



WARNING: Always use Safety goggles and gloves when handling chemicals.

Biodiesel is only compatible with Diesel engines.

The quality of your biodiesel will depend on your production ability. It is a process that many people have taken years to perfect. SCINTEX takes no responsibility for any adverse effects homemade biodiesel causes to your vehicle, engine or associated components.

Biodiesel has solvent properties. It is possible it will remove deposits from your fuel tank and fuel system. These freed deposits can cause your fuel filter to become blocked. It is recommended that the first few times you use biodiesel in your car you check and change your fuel filters.

To reduce any adverse effects from Biodiesel, including poorly produced biodiesel and a reduced cloud point compared to petro-diesel, a blend can be used. For example a Blend 20 would include 20% biodiesel and 80% normal diesel.

Directions:

Step 1: Free Fatty Acid Titration

- See the instructions included with your titration kit.

Step 2: Heating the oil

For the biodiesel reaction to work in a convenient amount of time the oil needs to be heated to between 50oC and 55oC. Heating also makes the oil filtering process faster if you chose to do so.

Heating times can vary depending on location and ambient temperatures, if operating in very cool conditions one might consider insulating the reaction vessel to assist in containing heat.

WARNING: Methanol is highly flammable and it is not recommended you heat the oil to above 55°C.

WARNING: Spilt oil is a slip hazard. Take care while transferring.

- Load 150L of oil into the 200L reaction vessel (see Valve Diagram 1).
- Do not energise the heating element until it is fully submersed.

- By holding the 'SET' key on the temperature controller face plate the set-point of the heater can be adjusted, this is the temperature the element will aim to maintain your oil at. When the element is energised and heating the oil you will see a 'snow flake' symbol flashing on the controller face plate.
- A small amount of pump mixing may be required to ensure the oil is evenly heated throughout the entire vessel. NOTE: Excess pumping of oil during the heating process will over cool the oil and make achieving the set-point more difficult.
- The thermostat will turn the element off when the oil has reached the set temperature.

Step 2: Free Fatty Acid Titration

- See the instructions included with your titration kit.

Step 3: Making the Methoxide

This step will turn part of the Methanol into methoxide by dissolving the KOH or NaOH. The key here is to ensure all of the KOH or NaOH dissolves and will then easily combine with the oil and catalyse the Biodiesel reaction.

CAUTION: Methanol is highly flammable. Keep away from sources of ignition and always wear safety glasses and gloves.

- Load the 60L methoxide vessel with 30L of methanol (or 200mL per 1L of oil). This can be done by pouring or with an external drum pump.
- Slowly, add the amount of NaOH or KOH determined in Step 1. Warning – Adding NaOH or KOH to methanol initiates an exothermic reaction, this means heat is released. Care must be taken to slowly introduce the NaOH or KOH to the methanol to limit temperature elevations.
- After adding the KOH or NaOH, gently mix until solids dissolve. It is best to do this in a well ventilated space. You are advised NOT to use the electric pump provided with the kit to mix the methoxide.
- Leaving the lid off the vessel will allow any fumes to vent.

Step 4: Transferring the Methoxide to the oil

De-energise and disconnect the immersion heater from power source before proceeding past this step!

- Turn on the pump timer and start circulating the heated oil around the vessel, the valves should be set to Valve Diagram 3.

- The goal is to slowly introduce the Methoxide to the oil, this is achieved by throttling Valve 2 towards 100% open and closing in Valve 1 to give the pump preference to draw from the 60L vessel, refer Valve Diagram 2.
- The lid should be left on the 200L vessel to ensure methoxide does not splash onto your skin or eyes as this can cause irritation and blindness.

Step 5: The Biodiesel Reaction

The bulk of oil is made up of triglycerides. When reacted with Methanol and a base catalyst, esters are formed by the process known as transesterification. The resulting esters provide a hydrocarbon mix which is very similar in properties to petroleum based diesel.

Warning – It is possible for methanol fumes to be released during this mixing step. It is recommended all ignition sources be removed. The immersion heater should have been de-energised already at this step in the process

Circulating the Methoxide/Oil

- With the pump timer ON, align to Valve Diagram 3.
- Set the pump timer to 60 minutes.

Allowing time for the reaction

- Allow at least 1 hr for the Biodiesel reaction to occur.
- After 1hr of mixing, the Biodiesel reaction should have occurred and the pump will automatically turn OFF.
- Allow mixture to settle for 24 hrs .
- After 24 hours you should see two layers: A golden brown biodiesel layer which will be on the top and a dark brown, almost black, bottom layer which is the glycerol layer.

Removing waste glycerol layer

- The glycerol layer may be removed by draining through valve 4 (see Valve Diagram 4b) or by pumping using the valve settings in Valve Diagram 4a. If pumping is chosen the Return hose (1D) can be uncoupled from the top of the 200L vessel. Care should be taken when pumping not to cause excessive agitation of the biodiesel/glycerol interface.

Note: The glycerol layer will contain impurities such as methanol and KOH or NaOH. Please dispose of this waste appropriately. For instructions on disposing of chemical waste you may need to consult with your local council.

Step 6: Washing the Biodiesel

The biodiesel produced at this stage will contain traces of FFA's, soap, glycerol, water, methanol, KOH and other impurities. Refining your biodiesel from here will determine the final quality of your fuel. The three most common approaches are 1) Water Washing 2) Dry washing and 3) No further refinement except filtering.

It is recommended you use option 1 or option 2 to increase the quality of your biodiesel and thus reduce any adverse effects it could have on your vehicle. The dry wash (usually a powder) is put into the biodiesel and agitated. It acts a hydrophilic substrate which will absorb water soluble impurities and can also filter out small particulates. The main advantage of dry wash is that it can easily be separated from the biodiesel through filtration and does not introduce extra water to the biodiesel as with water washing.

Dry Washing your biodiesel:

Dry washing has a great advantage over water washing as once the dry wash is introduced to the biodiesel it can easily be filtered out again as desired. The following instructions relate specifically to the use of SCINTEX branded 'Siliwash'.

- Heat your biodiesel to 50°C - 60°C (Optional)
- Add 1-1.5% by weight 'Siliwash' to the biodiesel. This means for 150L of biodiesel, add 1.5 – 2.25 Kg of 'Siliwash'.
- Using the same directions for 'Circulating methoxide/oil' (Valve Diagram 3) allow the SiliWash to circulate for approximately 20 minutes through the pump.

Step 7: Final Filtering of the biodiesel

These instructions are for use with SCINTEX Biodiesel Filter Housings and filter bags.

If filtering 'Siliwash' from the biodiesel, SCINTEX recommends a 2 step filtering process. Firstly removing the bulk of the 'Siliwash' using a 100um or great filter bag. This step will quickly block the filter bag allowing most drywash product to be physically removed from the system and disposed off. Secondly a final polishing filter should be undertaken.

Biodiesel should be polish filtered to at least 5uM and preferably 1uM.

NOTE: SCINTEX offers the following advice for reusing filter bags

-Filter bags will generally clean up well in a light soapy water solution, however, the filter bag manufactures report the micron rating of the filter bag is not retained post washing. For this reason, SCINTEX does not recommend the reuse of filter bags for polish filtering of biodiesel.

Filter Housing Operation

When filtering, raw biodiesel enters via the upper threaded connection of the housing and the filtered product discharges via the bottom outlet. The vessel also includes a small air release port with a valve that can be used for depressurising the vessel and expelling air as required.

Filter bags can be loaded into the filter bag support frame by first removing the top of the filter housing and lifting out the compression plate and spring assembly. The filter bag should rest in the support housing with the snap ring seating at the top of the support basket. Re-fitting the spring and compression plate will hold the filter bag firmly into position, ensuring all the biodiesel passes through the filter bag.

- Set the valves to positions shown in Valve Diagram 5
- Turn the pump ON and set the timer to the time you wish to filter for, SCINTEX recommends a minimum of 10mins. The biodiesel will circulate through the filter housing and back to the 200L vessel.

Note: Your final biodiesel should be an orange or bronze colour and should be see through. If your biodiesel is cloudy it is not ready for use.

Discharging your biodiesel

Once your biodiesel is clean and filtered you can discharge it to a storage vessel using the following steps:

- Release hose 1D from the top of the 200L vessel using the swivel hose connector.
- Set the valves to the positions in Valve Diagram 6. Depending on the height of your storage vessel you may need to use the pump to remove all biodiesel from your system.

Step 8: Testing your Biodiesel

To be 100% certain you have made quality biodiesel requires laboratory testing. Such tests can tell you many things including Acid number, Inferred pH, Free Glycerine, Water content, viscosity and the list goes on. This form of testing is not always economically feasible for the home producer of biodiesel. However, there are some tests you can do at home to gauge the quality of your fuel.

Water Test

Place a small sample (50mL) of your biodiesel in a container and add 30mL of water. Shake vigorously for 10 seconds. The water should quickly settle out and be clear and see through. If the water is white or cloudy the biodiesel is still contaminated with soaps, KOH or other impurities. If the water fails to separate quickly from the Biodiesel this indicates an emulsion has formed and you have significant amounts of soap still left in your Biodiesel.

PLEASE READ

After making Biodiesel you will be left with a mixture of waste glycerol, water, methanol and KOH. This waste bi-product needs to be disposed of correctly to prevent adverse effects to the environment. For details on disposing of chemical waste you should contact your local council.

The sale of biodiesel is subject to GST and may also incur the fuel excise tax. You should consult the Australian Tax Office for your obligations regarding producing and selling of biodiesel. SCINTEX does not disclose any information on its customers to the ATO. SCINTEX does not promote tax evasion in any manner or method.