Three universities in the United States have begun with a project focused on creating alcoholic juice pouches. Purdue has seen success with student-run production facilities, leading to an increase in student interest and engagement. In 2012, 34% of spirit consumption in the United States was vodka, the most of any spirit. A 2015 Mintel survey showed that millennials preferred drinks with good taste, convenience, and affordability. There are limited industry-based opportunities for biological engineering students during the academic year. In addition, there is a significant number of injuries and hospitalizations associated with overconsumption of alcoholic beverages, with unknown percentage of alcohol.

**PROBLEM STATEMENT:**
There are limited industry-based opportunities for biological engineering students during the academic year. In addition, there is a significant number of injuries and hospitalizations associated with overconsumption of alcoholic beverages with unknown percentage of alcohol.

**OBJECTIVES:**
1. Create hands-on experience for students.
2. Design a student-run alcoholic juice pouch production facility.
3. Provide a convenient alternative to current alcoholic beverages available.

**ORGANIZATIONAL CHART:**
- Lead ABE Professor
- ABE/FS Professor
- Management Professor
- Production Manager
- Graduate Student Worker
- Sales Graduate Worker
- Part-Time Student Worker
- Selling and Sales Graduate Worker
- Part-Time Student Worker

**INGREDIENT FUNCTIONALITY:**
- **Corn:** raw material used for fermentation
- **Yeast:** microorganism used to convert glucose to ethanol
- **Water:** used to maximize the conversion rate of starch to glucose
- **Cranberry Juice:** decrease the pouch alcohol content by diluting the vodka

**FORMULATION ALTERNATIVES:**
- Substitute cranberry juice with other low sugar fruit juice or concentrated beverage.

**PROCESSING ALTERNATIVES:**
- Allow mash to cool in fermentation vessel to eliminate cooling tank
- Start with aerobic fermentation to increase cell count
- Batch distillation instead of continuous to easily change between products

**ECONOMIC ANALYSIS:**
- **INITIAL COST**
  - Equipment: $408,117.00
  - Filter: $450,000.00
  - TOTAL: $858,117.00
- **ANNUAL COST**
  - Electricity: $85,900.00
  - Raw Material: $70,965.54
  - Packings: $2,800.00
  - Labor: $61,000.00
  - Maintenance: $54,000.00
  - TOTAL: $276,793.54
- **TOTAL EQUIPMENT COST**
  - $500,172.00

**YEARLY DATA VALUES**
- ROI 7%
- Annual Profit: $59,160.38
- Breakeven: 22 weeks
- Breakeven Production: 64,000 pouches

**PRODUCTION SPECIFICATIONS:**
- 1 pouch is 8 oz. and cost $2.42 to produce
- 1 batch produces 3200 pouches
- 1 batch can be made each week
- The plant will only operate during the academic year (32 weeks)
- 1 pouch will be sold to distributors for $3.00
- $1,200 pouches produced annually

**PROCESSES:**
- **Hammer Mill:** Grinds corn to powder in order to expose the starches inside the kernel.
- **Filtration Tank:** Removes small particles and sends large particles (>5/32”) back to milling stage to maximize starch to glucose conversion rate
- **Pressure Cooker:** Liquifies corn mash and cooks corn mash to increase glucose conversion rate
- **Circulation Tank:** Corn mash is heated at a constant temperature prior to fermentation.
- **Fermentation Tank:** Yeast converts sugars from corn to ethanol anaerobically at 30 degrees C.
- **Distillation Column:** Concentrate ethanol to 30% w/v based on liquid and vapor flow.

**SUSTAINABILITY:**
- Environmentally, little to no waste in production.
- Economically, self-sustaining

**GLOBAL/SOCIOECONOMIC IMPACT:**
- Increase hands-on opportunities for students
- Regulated alcoholic consumption option to minimize overconsumption