

Biodiesel Pre-Treatment Station

Team Members: Rainer Rodriguez, Harrison Mejia, Favyan Torres
Advisor: Dr. Andres Tremante

As fossil fuels are exhausted, the dependence on alternative energy becomes a necessity. Biodiesel is a rising, dependable renewable resource, which over the years has become increasingly popular. Biodiesel, which can be used in diesel engines, is mostly made from waste vegetable oil. The production of biodiesel however, requires the oil to have a certain purity; currently the raw products being obtained are far from that. The waste vegetable oil is mostly being obtained from restaurants, and it contains high contents of water and food debris, which cannot be processed through any biodiesel producing equipment.

The proposed idea is to design a device that will separate the desired oil from the water and debris. Acting as a pre-cleaning station, the design will allow biodiesel companies to purchase impure oil, purify it using the system and finally, run it through their plant. The main components of the design include: a pump to transfer the oil from one end of the system to the other; a storage tank where the purchased oil will be placed; a heater to heat the initial oil supply and lower its viscosity, thus requiring less pumping power; a centrifuge to separate the oil from the water as well as some of the debris; and a series of macro and micro filters. The prototype's expectations are to consistently produce oil that is 99% pure, thus leaving little room for design error. The system's obligation is to allow companies to purchase waste vegetable oil of any purity and eventually be able to use the cleaned oil; the final product will be efficient, dependable and cost effective.

The water content and amount of debris within the oil will differ depending on the supplier and the purpose that the waste vegetable oil served. Understanding this, one of the priorities is to design a prototype that can be adjustable to the type of oil being used. By having a series of valves, which can be closed or opened, the flow of the oil within the system can be controlled. Depending on the impurity of the oil, certain portions of the prototype can be sealed or unsealed, for example if the material being ran has an already high purity level some portions of the system can be closed and the desired final product will still be obtained. Another priority is for the pump to take the raw material from the storage tank at one end, run it appropriately through the system once, and obtain the desired oil at the other end. It is a point of emphasis to have a system that only requires one pass through, as this will save time and money. To further improve the efficiency and cost effectiveness of the system, the concept of solar energy will also be explored. Incorporating a solar energy component into the system can reduce the operating cost. The components that require energy are the pump, heater and the centrifuge, therefore changing the power source to solar energy would further benefit the total efficiency of the cycle. The system will be user friendly, requiring little to no knowledge about the process itself. Incorporating into the prototype separate on/off switches for the different components will simplify operating the system, as well as easy to understand instructions clearly written on the device.

The ambition for this project, as mentioned above, is to develop a system that will facilitate the production of biodiesel. Allowing companies to purify the waste vegetable oil they purchase in order to properly process it through their plants without damaging their equipment or obtaining undesired results. Maintaining a cost effective process and a safe work environment are the priorities for this design.