Improving Our Plastic Recycling Process using a Plastic Contamination Machine

National Design Project 2023

ECO CHAMPIONS
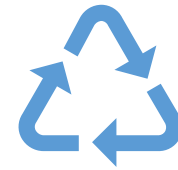from
EDGEFIELD
PRIMARY SCHOOL

	Name	Team Role
1	SHYJU ISHAAN	Leader
2	EDDA YEO	Assistant Leader
3	LEE JIA YI	Member
4	KARTHICK DIYAH	Member
5	KWEK ZHEN SEE	Member

Doing our part to recycle plastics

In 2021 and 2022, the overall recycling rate for plastics remained unchanged. In both years, only 6 per cent of plastic was recycled, which is lower than before.

We realized not all plastics collected are successfully recycled. This is due to contamination in the recycling process!

Doing our part to recycle plastics

Item	Total weight before washing (g)	Total weight after washing (g)	Contamination (g)
Plastic bottles collected during recess	703.27	232.46	470.81

- Although 703.27g of plastic bottles were collected, the actual weight for recycling is 232.46g.

- The difference is because the plastic bottles are not properly cleaned for recycling.

- There is contamination of 470.81 g and this would cause the plastic bottles to be unrecyclable.

The Challenge

- We have learnt that for plastic to be successfully recycled, it must not only be sorted out properly, but also free from contamination.

- Contamination occurs when materials are soiled by food or liquid.

The Challenge

- Although our school mates have been taught the proper way to prepare the plastic bottles for recycling, they are young and often forget what they must do before depositing the plastic bottles into the recycling bins.

The Problem Statement

How might we improve the recycling of plastic bottles by reducing contamination in the collection process?
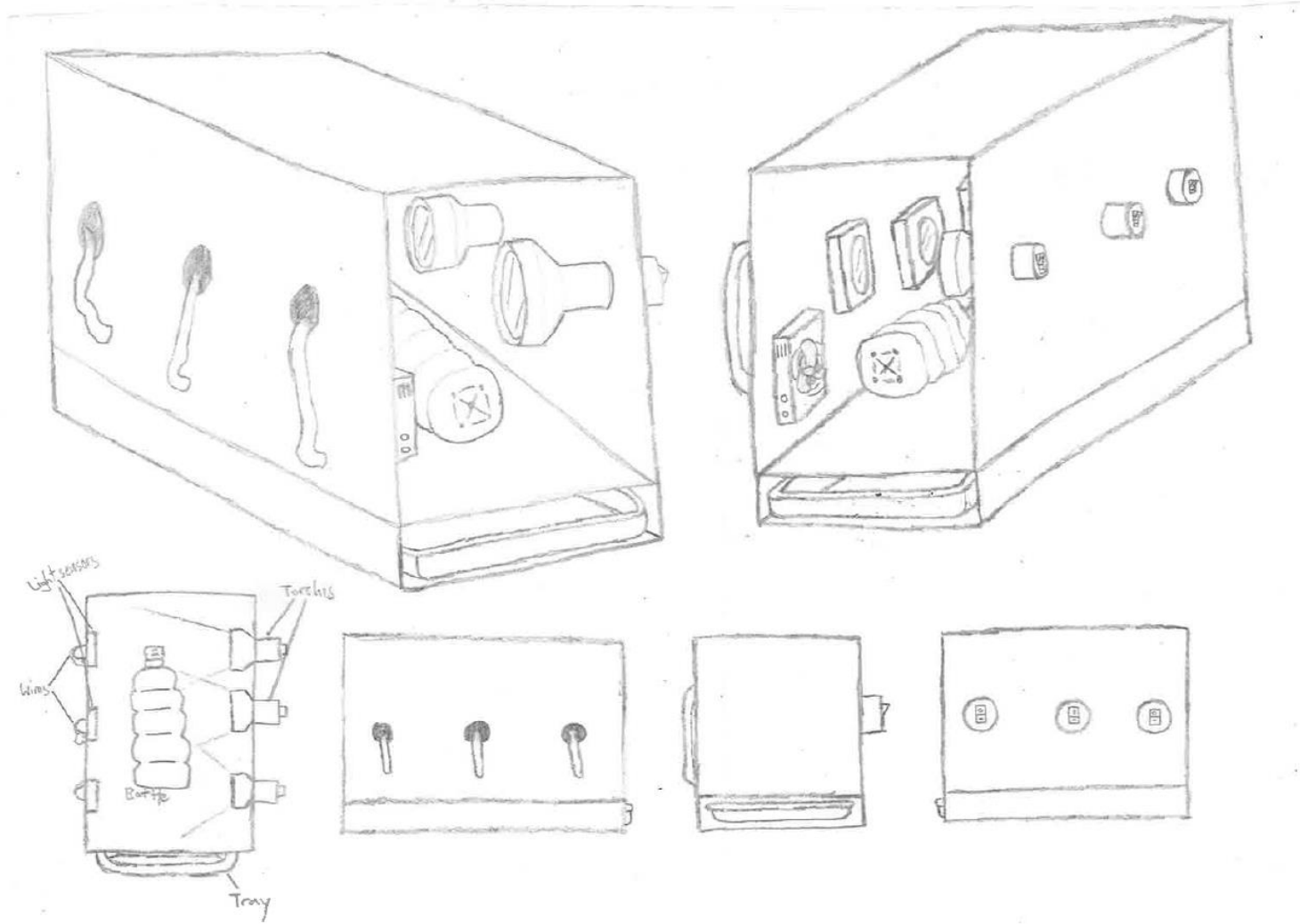
Our Solution

- We can build a prototype machine that scans the plastic bottle to determine whether there is contamination. It can be achieved through the use of and torch lights and light sensors.

- When light is shone through an empty bottle, the light sensors would capture a reading which changes when the same bottle has other matter in it. This would help determine whether the plastic bottle is contaminated.
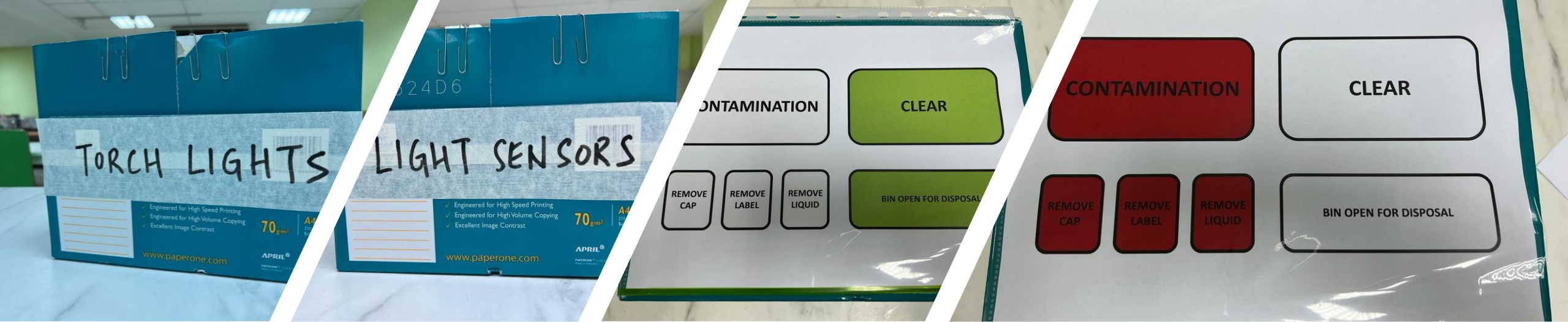
Clean vs Contaminated bottles.

Can you tell the difference?

Drawing of our prototype machine

TORCH LIGHTS

LIGHT SENSORS

CONTAMINATION   CLEAR

REMOVE CAP   REMOVE LABEL   REMOVE LIQUID   BIN OPEN FOR DISPOSAL

CONTAMINATION   CLEAR

REMOVE CAP   REMOVE LABEL   REMOVE LIQUID   BIN OPEN FOR DISPOSAL

REMOVE LABEL   REMOVE LIQUID   BIN OPEN FOR DISPOSAL

Our Prototype Plastic Contamination Machine

Light Chambers to check different types of contamination:

- Chamber A detects bottle cap
- Chamber B detects bottle label
- Chamber C detects presence of liquid
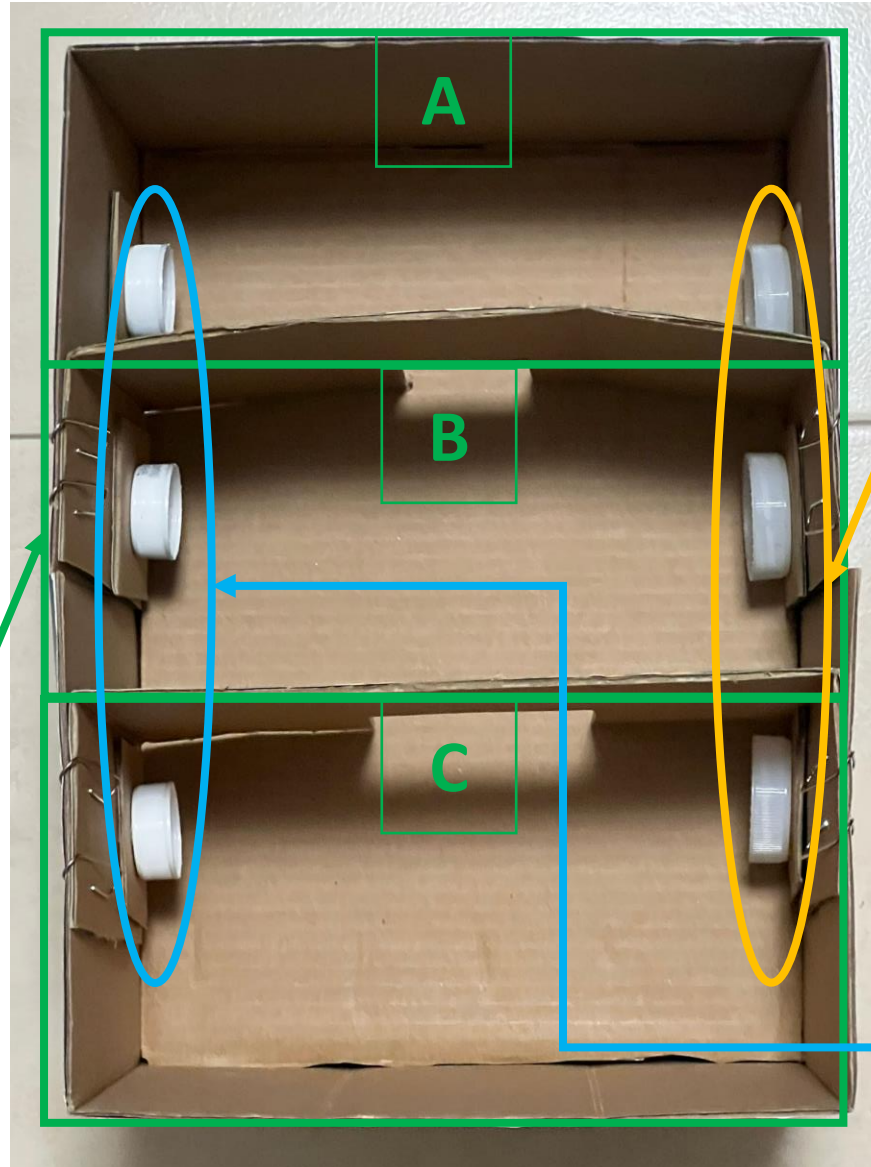
Torch lights to produce white light that shines through each part of the bottle.

Light sensors to capture the amount of light that passed through the bottle.

How does light sensors in our solution work?

The light sensors are positioned to capture light readings shone through at different parts of the bottle:

1. Sensor A captures light readings at the mouth of the bottle

2. Sensors B and C captures light readings in the bottle

When the light readings drop below the standard 1000 lux, light has been blocked by other matter so contamination has occurred.

Information displayed on the screen of our prototype machine

CONTAMINATION

CLEAR

REMOVE CAP

REMOVE LABEL

REMOVE LIQUID

BIN OPEN FOR DISPOSAL

Bottle Cap not removed

Bottle Label not removed

Presence of water droplets
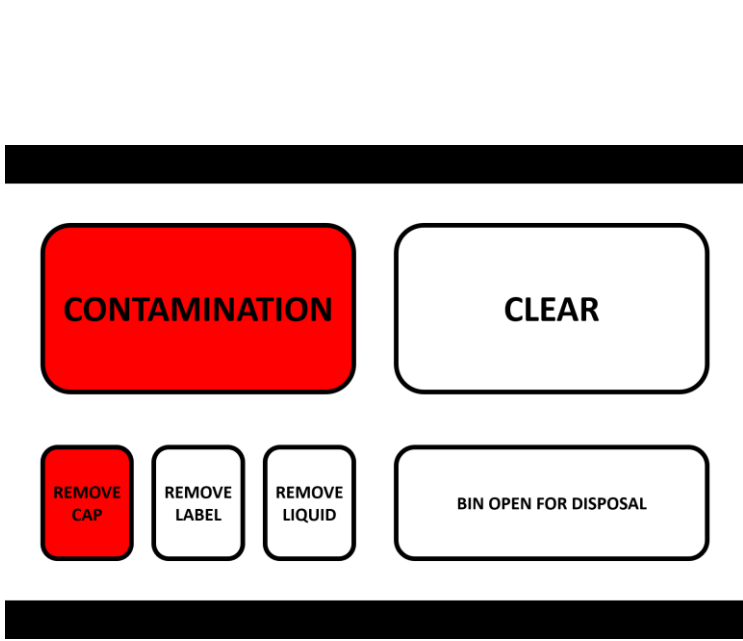
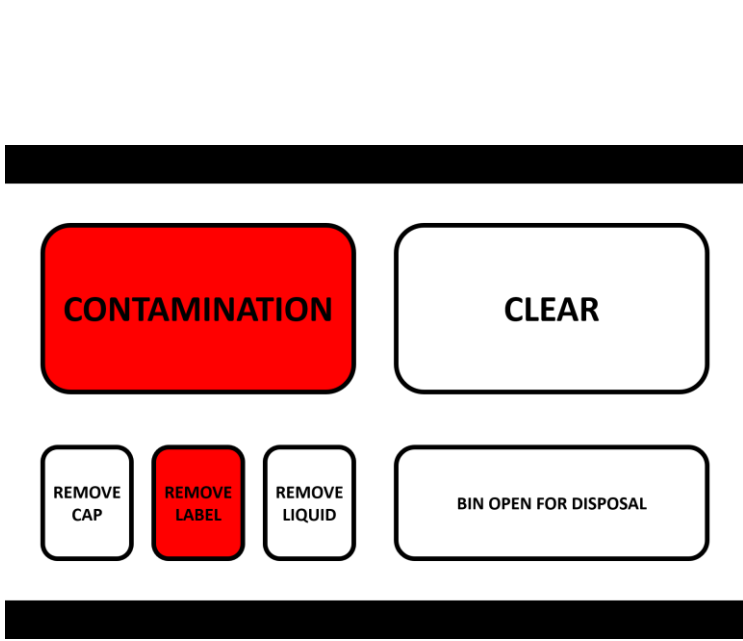CONTAMINATION   CLEAR

REMOVE CAP   REMOVE LABEL   REMOVE LIQUID   BIN OPEN FOR DISPOSAL

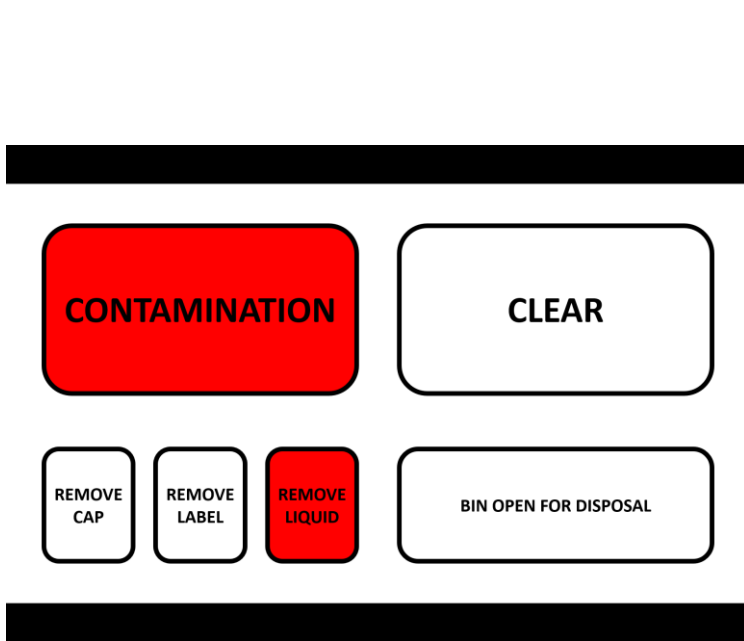Example of multiple contamination

Different information can be displayed depending on the type of contamination

Example when there is no contamination

Other benefits from our solution

Through our solution, we hope to:

1. Remind our school mates what was taught in school about recycling.

2. Help our school mates understand sustainability requires effort and commitment.

3. Remind our school mates to be conscious when they use plastic products.

Thank You!