

# Biodiesel

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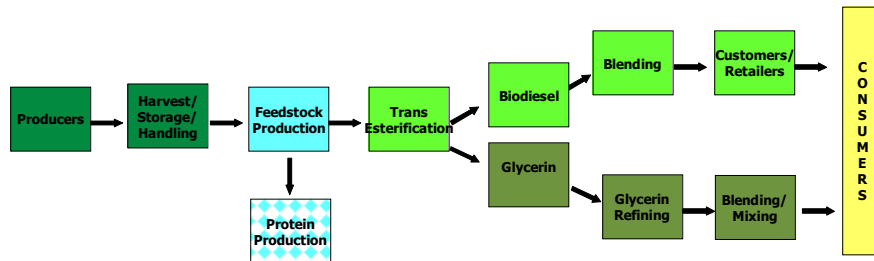
Biodiesel Supt.

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# Soy Biodiesel Value Chain



## Quick Facts: Iowa Falls

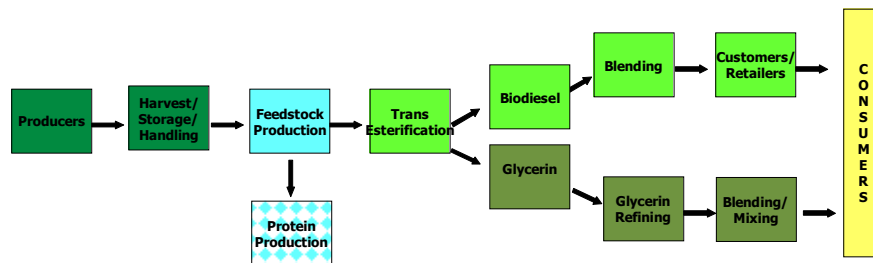
- **The largest biodiesel facility in North America: 40 MGPY**
- **Certified BQ9000 Accredited Producer**
- **Dedicated rail fleet to run biodiesel**
  - Iowa Falls is located on the UP and CN railroad
  - Closest BNSF interchange points are Council Bluffs or Dubuque
- **Capable of delivering B100 or B99.9**
- **Directly integrated with our soybean crush plant for consistent feedstock supply**
  - May some day utilize alternative feedstocks, subject to quality and customer acceptance
- **On-site laboratory and quality processes**
- **Integrated glycerin refinery making USP grade (99.7%) glycerin**



The Paseo Cargill Energy (our JV with a Missouri producer group) biodiesel facility in Kansas City is scheduled to start-up in Jan '08

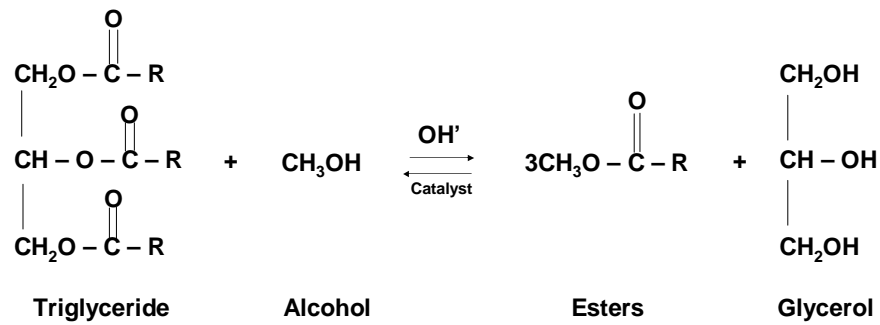
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## Soy Biodiesel Value Chain



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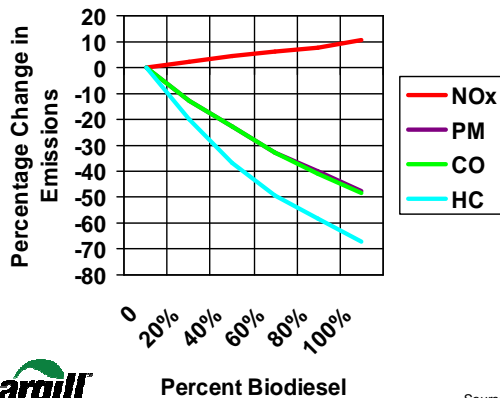
## Transesterification



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## Benefits of Biodiesel

**Biodiesel (SME) vs Diesel  
Emissions in CI Engines**



- **Renewable fuel**
- **Carbon dioxide decreases**
  - When replacing diesel with B100, CO<sub>2</sub> emissions are reduced 78%; B20 reduces CO<sub>2</sub> by 15.7%
- **Reduces tailpipe particulate matter, hydrocarbon and carbon monoxide emissions in most modern four-stroke CI engines**
  - Because B100 contains 11% oxygen by weight
- **New 2007 engine testing studies are underway evaluating emission profiles**



Percent Biodiesel

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Source: "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions, (EPA420-P-02\_001), [www.epa.gov/OMS/models/biodsl.htm](http://www.epa.gov/OMS/models/biodsl.htm)

## Biodiesel Feedstocks

- **Vegetable Oils**
  - Produced via extraction or pressed from seeds
  - Most biodiesel facilities require at least degummed vegetable oil, if not refined and bleached to ensure optimal reaction
- **Animal Fats**
  - Tallows (beef)
  - Greases (pork)
- **Waste Greases**
  - Recovered restaurant grease
  - Usually are mixtures of vegetable oils and greases

*The \$1.00/gallon federal excise tax exemption is on biodiesel produced from virgin vegetable oils, (also called "Agri-biodiesel"). "Biodiesel" produced from previously used oils and greases are eligible for \$0.50/gal excise tax credit.*



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## Biodiesel Usage in US

Reported Sales of Distillate Fuels (2003) – Billion Gallons

<b>Reported Distillate Sales 2003</b>	<b>63.8</b>
<b>of which:</b>	
residential	6.9
commercial	3.7
electric	1.1
industry	2.4
oil company	0.5
farm	3.2
railroad	3.7
vessel bunkers	2.2
military	0.4
off-hwy use	2.6
on-hwy use	37.1

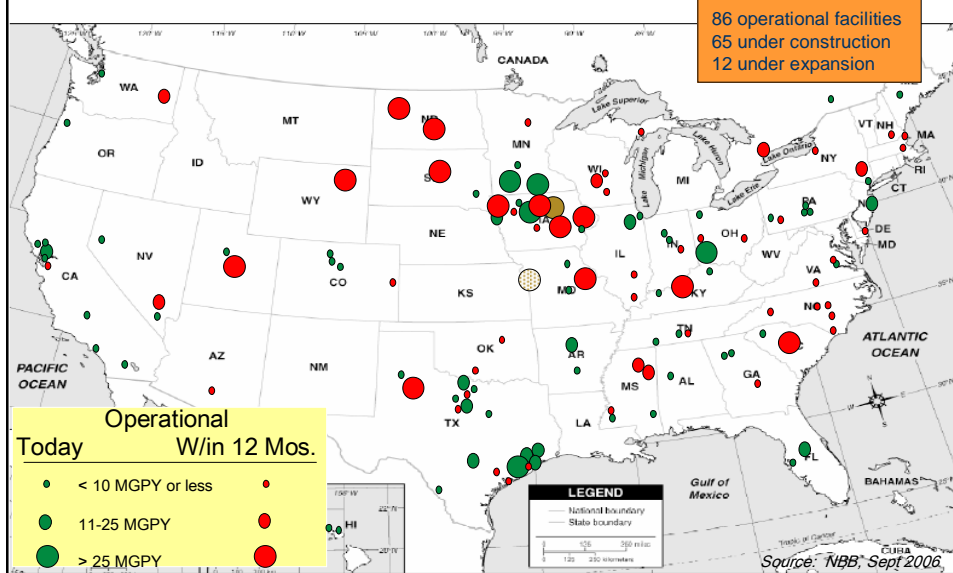


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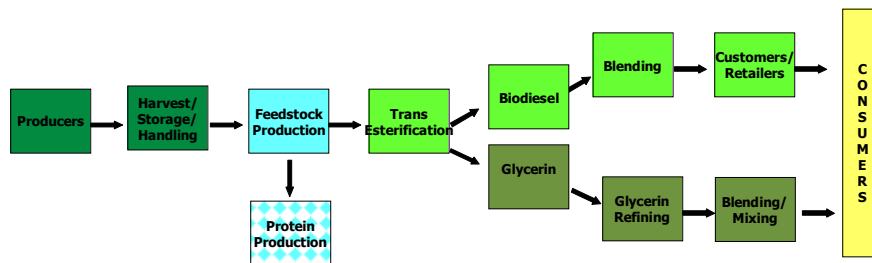
Source: [www.eia.doe.gov/](http://www.eia.doe.gov/)

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## Biodiesel Producers – Current and Under Construction



## Soy Biodiesel Value Chain



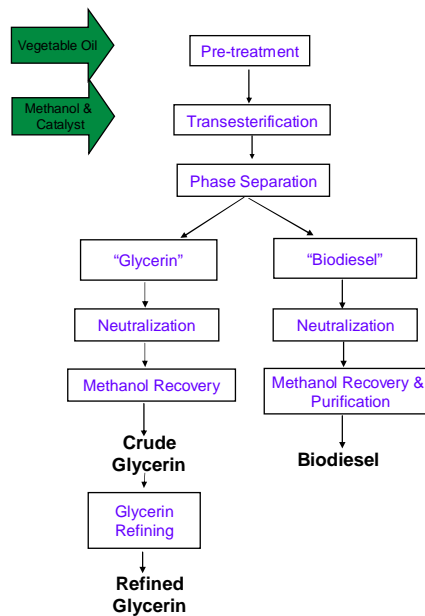
## What is Glycerin?

- **A clear, odorless, viscous liquid with a sweet taste**
- **A co-product in the transesterification process**
  - Crude glycerin is 80-83% purity
  - Refined glycerin is 99.5-99.7% pure
    - Cargill produces 99.7% USP grade glycerin
- **Is used as a humectant, plasticizer, emollient, thickener, solvent, dispersing medium, lubricant, sweetener, antifreeze and processing aid**



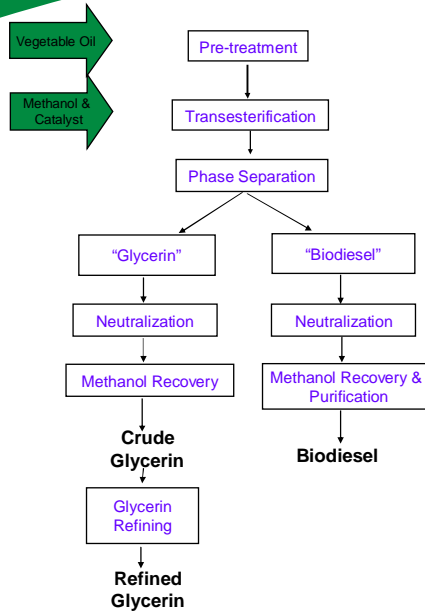
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## Biodiesel Production



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## Potential Wastewater Components



- Vegetable oil
- Free Fatty Acids - FFA
- Biodiesel – FAME
- Methanol
- Glycerin
- Sodium Methylate
- Acid
- Caustic
- Salt

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## Next Project

- Know the process
  - Use experts
    - Process technology
    - Wastewater processing
    - Regulatory officials
  - Understand water mass balance in the plant
  - Understand composition of individual streams
  - Understand characteristics of wastewater components
- Include wastewater in contract performance from Vendor
- Include wastewater in Site selection criteria
- Segregate streams and use appropriate technology

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**Questions?**

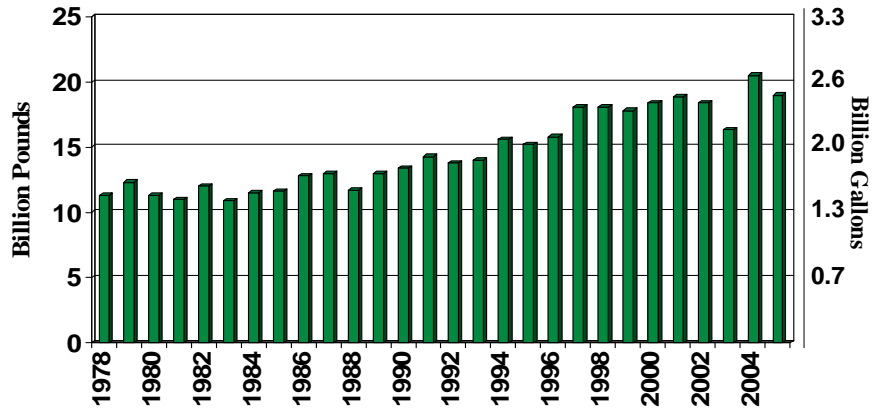
**Thank You**

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**Thank you**

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## Annual US Soybean Oil Production (Crude)

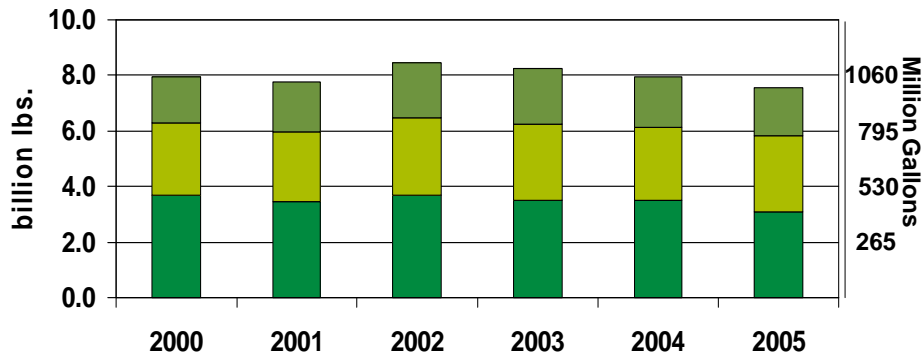


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Source: [www.soystats.com](http://www.soystats.com); USDA

## “Virgin” Animal Fat Production

■ Inedible Tallow ■ Grease ■ Edible Tallow



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# Biodiesel Production

