TEAM 100

Commercializing Biolubricant Production Using Waste Cooking Oil

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Introduction

Waste cooking oil (WCO) disposal poses serious environmental challenges. Our project, addresses this issue by converting used cooking oils into sustainable lubricants through an efficient transesterification process. This innovative approach transforms harmful waste into valuable, eco-friendly products, supporting sustainability and promoting a circular economy.

Objective

Our objective is to design and implement a sustainable, cost-efficient process that converts waste cooking oil into high-performance bio-lubricants using transesterification. The project aims to meet industrial quality standards, reduce environmental pollution, and support circular economy practices by turning a common waste into a valuable, eco-friendly product.

Prototype Parts

Stirrers

Workstation

Heating Rod

Gas Detector

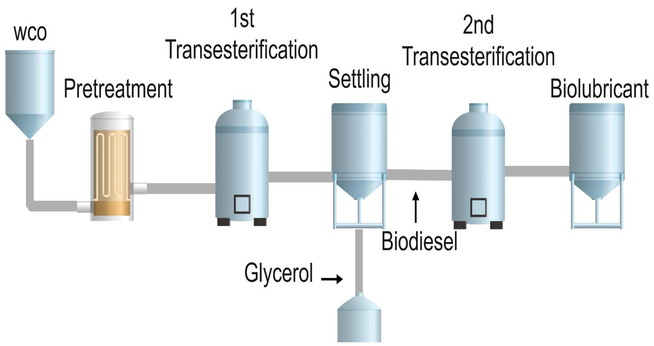
Temperature Sensor

Tank

Separation Funnel

Reactor

Process Flow Diagram



Project Constraints

- Batch size, ≤ 20 Liters
- Budget = 6000 SAR
- Process safety compliance
- Structural Durability

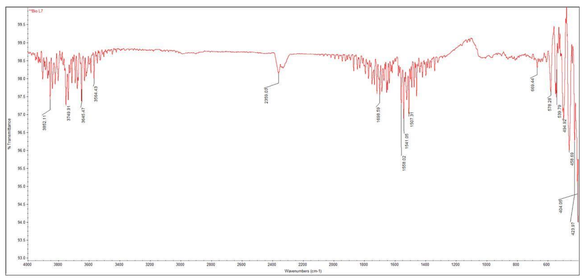
Target Specifications

- Material Selection, (Tanks Withstands 90C°).
- Equipment Design, (1500-2000 watt for heating element).
- Cost Minimization, (stay within 6k SAR).
- Viscosity Index, (Target 200 VI).
- Product Yield, (+85%)
- Integrating Sensors for safety and reading, (≤ 1 sec response time).
- Sustainable and Scalable Process.
- Industry-Compliant Lubricants Performance, (compliance with ISO VG 100).

Testing/Validation

- ✓ Sufficient for handling 20 Liter.
- ✓ Heating elements and insulation ensure consistent temperature control.
- ✓ Temperature sensors and gas detectors ensure fast response for safety and monitoring.
- ✓ Proper material used to ensure durability.

Charts and Verification



Broad peak at ~3400–3200 cm^{-1}
Peak at ~2940 cm^{-1} .
Peak at ~1640 cm^{-1} .
Peak at ~1540 cm^{-1} .
Peaks at ~1450 cm^{-1} and ~1380 cm^{-1}.
Peaks between 1200–1000 cm^{-1}
Overall shape: Peak positions align with the reference

Recommendations

- Incorporating a methanol recovery to integrate the process and lower costs.
- Integrating renewable energy sources, such as solar heating to reduce the environmental footprint
- Consider integrating a hydrotreating step to enhance the biolubricant's overall performance for industrial applications.