IPRO316: Biofuels Production Facility for Renewable Energy Generation

What?
- Biodiesel is an automotive fuel alternative to fossil fuels.
- Produced by chemically altering an organic oil through the use of a catalyst and an alcohol.
- Produces methyl esters which can be burned in diesel engines.

Why?
Renewable: Produced from vegetable oils
Sponsor: Testa Produce
Desire to be environmentally friendly
Environment:
  Cleaner burning emissions
  Recycles waste cooking oils

Biodiesel
- Produced by transesterification
  - Desired by sponsor
  - Large range of feedstock oils.
  - Few engine modifications required (diesel)

Bioethanol
- Produced by fermentation
  - Mainly corn and sugarcane stock
  - Requires flex fuel engines

Group Breakdown:
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Transportation

While delivering produce, pick up WVO from hotels, restaurants, etc.
- Cooled oil return to original container (3-5 gal)
- Or pickup (1 - 3) 55gal drums
- Will only pick up “purest” WVO if necessary
- Keep WVO in separate area of truck to avoid any contamination of fresh produce, line area with plastic

Restaurants use different oils
(3 main: canola, sunflower, soybean)
Hard to keep separate, but can be processed together
May have effect on gel point

Production

- Break down oil molecules and replaces the glycerin portion with an alcohol molecule

Storage

- Store WVO on site in 275 gal “Tote” or IBC (Intermediate Bulk Container)
- Store methanol on site in container (in accordance with OSHA)
- Waste glycerol can either be partially purified and sold or taken to a water treatment plant
- Waste water may have to be treated prior to disposal
- Make sure all state and federal permits are obtained for transport, storage and disposal

Production Reactions:

Required Biodiesel Reactants
- Gal/ 1200 week
- Oil/ 1470 week
- Gal/methanol/ 367.5 week
- Kg/KOH (90% Pure)/ 52 week

Products
- Gal/glycerol/ 184 week
- Gal/biodiesel/ 1654 week

*The biodiesel recipe must be fine-tuned based on available waste oil. For calculations a recipe of 22 vol% Methanol, 78 vol% Waste OIl, and 36grams KOH/gal Oil was used.