



## How The BioPro 150 Automated Biodiesel Processor Works



The BioPro 150 (BP-150) converts organic oils into an alternative to diesel fuel called Biodiesel through a chemical process. The common name for the process is called an acid/base catalyzation. It's just a fancy word meaning that the oil is chemically altered to allow it to run in an unmodified diesel engine.

What's unique about the BioPro 150 is that the majority of this process is done by the machine with very little user interaction. Instead of having to turn valves, meter in chemicals, and carefully monitor the machine, you just pour everything in, press a button and walk away.

Before starting the process, the user simply fills the machine with 40 gallons of filtered, dewatered oil. The oil can be any organic oil (tallow, fats, vegetable oil, etc), but in most cases, waste vegetable oil is the most commonly used feedstock to make biodiesel with due to it's wide availability.

Due to its smaller size, the 150 employs only one tank to accommodate the methanol/methoxide used for the esterification/transesterification reactions. After filling the machine with oil, the user fills the machine with a predetermined amount of methanol. The user must then stay with the machine for about 8 minutes while the methanol is pumped out of this tank into the main reaction vessel, after which the catalyst and a second dose of methanol are added to the tank. The only other interactive difference between the 150 and the 190 occurs during the wash cycle: after each automated spray wash or turbulent wash cycle the waste water must be drained off manually - total time is approximately 5 minutes.

How does the machine convert the the feedstock oil into ASTM grade biodiesel?

### **REACTION 1 - ESTERIFICATION**

a.k.a. the "Acid" stage During this stage, the machine mixes sulfuric acid and a portion of the methanol into the oil. The sulfuric acid goes on the hunt for free fatty acids and modifies them so that the methanol can attach to them and create biodiesel.

Over the course of a few hours a lot of heating and mixing will occur to make sure that the acid and the methanol have had a chance to do their job. This is because a thorough Acid stage helps to make the Base stage successful.

### **REACTION 2 - TRANSESTERIFICATION**

a.k.a. the "Base" stage After the acid stage has occurred it's time for the real action to get started. In this stage the machine mixes in the Base catalyst and the rest of the methanol. During this stage, the catalyst, which is usually Lye (Sodium Hydroxide - NaOH) or Caustic Potash (Potassium Hydroxide - KOH), attacks the oil and begins breaking the molecules apart into glycerol and fatty acid chains (the catalyst used is extremely powerful!). Just after the molecules are broken apart the methanol begins to attach to the fatty acid chains. This causes the glycerol molecules to begin to drop out of the mixture into a mixture called glycerin.



This stage takes several hours to occur as well. While this stage is happening the machine is mixing the oil, chemicals, and methanol together with an extremely powerful, tri-blade impeller. This helps to really mix things together and helps ensure that all of the oil has a chance to be chemically altered.

### **SETTLING PERIOD**

a.k.a. Glycerin Drop Out After both reactions have occurred, the oil is allowed to settle for a period of time. This allows the glycerin to fall to the bottom of the tank and separate away from the freshly made biodiesel. The settling can take several hours and helps to ensure that everything settles out properly.

### **MID POINT - DRAIN GLYCERIN**

At this point, the user comes back to the machine and drains out the settled glycerin and begins the washing cycle.

### **WASHING BEGINS**

The BioPro 150 now begins the washing part of the process. During this process, the machine will turn on the heat and lightly spray a mist of clean, fresh water into the biodiesel to begin the process of cleaning the biodiesel. It may sound strange to add water to biodiesel, but it works. Because water is heavier than biodiesel, it quickly falls to the bottom.

As the water falls, excess methanol and soap molecules attach to the water and fall with it, thereby cleansing the biodiesel. After the first mist wash, the water is then drained out manually and another mist wash is performed, only this time the big tri-blade mixing impeller comes on mixing the water and the biodiesel together to create a wonderful washing action. They call it an "agitated wash cycle" and agitate it does! It mixes the water thoroughly with the biodiesel so that it pulls the most impurities it can out of the biodiesel.

The machine then lets everything settle for a few hours. The user comes back to drain off the water and continue with another agitated mist wash. In an effort to cleanse the biodiesel the best it can, the machine performs this last wash cycle with the massive tri-blade impeller going in full force. Once it's done the water settles to the bottom and is automatically pumped out by the machine.

### **DRYING BEGINS**

Now the final settling stage begins. After the wash water has been drained off, the heat remains on and the tri-blade impeller kicks in again. The combination of the heat and the mixing help to evaporate any excess water from the freshly washed biodiesel. After the heat & mixing is done the BioPro allows the biodiesel to settle out one last time. During this time the now heated biodiesel evaporates off any excess water. When the process is complete, you're left with a clear, clean tank of biodiesel that is ready to use!

And that's it! That's all there is to it. Instead of having to transfer everything around from container to container the machine does it all for you. When it's completed you can even hook up the hose to the included fuel pump and pump the finished biodiesel right into your vehicle! **How's that for automation!**

If you'd like to learn more about how the machine works or just have a general question for us about it, feel free to [contact us](#).  
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