**Breathe Beauty**

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Design Day 2022

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**Introduction**

Imagine this— it’s been a long day of class. Rushing from Process Design to Hodson to Product Design in Bloomberg for the last 8 hours, you finally take off your mask only to be horrified to see what’s happened to your skin.

According to the Mayo Clinic, prolonged mask-wearing creates “excess moisture that [leads to] skin irritation on the nasal bridge, chin, and or cheeks.” This situation is all too common for young adults who juggle the dilemma of abiding by public health measures while keeping good health.

**How Does It Work?**

1. **BUY IT**
   - Our product comes in packs of 2
2. **WEAR IT**
   - Wear the mask normally, watching Vitamin E release at the arrow locations
3. **WASH IT**
   - Our product can withstand 3-4 washes!
4. **RECYCLE IT**
   - All parts are biodegradable

**Market & Challenges**

**Skin Care Products Market**
- TAM: US Facial Skin Care Market ($14B, 210 M people)
- SAM: US Consumers Ages 18-34 Using Moisturizer Cream 1x a week ($2.1B, 25M people)
- SOM: 5% Adoption Rate ($105 M, 1.25 people)

**Non-Luxury Facial Skin Care**

**Competition**

**Primary (Cosmetic Masks)**
- L’OREAL
- PROCTER & GAMBLE

**Secondary (Other Cosmetic Products)**
- L’OREAL
- PROCTER & GAMBLE

**Tertiary (Typical Face Masks)**
- Sunlight
- Humidity

**IP Challenges**

- No current active patents on this concept, many in development
- Bacterial Particulate Filtrate
- Efficacy
- Fluid Resistance
- Stability
- Flammability

**Regulatory Challenges**

- Must abide by FDA Mask Standards:
  - Non-flammable
  - Biodegradable

**Results**

**Wear the mask**

**How Does It Work?**

1. **BUY IT**
2. **WEAR IT**
3. **WASH IT**
4. **RECYCLE IT**

**Manufacturing Process**

**I. Microcapsule Preparation**

- Mixing
- Ultrasonic Emulsification

**II. Fabric Preparation and Capsule Embedding**

- Fabric Spraying
- Chemical Grafting

**III. Stitching and Packaging**

- Stitching

**Figure 1—Release Kinetics of Vitamin E**

The plots above show the total release of vitamin E and vitamin D over time over a one month time-span. The kinetics were modeled using the power rule based Ritger Peppas model using parameters found in literature for a similar product. (insert reference here.) Washing was assumed to happen weekly for 30 minutes, and was modeled using the same model, but a 10x larger rate parameter.

**Figure 2 — Manufacturing**

**Figure 3 — Financial Analysis**

Data shows it will take 2.7 years to break even even when considering the time value of money and 2.5 when not. There is about a 47% return after 6 years.

**Figure 4 — Final Product**

The final mask consists of three layers of absorbent, non-woven non-absorbent, and non-absorbent material with the innermost layer consisting of microcapsules.

**References**


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Introduction
Imagine this -- it’s been a long day of class. Rushing from Process Design in Hodson to Product Design in Bloomberg for the last 8 hours, you finally take off your mask only to be horrified to see what’s happened to your skin.

According to the Mayo Clinic, prolonged mask-wearing creates “excess moisture that [leads to] skin irritation on the nasal bridge, chin, and or cheeks.” This situation is all too common for young adults who juggle the dilemma of abiding by public health measures while keeping good health.

How Does It Work

1. BUY IT
Our product comes in packs of 2

2. WEAR IT
Wear the mask normally for Vitamin E release at the arrow locations

3. WASH IT
Our product can withstand 3-4 washes!

4. RECYCLE IT
All parts are biodegradable

Market & Challenges

TAM: $148M US Facial Skin Care Market (210M People)
SAM: $2.1B US Consumers Ages 18-34 Using Moisturizer Cream 14x a week (25M people)
SOM: $105M 5% Adoption Rate of SAM

Primary and Secondary
(Cosmetic Masks And Other Facial Cosmetic Products)

L’Oreal

3M

Honeywell

FDA Mask Standards:
1. Bacterial/Particulate
2. Filtrate Efficacy
3. Fluid Resistance
4. Delta P
5. Flammability

No currently active patents
Many patents in development

IP Challenges

Regulatory Challenges

I. Microcapsule Preparation

Mixing → QC → Emulsification → QC → Purge

II. Fabric Preparation and Capsule Embedding

Chemical Grating → QC → Purge/Recycle

III. Stitching and Packaging

Stitching → QC → Packaging → Distribution

Results

Figure 1 — Release Kinetics of Vitamin E
The plots above show the total release of vitamin E and the vitamin E release by day over a one-month time-span given an 8-hour wear-period per day. The kinetics were modeled with the power rule based Štěpánek Peppas model using parameters found in literature for a similar product. Furthermore, boundary conditions of the model were reset at the end of the day, and no vitamin E was assumed when the mask was not worn. Washing was assumed to happen weekly for 30 minutes, and was modeled using the same model, but with a 10x larger rate parameter.

Figure 2 — Process Flow Overview
The diagrams above summarize the manufacturing process for our BreatheBeauty face masks. Microcapsules are first manufactured, then embedded into the mask fabric. The final mask is stitched together for packaging and distribution.

Figure 3 — Financial Analysis
Data shows that it will take 2.7 years to break even when considering the time value of money. After 6 years, the expected average annual rate of return is around 47%.

Figure 4 — Final Product
The final mask consists of three layers of absorbent, non-woven non-absorbent, and non-absorbent material with the innermost layer consisting of microcapsules.

References
According to the Mayo Clinic, prolonged mask-wearing creates "excess moisture that [leads to] skin irritation on the nasal bridge, chin, and or cheeks." For young people, this creates a dilemma – how can we juggle the need to care both about public health and our own skin’s health?

**How Does It Work?**

1. **BUY IT**
   - Our product comes in packs of 2
2. **WEAR IT**
   - Wear the mask normally for Vitamin E release at the arrow locations
3. **WASH IT**
   - Our product can withstand 3-4 washes!
4. **RECYCLE IT**
   - All parts are biodegradable

**Figure 1 — Final Product**

The final mask consists of three layers of absorbent, non-woven non-absorbent, and non-absorbent material with the innermost layer consisting of microcapsules.

**Figure 2 — Microcapsule**

The final mask contains 0.1 g of microcapsules with 0.02 g of Vitamin E.

**Introduction**

**Kinetic Modeling**

![Graph showing Vitamin E release by day and total Vitamin E release over time.](image1)

**Manufacturing Process**

**I. Microcapsule Preparation**

- Mixing
- Ultrasonic Emulsification

**II. Fabric Preparation and Capsule Embedding**

- Fabric Spraying
- Chemical Grafting

**III. Stitching and Packaging**

- Design
- Stitching
- Packaging

**Figure 4 — Process Flow Overview**

The diagrams above summarize the manufacturing process for our BreatheBeauty face masks. The process is a three-step process in series and can be scaled to produce approximately 10 million masks per year.

**Figure 5 — Financial Analysis**

Data shows that it will take 2.7 years to break even when considering the time value of money. After 6 years, the expected average annual rate of return is around 47%.

**Market & Challenges**

**Competition**

- No currently active patents
- Many patents in development

**IP Challenges**

- Highly negatively charged
- Entrapment efficacies of 99%
- Encapsulated α-tocopherol (TOC) → α-tocopherol (TOC)

**Regulatory Challenges**

- FDA Mask Standards:
  1. Bacterial/Particulate
  2. Filtrate Efficacy
  3. Fluid Resistance
  4. Delta P
  5. Flammability

**Financial Projections**

**References**