

Can It Be Done?

By Lyle Pearl, June 2005.

I have been running a 1980 Mercedes car on vegetable oil for 5 months without a flaw. Many people are shocked when I tell them that I do it. I usually get responses like “No way!” “Really?” and “Get out of here!” They want to know how I do it and if vegetable oil performs as well as diesel fuel.

Rudolph Diesel designed the diesel engine to run off vegetable oil and it has been done successfully for over 100 years. I have talked with other people who are doing it and have read numerous success stories.

Doug Watson of Ohio conducted a horsepower (HP) Dyno performance test on his 1995 6.5 Ltr. Chevy. The results from the test performed on October 21, 2004 are 151.7 HP while running on vegetable oil compared to 145.3 HP on diesel. This indicates that there is not a decrease in power from using vegetable oil and there may even be a gain. I do not notice a difference in performance between the two fuels and experience a quieter ride while burning vegetable oil probably because it is a better lubricant.

A story did emerge in the 1990's that told of possible coking of vegetable oil (carbon build up on the pistons and fuel injectors) from the incomplete burning of the fuel. This seems possible in theory and simple back-up systems provide safeguards. A two fuel tank system is employed to heat the oil before it

enters the fuel filter and injector to ensure a clean burn. This is also necessary to ensure the viscosity of the oil has been decreased enough to flow since oil thickens as it cools and even solidifies a temperature of around 25 degrees Fahrenheit. Also, it may be beneficial to use a fuel injector/piston cleaner every six months to remove any accumulated carbon deposits. Simply pour the 12 ounce bottle into the tank and drive off.

Types of fuels

First of all there are a few different fuel types to be aware of. Vegetable oil, or SVO (straight vegetable oil) is harvested from many renewable sources like soybeans, sunflower seed, rape seeds, corn, palm and algae. It is most commonly collected from restaurants. Restaurants usually pay for spent oil disposal so they are usually glad to give their used oil away for free. I have even heard of one collector being treated to a gourmet meal simply for taking the used oil off the restaurants hands. SVO must be pre-filtered and heated before entering the fuel filter and injectors. A company is starting to import a less expensive, virgin non-edible vegetable oil which will make a great SVO and avoid the pre-filtering process. SVO may be the best way to use vegetable oil in a diesel as there is no processing required. This makes it the most efficient way to get the oil from the field to the fuel tank.

Biofuel (commonly referred to as B100 and biodiesel) is made from vegetable oil. There is a 90%

reduction in emissions when choosing to use biofuel over diesel. Biofuel has been chemically altered so that it remains at an adequately low viscosity at lower temperatures. B100 does not have to be heated before it enters the fuel filter and injectors. The drawback to B100 is its relative unavailability though it is being sold at Co-op's and is becoming more popular. Most people using B100 make it at home. The process to make biofuel is not complicated. It is made by way of a simple chemical process known as transesterification (similar to saponification--the chemical reaction used to make soap out of a vegetable oil/animal fat.) Used vegetable oil is collected then heated to between 120-130 degrees Fahrenheit, and then filtered to remove any large particles such as french fries and tempura. Methanol (20% of volume) and sodium hydroxide (lye at 3.5-9 grams per liter) are mixed then added to heated vegetable oil and mixed for one hour. The mixture is left overnight and the glycerin by-product settle to the bottom of the container. The top layer is a vegetable based fuel ready for use (greaseworks.org.)

Also, rubber engine seals in older vehicles must be replaced since biofuel has strong solvent properties. All newer diesel vehicles are fit for B100 since there are not any rubber seals.

B100 is combined with petrodiesel at a ratio of 1 to 5 to produce B20 (20% biofuel.) B20 may be used in any diesel engine without any modifications or additions. Emissions are reduced and 20% less petrodiesel is used. B20 is becoming more available

throughout the country and is available at the Amigo gas station on Cerrillos Road at Baca Street in Santa Fe, New Mexico. Remember that B20 can be used in your diesel now without any modifications and concerns.

Diesel fuel (commonly called “dinofuel”) is the standard petroleum based fuel available for sale at many gas stations. This is the least environmentally friendly of all the fuels mentioned above. In fact, it is not environmentally friendly at all as its use adds to global warming, air pollution, health problems and wars. Biofuel is a relatively environmentally friendly fuel but does require the use of lye and methanol. Chemicals are not required to make vegetable oil since it is a product from direct from Mother Nature.

How it works

My goal is to maximize the percentage of vegetable oil burned compared to other fuels. I use a two-fuel tank system to ensure that the vegetable oil is heated. Remember, vegetable oil congeals more readily than diesel fuel at low temperatures and its viscosity must be decreased enough to flow through the fuel line and oil filter. Vegetable oil in general is thicker than diesel fuel and must be warmed to ensure proper spray through the fuel injector and a hot enough burn in the cylinders to avoid possible coking (pg 1.) problems.

The vehicle is started on straight diesel, B20 or B100. The coolant system (as with all vehicles) removes excessive heat from the engine and warms the cabin when the heat is switched on. The engine would burn up without a coolant system. Heat from the coolant system is piped to the tank holding the vegetable oil which is set in the trunk. Coolant simply runs in a tube to the veggie tank and is dispersed to the oil by a heat exchange. The heat exchange is similar in appearance to an air conditioning or refrigerator coil. Oil from the veggie tank touches the metal fins of the coil and picks up heat from the coolant by conduction, the same way you would warm your hands on a cup of coffee. The liquid coolant returns to the engine, picks up more heat, returns to the radiator and then again to the veggie tank to disperse more heat in a continuous cycle. The required amount of warm-up time depends upon the temperature of the vegetable oil which in turn depends on the weather and when the engine was last run. A switch in the cabin is manually thrown once the oil is warm enough, allowing pure vegetable to flow and take over as the fuel source. The oil is sent through a heated filter to ensure the oil is clean and viscous enough before entering the fuel injectors. The switch is thrown again a few minutes before stopping for a prolonged period of time to ensure that vegetable oil is purged from the fuel line leading to the injectors as well as the injectors. The lines must be replaced with a fuel that sustains its viscosity such as B20, B100 or diesel fuel.

What are the advantages to using vegetable oil over diesel as a fuel?

- 1) Recycle oil from restaurants.
- 2) Greatly reduced emissions! Doug Watson from Ohio conducted a standard opacity emissions test on his 1995 6.5 LTR Chevy at a State of Ohio official vehicle inspection station. The vehicle released 3.4 ppm (parts per million) when run on diesel fuel compared to 1.8 ppm when run on vegetable oil. Burning diesel fuel released almost two times as much visible pollution as vegetable oil does.

There is no sulfur in vegetable oil and therefore no sulfur in the emissions! There are sulfur dioxide emissions from the burning of diesel and also biofuels. Sulfur dioxide emissions lead to acid rain which acidifies lakes leading to kill off, burns trees, and increases social stress from the rusting of statues to degradation of infrastructure. Burning biofuel is still a logical choice over diesel as biofuel releases 90% less toxic chemicals.

When choosing to use straight vegetable oil over diesel fuel, carbon monoxide emission is reduced by 40-60% and overall carcinogens are reduced by 90%. Hydrocarbon emissions are reduced by 50% which reduces photochemical smog (ozone) by 50% as well. Particulate matter, a major contributor to increased asthma cases, is reduced by 45% (<http://www.veggiebus.com/fags.htm>.)

This is similar to the findings from the emissions study conducted by Doug Watson on his 1995 Chevy.

The power is in your hands, ALWAYS! Take responsibility. Everybody's talking about it and you can do something about it. You can reduce your effect on global warming. Be a part of the natural carbon cycle. As an oil bearing plant (actually each and every plant) grows, it takes up carbon dioxide (CO₂) from the atmosphere. The same CO₂ is released back to the atmosphere when vegetable oil is burned. This process is referred to as "Carbon Neutral." Burning fossil fuels continually adds to the carbon load of the atmosphere. The current planetary carbon dioxide output is well beyond the Earth's natural ability to trap it. Hence, the atmosphere has the highest CO₂ concentration in modern times and most scientists believe this to be the cause of global warming. All ice core samples indicate that global average temperature increases with an increase in atmospheric CO₂.

3) Stop supporting wars for oil and Mankind's reliance on corporations. Basically, decrease your reliance on a system that you criticize. There are alternative sources of energy, NOW! They hydrogen cell sounds fantastic, but it is not here, now! Create a new system, one that reflects your values. It's easy. Many people are doing it and we can all do it together.

4) Oh yeah, it will save you money in fuel costs.

5) And finally, hobbies are fun!

Oil Gathering

Gather a few containers for transferring the oil from the source to your filtering destination. I use the same

5 gallon jugs that the restaurants receive the fresh oil in. Choose a clean source of oil. The better the quality of oil, the easier the filtering will be and the filters will last longer. Oil from Japanese restaurants is usually the best choice because their method of deep frying is usually quicker so less residue is left behind in the oil. A superior oil will be amber in color and is referred to as "liquid gold." Oil from other types of restaurants may also be suitable. Always ask the management before taking their oil. They are usually happy to give it to you since it saves them money in disposal fees. I collect the oil using a 12 volt fuel transfer pump which runs off the vehicle's battery. One hose is placed in the oil to be collected and the other end is placed in the collection container. The pump mechanically moves the oil from the source to the containers.

Oil Filtering

Now this is the fun part! Obtain filter bags that are rated to .5 microns. These bags are made of a tightly woven material and may be purchased from Greasel Company or constructed on your own. There is no limit to what you can imagine. Allow the oil to settle in a barrel for about a week so that most of the particulate matter settles to the bottom. Doing this will greatly extend the use of a filter bag. The muck on the bottom of the container is eventually discarded. Pump (using the fuel transfer pump) or scoop the oil with a bucket into a filter bag that is suspended above a barrel. There is a loop attached to the top part of the

filter bag so that it can be suspended by a string that is looped onto a hook which is screwed into a beam of a ceiling. Be sure to pump or scoop from the top of the barrel as most of the particulate matter and possible water contamination has settled to the bottom. The oil will filter through the bags and then into a clean barrel located directly below the filter bag. Have dinner and a beer and wala! The oil is now ready for use.

Fueling The Tank

Pour the clean oil into the veggie tank using a funnel or the fuel transfer pump. That's all there is to it!

How much does it cost to do?

Conversion kits are sold on various websites. Some sites are

www.greasel.com Offer SVO conversion kits

www.biofuels.ca/ Offer SVO conversion kits

www.distributiondrive.com Offer SVO conversion kits

www.greaseworks.com Offers equipment to convert to B100 including installation of new Viton hoses.

The kit used in our Mercedes cost about \$500 and installation is around \$1000 unless you can install it yourself. The initial cost may seem a bit expensive but keep in mind all the money you will save in fuel costs. Oil filter bags cost \$12 each and filter about 100 gallons of relatively clean and very well settled oil. They will filter a lot less if the oil is dirty or has not been allowed time (usually about 1 week) to settle.

Replacement engine oil filters cost about \$30 and will filter as much as 8000 miles worth of oil.

Conclusion

This may seem like a complicated process. Many things we consider doing seem complicated until we finally do it. Running a diesel vehicle on straight vegetable oil sounded like a fantastic idea to me back in 1999 but I thought it would be a lot of work and life would be much easier to continue in my current routine. I stepped out, took a chance and suddenly the thought was manifest into reality. I assure you the mental leap will be easier than you think if you use the following steps below.

- 1) Obtain a diesel vehicle.
- 2) Purchase a conversion kit and have it installed by a trusted mechanic. My mechanic did a top-notch job.
- 3) Get containers and a fuel transfer pump for ease.
- 4) Talk with a local restaurant and secure an oil source.
- 5) Collect the oil.
- 6) Filter the oil.
- 7) Fill your veggie tank.
- 8) Have fun!

At the time this article was put together 5 months ago, I did not have a chance to run my

vehicle during the warmer months of the year. Our summers here in Santa Fe, New Mexico are quite hot and the vegetable oil in the vehicles tank remains fairly warm. I have been running the engine completely on straight vegetable oil since the middle of May and have not had any problems. I am aware of the possibility of engine coking (pg. 1) and will continue to look for signs. I have and will continue to use a fuel injector and piston cleaner to decrease the chance of mishap. I have forgotten to switch over to B20 or diesel before stopping for a prolonged period of time during the colder months and the effects were noticeable. Starting is hard and at sometimes impossible until the outside air temperature warms the oil in the fuel injectors enough to flow and spray through the jets. In this case, a hair dryer may be used to blow hot air over the injectors to speed up the warming process. I have read that hot water may be poured over the injectors to achieve the same outcome.

This entire experience has been exciting with its up's and downs. The downs are all related to the problems of owning an older car and not related to the conversion process. Please send your comments and questions to hike2mountaintop@yahoo.com . Happy oil gathering!