



period poverty

helping her stand alone

the problem

education

20% of the school year is missed by girls on their period in Africa



10% of girls in Africa miss school while on their periods

consequences

- more likely that girls will drop out and be forced into child marriage
- more likely to face domestic abuse in marriage
- more likely to suffer from long term health consequences

health risks



alternatives to healthy products

use unhygienic products

- UTIs
- bacterial vaginosis
- vaginal itching
- white/green discharge

engage in transactional sex

- unwanted pregnancy
- anxiety
- depression
- trauma

shame

Many cultures have a taboo around menstruation causing women to be isolated and considered as unclean while on their period

stigma against periods

girls unprepared for periods

there is nobody to ask

unhealthy habits adopted

severe long term consequences

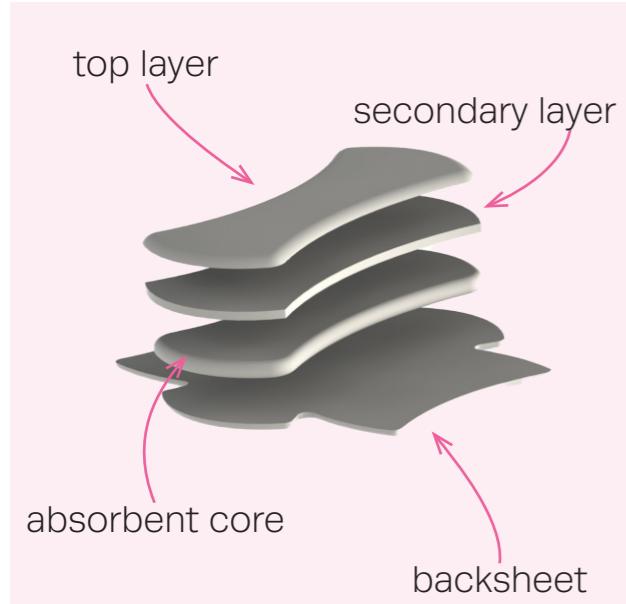
key takeaways

Period poverty is a cycle that is both the cause and the result of: **a lack of education, health risks** and **social stigmas** surrounding menstruation. Eliminating both the health risks and the lack of education will help dissuade people of the taboos and thus help in reducing the issue of period poverty in developing countries. For this reason, we will go forward looking into ways to ensure that **girls** on their periods are **healthy** and able to receive the **education** that they need.

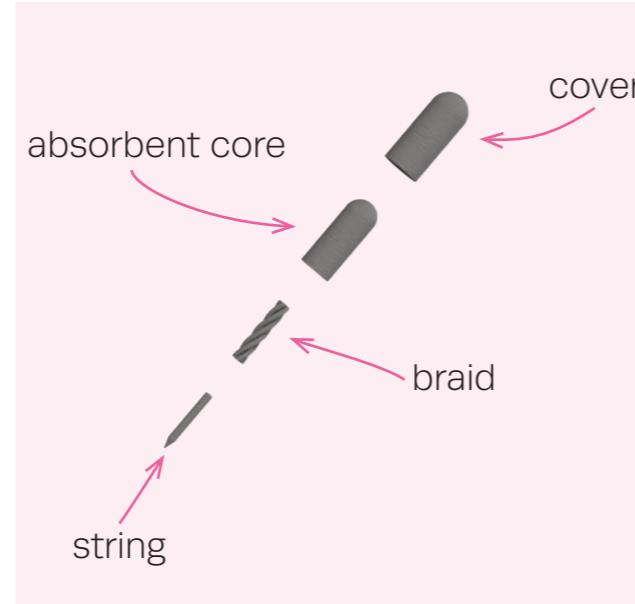
existing market

The existing market for menstruation products in developed countries is extensive (i.e **sanitary pads**, **tampons**, **menstrual cups** and **period pants**). The abolition of the pink tax in many countries has also made such products more affordable to the masses. It is these products that need to be more widely available in developing countries, to encourage **better menstrual health**.

sanitary pads



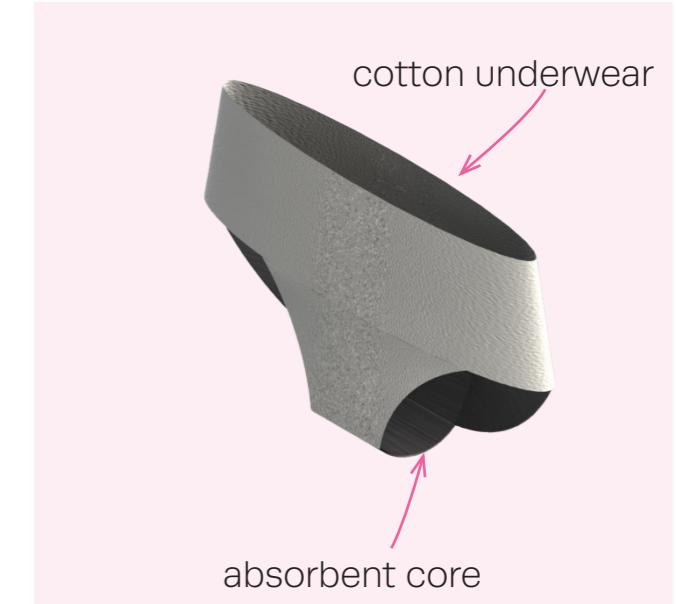
tampons



menstrual cups



period pants



80%

of women use pads in the UK

1 in 5

of women use tampons in the UK

\$292.36 million

is the predicted market size of menstrual cups by 2023

319%

increase in sales of period pants in June 2020

why?

♂ easy to put on and take off

why?

♂ best prevents leakage

why?

♂ long-lasting

why?

♂ easy to manage

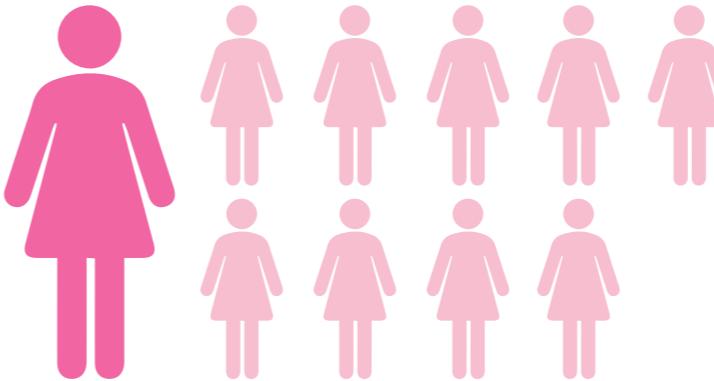
key takeaways

The existing market for menstrual products are sufficient, with the former two being much more readily used and the latter two slowly gaining speed in the market. Some of the reasons for the popularity of such products include: **comfort**, **ease of use** and **prevention of leakage**. While these are some general benefits that will inform the design process, further research will need to be done into the market reception of these products.

user feedback

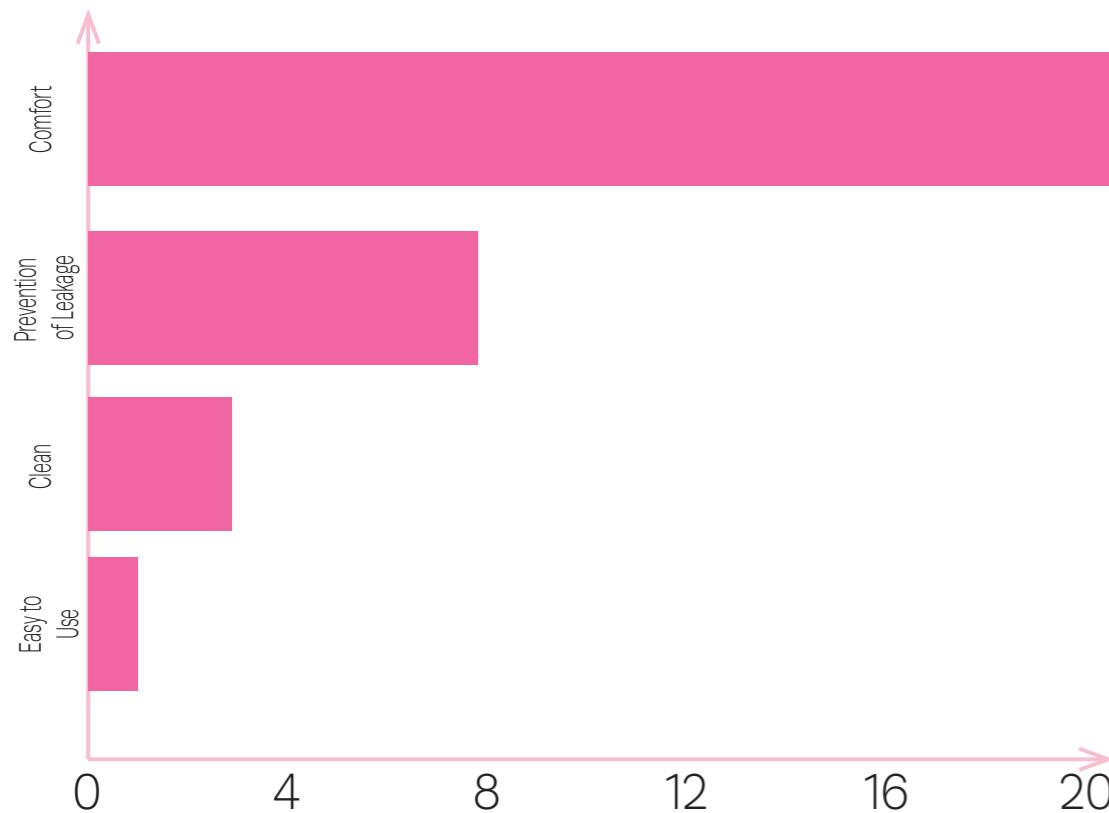
100%

of participants said that they use pads during their periods



1 in 10 participants have periods that last less than 4 days. Others are between 4 and 7 days.

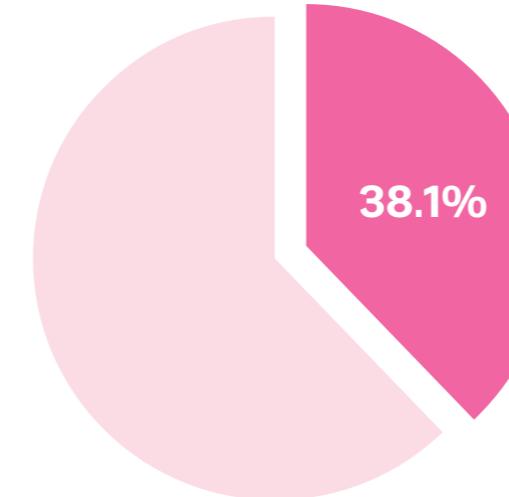
why?



2-3 times

3+ times

55% of participants need to change their menstrual product over 3 times on their heaviest days.



participants who would prefer disposable products over reusable

key takeaways

The survey conducted showed that the preferred choice of menstrual products were **pads**, primarily for comfort, while some also used tampons and period pants, but in significantly lower numbers. The average period lasts longer than **4 days**, with over **3 changes a day**. While the bulk of participants would prefer **reusable products** to disposable ones, a significant number did prefer the latter. This collated data will be used to inform the design process.

unhealthy alternatives

Many girls around the world do not have access to safe and hygienic options for menstrual products such as **sanitary pads** or **tampons**. As a result, they are forced to use unhealthy alternatives, many of which cause adverse reactions. They will either use **unhygienic substitutes**, which can have severe long-term physical consequences, or they will resort to extreme measures such as engaging in **transactional sex**, which has its own consequences, physical and mental.

physical consequences

Unhygienic materials such as tree bark, mud and rags are frequently used as alternatives to pads or tampons, all of which can have severe physical repercussions.

♀ bacterial vaginosis

Bacterial vaginosis can cause strong smelling discharge, as well as increasing the chance of complications in pregnancies.



♀ reproductive tract infection

RTIs can cause severe health problems, leading to infertility, ectopic pregnancies and an increased vulnerability to HIV.

♀ UTIs

UTIs, if left untreated, can lead to permanent kidney damage, and even sepsis, a potentially life-threatening infection.



♀ vaginal itching

Vaginal itching, while usually not serious, is often uncomfortable and even a painful condition to suffer through.

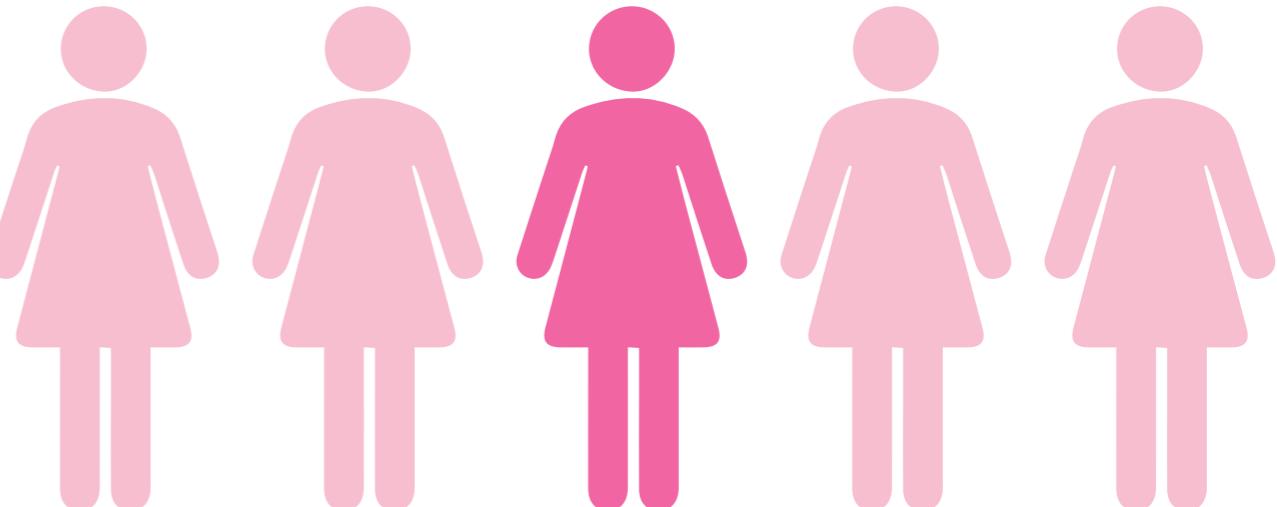
♀ white/green discharge

White or green discharge can cause an uncomfortable smell, as well as potentially leading to further infections.

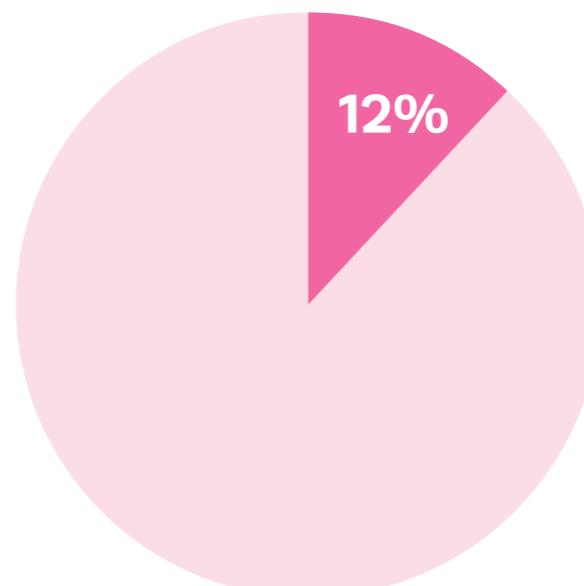


♀ hepatitis B

Hepatitis B, specifically in young girls, can persist for years, and can also lead to permanent liver damage.



1 in 5 girls miss school because of the lack of access to period products.



girls and women who have to use unhygienic substitutes to pads and tampons

key takeaways

Lack of availability to sanitary period products means that girls and women are forced to resort to extreme measures; **missing school**, reducing their ability to move forward in their lives or using **unhygienic products**, which can cause a wide variety of physical conditions, some of which can be serious and even life-threatening. It is for this reason that the product will be designed to improve the **availability of sanitary products**, particularly in **underdeveloped countries**.

brief & requirements

user requirements

- ♀ there must be a long-lasting supply of the products
- ♀ the products must be hygienic and not cause any detrimental effects to the user's health
- ♀ products must be discreet to avoid shame in some cultures
- ♀ products must be easy to use so girls and women can use it alone

final brief

How might we provide girls and women in underdeveloped countries with a long-lasting supply of hygienic menstrual products?

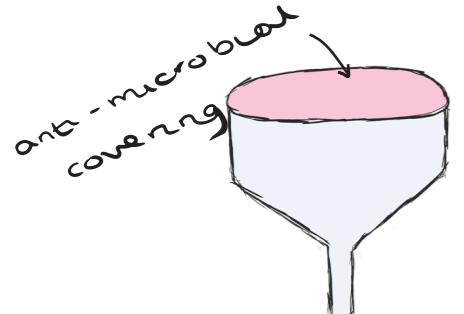
product requirements

- P**ermanent
Refreshing supply is not an option so the device must be able to provide the user with a permanent (or long-lasting) supply of menstrual products
- E**nvironmental friendliness
Existing products have a detrimental effect on the environment, and in order to be sustainable, the device should reduce the existing environmental friendliness
- R**eusable
Due to the lack of product availability, a reusable device will help women and girls to manage their periods safely for longer
- I**nconspicuous
Many cultures have taboos against menstruation, so the product should be fairly hidden so as not to expose the user to negative reactions from the community
- O**perative
It should be easy for women and young girls to use the products alone; making it difficult to use will backfire
- D**urable
The product should be able to survive in tough environments, as that is where it is likely to be used
- S**anitary
The products must be a safer alternative to what is currently being used by girls and women and therefore must be hygienic

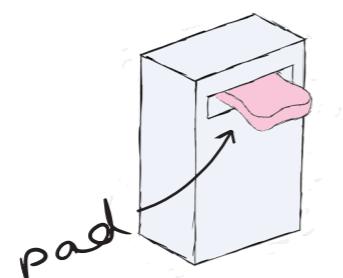
15 ideas

15 initial ideas were generated, based on the brief, user requirements and product requirements. Each was then taken back to the charity representatives who were being consulted, and a rating out of 5 based on how well they would work in the environments of usage was given. Three ideas were then selected to move forward with for further refinement.

1 anti-microbial cup



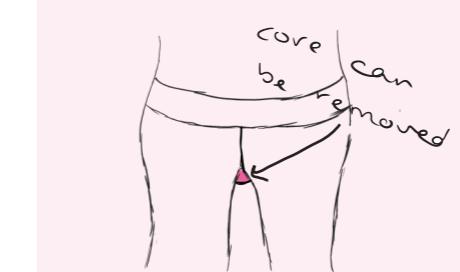
2 pad dispenser



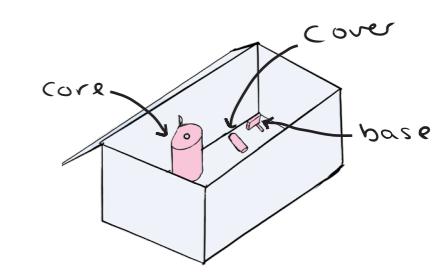
3 banana leaf pad



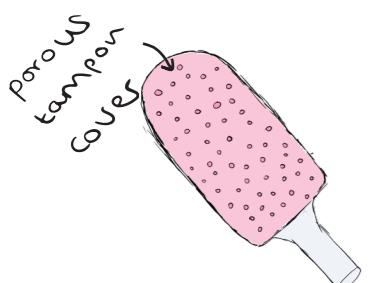
4 removable core pad



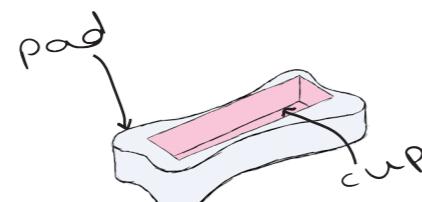
5 tampon-making kit



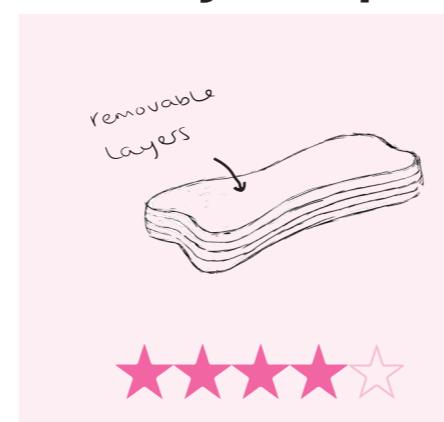
6 hollow tampon



7 pad cup



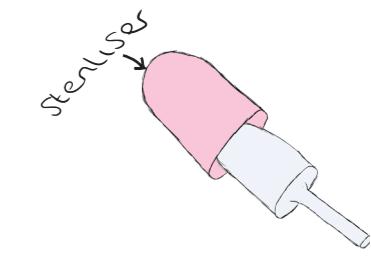
8 layered pad



9 self-cleaning pad



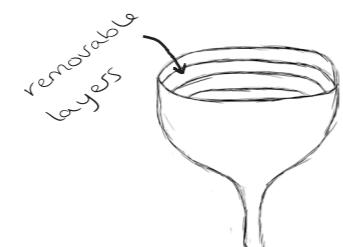
10 tampon steriliser



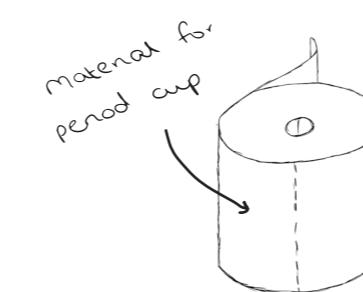
11 steriliser



12 layered cup



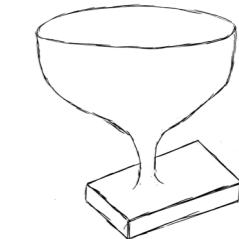
13 cup-making kit



14 skirt pad

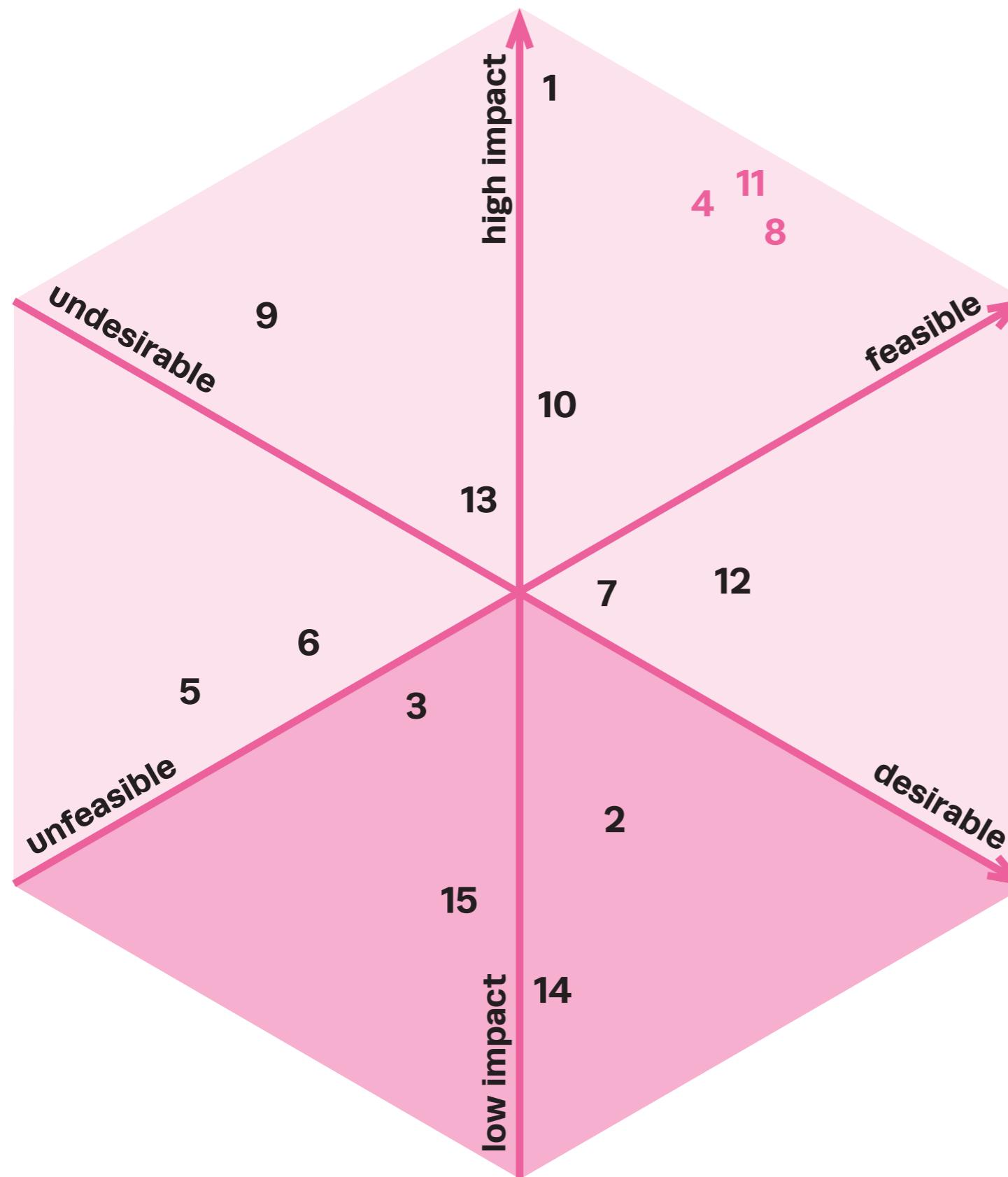


15 box cup



ideation matrix

Each of the 15 ideas were rated by the charity representatives on the basis of how well it could work in the environments of usage, but then further evaluated based on **impact**, **desirability** and **feasibility**. A matrix was created to find the ideas to take ahead.



prototyping - idea 1

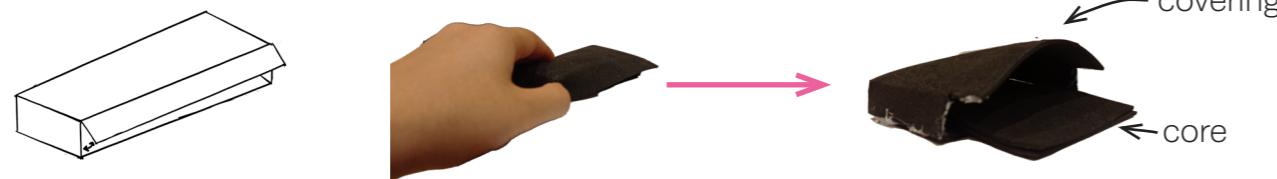
Idea 1, **the removable core pad**, is the first to be prototyped. The primary aspects to be decided are the **shape**, **structure** and **how the removable core can work**. A variety of materials can be used in prototyping, but will primarily be made out of EVA foam.

how will the core be removed?

1



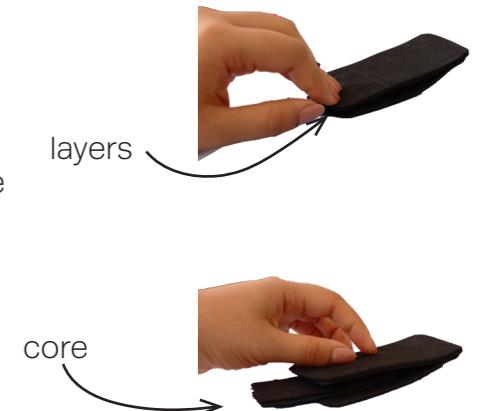
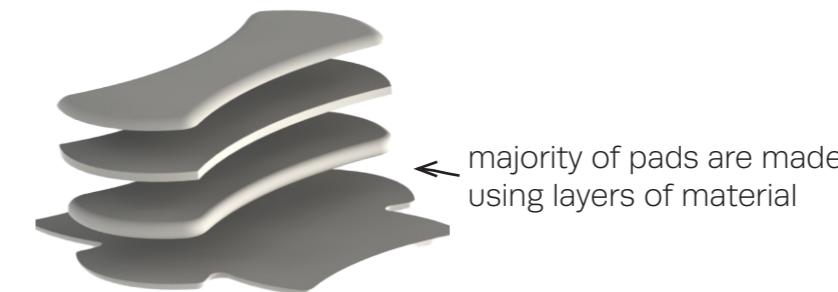
2



Option 1 was better received by users and it is therefore the one that will be used for removal of the core. The core will be removed via the short side of the pad.

what will the structure of the pad be?

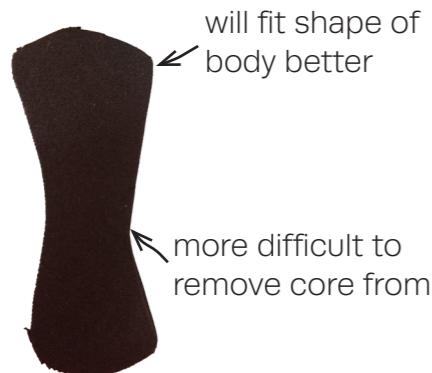
1



Using layers to manufacture the pad will make removal of the core quite difficult, therefore another alternative will need to be considered.

what shape will the pad be?

1



2



Option 2 seems to be the better plan for the shape of the pad. Removal of the core will be easier and the core can have a larger surface area with option 2.

2



By having the pad made only out of an outer covering and the core, it will make operation much easier

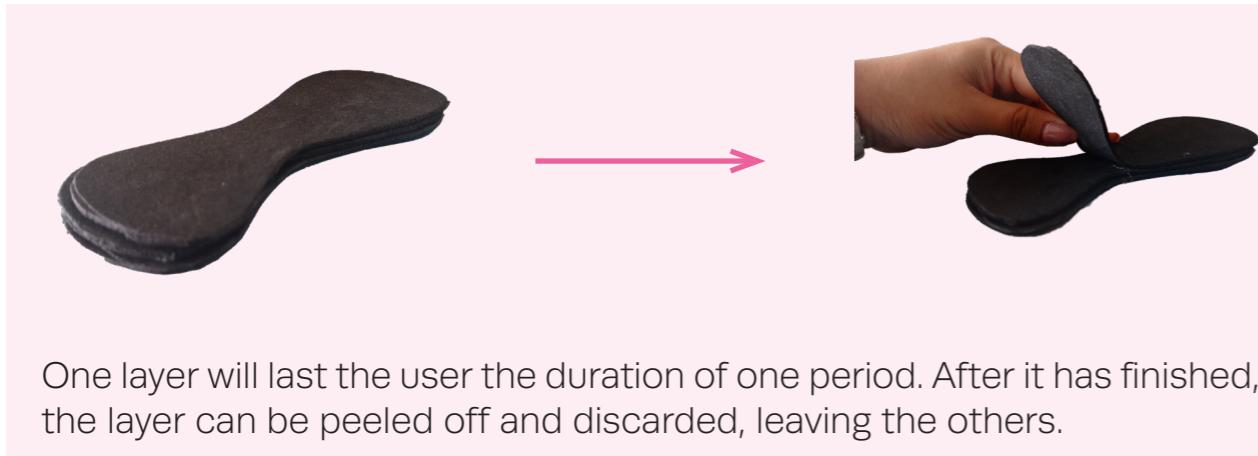
Option 2 will be a much better option for the structure of the pad. Having it made out of layers will make removal of the core much more difficult, while only having a covering will allow users to easily operate the product.

prototyping - idea 2

Idea 2, **the layered pad**, was prototyped next. The primary aspects to be decided are the **layers** and **how the pad can be attached**. A variety of materials can be used in prototyping, mainly, cardboard and EVA foam.

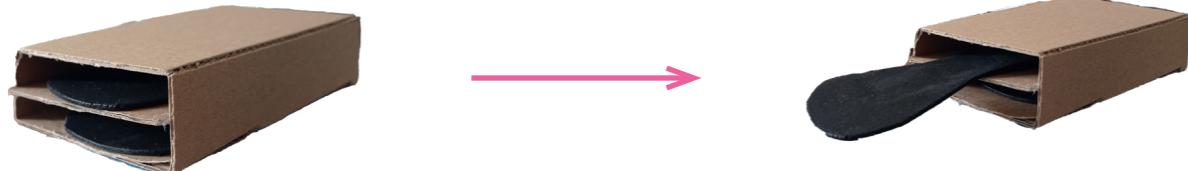
how will the layering of the pad work?

1



One layer will last the user the duration of one period. After it has finished, the layer can be peeled off and discarded, leaving the others.

2



The layers will be housed in a structure that will be worn like a pad. Each layer can be removed after usage.

3



Each layer can be removed, used for the duration of the period and then discarded. The user will get a new layer every time their period starts.

Option 1 will be the easiest for the user, where the user can use the pad for the duration of their period, then peel off the top layer (which will have absorbed the liquid), so the rest of the pad can be used for the next period.

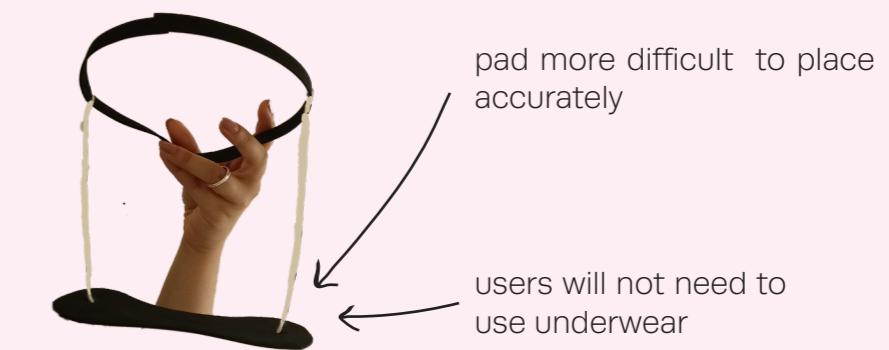
how can the pad be attached?

1



The pad being attached to the inside of the underwear is the most common way of wearing pads.

2



A belt could be worn under the clothes and around the waist, with the pad being attached at the front and back as shown above.

Using option 2 will be a better option for how the pad could be worn. The majority of the target users will not have access to underwear, but by simply using this belt, it would be a much more productive option.

prototyping - idea 3

Idea 3, the **steriliser**, was the last to be prototyped. There was only one aspect of the design that needed to be decided upon via prototyping: the **shape** of each of the parts. Other parts would need to be researched upon, but not modelled.

process of sterilization

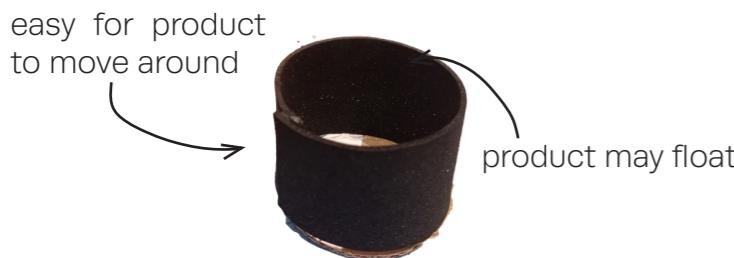
soak product in cold water

1



A cuboid container would have a large volume, allowing plenty of water inside.

2



A cylindrical container would allow the product to float more inside, exposing more area to water

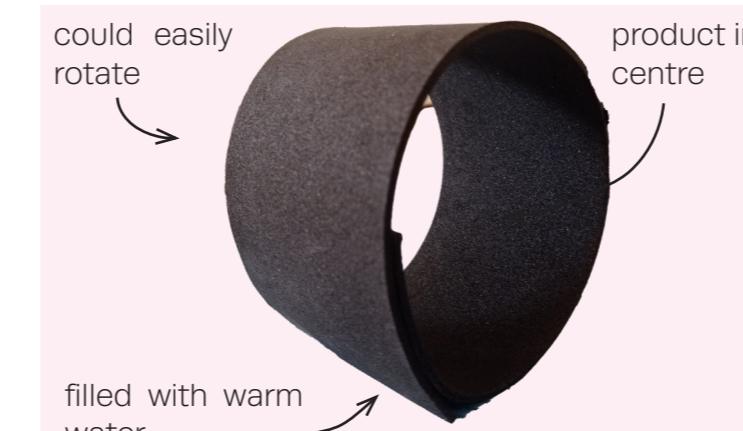
3



A shallow basin can be filled with water to allow the pad to easily submerge

wash product with warm water

1



A cylindrical container could rotate and allow the product to be completely covered with warm water

2

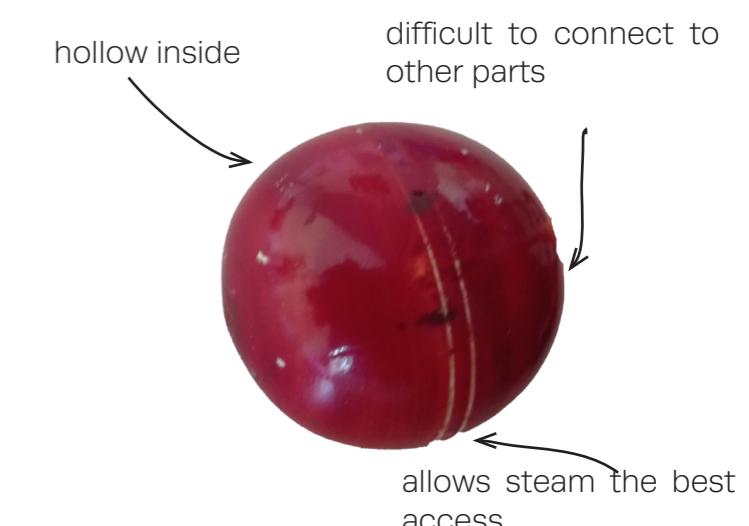


A rectangular container would not rotate as well but will hold a large volume of warm water.

Option 1 will be used as the container for warm water, as could rotate easily, allowing the product to be completely washed.

sterilize product using steam

1



A hollow spherical container would allow the steam to completely cover the product

2

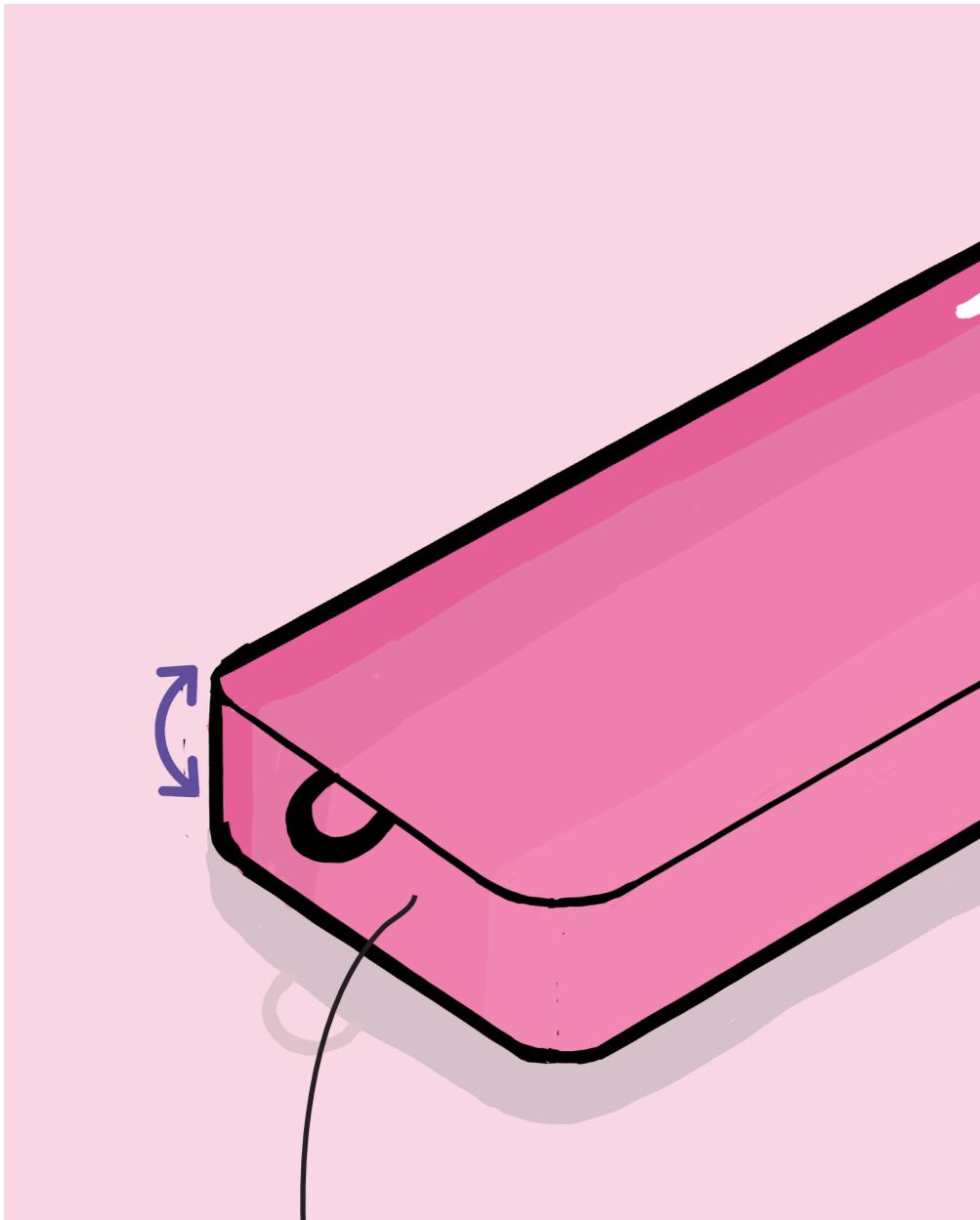


A shallow basin, like for the cold water, will allow the steam to reach all parts of the product

Option 3 was chosen as the best as it will allow all sides of the pad to be easily covered with water and best remove the stain.

Option 2 allows the steam to easily cover product, and will be easier to connect, making it the chosen option.

concept 1 - the removable core pad



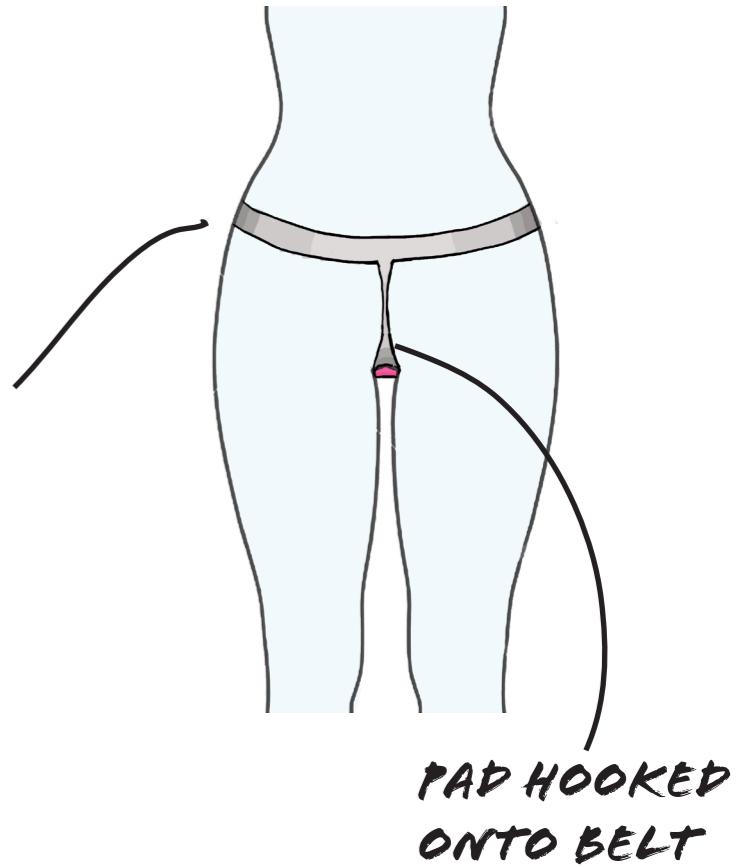
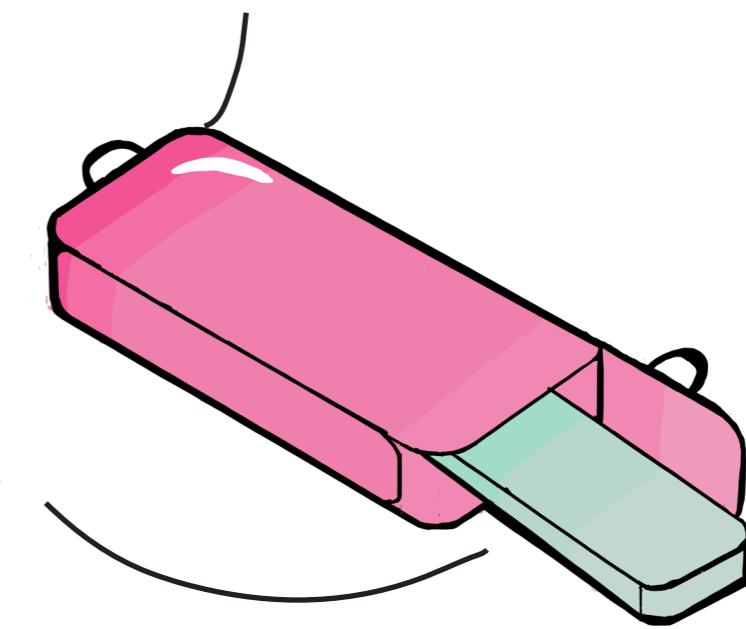
SIDE CAN OPEN TO REMOVE CORE

COVERING DOES NOT GET STAINED

BLOOD SOAKS THROUGH COVERING TO CORE

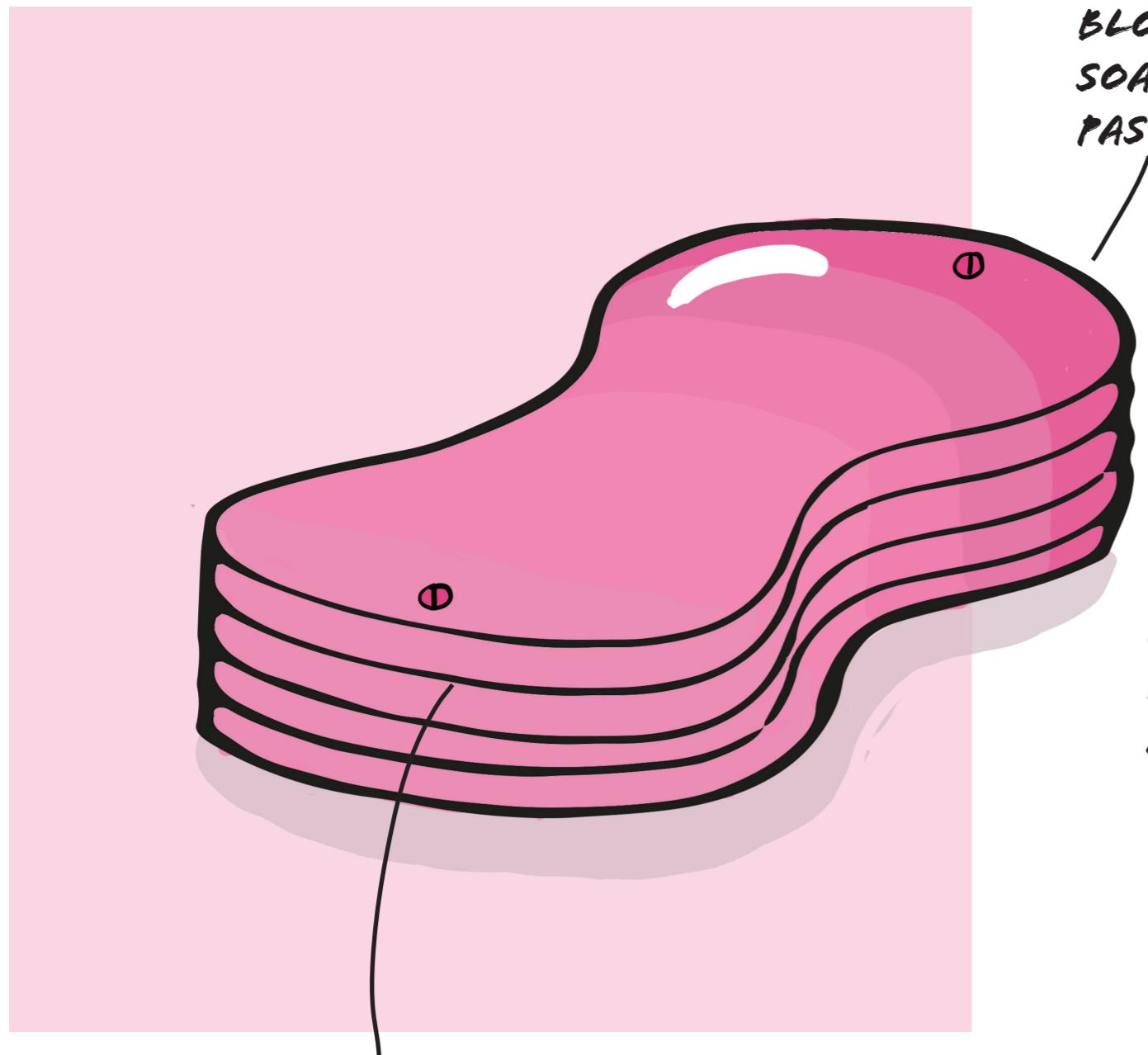
WORN ON BELT AROUND WAIST

CORE MADE OUT OF ANY MATERIAL THAT USER CAN FIND



POOROUS, HYGIENIC COVERING SO USER WILL NOT GET Affected BY BACTERIA

concept 2 - the layered pad

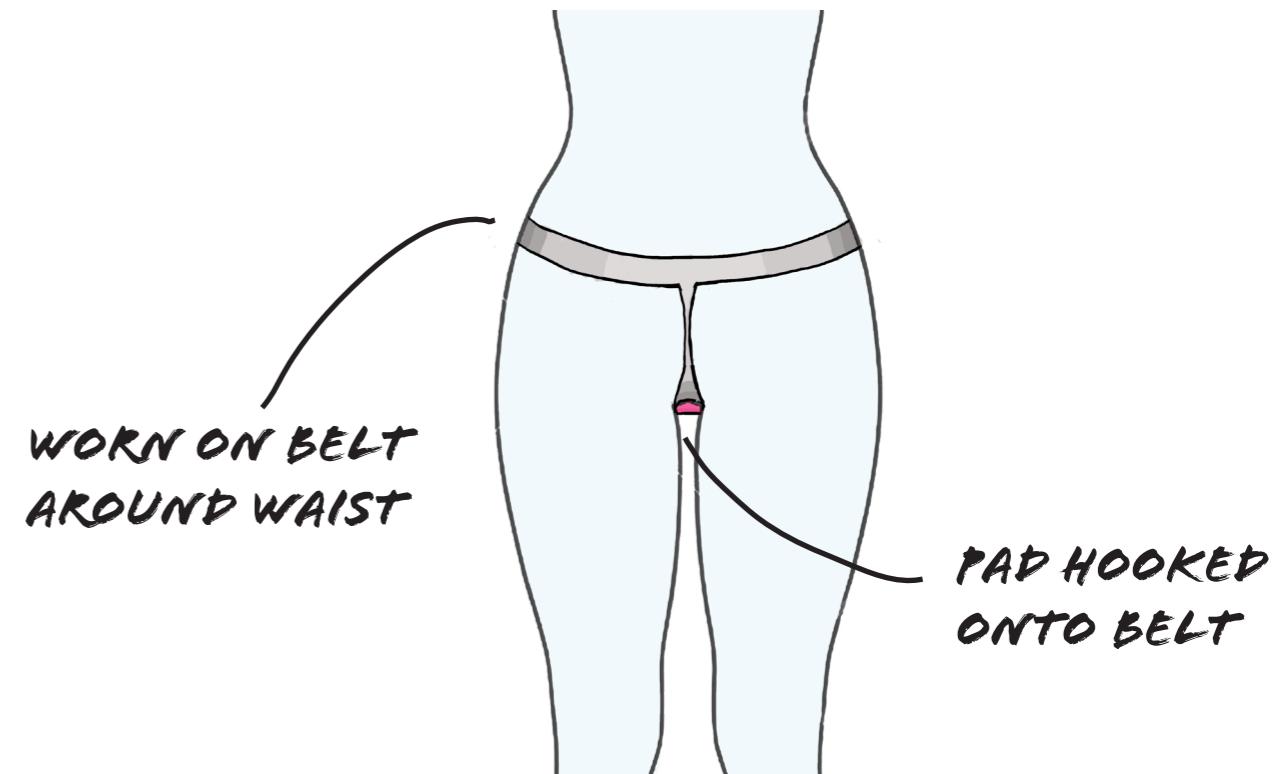
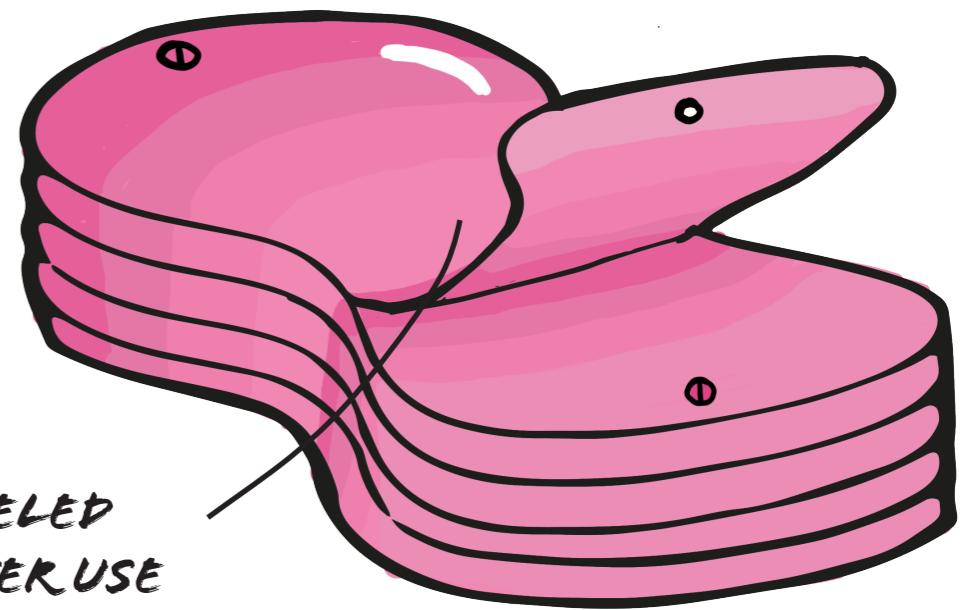


EACH LAYER
LASTS FOR
ONE PERIOD

BLOOD DOES NOT
SOAK THROUGH
PAST TOP LAYER

ONE PAD
LASTS 6
MONTHS

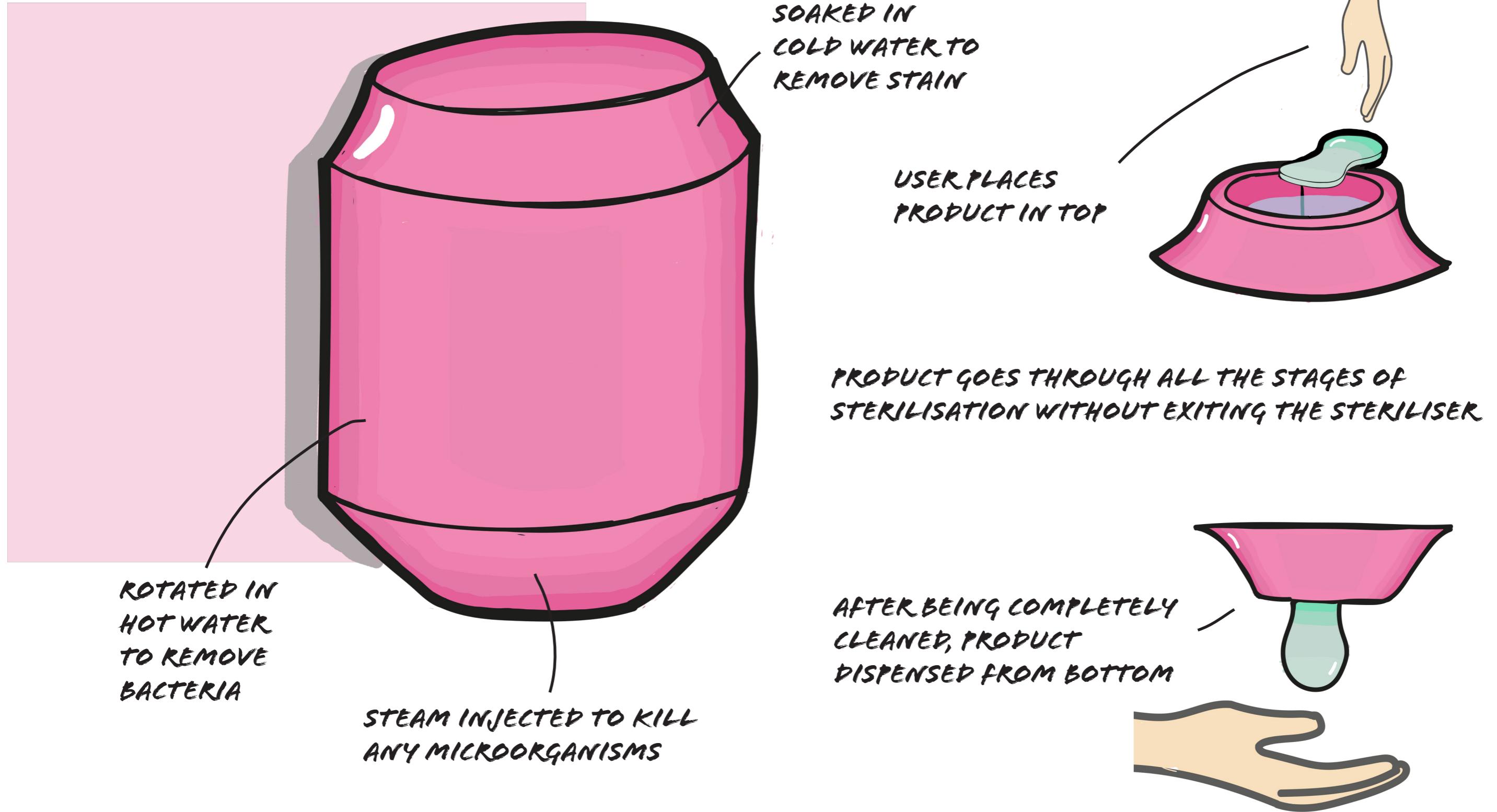
LAYER PEELED
BACK AFTER USE



WORN ON BELT
AROUND WAIST

PAD HOOKED
ONTO BELT

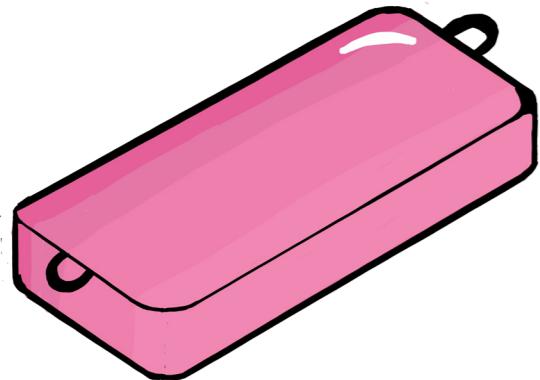
concept 3 - the steriliser



idea selection

The three ideas, **the removable core pad**, **the layered pad** and **the steriliser**, were shown to users to get their feedback. A selection of users were chosen, from charity workers who work with women in underdeveloped countries, to women who do not suffer from period poverty but do have periods and therefore can give their opinions on how willing they would be to use new products.

removable core pad



feasibility 

effectiveness 

comfort 

user ranking 3

steriliser



"Fabulous idea! It can be used by everyone, wherever they are"

- Amy
Charity Worker

"I love this! It completely removes the annoying part of pads"

- Clemence
Student

feasibility 

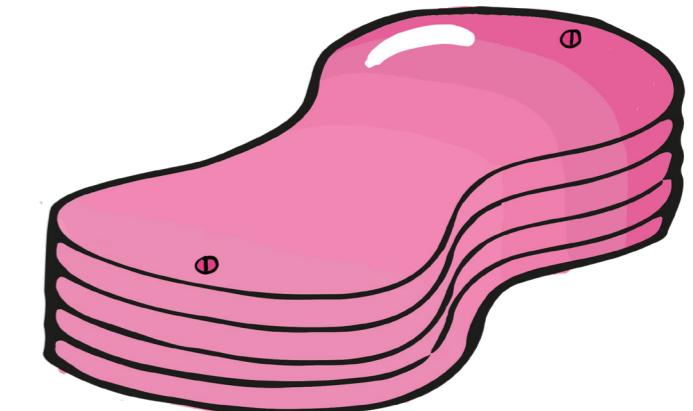
effectiveness 

comfort 

user ranking

1

layered pad



feasibility 

effectiveness 

comfort 

user ranking 2

key takeaways

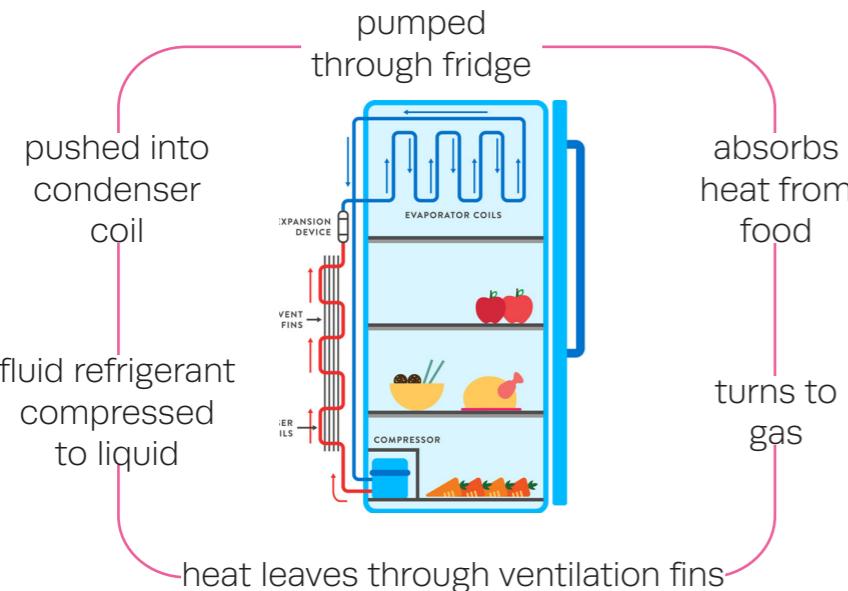
The three concepts were assessed by both a selection of users and by me. The assessments that I carried out of each of the concepts involved rating their **feasibility** and **effectiveness** out of 5. Users were asked to rate their **comfort level** (how comfortable they would be using the product) out of 5, then rank the three ideas in terms of **preference**. The **steriliser** emerged as the best option, and therefore I will proceed with development of its functionality.

functionality development - 1

The first stage of sterilisation involves **soaking the product in cold water**. There are 2 main aspects of this stage which need to be developed further: **how the water will remain cold** and **how the water will stay inside**.

how will the water stay cold?

the problem: a majority of the places in which such a product can be used are hot, meaning the water will be prone to warming up, ruining its effectiveness



1

Option 1 is to use a refrigeration system to keep the water cold. It is an effective method but it will require more components.



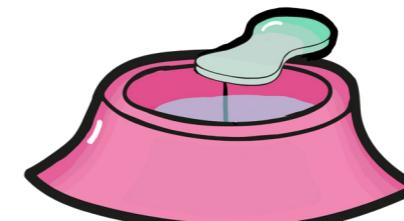
2

Option 2 is to use an icebox system. While it is easier, an alternative will need to be found to the fridge stage, as that is not an option.

Option 2, an icebox style cooling system will be used as it is easier on the small scale that is necessary. However, an alternative to the fridge stage will be needed, to keep the ice cool.

how will the water stay inside?

the problem: water will not be readily available and therefore it is essential that the water inside the steriliser stay there



Water will splash out if the pad is placed directly into the water

need to have it slowly entering the water

1



2



Option 1 is to have a platform which will rise so that the user can place the product on it.

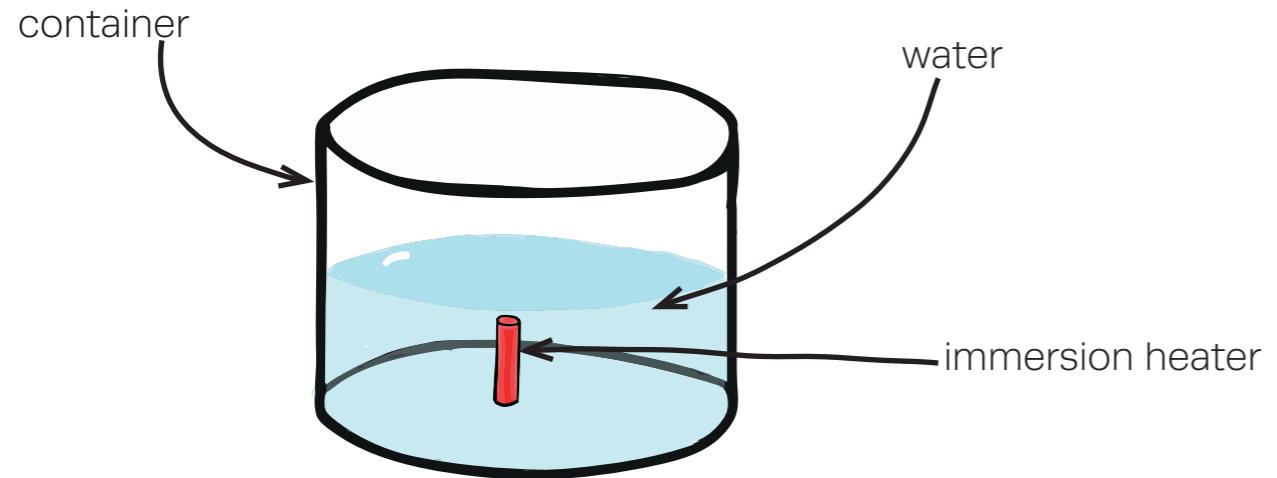
Option 2 is to only have a small gap in which the user can place product, thus stopping water from leaking.

Option 2 was decided to be the better option. Option 1 (the platform) would complicate the product further as it would subsequently require more components. Instead, there will only be a small gap in which users can place the product and there will be a long distance to the water, thus preventing any water from splashing out.

functionality development - 2

After the product is soaked in cold water, it must be **washed in hot water** to kill bacteria. The main aspects to be decided are **how the water will stay hot** and **how it will rotate** to allow full exposure of the product.

how will the water stay hot?

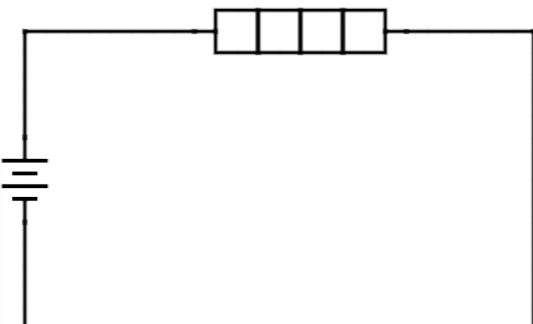


The water can be heated using an immersion heater, which is designed to heat up water by being placed inside. It will need a power source and therefore a circuit needs to be designed for it.

1



Immersion heaters are usually powered by mains electricity

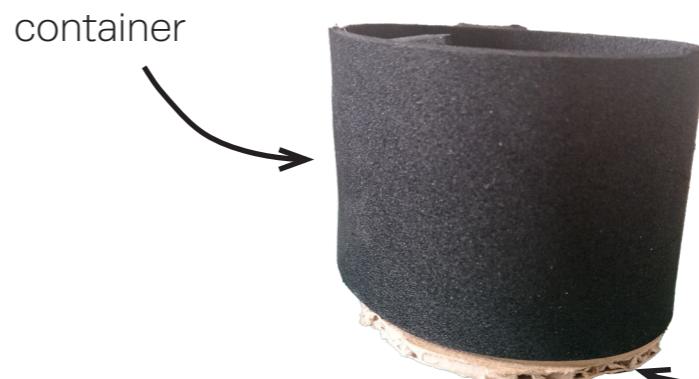


2

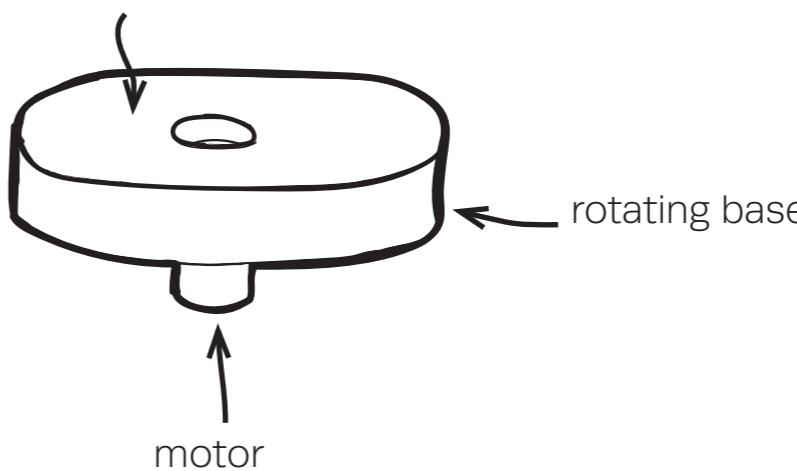


Solar panels are a good alternative to power a battery

how will the part rotate?



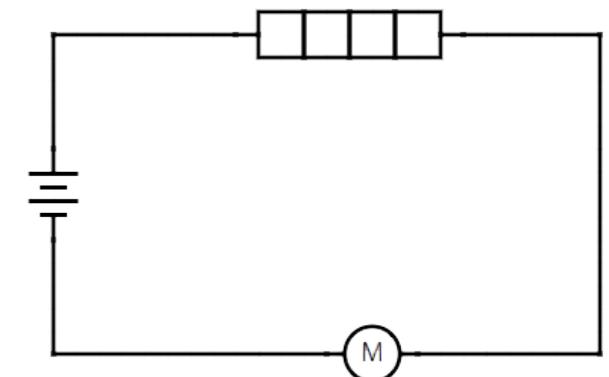
immersion heater circuit



If the container sits atop a rotating base, it will rotate as long as the base rotates. The base rotating can be done with a motor. The container will need to be attached to the base

rotating base

Like the immersion heater, the motor will also require a power source. To minimise the number components, this can be done in the same circuit as the heater.



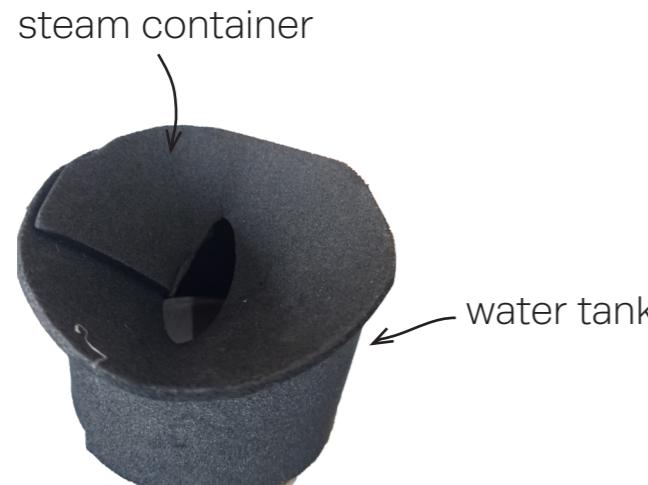
Given the fact that mains electricity is not an option, the immersion heater can be powered using a battery and a solar panel, which will work well given the large amount of heat in developing countries.

The battery can still be powered by solar panels although it is likely that a larger one will be needed

functionality development - 3

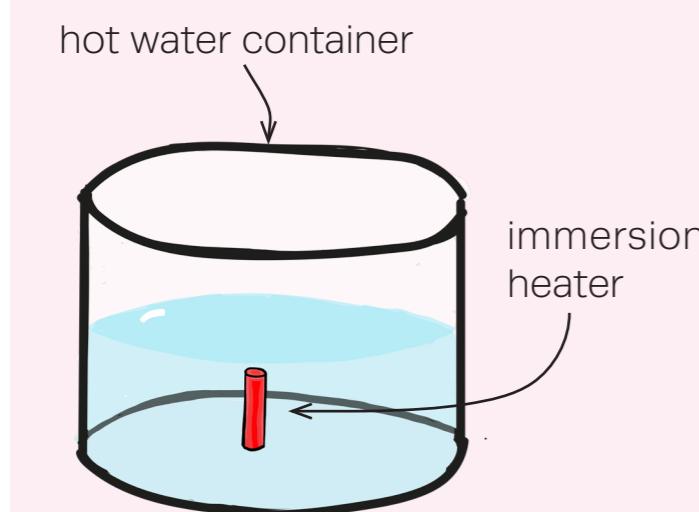
The last stage of sterilisation involves **injecting steam** at the product to ensure that any last microorganisms are killed. There is only one aspect to be decided, **how the steam will be generated and injected**.

how will the steam be generated?



1

Option 1 is to have a water tank underneath the steam container. In a similar way to the hot water container, it will have an immersion heater to turn the water into steam which is injected into the container.



2

Option 2 involves changing the design. Instead of having a separate compartment for steam injection, the hot water container can pose as both. The heater can continue to heat the water to steam, and sterilise it there. It can then be cooled back to liquid.

Option 2 will considerably simplify the design as well as reducing the number of parts needed, so will be used. However, there will need to be further development on how to cool the gas to liquid once again.

how will the steam be cooled?

The steam needs to be cooled so that it once again condenses to form a liquid. The same method here can be used to keep the water in the first stage (can be seen in functionality development - 1) cool.

1



Option 1 is to use a icebox system. It is not an effective option however, as it will require ice, which will simply extend the process, not give a solution to the cooling problem.

2



A fan inside the container could help to cool the steam inside. External air could be blown in and around the container to allow for the cooling process to take place

Option 2 is a good choice for both cooling processes, as it will not require many more components but will help in both keeping the water in stage 1 cool and in turning the steam in stage 3 back to a liquid.

functionality development - 4

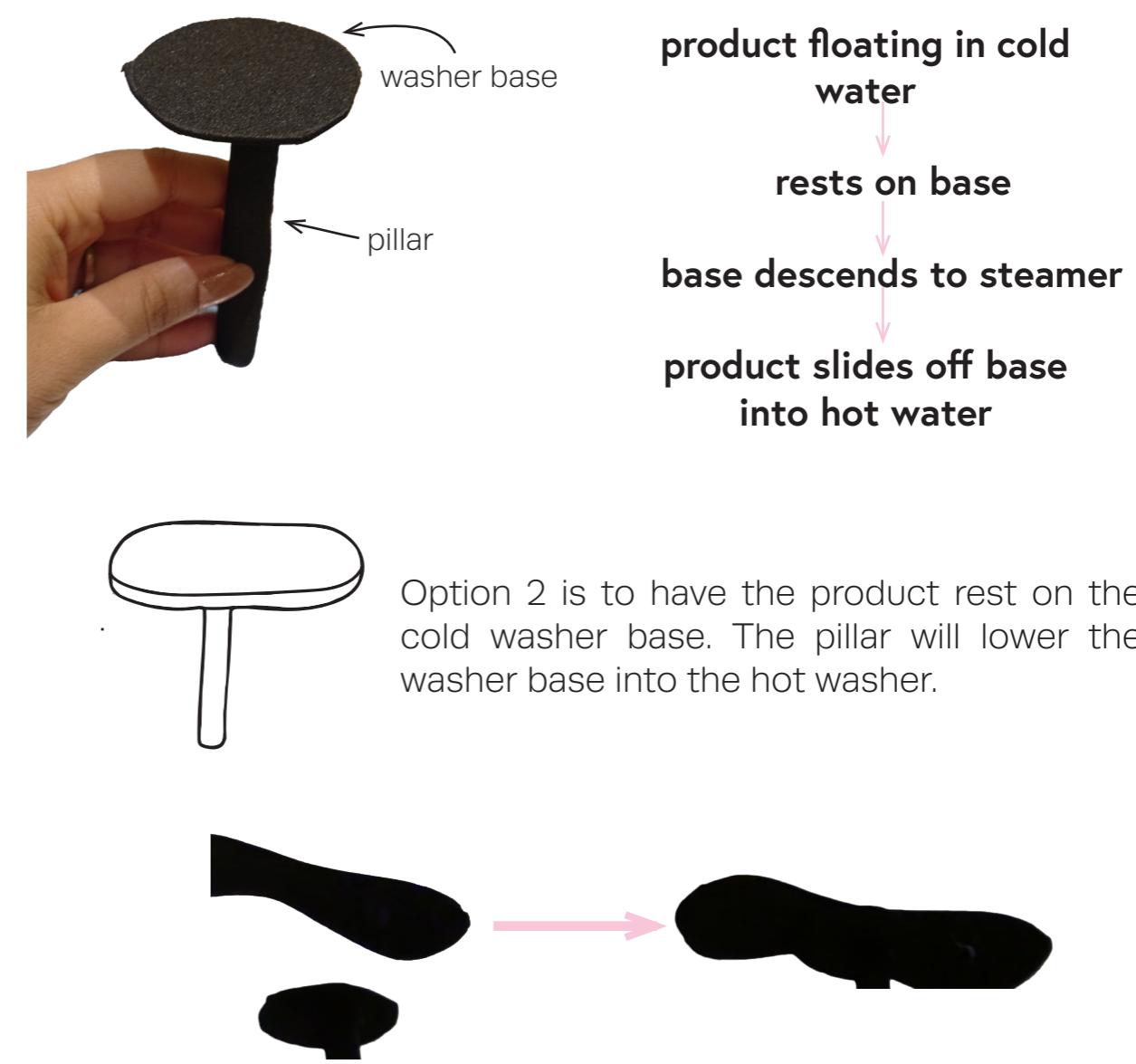
The last stage of development is **how the product will move** throughout the steriliser. It has to move from the cold washer to the hot washing compartment, then out of the steriliser altogether.

how will the product move?

1



2

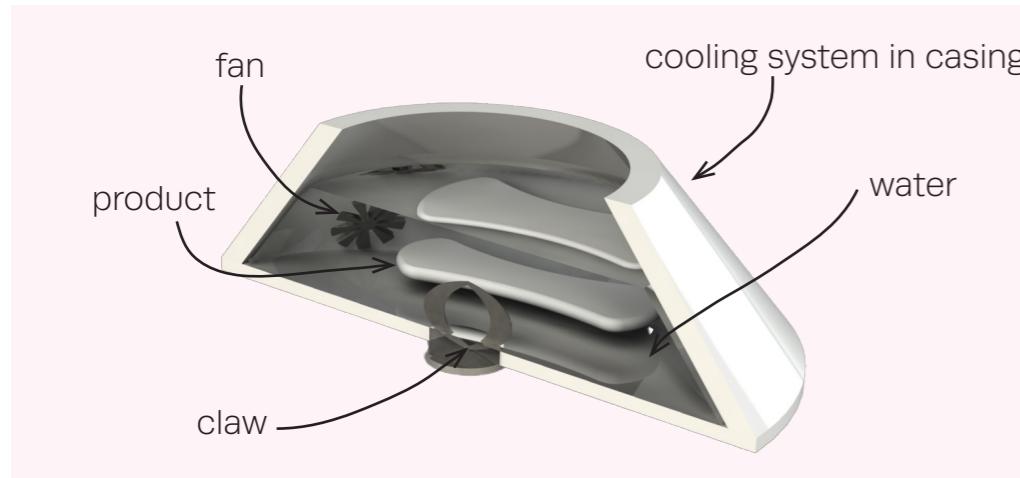


key takeaways

After looking at 2 different methods, it was decided that option 1, **the claw**, would be a better option for how to move the period product from the **cold washer to the hot washer**, and from the **hot washer out the steriliser**. Option 2 would cause issues with water retention, as water would cross compartments.

the sterilisation process

product cold washed



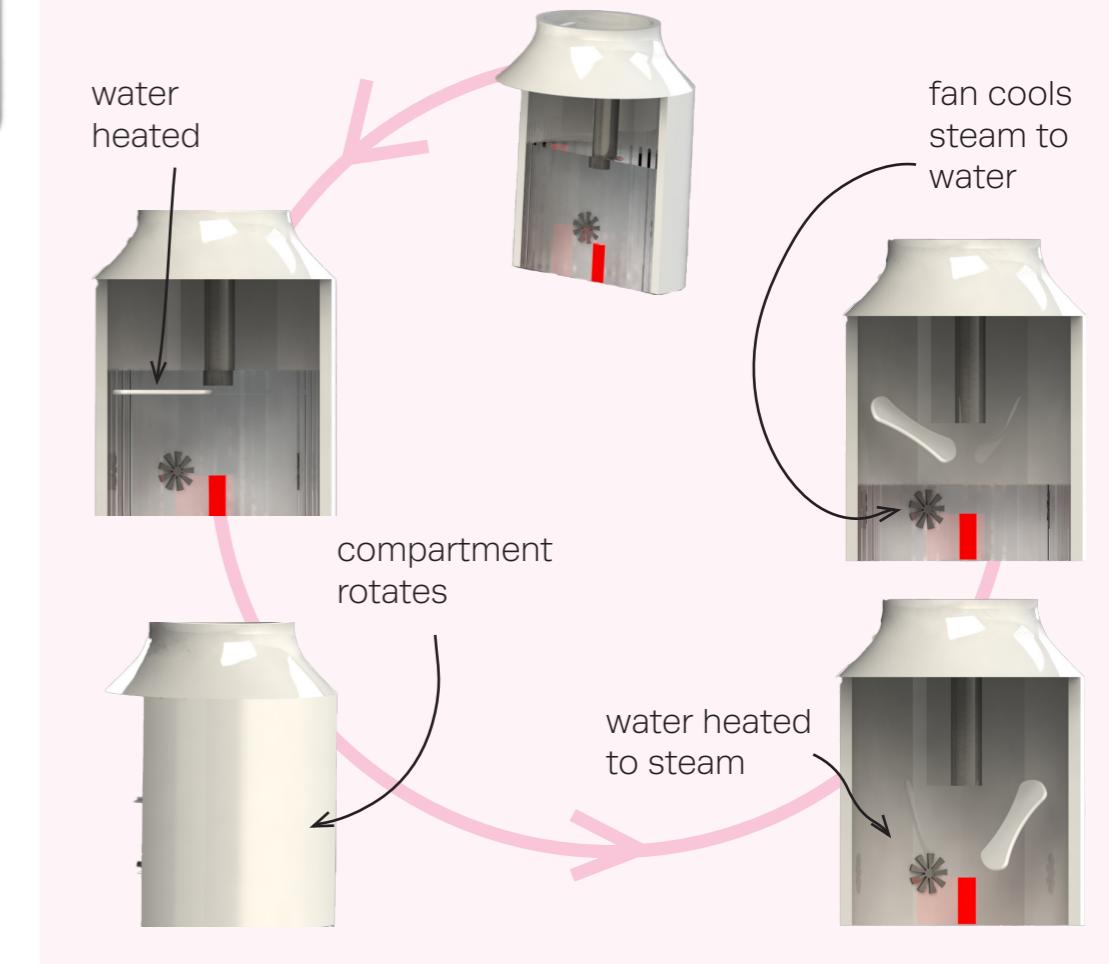
product moves compartment



product dispensed



product hot washed



the steriliser

top latch

The user will slide back the top latch and place the product inside to be sterilised

cold washer

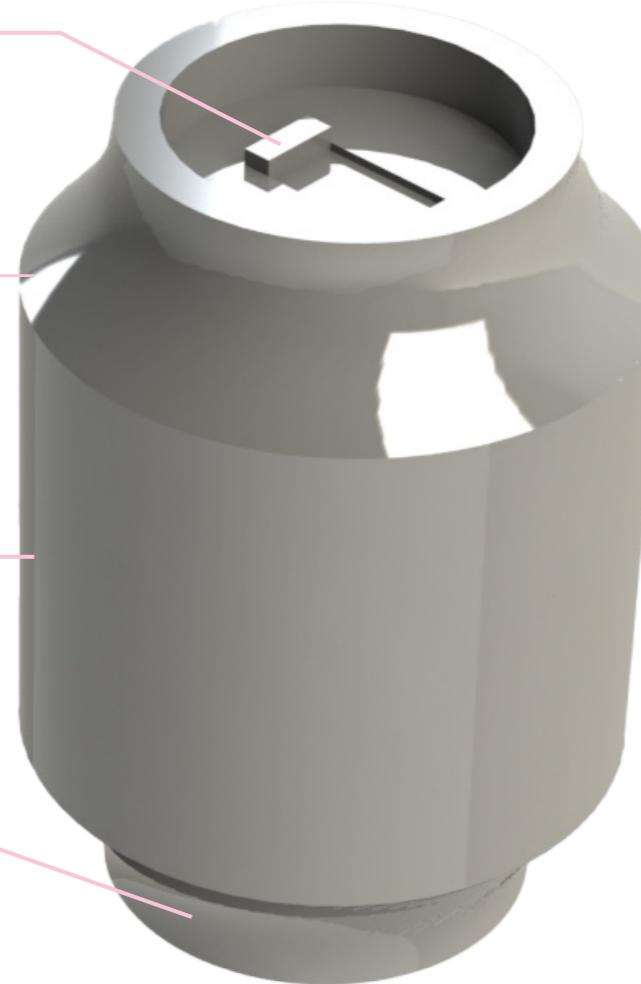
The product will be soaked in cold water to ensure that the stain is removed

hot washer & steamer

The product will be washed in hot water and then steamed to remove all bacteria

dispenser

The user will slide open the base latch and remove the sterilised pad from inside



use pad



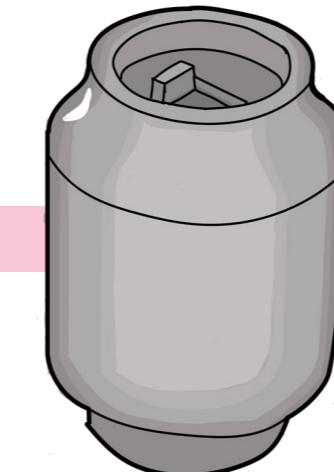
remove pad



open top latch



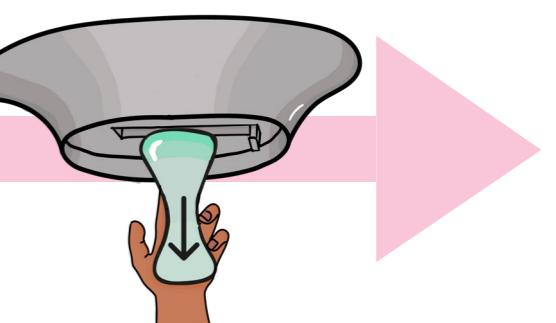
put pad in



pad is sterilised



open base latch



remove pad

P ermanent

It is solar powered and therefore will last for a while

E nvironmental friendliness

It lowers the amount of period products that must be thrown away

R eusable

It helps women reuse their period products

I nconspicuous

It can be used privately

O perative

The user only has to put in and take out the product

D urable

It will be made using durable polymers and metals

S anitary

It will greatly improve the sanitation of period products