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OBJECTIVE

To create a craft-brewed hard cider with a new flavor profile.

BACKGROUND

- Increased interest in hard cider has led to an expanding market
- Current industry is predominantly run by a few big name brands
- Increased interest in local manufacturers

UNIT OPERATIONS

Unit Operation	Optimization Variable
Pressing	Pressure & Time
Filtering	Volumetric Flow
Fermentation	Tank Size, Temperature
Pasteurization	Temperature

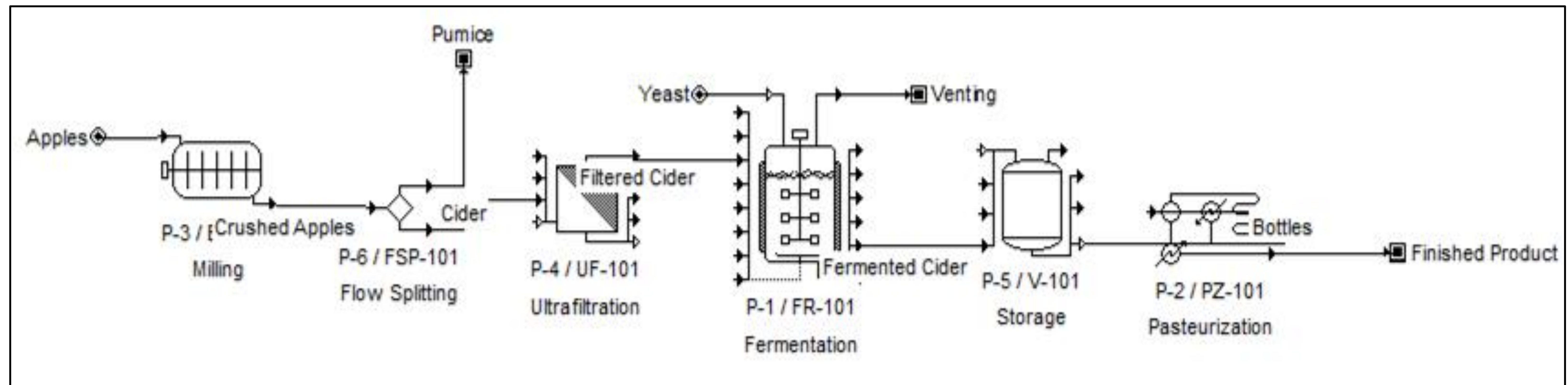
EVALUATION OF ALTERNATIVES

1. Apples: dessert apples vs cider apples
2. Pressing: belt filter press vs rotary press
3. Filtering: vibrating screen vs rotary sieves
4. Pasteurization: tunnel pasteurization vs UV light treatment
5. Fermentation: unstirred with temperature control vs without temperature control

PRODUCTION PROTOTYPES

Batch	Unique Feature	ABV
1	Sugar	8%
2	Apple Juice Concentrate	7.5%
3	No Added Sugars	6%
4	Added Honey	12%

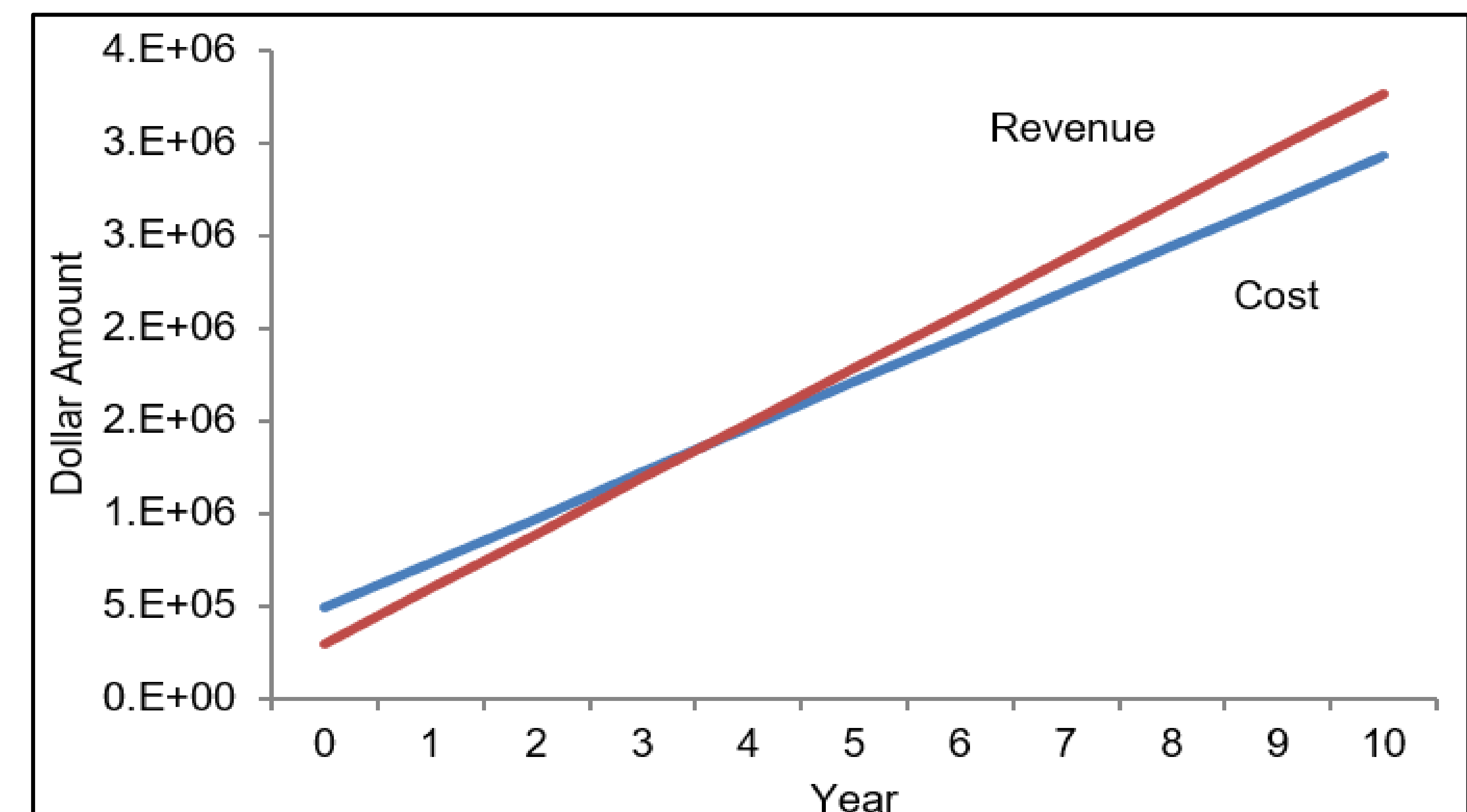
PROCESS FLOW



IMPACT & SUSTAINABILITY

- Promote responsible drinking
- Ethically and locally sourced raw materials
- Genetically modified apples
- Waste disposal
- Abundance of raw materials
- Job creation
- Highly demanded product
- International expansion

ECONOMIC ANALYSIS



Yearly Production	50,000 gal/year
Total Capital Investment	\$486,316.81
Fixed Charges (12%)	\$58,358.02
Variable Cost per Unit	\$879,141.98
Yearly Profit	\$34,722.22

FINAL DESIGN

Product Composition	
Serving Size 1 Bottle (12 fl oz)	
Servings per Batch 10	
Musselman's 100% Apple Cider	1 gal
Packed Light Brown Sugar	100 g
Wine Tannins	¼ tsp
Acid Blends	¼ tsp
Pectic Enzyme	½ tsp
Yeast Nutrient	¼ tsp
Red Star Champagne Yeast	1 g
ABV	8%



RECOMMENDATIONS

- Experiment with different apple varieties
- Add different flavor extracts

¹Atkinson & Bowen. (1959). *Process for Production of Sparkling Apple Cider*.

²Couper, J. R., & Walas, S. M. (2012). *Chemical process equipment: Selection and design*. Waltham, MA: Butterworth-Heinemann.

³Alcohol and Tobacco Tax and Trade Bureau. US Department of Treasury. 2016.

Sponsor: Agricultural & Biological Engineering Department

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