SCIENCE TALENT SEARCH

INVENTIONS REPORT FORMAT

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Name of Entry: SoapCycle

AIMS

How does my invention solve a real world problem?
What does my invention do?

My invention solves the problem of soap recycling in Australia where many hotels throw out soap that harms the environment. My invention solves that problem by recycling the soap at the hotel room itself without the use of a large truck hauling the soap.

INTRODUCTION

What were the ideas that made me build this invention/device?
How is my invention original or new compared to current existing technology?
Why is my invention important or relevant to an existing problem?

Some ideas that helped me build my device are the fact that soap is a large threat in the environment. Soap pollution in rivers and lakes promote algae growth and stunts the growth of other sea life. Sea plant life needs around 8mg of oxygen to live and the soap pollution takes 20mg and after the soap discharges, makes the oxygen levels go down to a measly 2mg (National Library of Medicine). However, after thorough research I found out that my device is not fully original as a similar invention called the Soap Butler is currently being funded through an IndieGoGo to be mass produced. Although they may seem similar, these inventions are very different and are used for different purposes. The Soap Butler is used for soap enthusiasts with moulds and oils to use to make your soap custom to you. My invention solely focuses on the environmental aspect of recycling soap and does everything to ensure it helps the environment.

INSTRUCTIONS

In point form, list the instructions on how to use your invention/device or how to operate it.

1. Place the soap scums into the cup followed by a little bit of water

2. Turn on the hot plate on the maximum heat setting

3. Turn on the auto-stirrer and watch as the soap becomes fully dissolved into the water

4. Take the dome off and allow the liquid to cool

5. After five minutes, place the mug into the freezer.

6. Watch as in 20 minutes, the liquid turns into a bar of usable soap.

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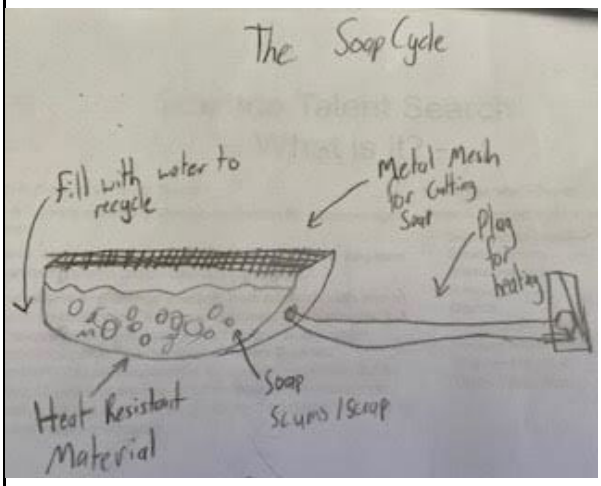
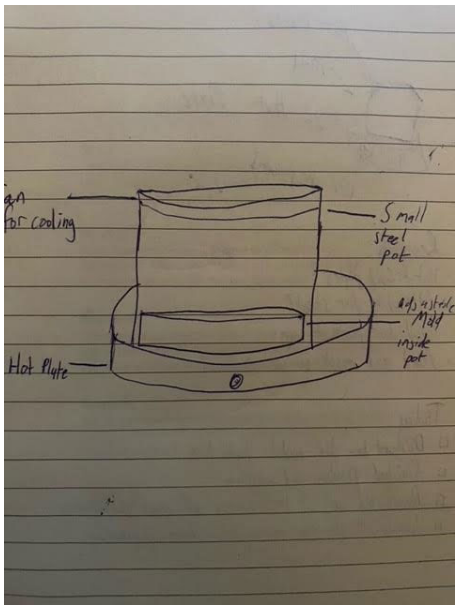
DESIGN BRIEF

How did I build my invention/device?
Describe any problems building it and how I solved it?
Draw a picture of my invention/device design (prototype)
Label my pictures with what each part does (2-3 or more recommended)
What do I know about the science and technology of the parts of my invention/device? Describe. Have I tested my invention/device? What were the results? Can I organise my results into a table or graph?



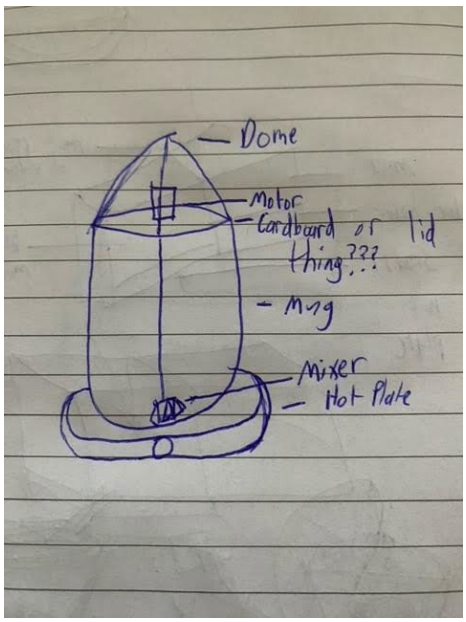
PROTOTYPE 1

This prototype was very unrealistic but it was a starting point for my design briefing. I realised that the metal mesh would be extremely hot and the container that was heating the soap liquid was going to take a while to cool down. I also had no stirring device which meant that the soap would just sink to the bottom and not infuse with the water.



PROTOTYPE 2

This prototype was mildly usable and only really could work if it was industrially made. I wanted to use an old kettle for heating but I considered it too dangerous and then went on to look at small cooking pots. I had the same issue as the last one with the pot being too hot for it to cool down quick enough. One silly idea I had was having a fan on the top acting as a lid and a cooling system which obviously wouldn't work.



PROTOTYPE 3

This prototype is what I ended up with as my final design. I used a mug or a ceramic cup with a thin bottom but a thick outside so it absorbs heat from the hot plate and it keeps the heat inside the mug. The motor is controlled by a battery pack with a togglable switch to turn it on and off. I used a large skewer stick and forks for the stirrer so it stirs efficiently. The dome is used to protect the motor and battery pack from the hot water and soap so it wont get damaged.

SAFETY				
Type of Risk	Hazard	Level of Risk	Precaution taken to control risk	Source of Information
Procedural	Boiling water splattering all over me	8/10	I can use a lid to stop the soap mixture from splattering everywhere.	
Procedural	The soap scum mixture burning the motor	5/10	I can make sure the motor doesn't stick out from the dome and stays put	
Equipmental	I may burn my hands on the mug	7/10	I can use gloves while heating the mixture or I can use a pot with handles that don't absorb heat.	
Equipmental	The head divider doesn't work and the machine short circuits	6/10	I will make sure the divider is safe and make the divider not let any liquid pass through it.	
Microorganism	The stirrer has areas that are not clean and contaminates the new soap	7/10	I will use a material that can be washed easily and wash the stirrer thoroughly after each use.	
Microorganism	The steam and vapour emitted by the soap may be a chemical byproduct and hurt the atmosphere	7/10	I will make sure the soap is heated at a perfect rate so it doesn't release any byproduct.	

DISCUSSION

What are some of the science principles and/or technology that I am showing in my invention/device? In detail, how does my invention/device solve the real world problem as mentioned in the aim? Analyse and include results of field tests.

Describe the limitations of the invention/device design.

Further considerations: how would I improve and develop my invention/device design?

Scientific idea/principle 1

Magnetism is shown in my DC Motor that stirs the mixture. It uses a mechanism that is controlled by magnets. Connecting the motor to a power source creates a temporary magnet - an electromagnet. The north magnet sends a signal to the south magnet and the signal runs through a coil that spins the motor. (Magnet Academy)

Scientific idea/principle 2
Convection is shown when the liquid inside the mug is being heated up and the hot liquid rises to the top, while the cold liquid goes down to the bottom to be heated up. This is used with the hot plate that heats up the liquid in the mug to evaporate the soap into the mixture. (UCAR)

Scientific idea/principle 3
Conduction is defined by heat being transferred to an area that is cold. For example, a steel pan heats up and the handle starts to absorb the heat is called conduction. Conduction is shown in my invention when the excess heat coming from the hot plate transfers itself to the mug. (UCAR)

How does my invention/device solve a real world problem?
I aim to put these in all hotels, resorts, motels, etc, and before we know it, soap will no longer be a problem for the Earth and we will all have a huge leap towards being carbon-neutral by 2050. Some companies have tried to mass recycle soap but unfortunately, the pollution that comes from the trucks that carry the soap, even out the amount of soap saved by recycling it.

Analysis and results of field tests
(Tables and graphs etc.)

Soap Used	Water Used	Temperature	Results
10g	3tbsp	75 C Degrees	A soft bar of soap

Problems encountered and how I solved it. Limitations and improvements?
Problems that I faced were the designing of this invention. I had to go through three phases to end up on my one design. They were all very hard to make in real life and I struggled to find a realistic option until my third draft. Some limitations that I faced were how hard it would be to make the device all-in-one. I initially wanted to use a hot/cold plate but they are only used in labs for animals and testing. Improvements I could make would be to make the device easy to manage and set timers on the stirrers and have a tray to slide the soap out of.

ACKNOWLEDGEMENTS
Thank all the people who helped you to complete this project

My Mother - Helping with the materials and making of the machine
My Uncle Pintu - Helping me with brainstorming all my ideas and editing the oral presentation
My Brother Advik - Helping me think of ways to implement soap recycling into the machine
STS Co-ordinator Caitlyn - Giving me feedback on all of my drafts and supporting me through it
STS Coordinator Lydia - Always checking up on me and discussing how the project is going

REFERENCES
Did I use any books, journals, articles or the internet to help with ideas and information to build my model? List this using the instructions from the STS Handbook page 23.

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