

Blackberry Brandy Production

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Problem Statement

A standard process for fermenting and distilling blackberry mash into a brandy product does not currently exist. A limited supply of blackberry liqueur exists in today's market despite a rising demand for this product and a desire for higher profit margins.

Overall Goal:

Increase the profit margin of blackberry derived products in the Lafayette area as well as a standardized process for blackberry production.

Design Objectives:

1. Design and properly size equipment for student-run blackberry brandy production
2. Determine capital investment needed and necessary costs for a return on investment of 30% and a profitable business after five years
3. Design process should have minimal discharge and all byproducts used for other purposes

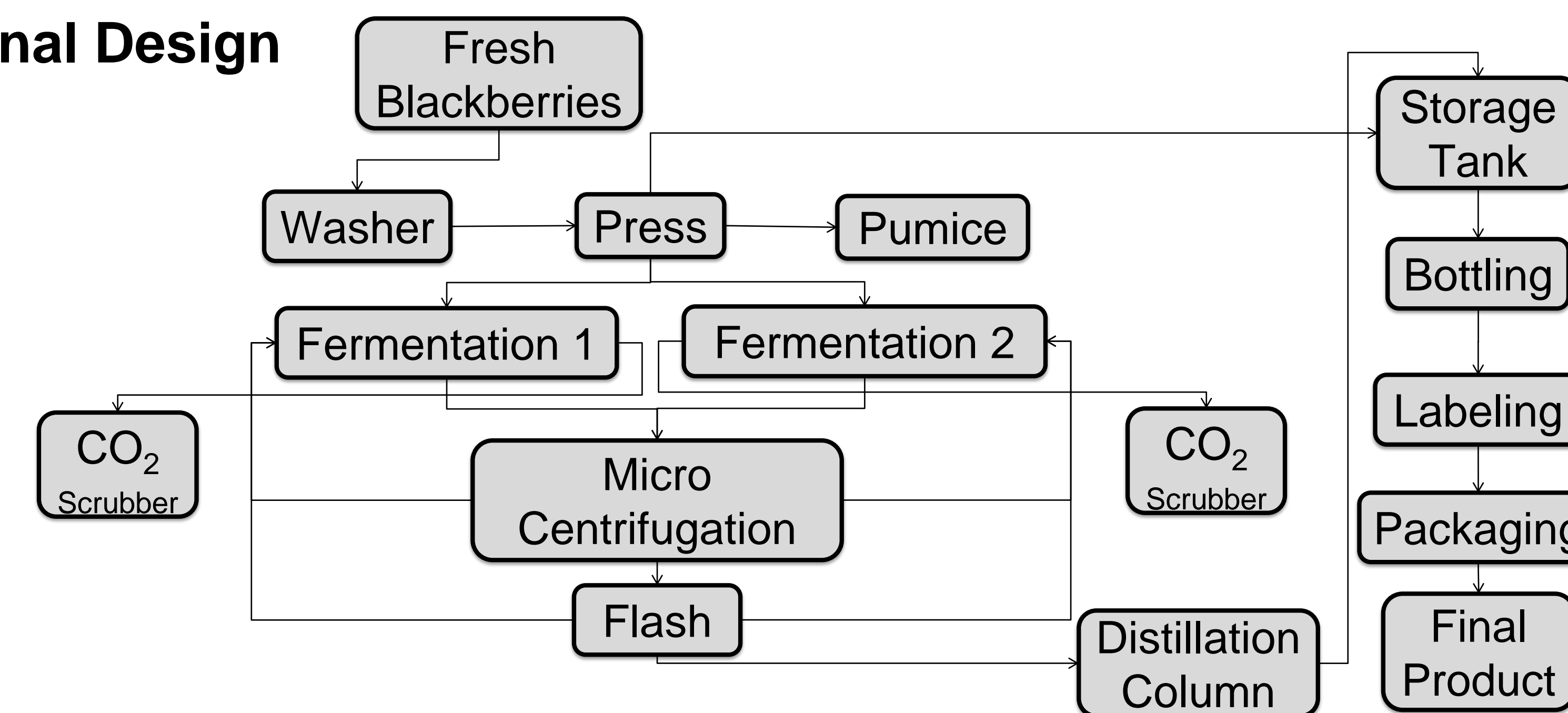
Included in the Design:

1. Fermentation process for conversion of fresh blackberries to blackberry wine (10-12% alcohol content)
2. Distillation process for the conversion of blackberry wine to blackberry brandy (40% alcohol content)
3. Capture of carbon dioxide emission from fermentation via the use of scrubbers
4. Alternative options to reduce the waste of water by reusing the spent water in multiple sections of the process

Background

- Blackberries are notable for their high nutritional contents of dietary fiber, vitamin C, and vitamin K.
- 100g blackberry contains 4.9 g sugar, less than grape (15.5g sugar/ 100g grape).
- 53.4 million pounds of blackberry produced per year. 4.03 Million pounds were sold as fresh berries and the remaining 49.2 million sold as processed product.
- The U.S. market beverage alcohol size is 9.4B gallons and \$197.8B in retail sales dollars.
- Spirits share 36% of \$197.8B in retail sales dollars, a \$72.1 Billion market.

Final Design

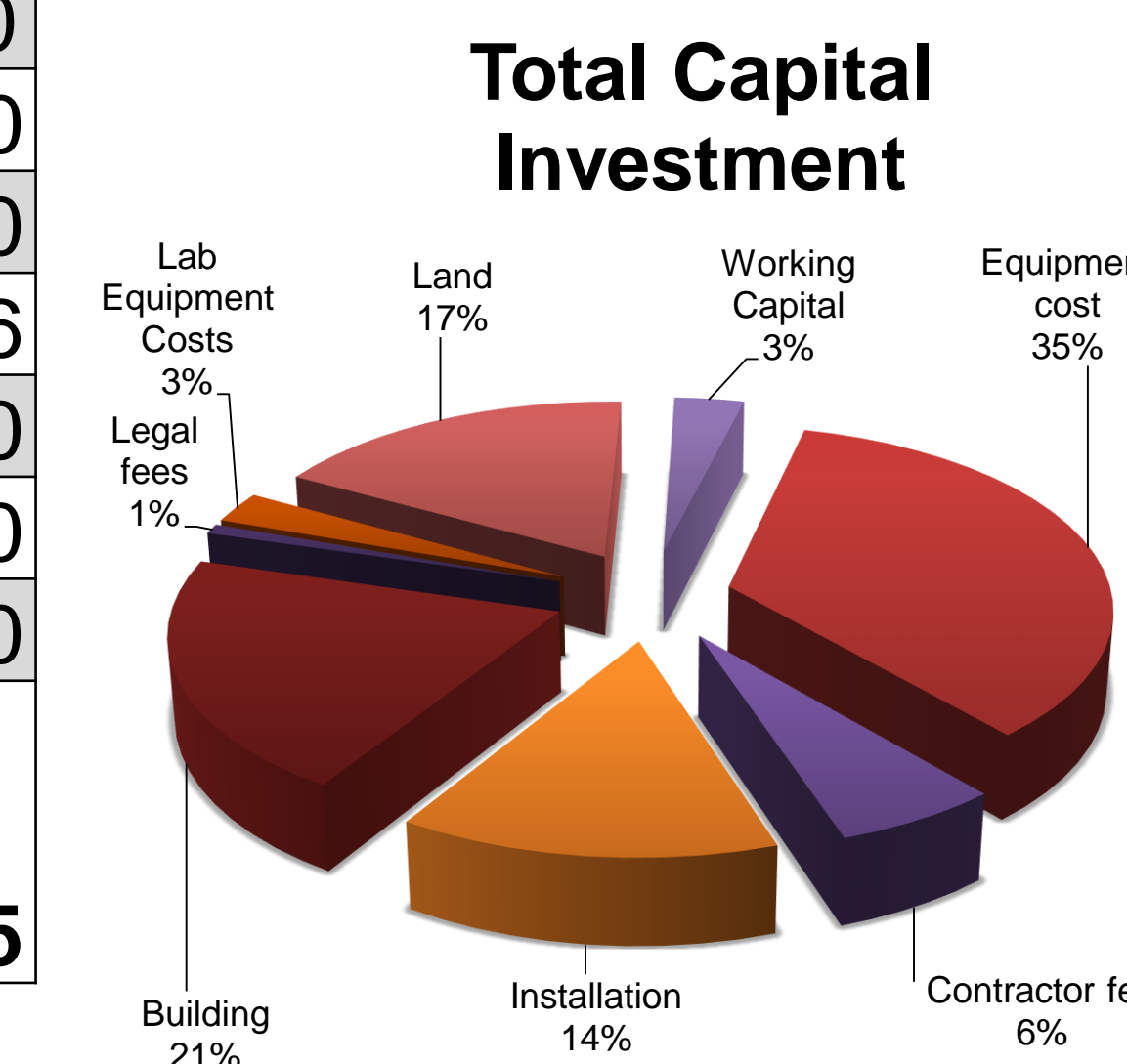


Item	Installation	Cost
Washer/De-stemmer	20 Lbs/min	\$4,000
Press	500 Liter Water Bladder	\$5,500
Fermentation Tanks	Two Stainless Steel, 250 Liter	\$2,800
Flash	200 Liter	\$7,000
Distillation Column	Continuous	\$26,000
Piping	25 ft Stainless Steel ½ inch	\$1,200
Pumps	4 Positive Displacement	\$950
Bottler	1 Bottler	\$13,000

Economic Analysis

Annual Cost (\$/year)	
Sugar	\$ 5,154.27
Blackberries	\$ 70,532.15
Yeast	\$ 1,077.12
Nutrients	\$ 167.55
Cleaner	\$ 11,050.00
Sanitizer	\$ 510.00
Water	\$ 765.00
Electricity	\$ 8,771.06
Labor	\$ 47,250.00
Still Permit	\$ 750.00
Lab	\$ 150.00
Total Annual Cost	\$ 146,177.15

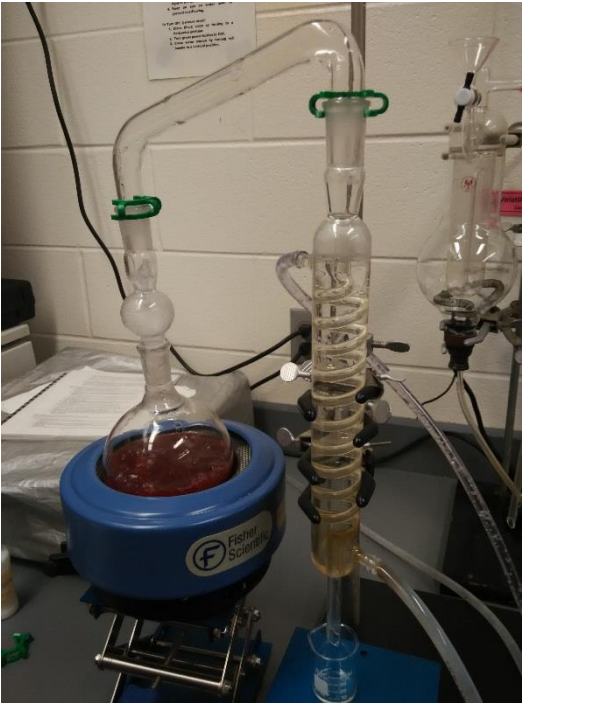
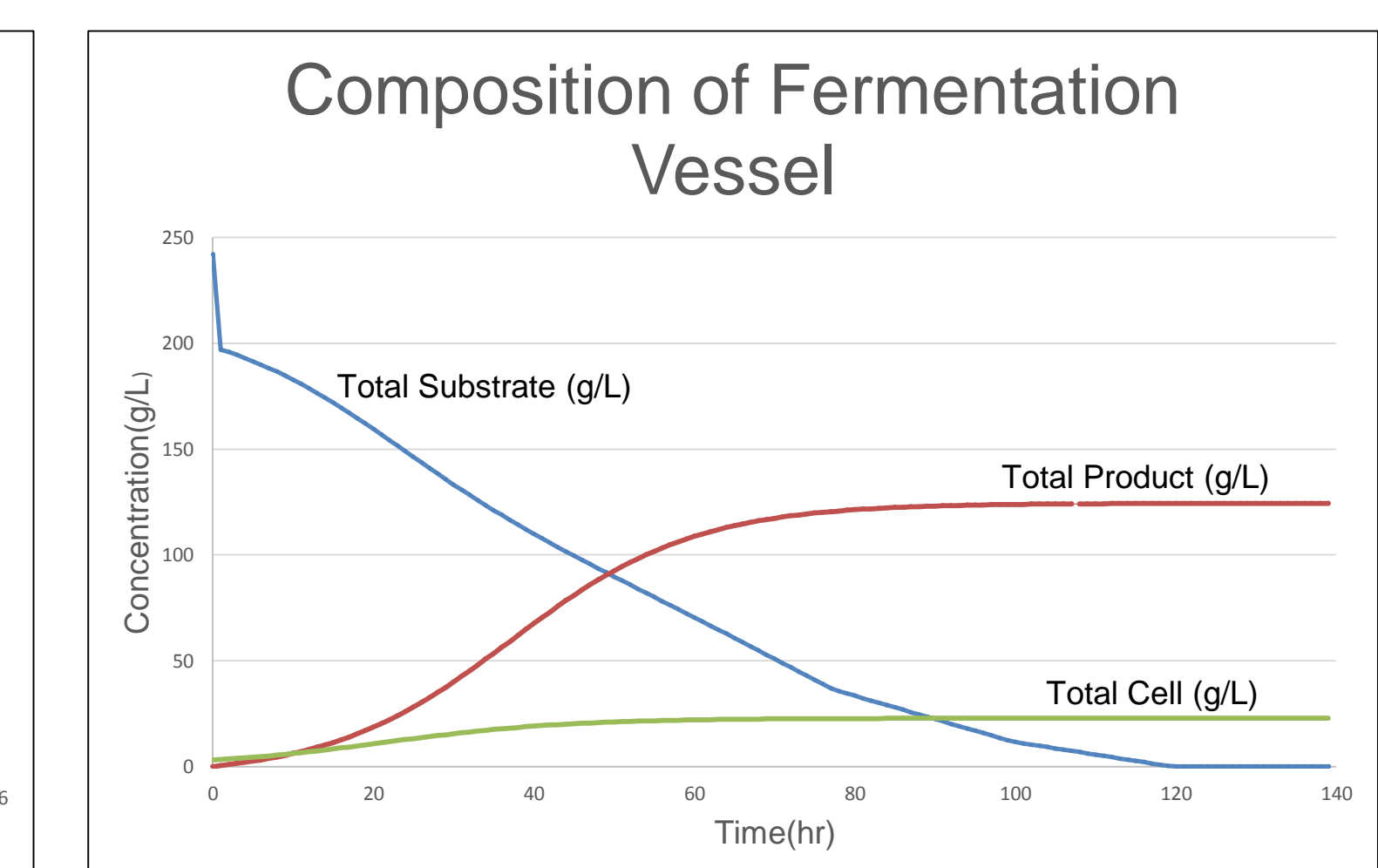
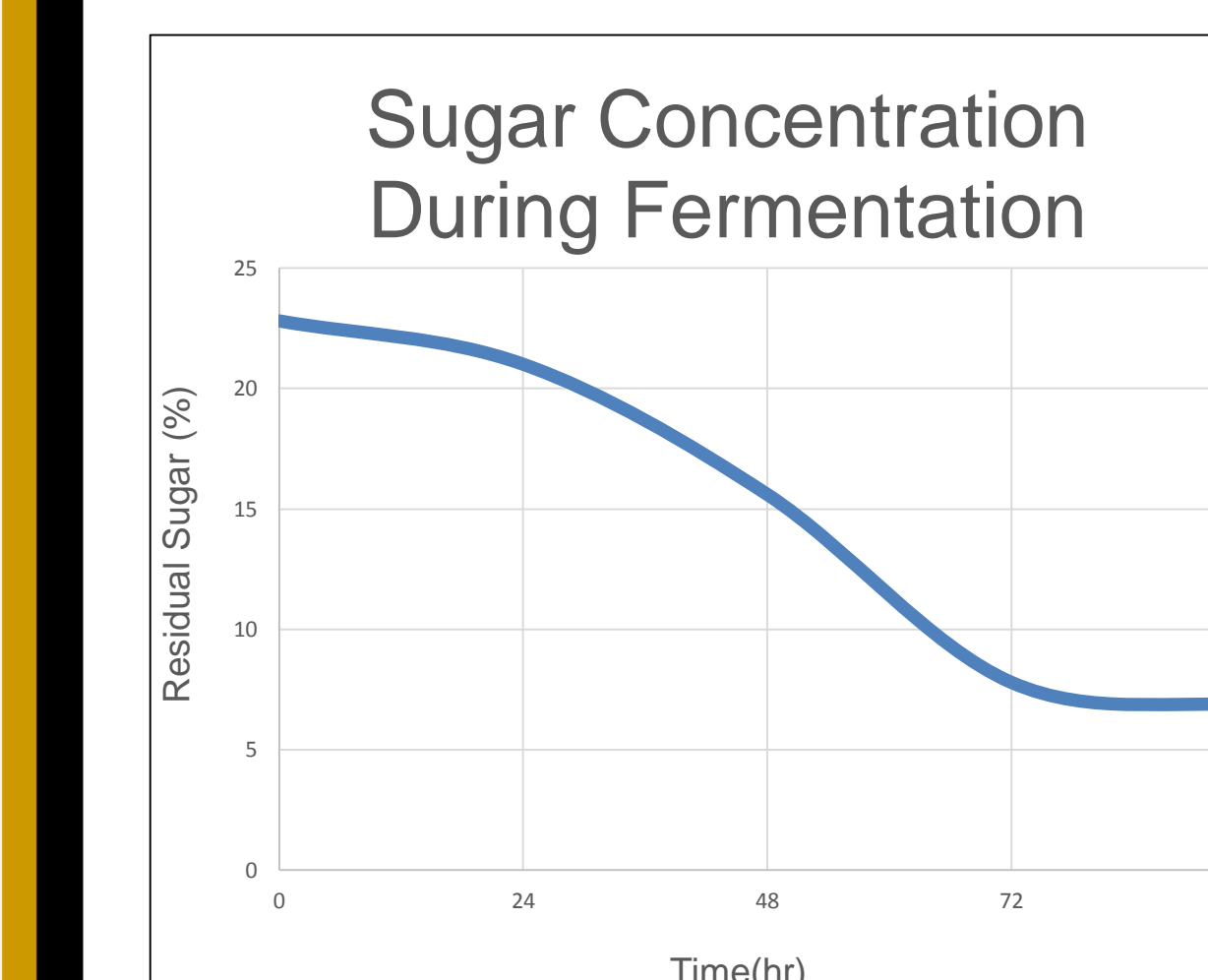
The economic analysis for this project assumes that the building is air conditioned and no winery currently exists. Costs involved will allow production of wine as well as spirits. Each bottle of Blackberry Brandy will be \$25 (725mL) and we will sell 6561 bottles per year. Fixed capital investment is \$315,296 and working capital is \$5,608.90. Total calculated capital investment will be \$320,904.96.



Summary	
Total Annual Revenue	\$164,025
Total Annual Cost	\$146,177.15
Net Annual Revenue	\$17,847.85
Return On Investment	0.12
Payback Period	4.92

Experiment

We successfully performed a small scale production of fermentation and distillation for the blackberry product. We measured the sugar concentration during the fermentation process as well as the alcohol content for the blackberry wine distillation.



Market Analysis

Purpose: Identify emerging trends and demographics for fruit-based brandy to capitalize on underserved market demand

Methods: Analysis of surveys and market research including: local distribution facilities, news sources and specialty websites for distilleries.

Findings: Increasing demand for local and small-production products in the Lafayette region. Increased demand exists for fruit based products, including blackberry brandy.

Strengths

- Unique product
- Minimal waste
- Processed with current technology
- Economies of scale: large scale production dramatically reduces costs

Opportunities

- New venture in Lafayette area
- Could change the interests of consumers in the market
- Can bring further business for other fruit based products

Weaknesses

- Generally can only be a seasonal product
- Barriers to entry: wine and other types of brandy
- Blackberry production varies yearly

Threats

- Unknown brand with no current brand loyalty
- Other types of Brandy and wine
- Obtaining a license

Alternative Solutions

Fermentation:

Fermentation requires 600 Liters of fermented liquid per week

1. Number of vessels:

- 2 Vessels, cost = \$2,600
- 3 Vessels, cost = \$3,900
- 4 Vessels, cost = \$5,000

Distillation:

1. Heat exchanger to preheat fluid before distillation entry
-Reduce work done by the distillation column.
2. Double condenser to decrease reflux
-Increase cost of distiller but decrease of operation costs.

Blackberry Pumice:

1. Used to create other food products such as salad dressings or fruit leather (Rich in fiber and high consumer value)
2. Composted and sold to nearby farmers.
3. Feed to digester, producing methane gas to produce electricity.

Global/Societal Impact

- Creating valuable on campus internship opportunities for Purdue students; allowing them to be better equipped for the workforce through more experience, and more likely to get hired before graduation.
- Creating more opportunities for the use of blackberries; expanding market share for blackberry producers.
- Low waste process, decreasing the strain on local waterways and dumps.

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