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PROBLEM STATEMENT

Develop the manufacturing process, preliminary business plan and initiatory marketing strategy of a student-based start-up cosmetic business that mass produces a facial cream mask consisting of ginseng extract using natural ingredient.

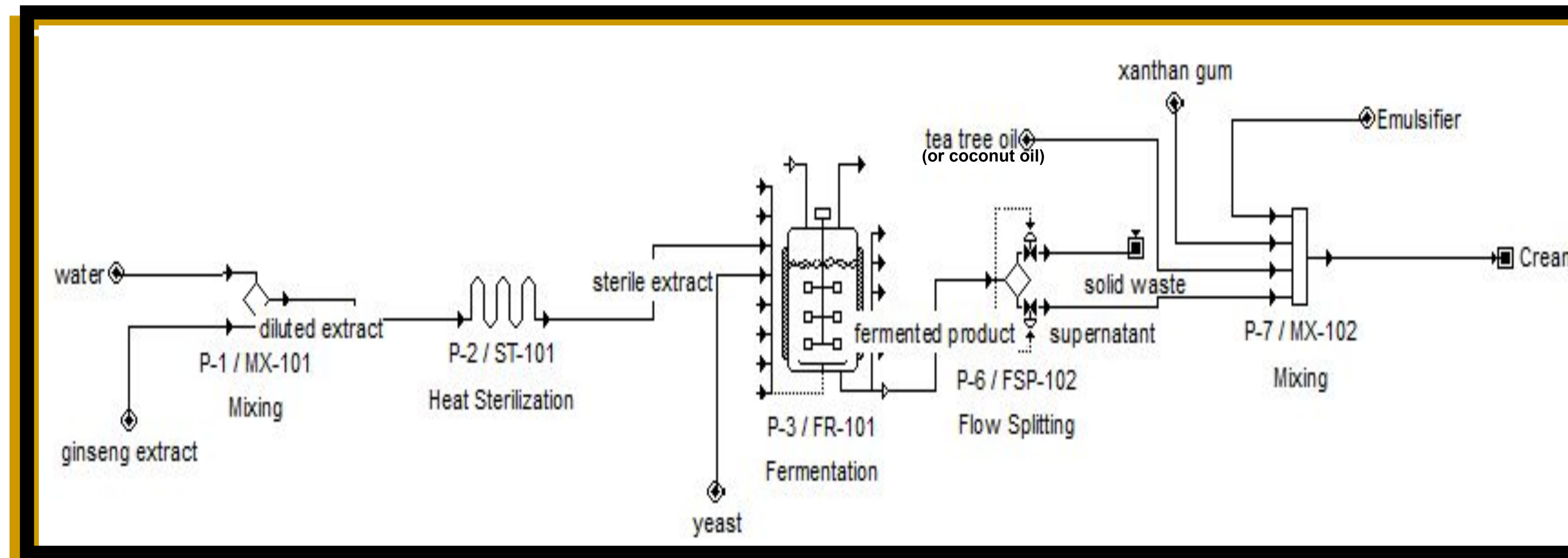
BACKGROUND

- Ginseng is the most commonly used herb in Asian cultures.
- Ginseng's use in beauty industry is prevalent.
- Easy, abundant local supply of ginseng in Indiana.
- Ginseng has brightening effect and anti-aging function.
- Natural, organic cosmetic product quickly gaining popularity.

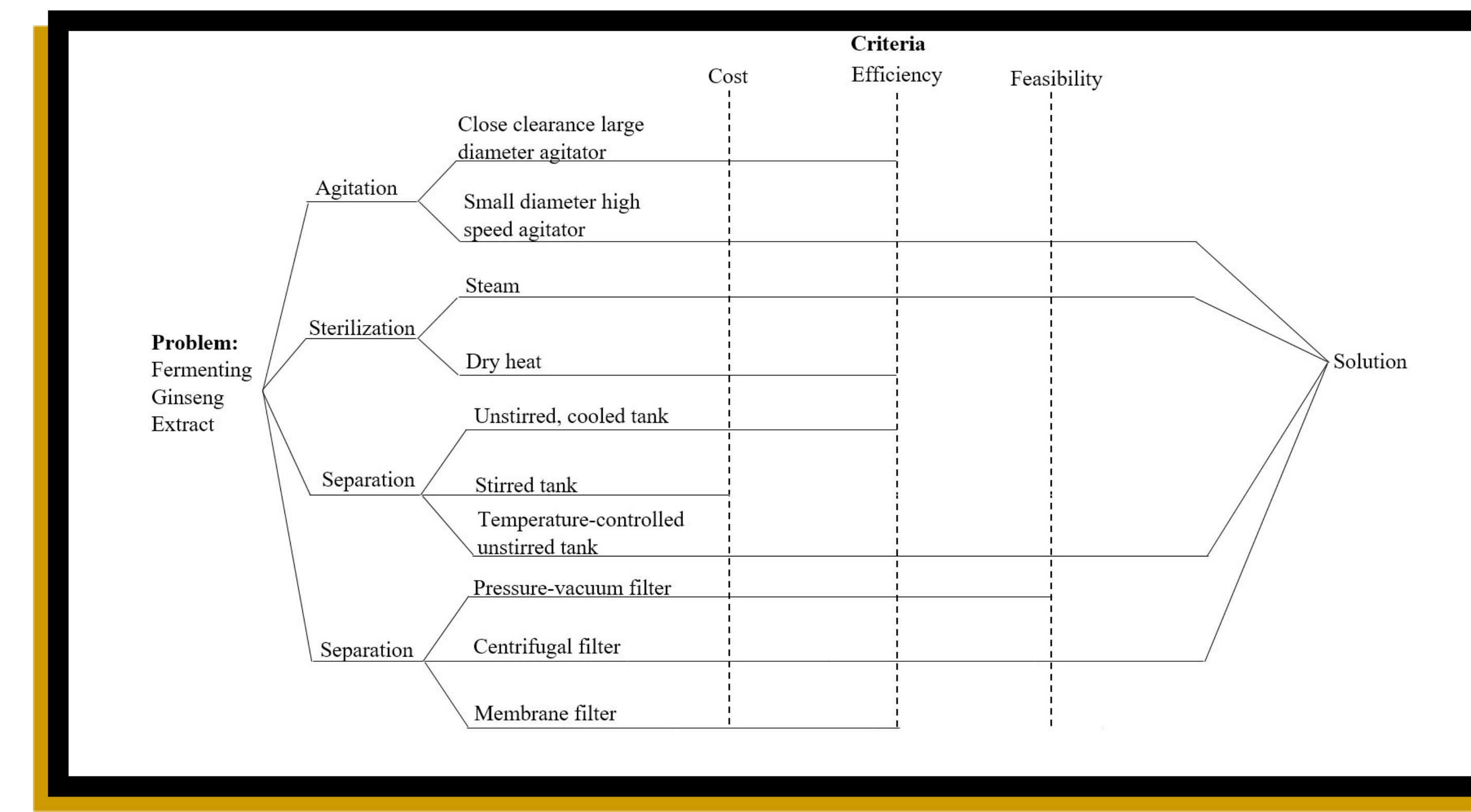
GLOBAL & SOCIETAL IMPACT

- Positive Impact**
- Encourage ginseng cultivation in Midwest region. Help with regional economic development.
 - Produce environmental friendly products.
 - Product mainly consists of natural, plant-based ingredient. No animal testing. Cruelty-free.
 - Help globalize ginseng market. Connect the ginseng industry between Asia and North America.
- Potential Drawbacks**
- The formula include animal product (egg white), which may be a problem for vegan customers.
 - Location of facilities (Indiana), is not based in economically most developed regions in the U.S.
 - Harder to ensure quality without animal testing.

PROCESS FLOW DIAGRAM



EVALUATION OF ALTERNATIVES



TIMELINE

Design Phase	Date
Design Selection, Problem Statement Determination, Literature Review	08/22/17 - 10/13/17
Mass Balance and Energy Balance	10/13/17 - 10/31/17
Unit Operation Sizing Calculation	10/31/17 - 01/16/18
Project Analysis, Alternatives Generation	01/16/18 - 02/23/18
Prototype Production Experiments, Project Revising	02/23/18 - 04/13/18
Poster & Presentation Preparation	02/23/18 - 04/13/18
Final Report Preparation	08/22/17 - 04/30/18

*Revise of the project is constantly made throughout the entire project.

PROTOTYPE DEVELOPMENT



The ginseng extract was diluted with water and fermented using *L. brevis* yeast at 60°C. Then, the fermented extract is filtered and mixed with oil phase and emulsifier to produce a homogenized cream form.

SUSTAINABILITY

Material Requirement	Life Cycle
Sufficient, continuous ginseng supply available from Asia and Midwest	Stable demand for cosmetic facial mask

PRODUCTION BUDGET

Cost	Price
Total Capital Investment	\$15,090,000.00
Annual Manufacturing Cost	\$5,012,922.61
Annual General Expenses	\$986,651.91
Annual Production Cost	\$5,999,574.52
Annual Gross Earning Cost	\$1,181,074.70

*Based on annual production 54,000 lb.

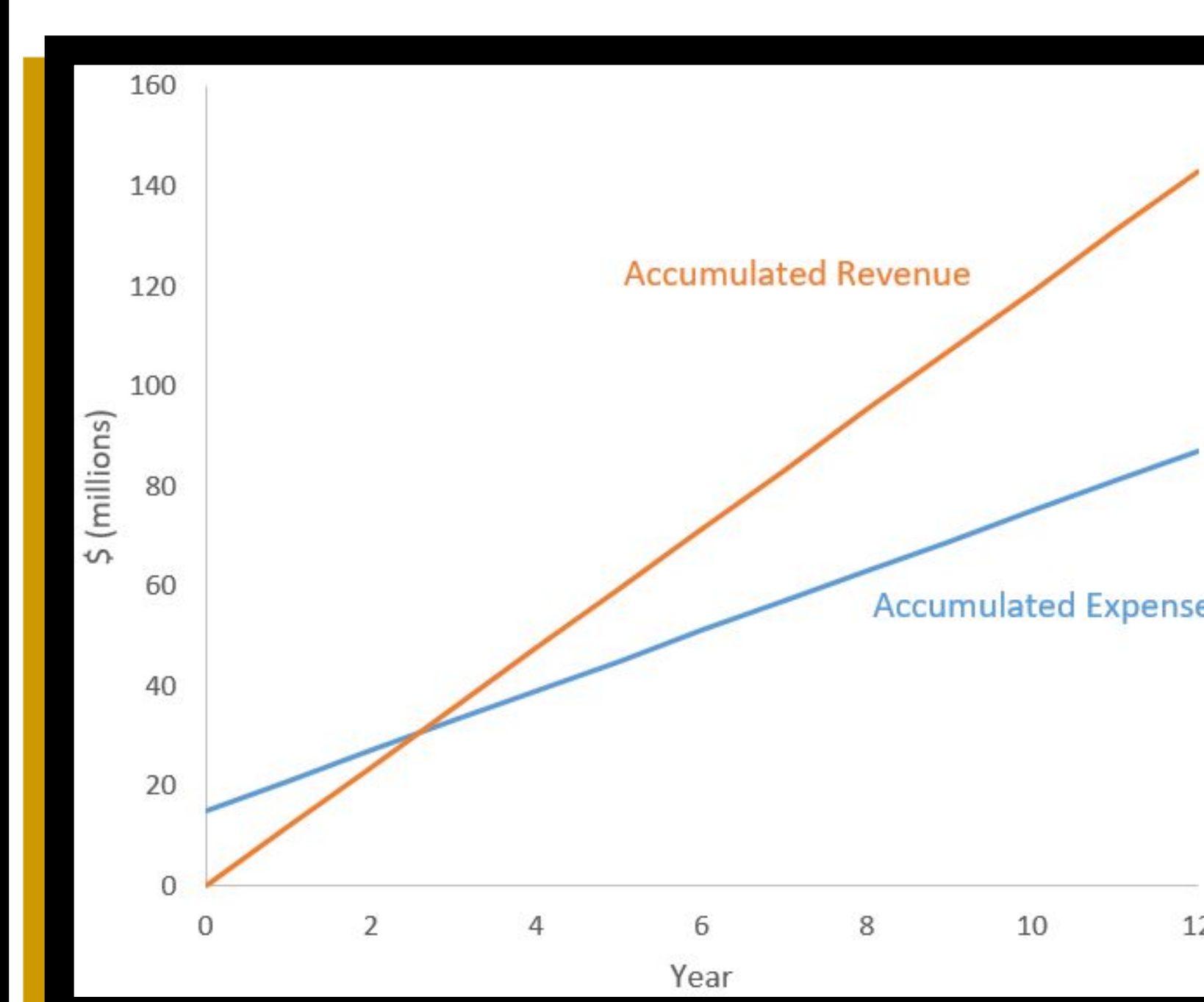
DESIGN EVOLUTION

Initial Design
Ginseng face mask powder that will be redispersed into cream after addition of water.

- Evolution**
- Changed the final form of product into cream.
 - Analyzed skincare need for different skin type.
 - Used two kinds of oil phase to produce face mask for dry skin and normal to oily skin.

Final Design
Ginseng face mask cream for dry skin and normal to oily skin.

ECONOMIC ANALYSIS



Year	Outflow	Inflow	Net Cash Flow	Profit
0	\$15,090,000.00	--	-\$15,090,000.00	-\$15,090,000.00
1	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	-\$9,184,626.52
2	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	-\$3,279,253.03
3	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$2,626,120.45
4	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$8,531,493.93
5	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$14,436,867.42
6	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$20,342,240.90
7	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$26,247,614.39
8	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$32,152,987.87
9	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$38,058,361.35
10	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$43,963,734.84
11	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$49,869,108.32
12	\$5,999,574.52	\$11,904,948.00	\$5,905,373.48	\$55,774,481.80

RECOMMENDATIONS

- Add fragrance to mask the strong herbal scent of ginseng.
- Conduct quality control tests, eg. ginsenoside concentration determination and toxicity screening.
- Revise production process to change batch process into continuous.
- Generate alternatives for ingredients that are common allergy source (eg. egg white, coconut).
- Improvement on product texture.

Technical Advisor and Instructor:
Dr. Martin Okos