

Biological Engineering Students: Timothy Jergens, Giulia Olivieri, Anthony Park

OBJECTIVE

To create a sustainable method of yogurt production while minimizing design criteria

BACKGROUND

- According to Health.gov, 75% of people don't meet the daily dairy requirements
- Current industry is predominantly run by a few big name brands
- Increased interest in local manufacturers

UNIT OPERATIONS & OPT. CRITERIA

Unit Operation	Optimization Variable
Pasteurization	Pressure & Time
Homogenization	Pressure & Gap Size
Fermentation	Time & Temperature
Cooling	Temperature

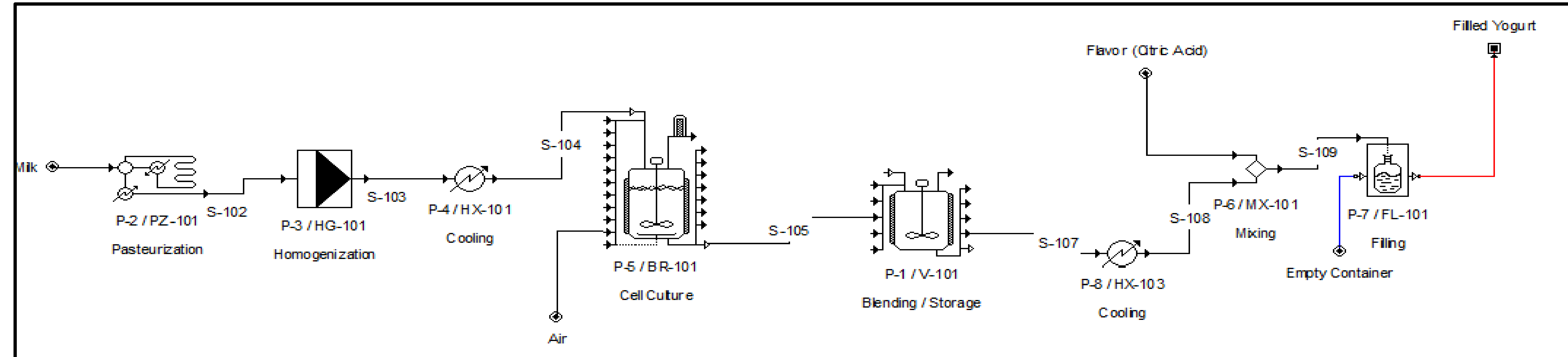
EVALUATION OF ALTERNATIVES

1. Milk: whole milk vs skim milk
2. Pasteurization: raw vs pre-pasteurized
3. Fermentation: unstirred with temperature control vs without temperature control, varying duration of fermentation process, varying target pH
4. Cooling: cooling tunnel vs storing in fridge room

CONSTRAINTS & DECISION MAKING

1. Cost: this process will recycle heat from the cooling to the pasteurization step.
2. Nutrition: vitamin concentrations will vary
3. Taste: different variables (pH, fat globule size, etc...) impact the product quality

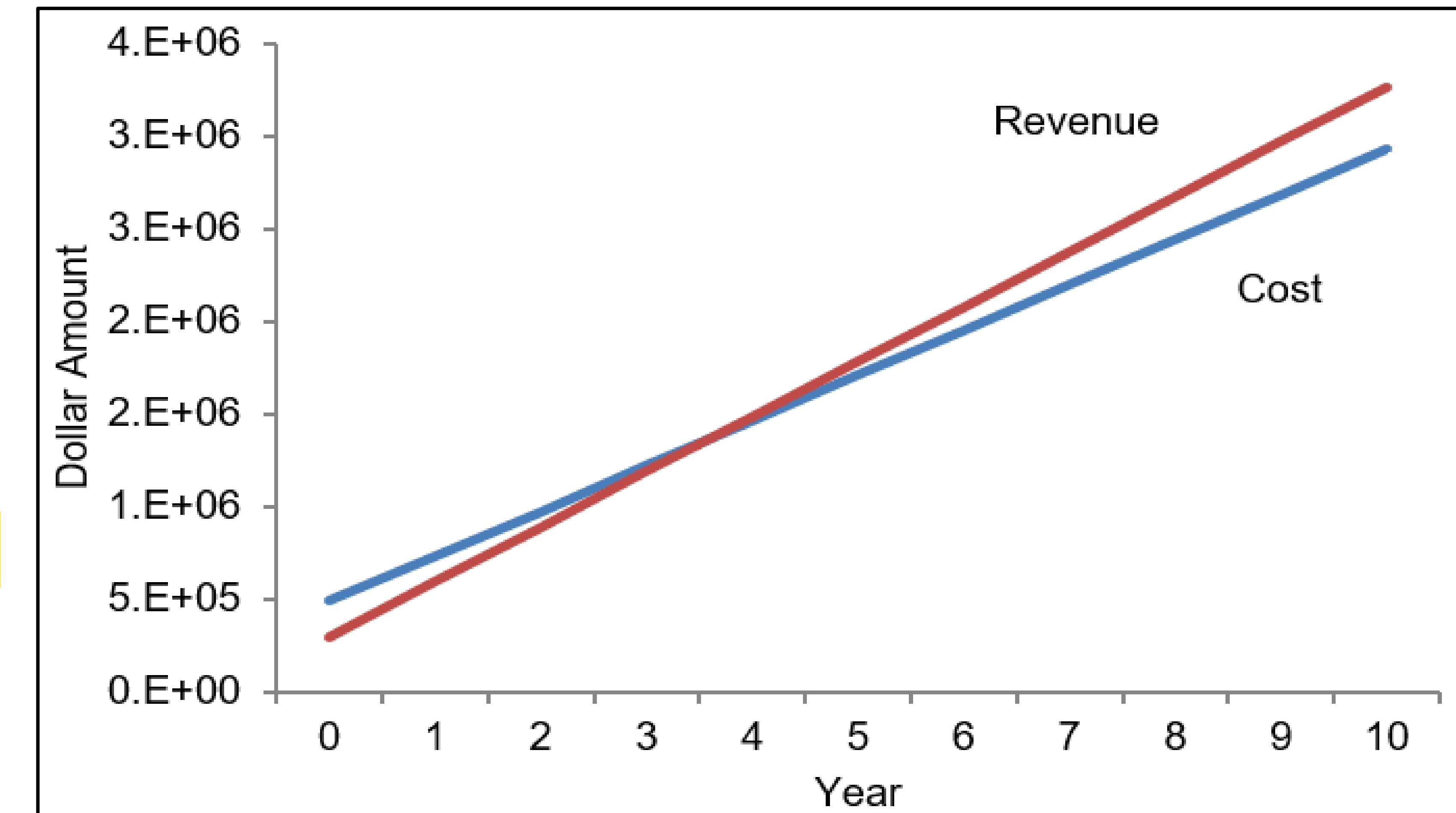
PROCESS FLOW



IMPACT & SUSTAINABILITY

- Increase dairy consumption
- Promote healthy snacks
- Ethically and locally sourced raw materials
- Waste disposal
- Abundance of raw materials
- Job creation
- Highly demanded product
- International expansion

ECONOMIC ANALYSIS



Yearly Production	1113 batches/year
Total Capital Investment	\$486,316.81
Fixed Charges (12%)	\$58,358.02
Variable Cost per Four Pack	\$3.40
Yearly Profit	\$158,059.90

PROCES EXPERIMENT

Product Composition:
Serving Size 1 cup (7.9 oz)
Ingredients Used:

- whole milk
- commercial yogurt with live active cultures



Nutrition Facts
4.5 servings per container
Serving size 1 cup (225g)

	Per serving	% DV*	Per container	% DV*
Calories	140		630	
Total Fat	3.5g	4%	15.75g	20%
Saturated Fat	2g	10%	9g	45%
Trans Fat	0g		0g	
Cholesterol	15mg	5%	67.5mg	23%
Sodium	150mg	7%	675mg	29%
Total Carbs.	15g	5%	67.5g	25%
Dietary Fiber	0g	0%	0g	0%
Total Sugars	15g		67.5g	
Incl. Added Sugars	0g	0%	0g	0%
Protein	11g	22%	49.5g	99%
Vitamin D	0mcg	0%	0mcg	0%
Calcium	520mg	40%	2340mg	180%
Iron	0mg	0%	0mg	0%
Potassium	0mg	0%	0mg	0%
Vitamin A	2%		8%	
Vitamin C	6%		25%	
Thiamin	10%		45%	
Riboflavin	40%		180%	
Vitamin B6	8%		35%	
Vitamin B12	20%		90%	
Phosphorus	30%		140%	

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.



RECOMMENDATIONS

- Test quality with different types of milk
- Experiment by adding different flavors or fruits