



**Biodiesel Production
Economics**

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Cost estimation- Three Questions

1. What does a biodiesel plant cost?
2. What will it cost you to produce the biodiesel?
3. How does your production cost relate to selling price?

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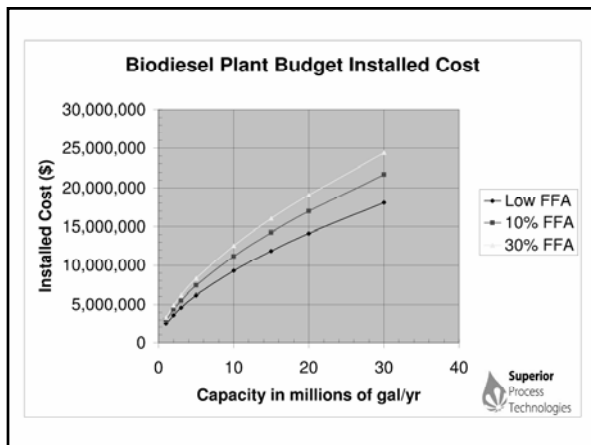
Plant Cost- Buy

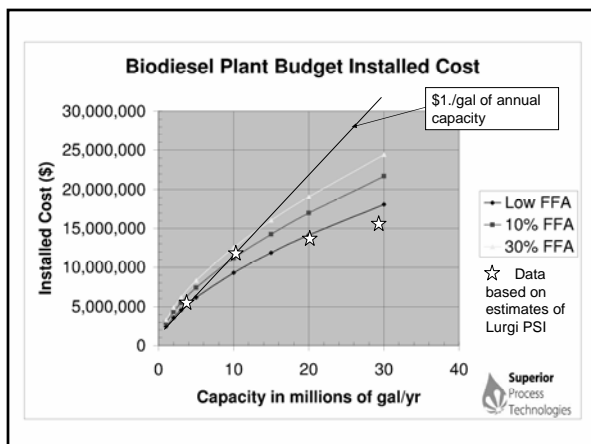
- Are you going to buy a turn-key plant from a technology provider such as Lurgi, REG, Crown, Superior Process, etc.?
 - Most expensive but quickest option.
 - If it is their first plant, you should expect a substantial discount.

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Plant cost- Build Your Own

- Are you going to design and build your own plant?
 - Least expensive (maybe) but longest time due to need for development.
 - Should be able to take advantage of used or existing equipment.
- Some combination of these two options.





Methanol prices

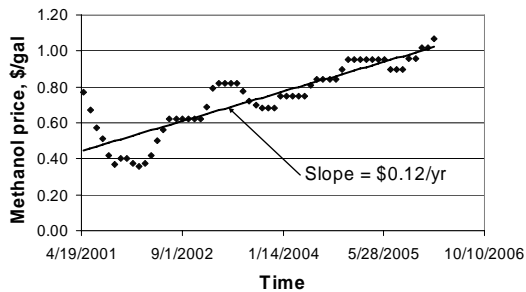
- The reaction consumes about 0.11 lb methanol per lb of biodiesel.
- $0.11 \times 7.3 \text{ lb/gal} = 0.80 \text{ lb methanol/gal biodiesel}$
- $0.80 \text{ lb} / 6.6 \text{ lb/gal methanol} = 0.12 \text{ gal methanol per gallon of biodiesel}$
- $0.12 \text{ gal} \times \$1.35/\text{gal} = \$0.16/\text{gal biodiesel}$
- But remember we are using 100% excess methanol. Can we recover all of this? This depends on your plant design.

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Methanex Monthly average price



http://www.methanex.com/products/documents/MthlyAvgPrice_Mar2006.pdf

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Catalyst

- Using 2% sodium methylate solution (25%)
 - If a lb of oil gives a lb of biodiesel and 1 gallon of biodiesel is 7.3 lb:
 - $7.3 \text{ lb/gallon} \times 0.02 \text{ lb cat/lb bio} \times \$0.55/\text{lb cat} = \$0.08/\text{gallon biodiesel}$
- Using 1% sodium hydroxide
 - $7.3 \text{ lb/gallon} \times 0.01 \text{ lb cat/lb bio} \times \$0.42/\text{lb cat} = \$0.03/\text{gallon biodiesel}$

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Neutralizers and other production inputs

- Need to neutralize catalyst and split soaps. Typically use 1% HCl in water.
- Energy costs will depend on process but are usually small unless using high temperature processes (heterogeneous catalyst or supercritical).

Labor

- Estimate about 1 plant operator per million gallons.
- Half a manager per two employees. Try to leverage this with other businesses (soybean crushing, etc.)

For example:

- 2 employees @\$30K, 0.5 manager @\$50K
- $\$85K / 2 \text{ million gallons} = \$0.04/\text{gallon}$

Depreciation- Expensing the Assets

- Land can't be depreciated.
- Building might be 20 or 25 years.
- Equipment is typically 7 or 10 years.

- If a 10 million gallon, \$9 million plant is depreciated over 10 years, this is \$0.09/gallon.

Business Models

- **Large centralized plant**
 - Lower operating cost (main savings is labor and cost of capital)
 - More transportation cost
- **Small decentralized plant**
 - Higher operating cost
 - Reduced transportation (It is quite feasible to make up for a \$0.10/gallon penalty on the plant operating cost with lower transportation costs)

Business Models

- **Most plants try to leverage local advantages such as building next to an existing crush plant.**
 - Close proximity to oil
 - Can share marketing, management, lab facilities
- **Might also locate close to petroleum distribution or close to meal market.**

Business Models

- **Tying up an oil supply will be important to weather up-coming industry shake-out.**
- **Suggested approach:**
 - Start by buying and reselling biodiesel in your area.
 - Is the market there? Make sure you can sell the product before you invest in making it.
