

Calvin Biofuel Vehicle Project

Engineering 333, Calvin College
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Introduction

The objective of the project was to answer the question:

“What would it take for Calvin College to operate a biofuel vehicle from campus resources.”

The class split into 3 teams:

- Fuel/Feedstock
- Facilities/Infrastructure
- Vehicle

Design Constraints

- Cost
- Ease of Production and Production Time
- Transportation
- Cleanliness
- Environmental Impact and Conditions
- Energy Required and EROI
- Available Space
- Cleaning & Maintenance
- Safety & Ergonomics



Figure 1. Fall 2013 Class Picture

Fuel Options

- Methane from compost
- Ethanol from grass clippings
- Biodiesel from vegetable oil & alcohol reaction
- Waste Vegetable Oil from Calvin Dining

Waste Vegetable Oil (WVO) was chosen from the four choices due to its high yield at low upfront and variable costs.

Through titration, filtration, and centrifuging, the oil becomes usable for fueling.

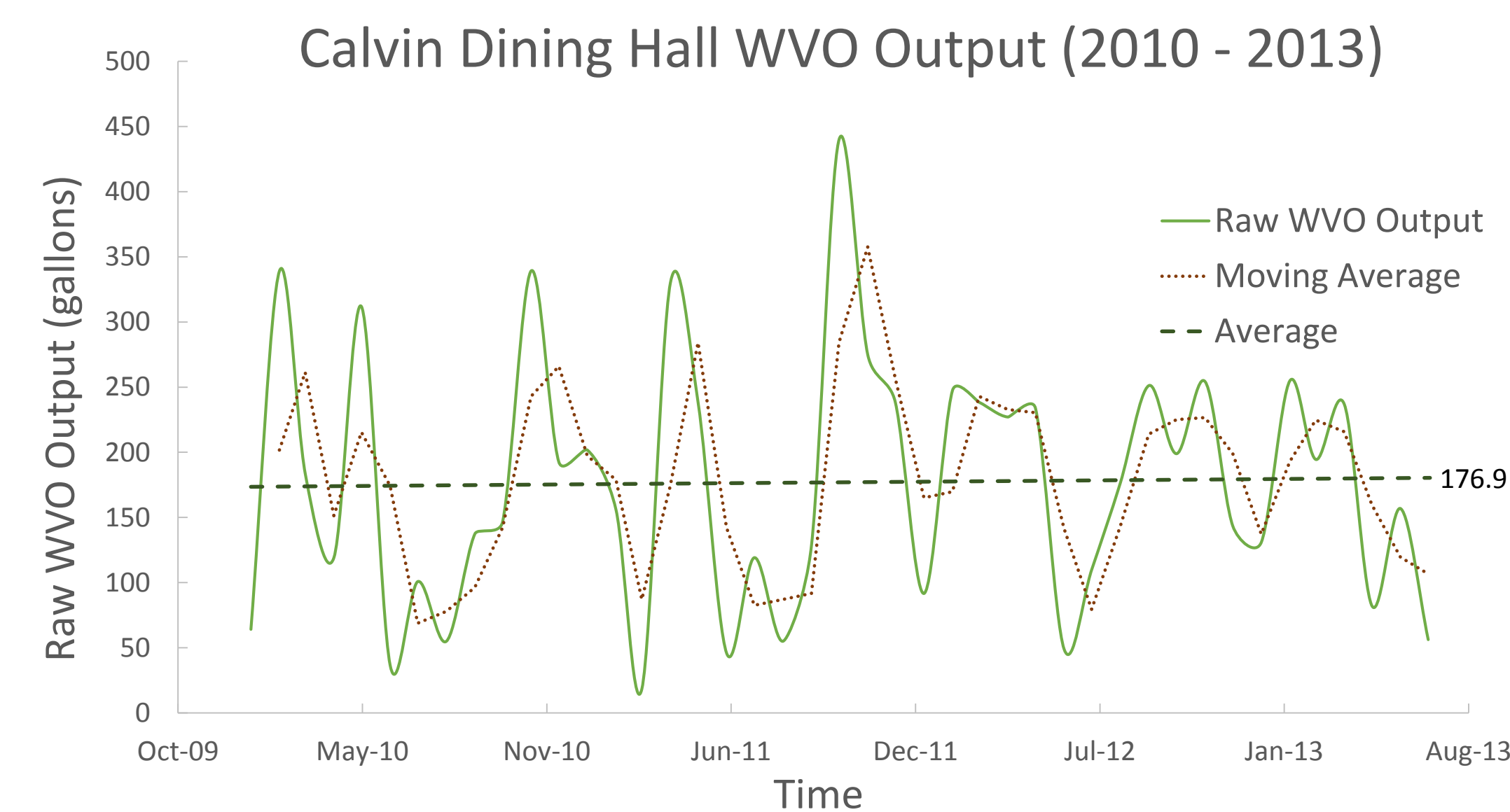


Figure 2. Flow Diagram and Processing Layout

Processing Design

Front View

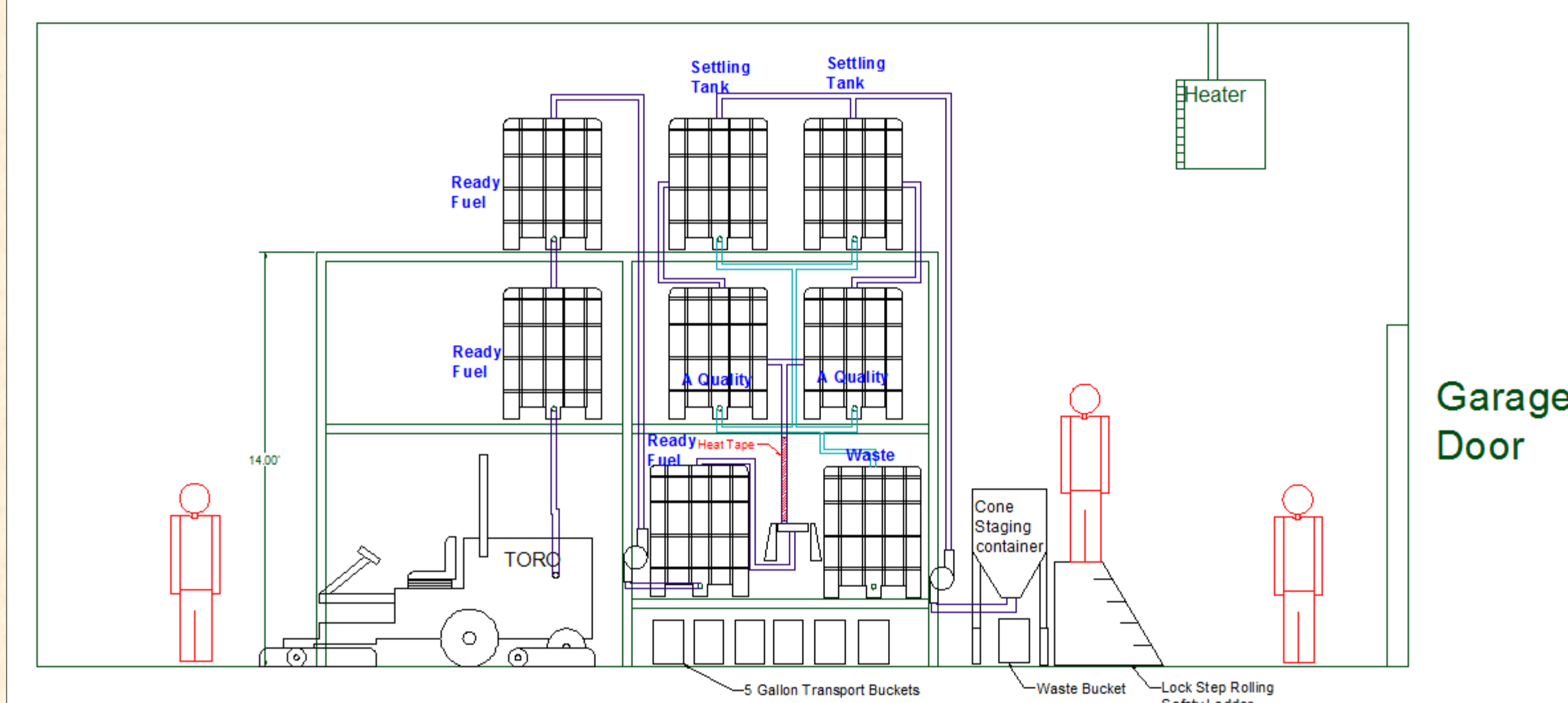


Figure 3. WVO Processing System Schematic

Flow Diagram/Processing

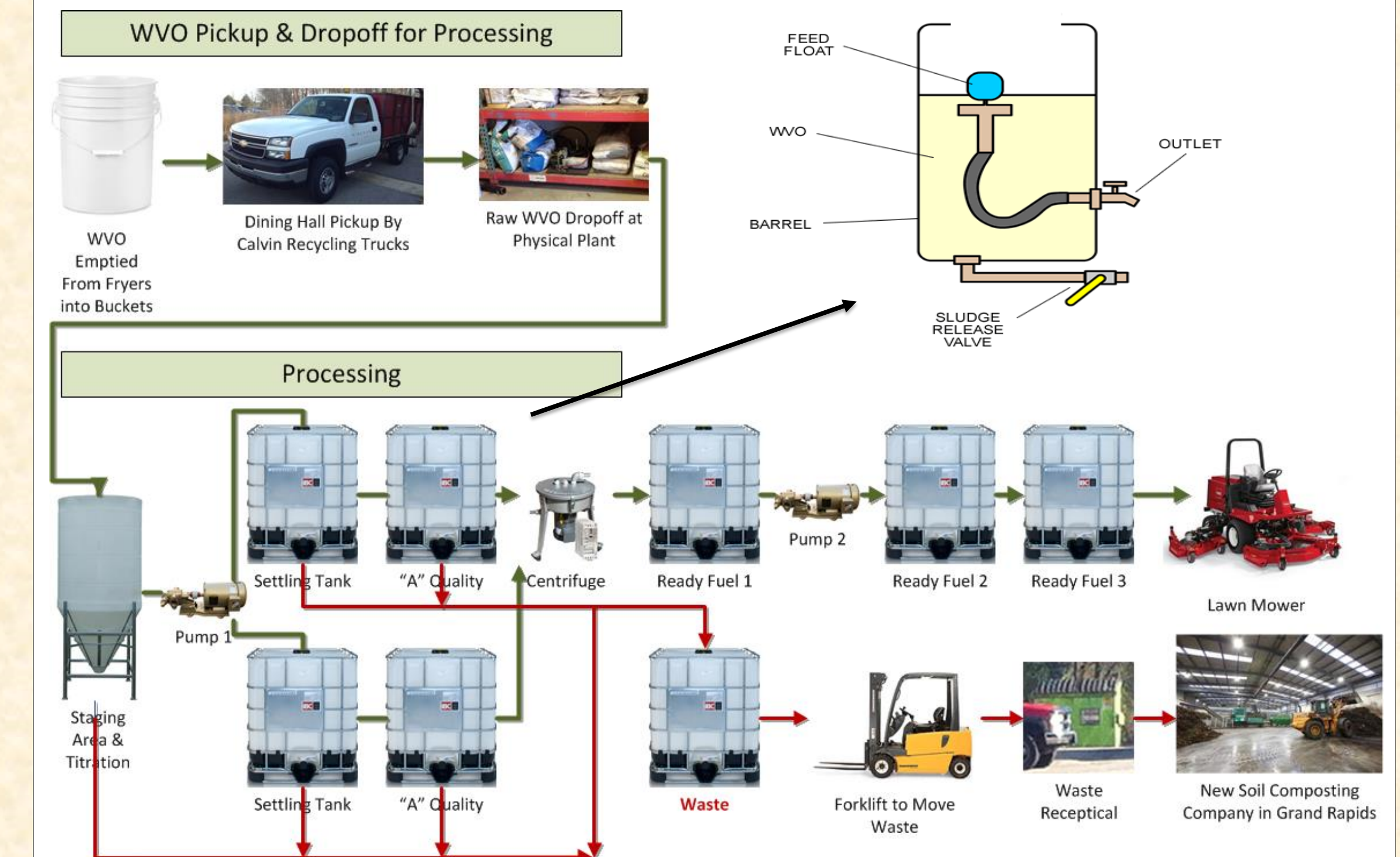


Figure 4. Flow Diagram and Processing Layout

Critical Component Costs

Table 1. Costs of most expensive pieces of equipment

Component	Source	Cost	Quantity	Total Cost
Raw Power Centrifuge	WVO Designs	\$ 1,197.00	1	\$ 1,197.00
Centrifuge Bolt-on Heater	WVO Designs	\$ 297.00	1	\$ 297.00
275 gallon IBC Tote	Craigslist	\$ 30.00	6	\$ 180.00
25gpm Industrial Oil Transfer Pump	WVO Designs	\$ 350.00	2	\$ 700.00
Installation Time	Calvin Physical Plant	\$ 30.00	20	\$ 600.00

Project is Feasible

We recommend that the project is feasible for the following reasons:

- A clean, safe, user friendly process has been
- The process has an overall payback of 2 ½ years