

# UTAH BIODIESEL SUPPLY

## Biodiesel 101: How To Make It

### The Basic Recipe (New Oil)

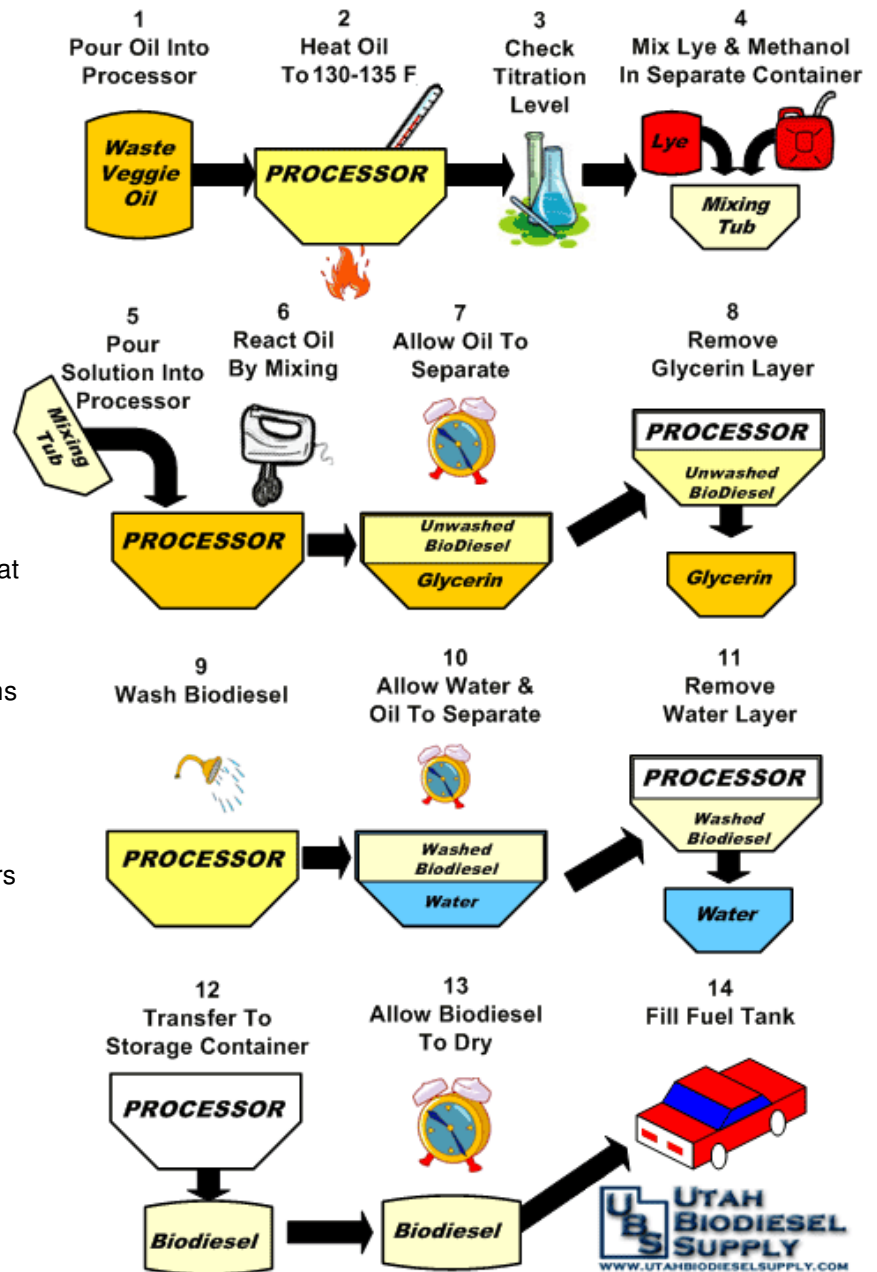
- 1 liter New Vegetable Oil
- 200 mL Methanol (Yellow bottle of Heet, racing fuel, etc)
- 7.0 Grams Potassium Hydroxide (KOH) a.k.a. Caustic Potash a.k.a. "The Catalyst"
- OR
- 5.5 Grams Sodium Hydroxide (NaOH) a.k.a. Caustic Soda a.k.a. Lye a.k.a. "The Catalyst"
- 1- Dissolve Catalyst into Methanol (this is called Methoxide)
- 2- Heat Oil to 120-130 deg F
- 3- Turn off heat & add "Methoxide" to Heated Oil
- 4- Stir Methoxide into heated oil
- 5- Allow to sit for about 2-4 hours
- 6- Drain off Glycerin & Wash with water

### Recipe For Used Oil

- 1- Start with a known amount of oil.
- 2- Oil Amount X 0.20 = Methanol required
- 3- Titrate Oil = Strong Base required
- 4- Mix Methanol & Strong Base together until fully dissolved
- 4- Heat oil to 130-135 °F
- 5- Kill heat source & add methoxide to oil
- 6- Mix for 2 hours
- 7- Allow to sit for 18-24 hours
- 8- Drain off glycerin
- 9- Wash out excess contaminants
- 10- Remove any water by drying the Biodiesel
- 11- Add final product to diesel tank
- 12- Drive away!

### EXAMPLE:

- 1- Add 100 liters of oil to processor & turn on the heat
- 2- Measure out 20 liters of Methanol
- 3- Titrate oil using KOH as strong base
- 4- Assume a Titration of 3.
- 5-  $3 + 7 = 10$  grams per liter.  $10 \times 100 = 1,000$  grams
- 4- Add 1,000 grams of KOH to the methanol
- 5- Allow the KOH to fully dissolve
- 6- Once the oil hits 130 deg F, kill the heat
- 7- Slowly add the KOH/Methanol mixture to the processor
- 8- Mix everything in the processor for at least 2 hours
- 9- After 2 hours, allow it to sit for 18-24 hours
- 10- After it's sat, drain off the glycerin
- 11- Transfer it to a wash tank
- 12- Wash and dry the Biodiesel
- 13- Once dry, add it to the fuel tank & drive away!



### ADDITIONAL RESOURCES:

- Utah Biodiesel Supply – [www.utahbio.com](http://www.utahbio.com)
- Collaborative Tutorial – [biodieseltutorial.utahbiodieselsupply.com](http://biodieseltutorial.utahbiodieselsupply.com)
- Make-Biodiesel – [www.make-biodiesel.org](http://www.make-biodiesel.org)

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# UTAH BIODIESEL SUPPLY

## Titration Used Oil For FFA% Content

### The Basic Method

#### **Items Needed**

- 1 Pint of Isopropyl Alcohol (the higher the % purity the better)
- 1 Liter of distilled water
- 1 Gram of Catalyst (either NaOH or KOH-should be the same as what you'll make your biodiesel with)
- 3 Small Cups
- 3-4 Small Syringes
- Ph Indicator (Phenol Red, Phenolphthalein, or Turmeric Powder)
- Sample of oil to titrate
- Calculator & some paper

#### **Make Titration Solution**

- 1- Add 1 Gram "Catalyst" to 1 liter distilled water
- 2- Mark as POISONOUS!!!

#### **Prepare Titration**

- 1- Add 10 mL Isopropyl Alcohol to titration cup
- 2- Add 1-2 drops of pH Indicator
- 3- Add small amount "titration solution" to "blank the titration"
- 4- Add 1 mL Oil Sample to titration cup
- 5- Dissolve Oil & Alcohol (heat can be your friend)

#### **Perform Actual Titration**

- 1- Fill second cup with 30 mL Titration Solution
- 2- Fill a syringe with 10 mL Titration Solution
- 3- Add 1 mL Titration Solution to Titration Cup & watch for color change
- 4- Repeat adding Titration Solution until color changes & stays changed for 30 seconds or more
- 5- Record amount of solution used to change color

#### **Calculating Catalyst Required**

X = Amount of solution used in mL

7 = KOH as catalyst

5.5 = NaOH as catalyst

O = Oil to be converted in liters

#### **Formula:**

If using NaOH for catalyst

$(5.5 + X) * O = \text{Total Grams of Catalyst to use}$

#### **Helpful Information:**

3.87 liters to 1 gallon

#### **Example:**

Using a KOH solution, it took 5 mL titration solution to turn the indicator

We have 40 gallons of oil we want to convert to Biodiesel

A)  $40 \text{ gal} * 3.87 = 155 \text{ liters}$

B)  $155 \text{ Liters} * .20 = 31 \text{ liters of methanol}$

C)  $7 \text{ (base)} + 5 \text{ (titration value)} = 12 \text{ grams}$  (So for every liter of oil, we'll use 12 grams of KOH)

D)  $155 * 12 = 1860 \text{ grams}$

#### **So, to make this into Biodiesel.....**

155 liters of oil

31 liters of methanol

1860 grams of KOH

Heat, Stir, Let Settle & Wash

#### **ADDITIONAL RESOURCES:**

Utah Biodiesel Supply – <http://www.utahbiodieselsupply.com/titrating.php> (example videos and details)

Collaborative Tutorial – <http://biodieseltutorial.utahbiodieselsupply.com> (then click on Titrating Oil)

Murphys Machines – <http://www.murphysmachines.com> (click on How To Do A Biodiesel Titration)