



CLEAN ENERGY RESOURCE TEAMS

CASE STUDY: BIOFUELS | CENTRAL REGION

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# Eco-domes: Turning Used Fryer Oil into an Abundant Alternative Fuel

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At the Eco-domes Conservation™ Campus in Brainerd, MN, used fryer oil has a new purpose—to power engines. When David Winkelman wanted to run a diesel engine on a clean fuel, he didn't grow energy crops. Instead, he went to a local restaurant. He discovered that an abundant energy source is sitting in restaurants—used fryer oil.

Used Fryer Oil (UFO) is generated by many restaurants and they are usually happy to give it away for free to people who ask for it. Through a conversion process, technicians can convert diesel engines to run on the UFO fuel. This technology isn't entirely new—the first diesel engine, designed in 1894, was designed to run off peanut oil, another type of vegetable oil.

The UFO fuel must go through a cleaning system before it can be used as a fuel source. First, the used oil needs to be poured through a screen into the barrel to filter out larger waste material. Then you need to turn on the barrel heater to warm the oil. Once the oil is warmed to between 100°F and 150°F, turn off the heater and turn on the pump to flow the warmed oil into and through the centrifuge. The centrifuge uses natural processes to filter the oil to one micron. Then transfer the clean oil to your vehicle, storage container or finishing tank for use when you need it.

A UFO system involves adding an additional fuel tank and delivery system to a diesel vehicle or generator. The engine's existing diesel tank and filter will supply diesel fuel to the engine at start up and shut down. After start up, radiator fluid transfers heat from the engine to the heat exchangers in the UFO heat system. As the heat warms the UFO, the viscosity (resistance of flow) of the oil is reduced so that it is similar to diesel fuel and can be injected into the engine properly. Once at proper temperature, a switch is flipped to begin running on UFO (and shutting off the diesel fuel supply to the engine). When the vehicle is being shut down, the switch is flipped

back to run on diesel for a few minutes prior to shut-down. This cleans the UFO out of the fuel system and prevents the oil from thickening in the engine (assuming the engine is shut off long enough for the fuel to cool down).

The Eco-domes company car and truck now run on the UFO fuel. From Winkelman's experience with the fuel, the mileage is great, the engine seems to run better because of the lubrication properties of the UFO fuel, and there are fewer emissions from the vehicles as compared to those that run on diesel because there is little visible black smoke from the ignition as compared to diesel.

One unexpected challenge the team at Winkelman's encountered was that the UFO fuel was able to leak through the many connections between fuel cleaning equipment pieces, especially between metal pieces, no matter how tight the connections were made. This challenge was unexpected and so far has not been solved.

If the team were to attempt this project again, Winkelman said they would prepare more for oil spills and devise an easier way to clean them. The sticky and liquid nature of the used fryer oil meant that spilled oil around the equipment became a sticky mess that was virtually impossible to remove all of it from the concrete floor.

The cost to install a system in a personal vehicle can cost between \$850-\$1000 for the conversion kit and between \$1200-\$1500 for labor costs; the conversion can usually be completed within one day.

Winkelman shared why he thinks the need for UFO fuel is so important: "All of us need to be looking for better alternative fuels to reduce our carbon footprint and emissions. UFO is an abundant waste that needs to be put to the best use possible...Replacing diesel and reducing pollution is a great way" to do just that.

For more information, contact WERC at 218-764-2321

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