



*Advanced Biodiesel Production*

*West Virginia BioEnergy Forum*

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# Biodiesel History

- 2004 production capacity was 100 million gallons, most plants less than 10 million gallons/year. **Production was only 25 million gallons.**
- 2006 capacity about 600 million gallons capacity, **production was 200 to 250 million gallons.**
- 2007 saw announcement of 55 new and expanded plants. This additional capacity would raise the US biodiesel production to well over 800 million gallons/yr. **Actual production was about the same as 2006—about 250 million gallons.**
- What happened?

# Feedstocks

- For all of the hype, little used cooking oil is converted to biodiesel.
- Almost all biodiesel is being produced from refined soybean oil.
- A few plants in the upper Midwest use other refined vegetable oils like canola and sunflower oil.
- Some plants import palm oil from outside the USA.
- There are huge supplies of animal fats (tallow and other), at attractive prices.

# Feedstocks

The ideal oil for biodiesel would have the following properties:

- High degree of unsaturation. This depresses the freezing point so the biodiesel remains a liquid at winter temperature. (This criteria limits feedstocks like the tropical oils and animal fats which are highly saturated in most of the US.)
- Very low Free Fatty Acid content. FFA requires additional processing steps, increasing the plant investment and operating cost. (Strike two for animal fats and also makes used cooking oil undesirable.)
- Low price.

Through 2006 refined soybean oil met all of these criteria.

# Feedstocks

In 2007 things began to change quickly.

- With more biodiesel plants running and using soybean oil, the demand for the oil became par with the demand for meal. Hence, no byproduct pricing.
- Suddenly, even the federal tax subsidy was not enough to be profitable. Some states, mostly in the soybean growing belt, added state subsidies and this kept some plants marginally profitable.

# Industry Response

- Several new plants that were completed in 2007 only ran to demonstrate the plant worked, and then they were shut down until the plant could run profitably. At least one plant did not run at all.
- Plants looked to find cheaper feedstocks. Some plants added Esterification Processing to convert high FFA feedstocks to biodiesel. Some imported palm oil as feedstock.
- Some plants began to look at cheaper oils—crude oils (not refined)

# New Technology

In 2006 MATRIC formed a partnership for Biodiesel technology with BEST Energies, a Wisconsin bioenergy company.

The first task was to develop technology for the reaction and refining of biodiesel made from refined soybean oil.

As this work was progressing it was clear that refined soybean oil would not be an economic feedstock in the future.

The Partners agreed to research opportunities for lower cost raw materials

# Customer Offering

- BEST is working with other plants to take advantage of the new technology.
- The partner plants will install and operate operations to meet specifications to assure the oil is suitable for biodiesel feedstock.
- The oil will be transported to the biodiesel plant.
- The biodiesel plant will install additional investment for biodiesel production.
- The partner plants and the biodiesel plant will share in the extra profit due to low cost oils.

# New Technology

Through 2007 the technology focus was on new feedstocks,. The research proved that the new technology can be done simply and at low cost.

The final step is to develop further technology to treat the other impurities in less costly feedstocks.

BEST has seven patent applications covering this technology.  
**(MATRIC Developed)**

# Future of Biodiesel

The biodiesel industry understands the raw material cost problem and many companies are looking for lower cost feedstock.

BEST and MATRIC believe that their technology will permit biodiesel plants to feed the lowest raw material cost and the lowest investment for biodiesel.

This process will be offered for license once the technology is proven at the site.

# Control Room



# Process Structure



# Reactors



# Intermediate Tanks



# Tank Farm at Plant

