# Replenishing Rosewood

## ChemEng. Clean Corporation

Fernando Cabrera
Wesley Smith
Ernest Fedorowich
Louis Gao

https://youtu.be/a-cnm0lF0a0

# Meet the Team


“As a varsity athlete, I understand the importance of having a soap that will not irritate the skin and last after prolonged, daily usage”

- Fernando Cabrera

“I know our soap looks amazing, but please do not take a bite out of one of them, thanks.”

- Wesley Smith

“Our soap, not only does it clean everything, but it also smells like nice flowery perfume, embracing you all time”

- Louis Gao

“I want to create a soap with a pleasant scent, since I want to smell the exact opposite of CS students”

- Ernest Fedorowich

ChemEng. Clean Corporation

# Our Goal

UNIVERSITY OF WATERLOO
FACULTY OF ENGINEERING
Department of Chemical Engineering

Through the use of solely natural ingredients and the oversight of the entire chemical process by four undergraduate chemical engineers we can ensure...

## 100% SATISFACTION GUARANTEE

Natural

Trusted

Fresh

# Branding

- Catchy colour
- Sticks to our theme
- Contrasts well with the colour of the soap
- Contains all of the necessary information for consumers
- Catchy company and product name

# What Properties Did our Calculator Consider?

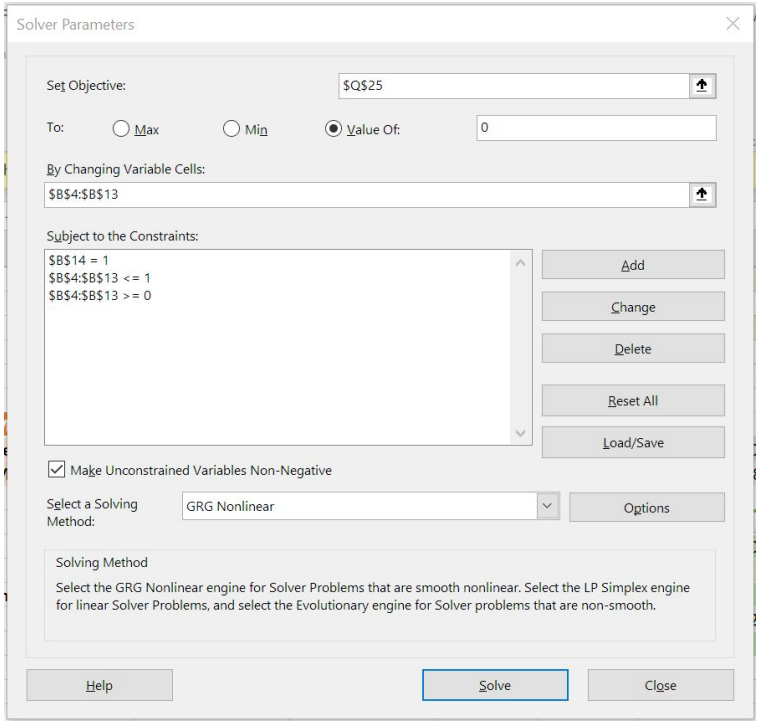
As a team, we wanted the following soap properties:

- Moderate hardness
- Excellent cleansing
- Equally bubbly and creamy lather
- Moderate conditioning
- Feasible cost
- Pleasing scent
- Aesthetic colour/molding


So, we created a soap calculator that would determine the ideal oil composition based on minimizing the cost in terms of the property range values.

# Setting Up Excel Solver

- We set up the Excel Solver tool to give us a combination of oils that would satisfy our desired soap properties.




| | Mass of NaOH(g) | Mass of KOH (g) | Hardness | Cleansing | Bubbly Lather | Creamy Lather | Conditioning | Cost |
|---|---|---|---|---|---|---|---|---|
| **Totals** | 76.66894832 | 107.4552941 | 40.0066221 | 20.001276 | 20.00127605 | 20.00534601 | 50.01830558 | $ 8.01 |
| | | | | | | | | |
| **Recommended Ranges** | | | 29-54 | 12-22 | 14-46 | 16-48 | 44-69 | |
| | | **Targets** | 40 | 16 | 24 | 20 | 50 | |
| | **Objective Function** | | $ 40.01 | | | | | |

# Solver output of Desired Masses

- Solver gave us an output of oil composition.
- The oil output recipe could be used during the soapmaking process.
- We also needed to consider the output of lye composition and the amounts of each extra additive.

| Oils | Percenta | Quantity (g) | Cost | |
|---|---|---|---|---|
| Coconut Oil, 76 deg | 24% | 121.206225 | $ | 2.15 |
| Ghee, any bovine | 25% | 125.3213965 | $ | 2.07 |
| Crisco, old | 17% | 82.87188917 | $ | 0.43 |
| Avocado Oil | 0% | 0 | $ | - |
| Olive Oil | 0% | 0 | $ | - |
| Sesame Oil | 0% | 0 | $ | - |
| Corn Oil | 0% | 0.001070448 | $ | 0.00 |
| Grapeseed Oil | 0% | 0 | $ | - |
| Sunflower Oil | 14% | 71.41236485 | $ | 0.22 |
| Canola Oil | 20% | 99.18705401 | $ | 0.23 |
| Total | 100% | 500 | $ | 5.09 |

| Lye Composition | Mass (g) | Cost |
|---|---|---|
| Water | 190 | $0.00 |
| NaOH | 72.84 | $2.18 |

| Additional Compo | Quantity (g) | Cost: | |
|---|---|---|---|
| Red food colouring | ~3.5 | $ | 0.36 |
| Rosewood Essential ( | 7.5 | $ | 2.17 |

# Comparison of Design and Final Product

- In our use of the soap calculator, we wanted a soap that cleansing property value of 16 and bubbly lather property value of 24, however, this is not what we achieved. Our design gave us a soap that was more cleansing (value of 20) and less bubbly (value of 20)
- During the lab process, we lost trace amounts of oils and lye since we could not remove 100% of contents from each beaker or container.
- This could have impacted the saponification process

| Hardness | Cleansing | Bubbly Lather | Creamy Lather |
|---|---|---|---|
| 40.0066221 | 20.001276 | 20.00127605 | 20.00534601 |
| | | | |
| 29-54 | 12-22 | 14-46 | 16-48 |
| 40 | 16 | 24 | 20 |
| $ 41.81 | | | |

# How Much will Labelling Cost?

## Norprint Corp.

1041 North Service Road East, Oakville, ON L6H 1A6
Phone: 905-849-8984 Fax: 905-849-9651

**Date: November 18, 2019**

**Product Description: 3.5" x 3.5" Roll Label, with gloss lamination, permanent adhesive,**

Shape: Square or Circle

Stock: White Paper

Colour: Full Colour CMYK

**Qty 100 @ $ 0.68 cents each label**
**Qty 500 @ $ 0.37 cents each label**
**Qty 1000 @ $ 0.28 cents each label**

**Shipping to Waterloo University Postal Code N2L 3G1:**

**Qty 100 – Shipping Cost: $ 9.99**
**Qty 500 – Shipping Cost: $ 9.99**
**Qty 1000 – Shipping Cost: $14.42**

**Additional: Applicable Taxes HST**

Production time is 5 - 7 business days from order confirmation and artwork approval.

Please contact us if you have any questions. We look forward to working with you on this order.

Thank you in advance for your business.

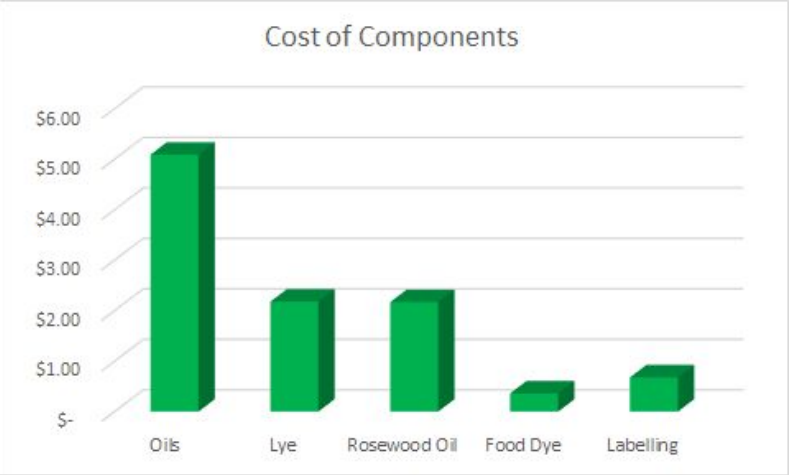
Regards,

NORPRINT
Promotional Print Excellence

This is an official label cost estimate according to a local printing company. The cost is $0.68 per label.

# Price Point

- Need to charge at least $2.13 per each 100g bar to cover production costs.
- Average cost of other soaps (according to online sources) is $6.66 per 100g.[1]
- A fair price point would be $3.49 per each 100g bar.
  - This would give us a gross profit margin of **40%**
  - This would insulate for losses, such as from underselling.
- The unit price is 3.5 cents per gram.




1: https://www.amazon.ca/Soap-Natural-Handmade-Calendula-Carrot/dp/B07K5JH1FB/ref=redir_mobile_desktop?_encoding=UTF8&aaxitk=HbNugA4mUmcph896wrX4Eg&hsa_cr_id=5659039280601

# What if we wanted to Scale Up the Process?

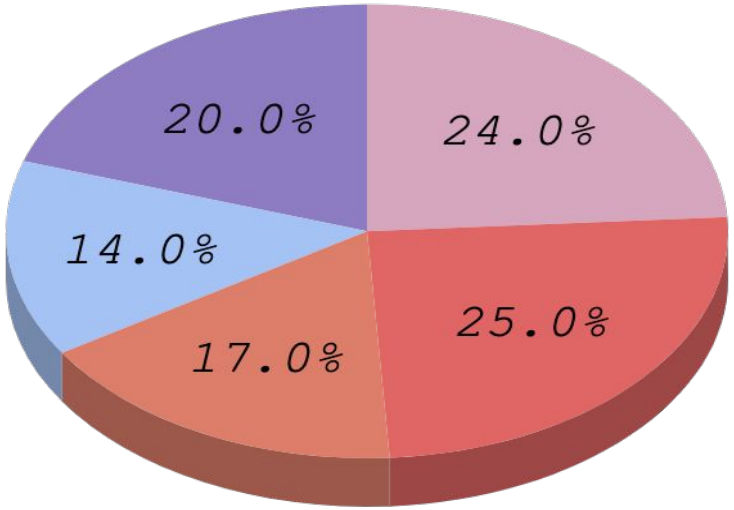
- Overall, the cost per bar would be higher if:
  - We conducted an advertising campaign
  - We paid for shelf space in a local market
  - We set up an online store
  - We had to ship product
- New equipment might be necessary for a scaled manufacturing process.[2]
- We would have to consider changing the price charged per bar.

2: http://www.cemcorp.com/2017/10/12/moving-on-up-how-to-scale-in-the-manufacturing-process/

# what's In our Soap?

**Soap Oil Composition per 500g**

3.5 mL Red Food Colouring, 7.5g Rosewood Essential Oil




Coconut oil Ghee Crisco Sunflower Oil Canola Oil

***Did you know:***
*Rosewood is used in aromatherapy to help relieve stress-induced headaches (Sounds perfect for stressed engineering students!)*

# Other Considerations

- We considered various designs during the design stage:
- One of our design ideas was to use two different colours. White and red, we would have the bottom half of the soap to be white and the top half to be red.
- Another idea we had regarding colour, was to have the petals of the flower mold to be red soap while the rest of the mold was filled with white soap.
- A soap composition with better conditioning and bubbly lather was considered, however, the cost was not very feasible.


# Why these Ingredients?

- One of our goals was to create a soap that moisturizes the skin but also fulfills its main purpose. *Can you guess what that purpose is?*

(Hint: It's to clean!)

Ever had dry and cracking skin? Well, sunflower oil, canola oil, coconut oil, crisco, ghee are all great oils to help keep your skin moisturized!

The safe to use red food colouring gives a pleasant pink appearance.

Ghee combined with coconut oil helps to provide you with a firm soap.

Sweet smelling rosewood essential oil + a flower shaped mold, it's like washing yourself with roses!

# Why we chose this packaging

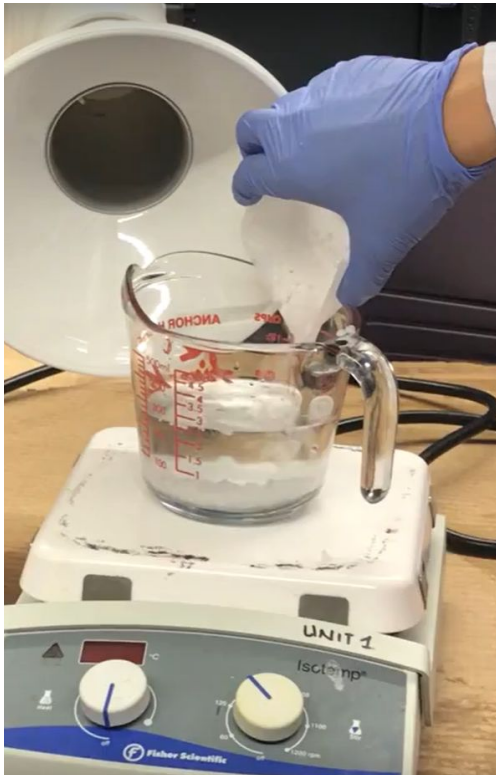
The minimalistic packaging around the soap is meant to be thrown away, and when it is, there isn't much waste. It's also super easy to remove. **No** scissors required!

The thin and transparent material allows you to see the shape and colour of the soap as well as its smell before you purchase it.


Even with little material, it's still able to protect our soap from dirt, water, and anything else that it might come in contact with.

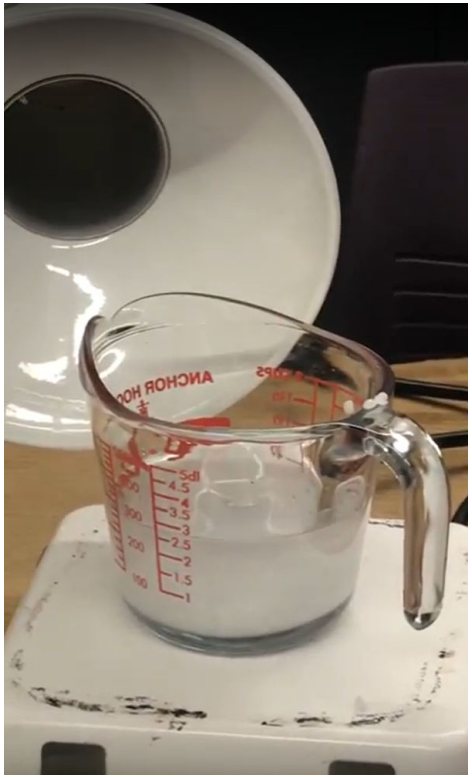
The label on the back of the soap helps to prevent any allergic reactions to the ingredients by informing you of the contents of the soap

# How did we make our soap?

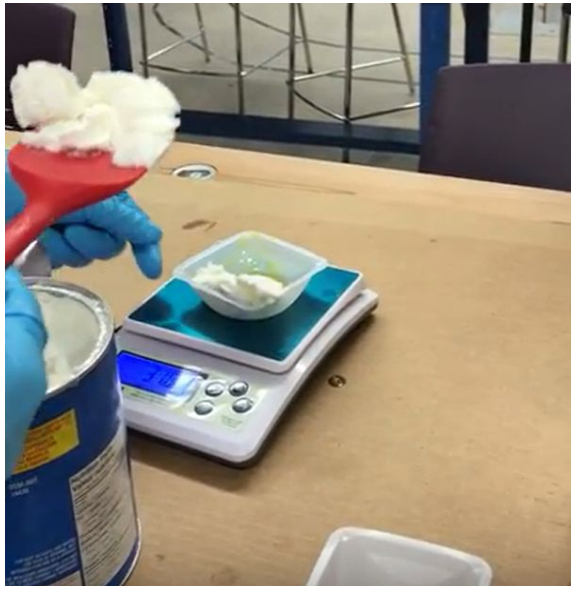



Adding about 14.6g of sodium hydroxide(NaOH) into 38g of water

Heating and stirring to form a NaOH solution

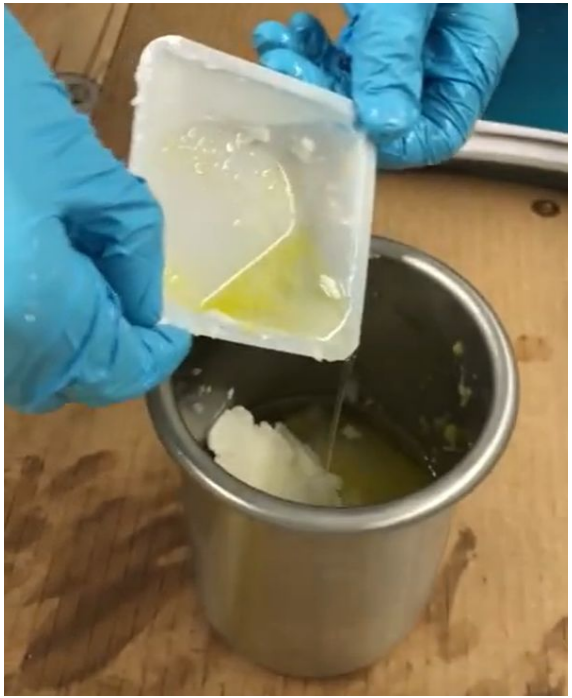


Measuring different types of oil and forming an oil mixture



Ghee

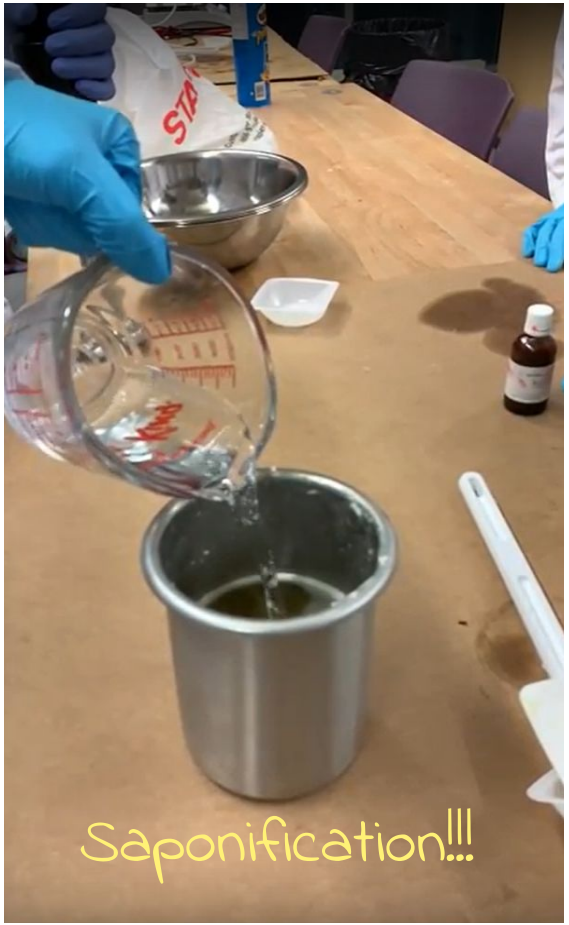
Sunflower oil



Mixture of oil

Heating up
oil mixture

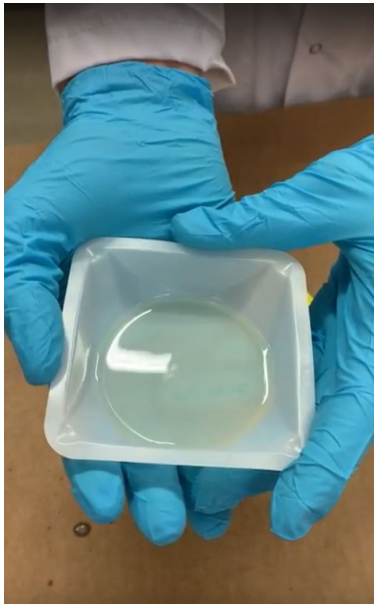
Measuring temperature
of the mixture until a
desired temperature
is reached, stirring is
necessary to speed
up the mixing




Adding NaOH solution into the oil mixture

Keep stirring until the mixture becomes viscous

After more than 10 mins of stirring




Adding 5g of rosewood essential and 35 drops of red food colouring

Filling up different moulds and wait for the soap to dry

# References


1. http://clipart-library.com/clip-art/soap-clipart-transparent-3.htm
2. https://www.canva.com/q/pro/?v=13&country=ca&utm_source=google_sem&utm_medium=cpc&utm_campaign=REV_CA_EN_CanvaPro_Branded_Tier1_Core_EM&utm_term=REV_CA_EN_CanvaPro_Branded_Tier1_Canva_EM&gclid=Cj0KCQiAn8nuBRCzARIsAJcdIfMyNmiFW5x4GNZe0oFjS_5dib0MD_xj2pQXei1egDohy6ZUV4qmP4IaAmR8EALw_wcB
3. https://divineessence.com/en/product/rosewood/
4. https://www.123rf.com/clipart-vector/environment.html?sti=lr6ogsfh71nqk9ndkz|
5. https://www.isatonic.com.au/which-cooking-oils-are-best/
6. https://www.msicertified.com/blog/three-forms-of-waste
7. https://www.amazon.ca/Soap-Natural-Handmade-Calendula-Carrot/dp/B07K5JH1FB/ref=redir_mobile_desktop?_encoding=UTF8&aaxitk=HbNugA4mUmcph896wrX4Eg&hsa_cr_id=5659039280601