



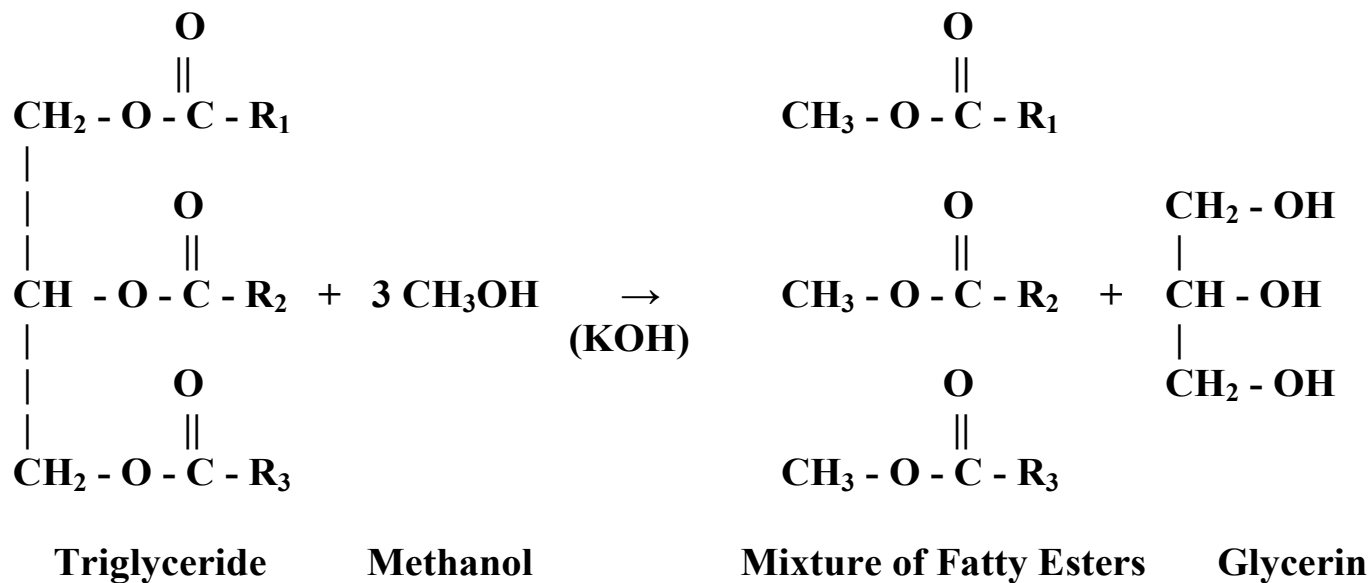
**Where you find solutions**

# **Biodiesel as a Business**

# What is Biodiesel?

- Biodiesel is defined as the mono-alkyl ester of fatty acids derived from vegetable oils or animal fats, commonly referred to as B100.
- Biodiesel must meet the specifications of ASTM D6751
- Biodiesel blends are a mixture of Biodiesel with petroleum diesel, commonly referred to as B20, B5, B2.

# Transesterification







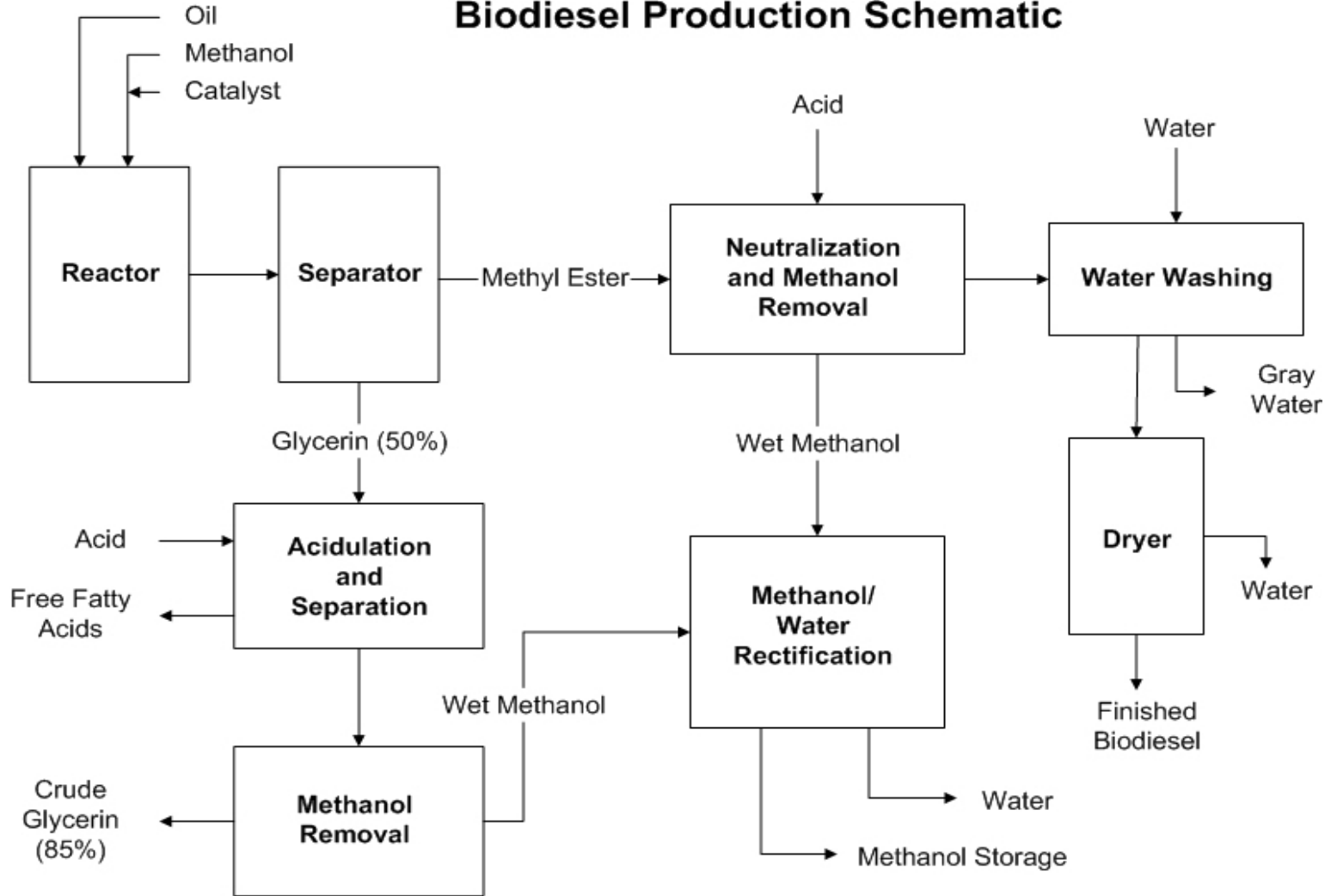
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# Biodiesel Standard ASTM D6751-06

Property	Method	Limits	Units
Flash point, closed cup	D 93	130 min	° C
Water and sediment	D 2709	0.050 max	% volume
Kinematic viscosity, 40 ° C	D 445	1.9 – 6.0	mm <sup>2</sup> /s
Sulfated ash	D 874	0.020 max	wt. %
Total Sulfur S 15 Grade S 500 Grade	D 5453	15 max 500 max	ppm
Copper strip corrosion	D 130	No. 3 max	
Cetane number	D 613	47 min	
Cloud point	D 2500	Report to customer	° C
Carbon residue	D 4530	0.050 max	wt. %
Acid number	D 664	0.50 max	mg KOH/g
Free glycerin	D 6584	0.020	wt. %
Total glycerin	D 6584	0.240	wt. %
Phosphorus	D 4951	0.001	wt. %
Vacuum distillation end point	D 1160	360 °C max, with 90% recovered	° C
Sodium/Potassium	UOP 391	5 max combined	ppm
Storage stability	To be determined	To be determined	To be determined

# Where you find solutions

## Biodiesel Production Schematic





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# **Steps to Starting a Biodiesel Business**

- Conduct a feasibility study
- Write a business plan
- Form a board or group of business persons
- Solicit Financing
- Hire an engineering company
- Develop your markets
- Build the plant and the business

# Feasibility Study Areas

- State of the Biodiesel industry
- Business structure or type of organization
- Production processes and technologies
- Feedstock choices and considerations
- Transportation availability
- Markets and marketing issues





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# Feasibility Study Areas

- Plant size and construction cost
- Operating cost and manpower requirements
- Environmental issues
- Risk factors
- Financial analysis and case scenarios
- Site selection criteria



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# **Important Business Factors**

- Feedstock supply
- Market size
- Government incentives
- Competition
- Financing and source of funds
- Business structure and community involvement
- Sensitivity analysis
- Plant and operating cost



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# Why Do Sensitivity Analysis?

- Historical prospective of cost
- Identifies cycles in pricing
- Identifies which cost have the largest affect on profits
- Helps in price negotiations for feedstock and other chemicals



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# Sensitivity Analysis on Soy Bean Oil

Soy Bean Oil History Based on Closing Price Average in Dollars per Pound \*

Month	1998 Close	1999 Close	2000 Close	2001 Close	2002 Close	2003 Close	2004 Close
January		\$0.20	\$0.16	\$0.14	\$0.14	\$0.18	\$0.28
February		\$0.16	\$0.14	\$0.14	\$0.14	\$0.20	\$0.32
March		\$0.18	\$0.16	\$0.14	\$0.14	\$0.20	\$0.30
April		\$0.18	\$0.16	\$0.14	\$0.14	\$0.20	\$0.32
May	\$0.24	\$0.16	\$0.14	\$0.14	\$0.18	\$0.20	
June	\$0.24	\$0.14	\$0.14	\$0.14	\$0.16	\$0.20	
July	\$0.22	\$0.14	\$0.14	\$0.18	\$0.18	\$0.18	
August	\$0.22	\$0.16	\$0.14	\$0.16	\$0.20	\$0.20	
September	\$0.22	\$0.14	\$0.14	\$0.14	\$0.18	\$0.24	
October	\$0.24	\$0.14	\$0.14	\$0.14	\$0.20	\$0.24	
November	\$0.24	\$0.16	\$0.14	\$0.14	\$0.22	\$0.26	
December	\$0.22	\$0.14	\$0.14	\$0.14	\$0.20	\$0.26	
Yearly Average	\$0.23	\$0.16	\$0.15	\$0.15	\$0.17	\$0.21	\$0.31
Total	\$1.84	\$1.90	\$1.74	\$1.74	\$2.08	\$2.56	\$1.22
Total Number of Months with Data			72	Six Year Average of Monthly Averages			\$0.18
Grand Total of all Months			\$13.08	Six Year Average of Monthly Lows			\$0.17
				Six Year Average of Monthly Highs			\$0.19

\* Less 1.5 cents per pound adjusted basis



# Where you find solutions

## Biodiesel from Soy Bean Oil Income Before Tax Sensitivity Analysis

### B100 Biodiesel Price \*\*\*

Soy Bean Oil Price	B100 Biodiesel Price ***												
	\$1.50	\$1.60	\$1.70	\$1.80	\$1.90	\$2.00	\$2.10	\$2.20	\$2.30	\$2.40	\$2.50	\$2.60	\$2.70
\$0.12	\$362,533	\$560,533	\$758,533	\$956,533	\$1,154,533	\$1,352,533	\$1,550,533	\$1,748,533	\$1,946,533	\$2,144,533	\$2,342,533	\$2,540,533	\$2,738,533
\$0.14	\$70,533	\$268,533	\$466,533	\$664,533	\$862,533	\$1,060,533	\$1,258,533	\$1,456,533	\$1,654,533	\$1,852,533	\$2,050,533	\$2,248,533	\$2,446,533
\$0.16	(\$221,467)	(\$23,467) 1999*	\$174,533	\$372,533	\$570,533	\$768,533	\$966,533	\$1,164,533	\$1,362,533	\$1,560,533	\$1,758,533	\$1,956,533	\$2,154,533
\$0.18	(\$513,467)	(\$315,467)	(\$117,467)	\$80,533	\$278,533	\$476,533	\$674,533	\$872,533	\$1,070,533	\$1,268,533	\$1,466,533	\$1,664,533	\$1,862,533
\$0.20	(\$805,467)	(\$607,467)	(\$409,467)	(\$211,467)	(\$13,467)	\$184,533	\$382,533	\$580,533	\$778,533	\$976,533	\$1,174,533	\$1,372,533	\$1,570,533
\$0.22	(\$1,097,467)	(\$899,467)	(\$701,467)	(\$503,467)	(\$305,467)	(\$107,467)	\$90,533	\$288,533	\$486,533	\$684,533	\$882,533	\$1,080,533	\$1,278,533
\$0.24	(\$1,389,467)	(\$1,191,467)	(\$993,467)	(\$795,467)	(\$597,467)	(\$399,467)	(\$201,467)	(\$3,467)	\$194,533	\$392,533	\$590,533	\$788,533	\$986,533
\$0.26	(\$1,681,467)	(\$1,483,467)	(\$1,285,467)	(\$1,087,467)	(\$889,467)	(\$691,467)	(\$493,467)	(\$295,467)	(\$97,467)	\$100,533	\$298,533	\$496,533	\$694,533
\$0.28	(\$1,973,467)	(\$1,775,467)	(\$1,577,467)	(\$1,379,467)	(\$1,181,467)	(\$983,467)	(\$785,467)	(\$587,467)	(\$389,467)	(\$191,467)	\$6,533	\$204,533	\$402,533
\$0.30	(\$2,265,467)	(\$2,067,467)	(\$1,869,467)	(\$1,671,467)	(\$1,473,467)	(\$1,275,467)	(\$1,077,467)	(\$879,467)	(\$681,467)	(\$483,467)	(\$285,467)	(\$87,467)	\$110,533
\$0.32	(\$2,557,467)	(\$2,359,467)	(\$2,161,467)	(\$1,963,467)	(\$1,765,467)	(\$1,567,467)	(\$1,369,467)	(\$1,171,467)	(\$973,467)	(\$775,467)	(\$577,467)	(\$379,467)	(\$181,467)
\$0.34	(\$2,849,467)	(\$2,651,467)	(\$2,453,467)	(\$2,255,467)	(\$2,057,467)	(\$1,859,467)	(\$1,661,467)	(\$1,463,467)	(\$1,265,467)	(\$1,067,467)	(\$869,467)	(\$671,467)	(\$473,467)

\*Annual average of Soy Bean Oil Price and \$1.00 over annual average Diesel #2 price for each year.

	1998	1999	2000	2001	2002	2003	2004**
Annual Average Closing Price for Soy Oil	\$0.253	\$0.174	\$0.159	\$0.158	\$0.189	\$0.229	\$0.338
Annual Average #2 Diesel Price	\$0.59	\$0.63	\$1.01	\$1.05	\$0.88	\$1.05	\$1.14
Annual Average Biodiesel Price***	\$1.59	\$1.63	\$2.01	\$2.05	\$1.88	\$2.05	\$2.14

\*\* Only 4 months

\*\*\* Biodiesel price is based on #2 Diesel annual average price plus \$1.00, which is equivalent to 1 cent per percent biodiesel content



Where you find solutions

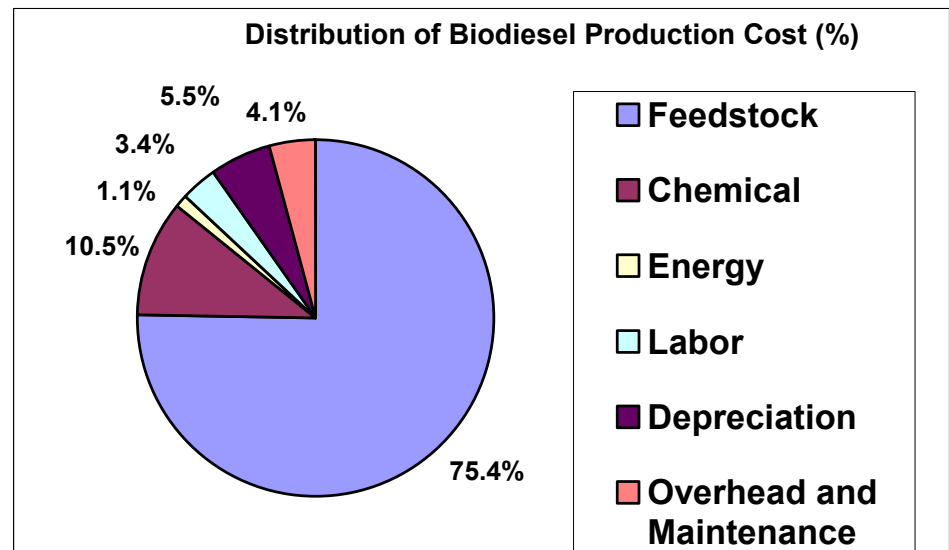
# 5 mm gpy Biodiesel Production Cost

## Biodiesel Production Cost Summary

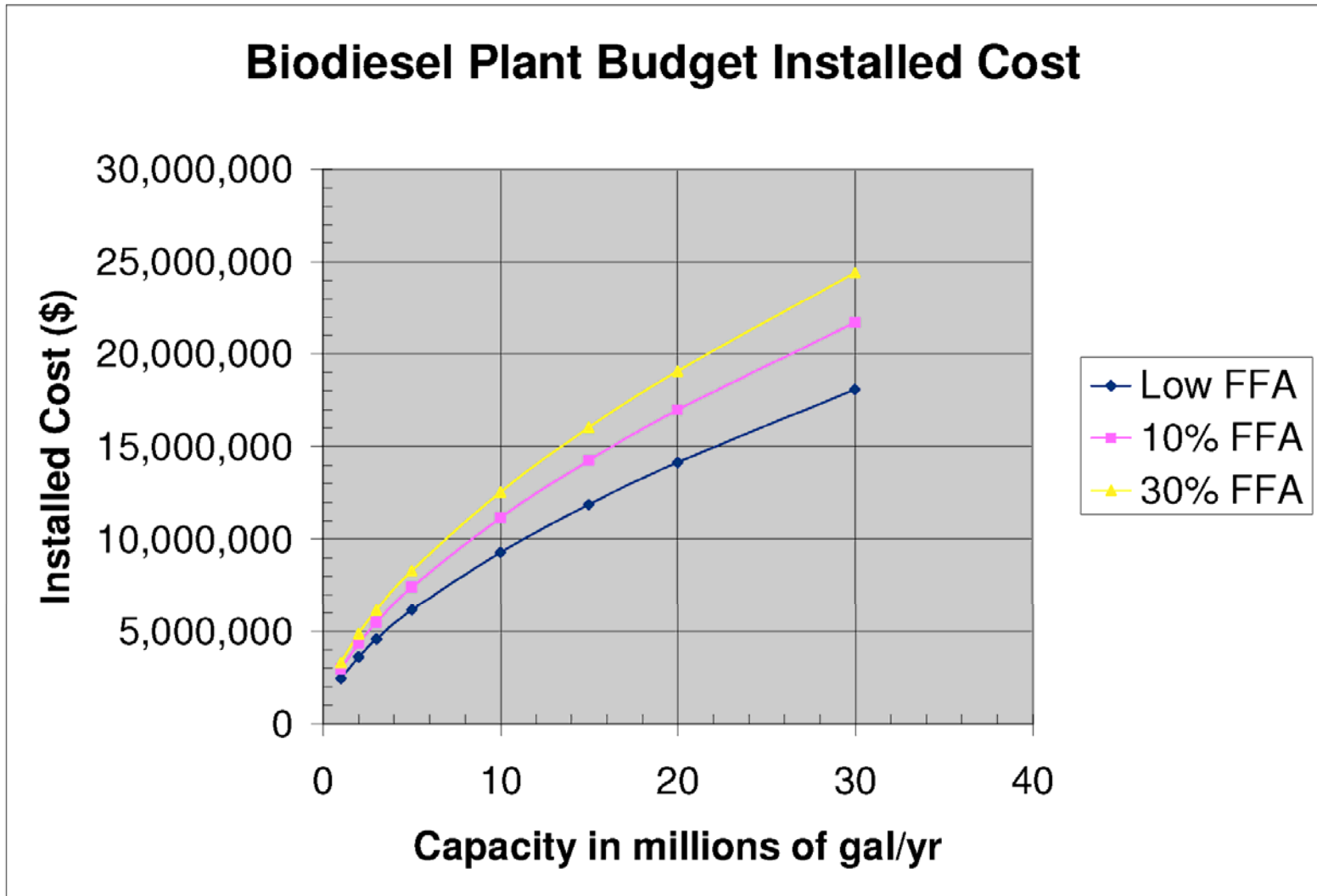
Customer: CIRAS Iowa State University

Case: Product cost with \$0.22/lb Soybean Oil feed (5 mm gpy plant size)

Biodiesel Production Cost	Cost/gal (\$)	Cost/liter (\$)	% of Total
Cost of Feedstock	1.672	0.442	72.1%
Cost of Feedstock Transport	0.076	0.020	3.3%
Cost of Acid	0.011	0.003	0.5%
Cost of Base Catalyst	0.108	0.029	4.7%
Cost of Sodium Hydroxide	0.001	0.000	0.1%
Cost of Methanol	0.122	0.032	5.3%
Cost of Heat Energy	0.022	0.006	0.9%
Cost of Electricity	0.004	0.001	0.2%
Cost of Labor	0.079	0.021	3.4%
Depreciation	0.128	0.034	5.5%
Cost of Maintenance	0.040	0.011	1.7%
Cost of Admin and Overhead	0.025	0.007	1.1%
Cost of Marketing	0.030	0.008	1.3%
<b>Total</b>	<b>2.320</b>	<b>0.613</b>	<b>100.0%</b>



## Where you find solutions



# Plant Cost

- Basic estimates vs. All equipment estimates
- Installation Cost + Equipment Cost = Installed Cost
- Installation cost equals 1 ½ to 2 times the equipment cost
- New versus used equipment



# Advantages of Large Plants

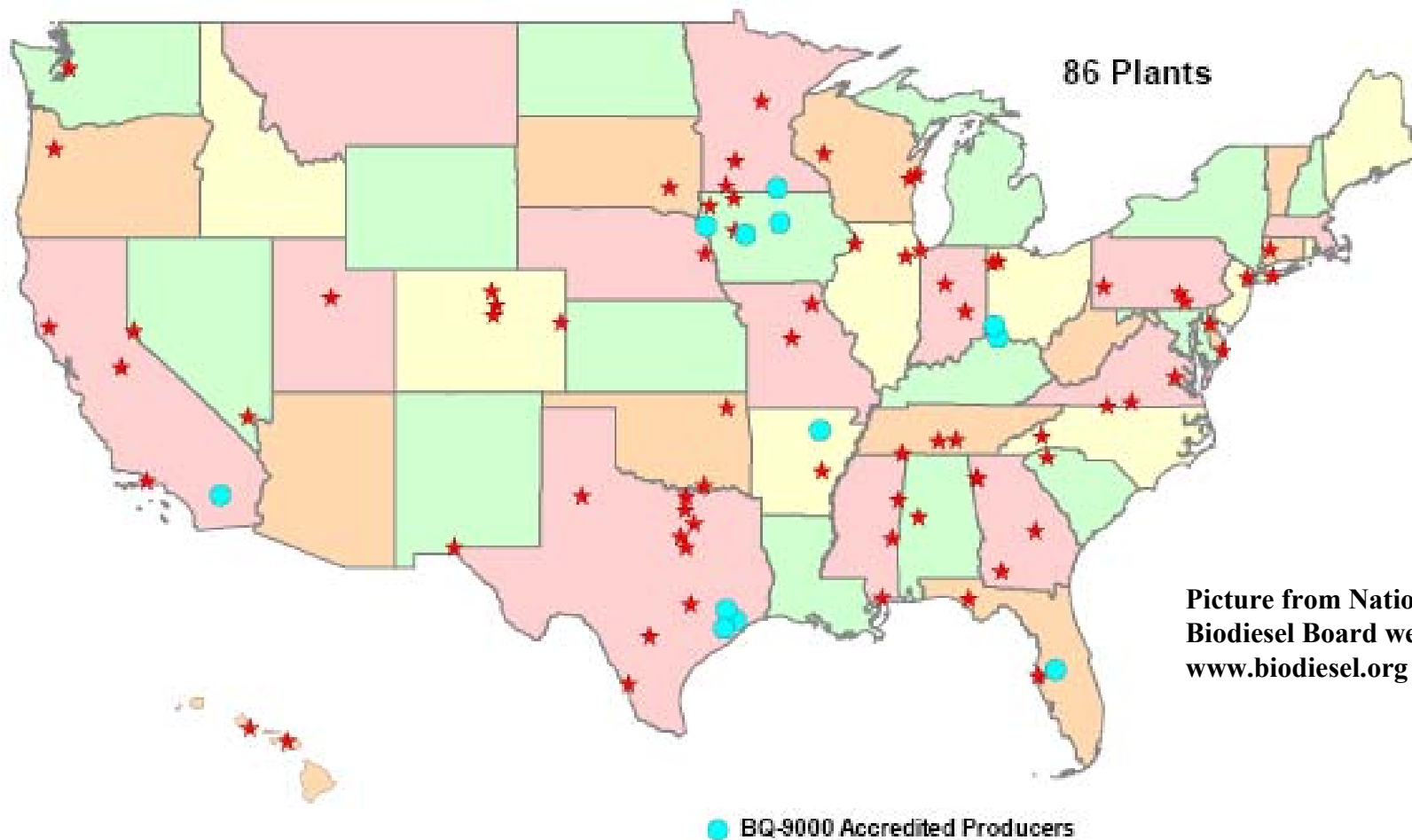
- Large plant > 10 million gpy
- Does a larger Biodiesel plant size make sense?
  - Don't only look at the numbers
- Benefits of a larger plant
  - Equipment cost per gallon produced are less for larger capacity plants
  - Operating expenses are usually less

# **Disadvantages of Large Plants**

- Need more customers
- Need more financing or capital investment
- Usually higher transportations costs
- Loss of efficiencies and quality when operated at reduced capacities or as a batch plant

## Where you find solutions

Commercial Biodiesel Production Plants (September 13, 2006)



Picture from National Biodiesel Board website [www.biodiesel.org](http://www.biodiesel.org)



Where you find solutions

# Current and Proposed Biodiesel Production

- Current biodiesel production in the US:
  - Estimated 581 million gpy
- Proposed biodiesel production in the US listed on National Biodiesel Board website:
  - Estimated 1.4 billion gpy
- Other plants being considered:
  - Estimated 250 million gpy



**Where you find solutions**

## **Why Write a Business Plan?**

- Forces you address all aspects of starting a biodiesel business.
- It's a road map for your business to follow – a living document.
- Proves that you have considered all aspects and risks of the biodiesel business and states how you are addressing them.
- Important for securing investors and financing.



Where you find solutions

# Parts of a Business Plan

- Request Page
- Table of Contents
- Executive Summary
- Business Description
- Management
- Market Analysis
- Marketing Plan
- Product or Services
- Manufacturing Plan
- Financial Data
- Supporting Documents



**Where you find solutions**

# **Ten Key Points to Remember When Writing a Business Plan**

- Be honest
- Write in easy to understand terms
- Describe your company's image and why you are starting a biodiesel business
- Provide the reader with an understanding of your business and how you will use the loan or monies
- Evaluate the company's management team



**Where you find solutions**

# **Ten Key Points to Remember When Writing a Business Plan**

- Do your strategic planning and put it in the business plan
- Quantify your markets and market area
- Illustrate major points or assets you have in the business
- Nature and complexity will vary
- Business plan is your sales document





**Where you find solutions**

# Resources

- Biodiesel Workshop, material from the Biodiesel Production, Analytical, and Business workshops, Iowa and Idaho, 2005, <http://www.me.iastate.edu/biodiesel>
- National Biodiesel Board, <http://www.biodiesel.org>
- USDA
- CIRAS and Iowa State University

# Resources

John Van Gerpen, Rudy Pruszko, Davis Clements, Brent Shanks, and Gerhard Knothe, *Building a Successful Biodiesel Business*, 2005, Iowa.



Available from

<http://www.biodieselbasics.com>



**Where you find solutions**

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