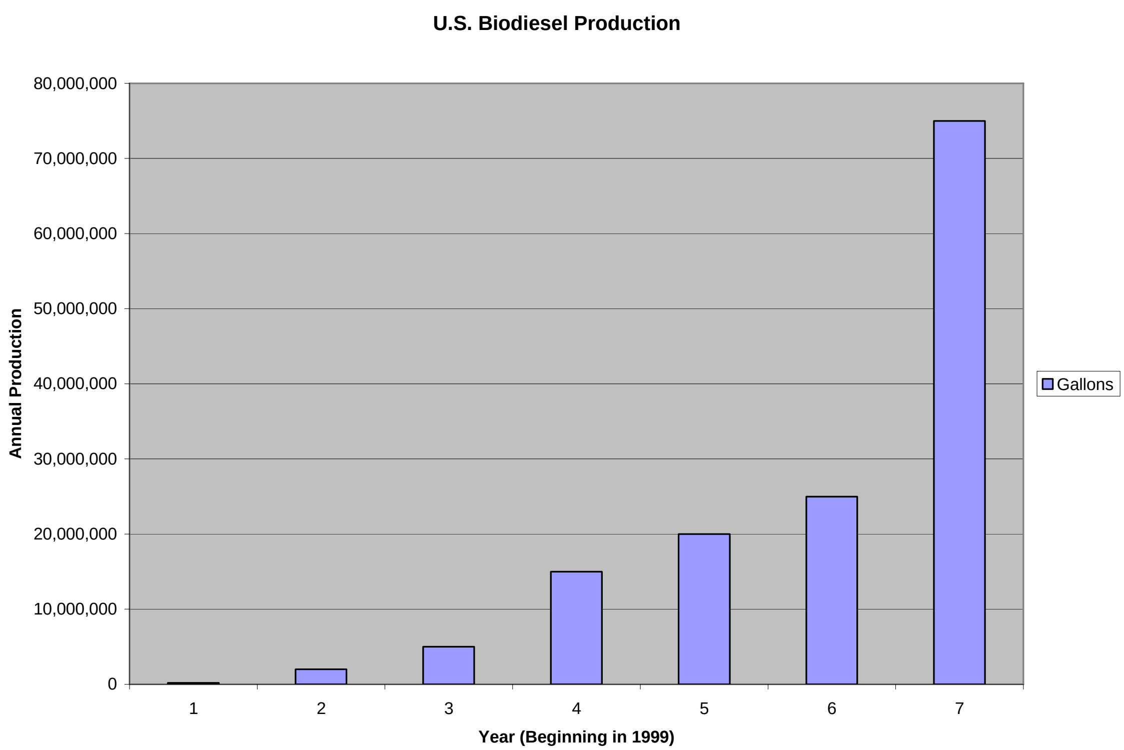
[1] ERS/USDA Report. US Biodiesel Development. September, 1998.
[2] http://www.eia.doe.gov/oaif/analysispaper/biodiesel
[3] ERS/USDA Report. US Biodiesel Development. September, 1998

Flash point measures the temperature to which a fuel must be heated so that the mixture of vapor and air above the fuel can ignite. The higher the flash point, the less likely a fuel will ignite accidentally. While D-2 flashpoint is typically 54 to 71 degrees Celsius, biodiesel is safer, with a flash point greater than 100 degrees.

Supply And Demand

LECG, an international consulting group, developed a report for the national soybean board to assess the contribution of biodiesel to the economy of the United States. In this report, comments about biodiesel supply and demand agree with other estimates. In 2005 the U.S. used 75 million gallons of biodiesel, up from 500,000 gallons in 1999. There were 65 manufacturing plants with an annual capacity of 390 million gallons that year. Eight of these plants were in the process of expanding, and an additional 50 were under construction. The combined capacity of existing and developing plants was estimated to be 714 million gallons.[4] This results in a supply:demand ratio of 9.5 to 1. Demand for biodiesel is projected to increase from 75 to 650 million gallons annually by 2015. Biodiesel plants tend to be located in two areas; near major cities where restaurant grease is the primary feedstock, and in rural areas where soybean oil is the primary feedstock.[5] In addition to soybean oil, other oils including lower cost feed stocks like palm oil could be diverted into biodiesel production.



[4] LECG Report. 2006.
[5] http://www.aec.msu.edu/product/documents/roa/bio/bio_biodiesel.pdf

An ERS/USDA report on biodiesel market development illustrates domestic supply of biodiesel feedstock and the potential for using biodiesel for manufacturing blended diesel fuel.[6] Total current supply is listed at 3,740,000,000 gallons. If blended with petroleum based diesel to create B-20, biodiesel can generate 18.7 billion gallons annually or 67 percent of U.S. annual diesel consumption.[7] It is not likely that all feed stocks will be diverted to biodiesel production. In fact, one of the risks in biodiesel ventures is that feed stocks will be diverted to produce products in other sectors of the economy. A basic economic problem with using vegetable oils and animal fats, cited in a 1998 USDA report, is that these products are more expensive than diesel fuel. According to this report the U.S. average refiner price to end users for No. 2 diesel fuel from 1993 to 95 was $0.57 per gallon. Since 1978, the closest price margin between diesel fuel and soybean oil occurred in 1981 when soybean oil was priced at about $1.46 per gallon. In only two other years were soybean oil prices lower than $1.46. Assuming that 10% of feedstock is used in biodiesel production for a B-20 product, the result would be that 7% of national annual diesel consumption could come from this product line.

Because of the importance of the issues related to competing feedstock usage, more attention will be given to the flow of oilseeds into the marketplace. Soybeans, the main oilseed source in southeast Michigan, are marketed in three forms: unprocessed, as oil, and as meal. One third of U.S. soybeans are directly exported without any processing, meaning that oil from those beans is not available to biodiesel producers. Of the 15 billion pounds of soybean oil produced annually, 2 billion pounds are exported. Ninety-seven percent of soybean oil is used for edible purposes like cooking oil, margarine, and salad dressings. Soy oil is also used in production of soap, cosmetics, surfactants, lubricants, paints, and other industrial products. The same pattern holds for other biodiesel feed stocks. Even though there is a larger potential pool of feedstock, most oils suitable for biodiesel production have higher-value alternative uses. Shifts in the national or global economies could divert relatively large amounts of biodiesel feed stocks into the fuel sector.

Soybean meal accounts for 50 to 75% of the monetary value of commodity soybeans. Soy meal is the most common animal feed protein supplement worldwide.

So, given the unfavorable supply:demand ratio, why are investors gearing up for biodiesel production in the U.S.? The answer seems to lie both in the exponential growth of the relatively small domestic market, as well as in the much larger international demand for biodiesel fuel. European biodiesel production and use is significantly higher than U.S. levels. The following graph illustrates how European biodiesel production equates to a ten fold magnification of the U.S. market.

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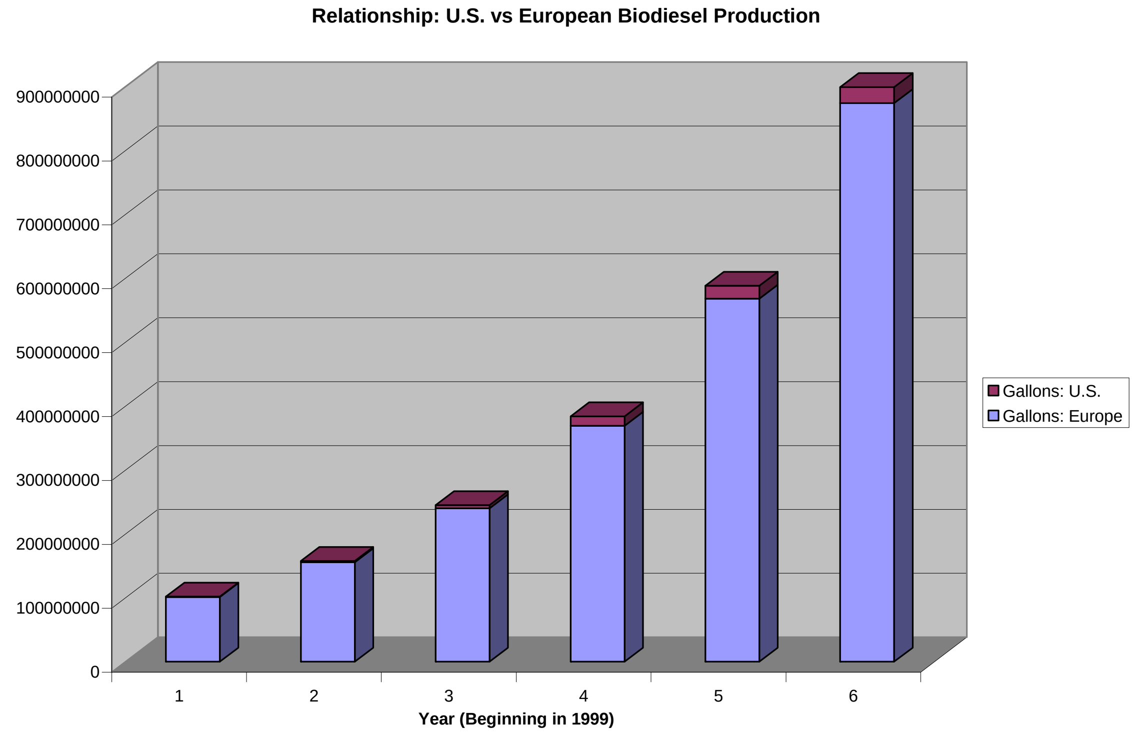
[6] /USDA Report. US Biodiesel Development. September, 1998
[7] ERS/USDA Report. US Biodiesel Development. September, 1998.



Production reports in global markets vary in estimates of oilseed conversion for use as diesel fuels. The middle of the bell curve for global estimates in 2006 is somewhere around 800 million gallons. Germany, France, Italy, and Austria are leading nations in European biodiesel production, collectively accounting for 94% of European supply.

Drivers For Expanded Use

The main drivers for increased biodiesel demand in the U.S. will be continued high energy prices and incentives provided by the Energy Policy Act of 2005. EPACT05 requires that a minimum of 7.5 billion gallons of renewable fuels (ethanol and biodiesel) be used in the nation's motor fuel by 2012.[8] The legislation also provides for extending the biodiesel tax credit through 2008 at one cent per gallon for agri-biodiesel and ½ cent per gallon for biodiesel from recycled fats and oils, and a tax credit of 10 cents per gallon for small scale producers (less than 60 million gallons annually). High energy prices and interest in movement toward national energy independence are also drivers toward increased use of biofuels. Biodiesel is becoming more popular with school districts and other users who want to reduce the smell from traditional diesel fuels. Biodiesel is used in national parks, sensitive waterways, and other locations where environmental and health concerns are particularly important.[9]

The following excerpt from an article on European biodiesel production speculates on the cause of increased production:

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[8] LECG Report. 2006.

[9] http://www.aec.msu.edu/product/documents/roa/bio/bio_biodiesel.pdf

"Increasing concern over global warming and the security of mineral fuel supplies are driving the growth of the biofuel industry. Nations across the globe are mandating the introduction of biofuels, particularly biodiesel, to curb global warming and meet Kyoto Protocol requirements. Continuing unrest in the Middle East and volatile fuel prices are also encouraging the use of biofuels as substitutes for petrol and diesel."

"Growth is being driven through mandated biodiesel blends and fiscal incentives. From 2005, the EU has directed that 2% of the energy content of all petrol and diesel for transport must come from renewable sources. All diesel sold in France is already blended with 2% biodiesel. In India, a 20% blend is possible for 2020. Thailand is aiming for a 10% blend by 2012. Meeting these targets will depend on feedstock availability and investment in production capacity, but the prospects for growth look strong."[10]

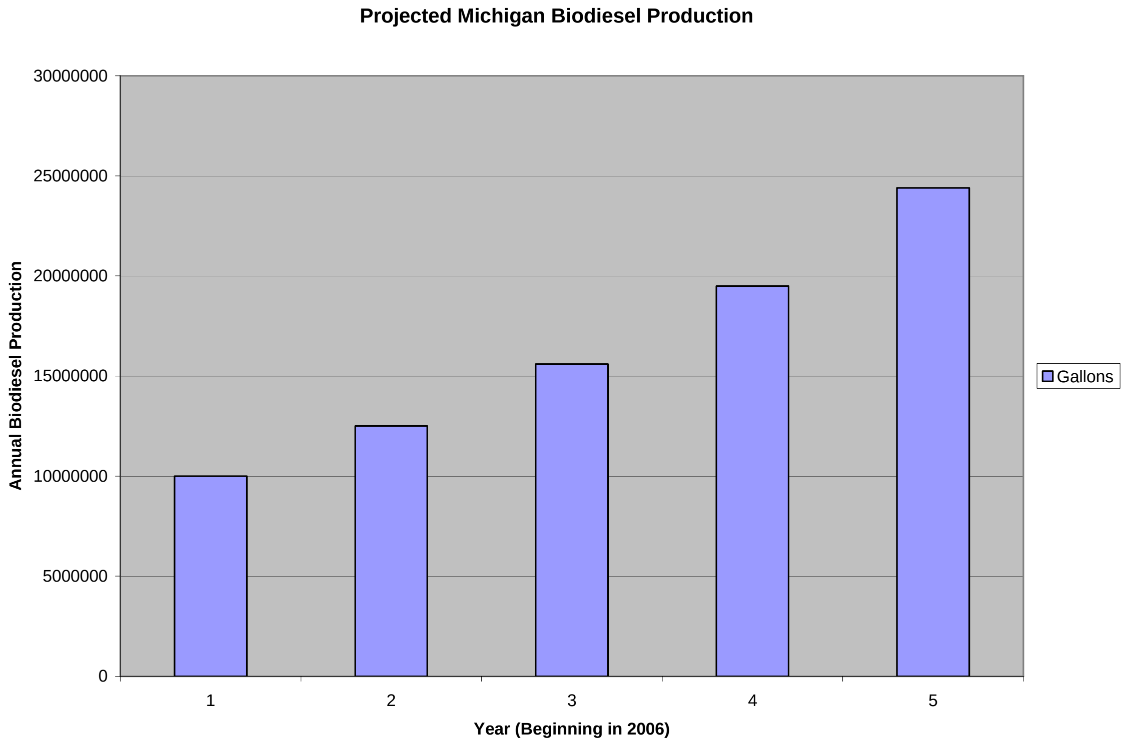
Implications Of Industry Analysis For Biodiesel Production In S.E. Michigan

Because of price relationships between commodity diesel fuel and commodity oil seed prices production of biodiesel fuel in our region will require the following conditions to be met:

- Continuation of Federal incentives for biodiesel production
- Continuation of Federal policies requiring use of ultra-low sulfur diesel
- Identification of dedicated end users who agree to blend biodiesel with petroleum based product to reduce emissions and improve lubricity.
- Continued strong regional demand for soy meal as a protein supplement in livestock feed and/or development of expanded uses for soy meal.
- Prolonged high retail prices for diesel fuel.

Michigan currently has reported capacity in new facilities for producing 5 to 10 million gallons of biodiesel (2006). This capacity is from a single plant in Bangor, Michigan. Bangor is located in Van Buren County of southwest Michigan. There are discussions related to building additional Michigan facilities across the southern tier of Michigan. A plan has been under construction in Milan, Michigan since 2005 but it has progressed slowly and is not yet on line. Applying an annual production growth ratio of 1.25 to Michigan production facilities, Michigan facilities are projected to produce 24.4 million gallons of biodiesel by the year 2010.

[10] http://answers.google.com/answers/threadview?id=600845



A BBI feasibility study for building production facilities in the Michigan/Ohio region indicates an acceptable supply/demand ratio which justifies production expansion. The feasibility study projects an annual return on investment of 20 to 30%.[11]

[11] http://www.bbiethanol.com/oh-mi-biofuels/Frazier-OHMI.pdf#search='michigan%2C%20biodiesel%20production'