

# UConn Sustainable Energy Symposium

April 1, 2008

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CT Biodiesel/Bioheat Association

# CT Biodiesel/Bioheat Association

- Representing producers, marketers and affiliates
- Primary objectives
  - Establishing state incentives for the production and use of biodiesel in CT
  - Ensuring product quality
  - Outreach and education

# What is *biodiesel*?

Biodiesel is a cleaner burning, domestic and renewable fuel that can be produced from virgin or recycled vegetable oil and animal fat.

*Biodiesel, n*—a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of ASTM D 6751.

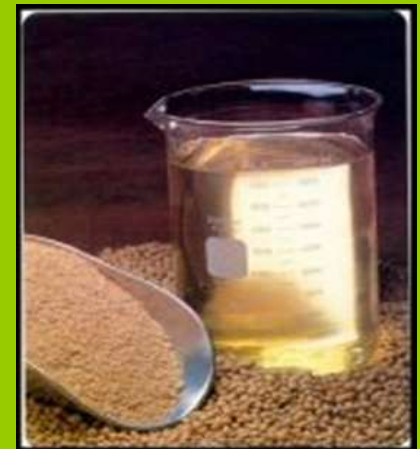
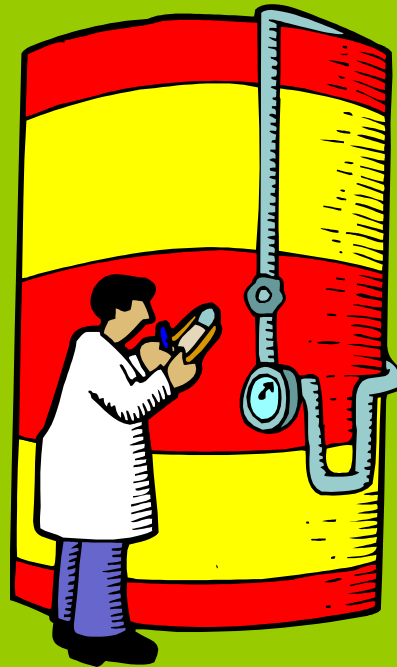
# How is biodiesel made?

Biodiesel is refined from vegetable oils through a fairly simple chemical reaction called *transesterification*.

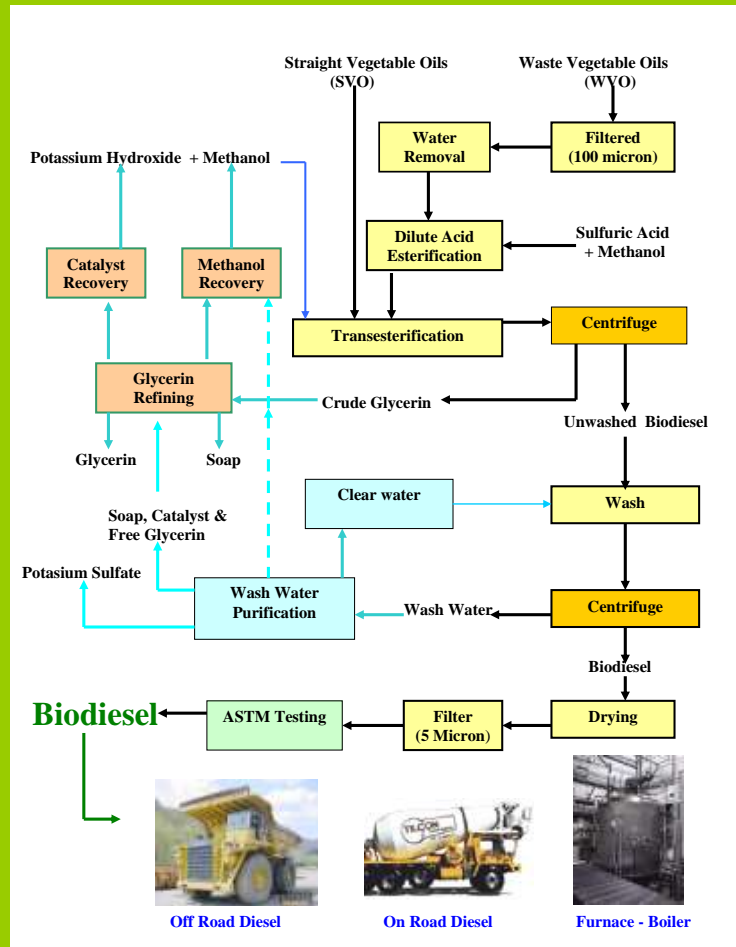
# How is biodiesel made?

(Catalyst)

**100 pounds triglyceride** + **10 pounds Methanol** = **100 pounds Biodiesel** + **10 pounds Glycerine**  
(Vegetable oil or animal fat)



# How is biodiesel made on a commercial scale?



- Several variations based on feedstock used and process/wash technology deployed

(see handout)

# How is biodiesel used?

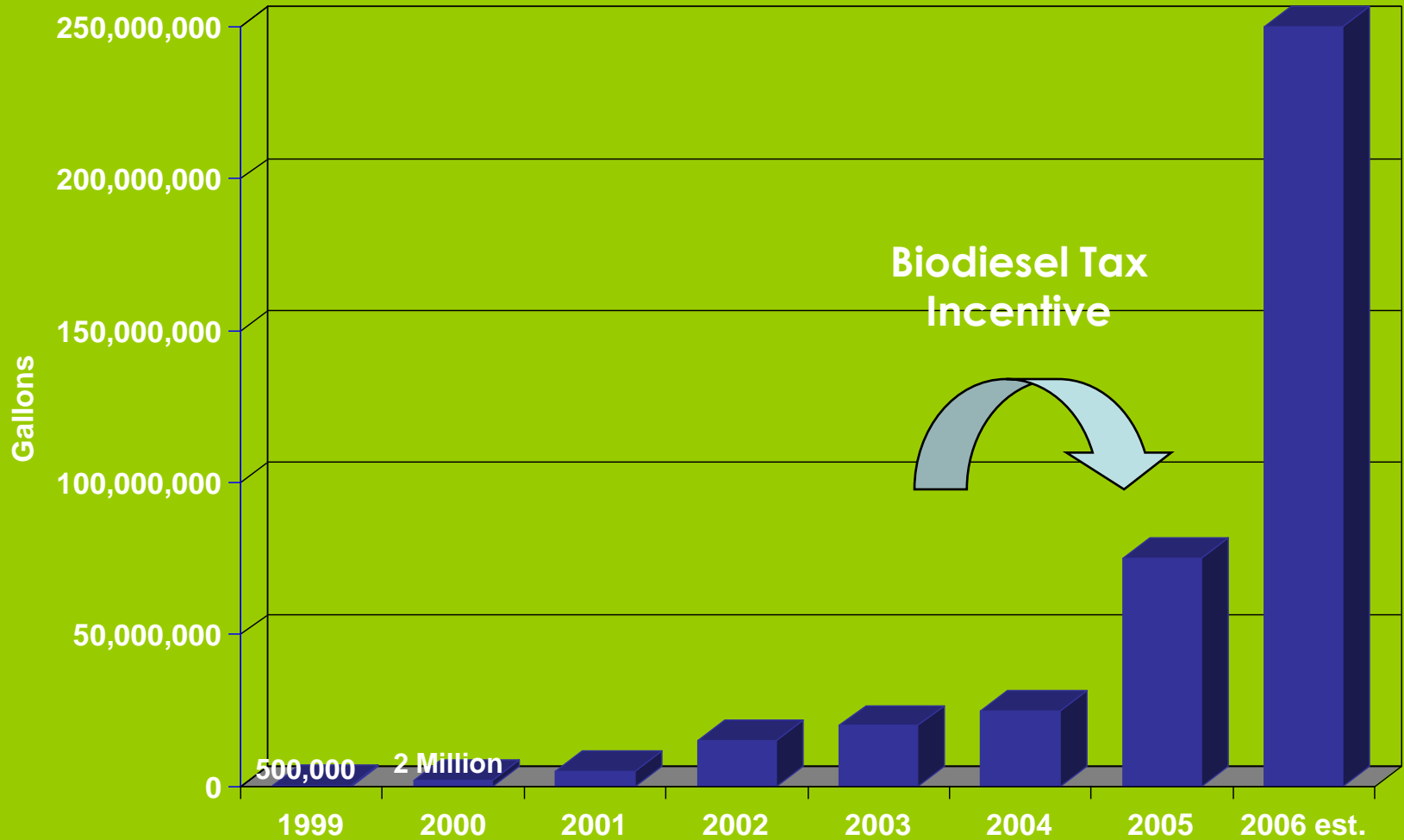
- Diesel engines
  - On-highway
  - Off-highway
- Oil-burning furnaces
- Easily blends with petroleum products



# Who is using biodiesel today?

- Military - U.S. Coast Guard Academy
- State Fleets - Connecticut DOT: over 1 million gallons of B20 used since 2001
- Municipal fleets - including New Haven, Cheshire, Glastonbury, Sharon and Salisbury
- Bus fleets - including Glastonbury Public Schools; University of Connecticut; Yale University

# U.S. Biodiesel Demand



# Key attributes of biodiesel

- **Renewable**

- A liquid fuel that, in essence, extracts solar energy from plants in the form of carbon stores through a simple process of refining the plants' oil. The plant oil (feedstock) is harvested from crops that are grown year after year.

# Key attributes, cont'd

- Biodegradable
  - Straight biodiesel (B100) biodegrades as fast as sugar, and even accelerates the biodegradability of petrodiesel, thus minimizing the environmental impact of fuel spills. Classified as a non-hazardous material.
- Non-toxic
  - Straight biodiesel (B100) is less toxic than table salt and irritates skin less than ordinary hand soap.

# Key attributes, cont'd

## Cleaner burning:

Bio Diesel is currently the only fuel which meets the EPA Tier 1 & Tier 2 Clean air targets.

### B-100 Biodiesel emissions vs. Petrodiesel

No Sulfur Dioxide emissions (ACID RAIN)

78% reduction in CO<sub>2</sub> emissions (GLOBAL WARMING)

48% reduction in CO emissions (SMOG)

67% reduction in unburned hydrocarbons (SMOG)

47% reduction in particulate matter (SMOG)

80% reduction in PAH (polycyclic aromatic hydrocarbons)  
(CANCER)

+/- NO<sub>x</sub> (nitrogen oxides)\*

# Positive energy balance

- Energy balance is the ratio:  
$$\frac{\text{Units of alternate fuel energy created}}{\text{Unit of fossil energy used to produce}}$$
- Soy Biodiesel: 3.5
- Ethanol: 1.2
- Diesel: .8
- Used Vegetable Oil Biodiesel: 7.8
- Biodiesel has the highest energy balance of any transportation fuel today

# Energy Security

- Surging national, regional and local interest in energy independence
  - Connecticut's annual petroleum demand is 3.1 billion gallons
  - 1.6 billion gallons are imported
  - 1 billion gallons of these imports originate outside the Western hemisphere
  - 320 million gallons originate from the Persian Gulf region (\$815M)

# Good or Bad?

- Rising concerns:
  - Food vs. Fuel
    - Population
    - Global climate change
  - Lifecycle CO<sub>2</sub> emissions
    - Low-tillage/no-tillage crops
    - Land use
  - Sustainability
    - Environmental
    - Economic
    - Social

Thank You!