



SENIOR DESIGN PROJECT SYNOPSIS – FALL 2013

BIODIESEL FEEDSTOCK PRE-TREATMENT STATION

SPONSOR: GREEN BIO-FUEL

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Summary

The elaborate design of this Waste Vegetable Oil (WVO) purification station for biodiesel production is prepared following every professional and ethical engineering requisite. By focusing on our sponsor's concern, Green Biofuels, we have developed a rough mechanical system design which is the solution for their existing problem. Green Biofuels's biodiesel processing plant is technically limited to the amount and type of WVO they can process hence purchase. Our design, the Biodiesel Feedstock Pre-treatment Station is capable of removing the residual water and organic debris from the WVO prior to its delivery into the plant. This preliminary cleaning stage for the existing plant takes hold and is finalized while leaving small room for error as the biodiesel production will not allow for much water or bio-solid contents in its treatment. The end product follows strict quality control test in order to provide the best results and meet our sponsor's conditions.

Project Platform

Fossil fuels have become expensive and undesirable pollutants around the world, pushing energy developers to exploit alternative sources of fuels. Our sponsor, Green Biofuels, specializes in producing Biodiesel from used vegetable oil. They are a South American entity, and have exported their biodiesel production to South Florida, creating a good use to WVO which would otherwise pollute waters and impair sewers. Our design considerations were prepared following biodiesel composition guidelines set forth in ASTM D 6751 and from agreed conditions from our client. The delivered oil for biodiesel processing has to be of a water and organic-solid content less than 1000 and 5000 PPM respectively. A higher contamination than the previously stated would seriously interfere in the plant process and the chemical properties of the biodiesel produced. The prototype design which ensures the quality of the feedstock is to be depended on specific mechanical systems and is assembled on a two level 3x2 feet cart. As the raw material is obtained it is classified by testing its water and debris content in order to pin point an adequate cleaning sequence, it is then poured into the storage tank through a filtering screen. A sedimentation juncture occurs in the tank where after a time interval set by the WVO condition and accelerated by increase heat from a heating element, water and debris particles separate from the oil to the bottom of the tank and are removed consequently. The oil at a selected level in the tank is then removed using a transfer pump, passing through an inline filter. The system is then split in two cycles by a three-way valve, traveling via a centrifuge or by a filtering membrane with several cycles on themselves. Most of the raw material is treated through the centrifuge due to its easy maintenance and water separating capabilities, although the brown grease is most effectively cleaned via the filtering membrane as the debris testing results of the report show. Both treatment sequences end at a collection tank located in the lower level of the cart, finalizing the pre-treatment station process. The end product is then tested on its proposed terms, maintaining a thorough analysis in the design proposition.