Biodiesel

An Overview

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Biodiesel

- Part 1: Consumer Issues
- Part 2: Oilseed Processing
- Part 3: Biodiesel Production
- Part 4: US Biodiesel Industry

Biodiesel Facts

- What is biodiesel?
  - Fuel created from vegetable oil or animal fat
  - Can be used in traditional diesel engines
  - Biodiesel can be blended with diesel fuel
  - Biodiesel be produced in small or large quantities

Biodiesel Facts

- Lower energy content than Diesel
  - Biodiesel: 118,296 BTUs per gallon
  - No. 2 Diesel: 129,500 BTUs per gallon
    - Source National Biodiesel Board

Biodiesel Facts

- What type of oil is most biodiesel made from?
  - Soybean oil in the USA
  - Rapeseed oil in Europe
- Biodiesel can be made from any vegetable oil.
- Is biodiesel the same as vegetable oil?
  - No!

Biodiesel

- Will biodiesel damage my engine?
  - No…if the biodiesel meets the standards of ASTM 6751
  - One exception:
    - Biodiesel can damage certain natural rubber engine components over time.

SVO and WVO

- **S**trait **V**egetable **O**il (SVO) is not biodiesel
  - This includes **W**aste **V**egetable **O**il (WVO)
- Diesel engines can be **modified** to run on vegetable oil
  - Even modified engines have long term problems using SVO
  - SVO and WVO are deemed experimental in Montana and require a special permit

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Obtaining Vegetable Oil

- Step 1: Produce an Oilseed Crop

- Step 2: Extract the Oil from the Oilseed

Oilseed Processing

- The Oilseed Processing Industry:
  - Separates the “whole seed” into 2 or more products
  - The difference between the cost of the seed and the value of the products created is the “crushing margin”

Processing Technology

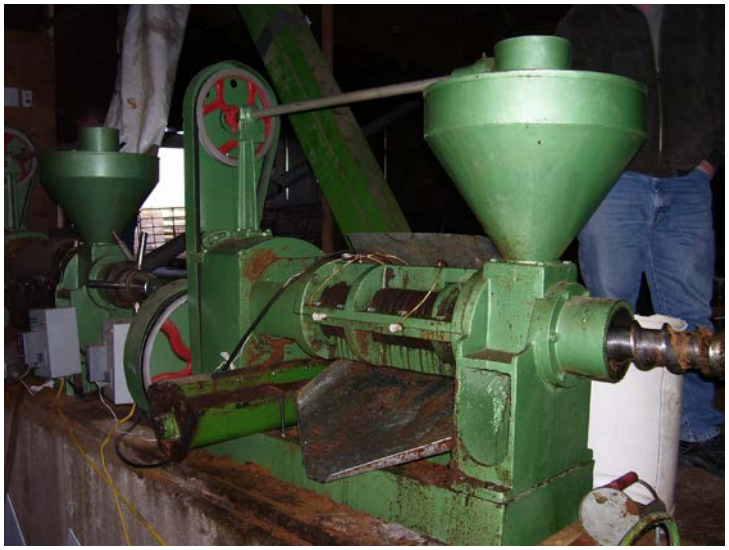
- Two General Methods
  - Solvent Extraction
    - Standard technology for facilities with daily capacities of greater than 300 tons per day
    - Commonly used in conjunction with some form of mechanical extraction
  - Mechanical Extraction
    - Typically used for facilities with daily capacities of less than 150 tons per day

Solvent Extraction

- Benefits:
  - Solvent Extraction is capable of recovering of 99% of the oil contained in the seed
  - Lowest cost per ton for commercial processing
- Draw Backs:
  - Large capital investment
  - Not feasible for small scale processing
  - Environmental concerns

Mechanical Extraction

- The basic process:
  - Seed Preparation
    - Removal of foreign objects
    - Removal of seed hulls or shells for some seeds
  - Extraction
    - Seed is processed by a mechanical press
      - Removing 65-80% of oil contained in the seed



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Example

- On-Farm Example:
  - If you plant 100 acres of canola,
  - with an average yield of 1,100 lbs per acre,
  - your production is approximately 55 tons

Example

- The 55 tons of seed will yield approximately:
  - 4,200 gallons of oil
  - 36 tons of meal

* Assuming: The seed has 38% oil content and press recovers 75% of the oil content in the seed.

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Biodiesel Process

- Basic Overview
  - Inputs: Oil, Alcohol & Catalyst
  - Outputs: Biodiesel & Crude Glycerin

Biodiesel Process

- Sample Recipe
  - Oil 100 Parts
  - Alcohol 10 to 20 Parts
  - Catalyst 0.5 to 3 Parts

* Manufacturers often provide a “basic” recipe to use as a starting point.

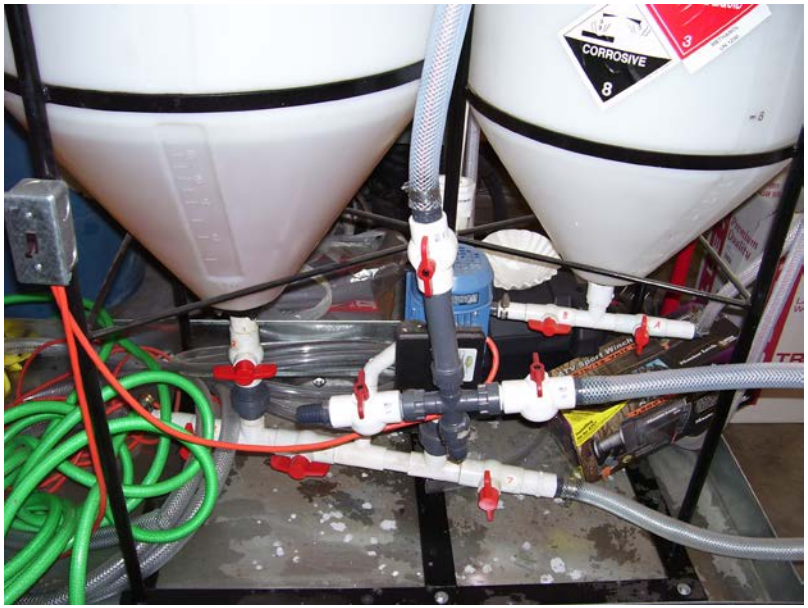
Biodiesel Process

- Outputs
  - Biodiesel 100 Parts
  - Crude Glycerin 10-20 Parts

Photo Courtesy of Joel Schumacher, MSU

Biodiesel Process

- Pre-Reaction Equipment
  - Oil Storage Tank
  - Alcohol Storage Tank
  - Catalyst Storage
  - Biodiesel “Reactor”
  - Pumps, Filters, Plumbing



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Biodiesel Process

- Post-Reaction Equipment
  - Settling tanks and/or Separating Equipment
  - Washing Equipment
  - Drying Equipment
  - Biodiesel Storage Tank
  - Glycerin Storage Tank
  - Pumps, Filters, Plumbing

Biodiesel Process

- Biodiesel Equipment
  - Micro Scale Processors
    - 300 gallons or less per batch
    - Numerous Manufacturers
    - Some sold as “kits”
    - Others sold as “ready to use”
    - Accessories included in the package varies

Biodiesel Process

- Processing 4,200 Gallons
  - 40 gallon processor: 105 batches
  - 60 gallon processor: 70 batches
  - 100 gallon processor: 42 batches

Final Products: Biodiesel Process

- Biodiesel
  - Personal Use
    - Fuel Quality is important
    - ASTM testing in not “required”
  - Off-Farm Use
    - Fuel Quality Very Important
      - ASTM Standards
    - Marketing is required

Final Products: Biodiesel Process

- Crude Glycerin
  - No Ready Market for Crude Glycerin
  - Quantity produced is 10% to 20% of biodiesel production
  - Contains Methanol & Catalyst
  - Possible Uses:
    - Compost
    - Fuel Oil
    - Refine to Pharmaceutical Grade Glycerin

Thank You for Attending

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