

Trabajo Fin de Grado

El diseño industrial: Protagonista en
políticas medioambientales

The industrial design: An environmental
policies actor

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Grado en Ingeniería del
Diseño Industrial y
Desarrollo del Producto

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INTRODUCCIÓN:

En el diseño de productos, la preservación del medioambiente se debe considerar no sólo como un factor influyente sino como un objetivo en sí mismo.

El concepto de Diseño para el Medio Ambiente (DfE), acuñado en 1992 en EEUU, incorpora la concienciación medioambiental al desarrollo de los productos. En España un concepto análogo, Ecodiseño, persigue el mismo fin. Incluso algunos estudios utilizan una nueva definición, Diseño Ambientalmente Integrado (dAI), por considerarlo más holístico e integrador a los principios del Desarrollo Sostenible, aunque no como sustituto de los conceptos anteriores sino aplicado a casos específicos referidos a la industria forestal.

Los conceptos descritos anteriormente definen la relevancia que alcanza en los últimos años el medioambiente en el contexto del diseño industrial. El trabajo del diseñador industrial consiste en dar forma a los productos que nos rodean facilitando el día a día de las personas de una manera creativa, innovadora y respetuosa con el medio ambiente.

Hay una serie de aspectos a considerar en este concepto de diseño:

- El proceso de producción y fabricación amable con el medioambiente: la extracción o adquisición de las materias primas necesarias para la producción de sus componentes, así como el procesamiento y la fabricación se realiza con materiales y procesos que no son peligrosos ni para el medio ambiente ni para los trabajadores que los llevan a cabo.

- Envases ecológicos: los materiales utilizados en el embalaje no deben ser nocivos para medio ambiente, utilizando la mínima cantidad posible de materiales y procurando que éstos sean mayoritariamente, en la medida de lo posible, materiales reciclados y reciclables

- Diseño para su eliminación o re-utilización: Al diseñar un producto no debemos pensar sólo en su vida útil, sino también en su eliminación o reciclaje posterior.

Teniendo en cuenta estos factores, el trabajo que se presenta a continuación desarrolla tres ideas, 2 de ellas originales (bolsitas mono dosis y luz para bicicleta) y una ya existente pero que se ha considerado un claro ejemplo del concepto de diseño que estamos manejando.

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Diseño 1: Champú + acondicionador
monodosis

Design 1: single-use shampoo + conditioner
sachets

DESCRIPCIÓN DEL PROYECTO:

Proyecto realizado en Middlesex University, seleccionado por la Universidad para concursar en RSA Student Design Awards de Londres, competición de diseñadores emergentes con el objetivo de reforzar el potencial del diseño para el beneficio de la sociedad y el medioambiente.

El proyecto consiste en crear un diseño que favorezca la economía circular, mediante un producto o mejora sostenible para el medioambiente; este proyecto está relacionado con la empresa Unilever, ya que ésta era la patrocinadora de la competición.

Para llevar el proyecto a cabo, se elaboró un estudio de mercado, de producto, de diseño y la presentación para el mismo, el cual consistía en un champú + acondicionador mono dosis, destacando dos características relevantes:

1. Respeto total del medioambiente:

El envase en la ducha, mediante su uso, se diluye y desaparece completamente sin contaminar nada en absoluto, ya que se trata de un plástico que, mediante el agua (si ésta está a una mayor temperatura, será más rápido), comienza a desvanecerse hasta desaparecer por completo.

2. Coste de producción y precio de venta bajo:

Lo que permite un alto consumo tanto en economías con bajo poder adquisitivo como en economías desarrolladas, por su fácil aplicación a usos deportivos, viajes, etc.

PROJECT DESCRIPTION:

Project carried out at Middlesex University, in which it was selected for taking part of the RSA Student Design Awards of London, a competition for emerging designers with the objective of reinforcing the design potential in order to benefit the society and environment.

The project consists in making a design which improves the circular economy, and this solution would be achieved by a product or eco-friendly improvement. This project is related to Unilever, since this company was the competition sponsor.

For carrying through the project, a market research, a product one, design study and its presentation was realized, which consisted in a single-use shampoo + conditioner sachet. We can highlight two important features:

1. Total respect of the environment

The sachet, by using it, it vanishes and starts to completely disappear with no-contamination at all, since it is a special plastic that, mixing it with water (even faster is it being mixed in a higher temperature), starts to disappear until there is nothing.

2. Low fabrication costs and retail prices:

This allows a high consumption not only in low income countries but also in developed economies, as it has a really easy application for sportive topics, trips, etc.



**'SHOCKING 100% OF SACHETS
WILL END UP AS WASTAGE.'**

- www.ecopolysolutions.com



Reaching a landfill is the best scenario. In most cases used sachets just get tossed on the street and they will not degrade as they are not compostable, nor recyclable.

OUR **SOLUTION** IS
THE **SOLUBLE** SACHET:

A product that is literally single-use, perfectly eco-friendly and a potential first pillar of a circular economy.

PROBLEM

with sachets nowadays

Finite

Most packages are made of PVC plastic, but the reserves of this raw material, are getting empty. We need an alternative.



PVC

Toxic

Commonly, sachets are made of polyvinyl chloride (PVC), which is a toxic material. It is damaging for both the environment and humanity causing liver illnesses and, in some extreme situations, even cancer.

Non-recyclable

These sachets are thrown into general waste bins, ending up in the sea, endangering the lives of countless marine species.

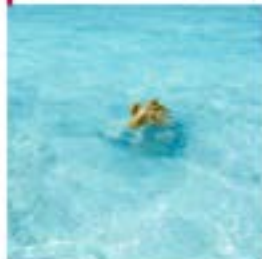


Green industries

Each possibility you take (Gets tossed on the street or ends up in the sea), this sachet is not going to cause any pollution at all.

Soluble

Just by holding it under water within 5 seconds, the content escapes to your palms. After another 7 seconds, this sachet will degrade completely. There is no waste of material.



Eco-friendly

As the material is fully dissolvable, there will not be any wastage. This results cleaner oceans and a safer, healthier marine life.

SOLUTION?

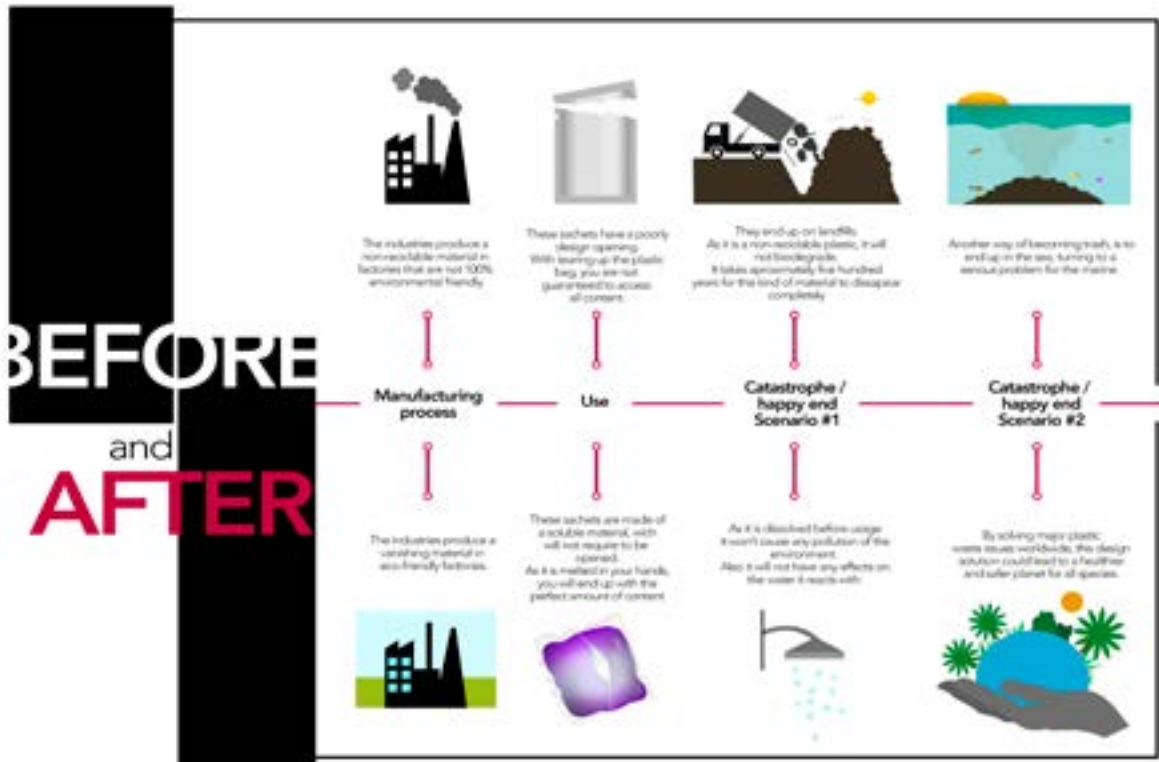
soluble plastic

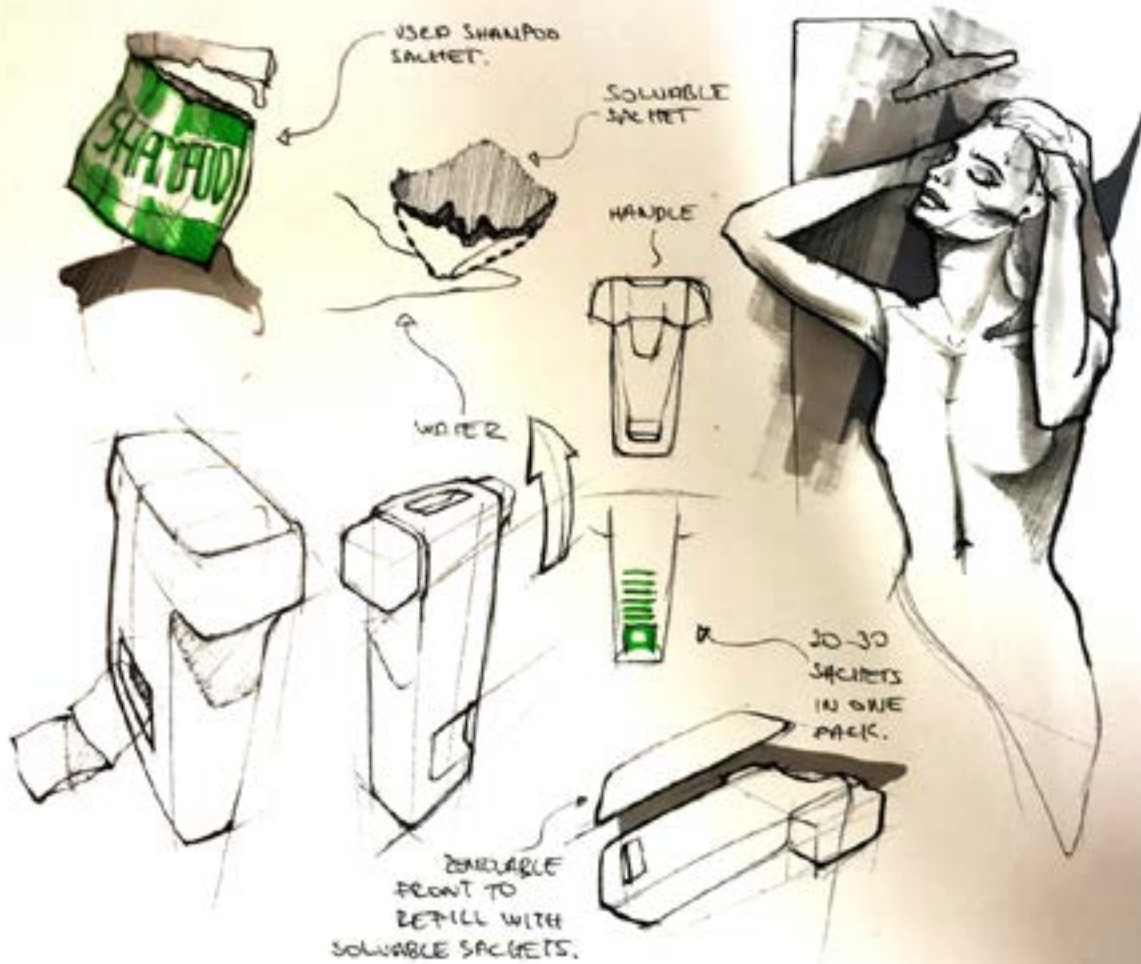
DETAILS of usage



IT WILL TAKE AROUND **5 SECONDS** FOR THE CAPSULE TO **DISSOLVE COMPLETELY UNDER WATER.**

The shampoo capsule would come in two sizes: **Regular** and **large**. (for short/medium and long hair)
The sachet would contain **shower gel** right next to the shampoo in order to make the **shower experience** as **comfortable** as possible.





LIFE CYCLE OF SINGLE-USE SACHETS

Raw Materials

NORMALLY SINGLE-USED SACHETS ARE MADE OF A THIN FILM OF PLASTIC, BUT OCCASIONALLY THEY USE PETROLEUM, ALUMINIUM AND POLYESTER.

Manufacturing

TWO SHEETS SEALED TOGETHER AT THE EDGES. BETWEEN THE SHEETS THERE IS THE CONTENT.
ONE SINGLE MACHINE PRODUCES THE SACHETS. 1 SACHET/SEC. = 27.000/DAY

Distribution

MOST SACHETS ARE MADE LOCALLY. THEY WOULD JUST SHIP (CONTAINER SHIPS) THEM OVERSEAS AFTER HAVING IT FILLED AND TOTALLY READY.

Retail

HOTEL CHAINS BUY THEM AS ROOM ACCESSORIES OR CORPORATIONS/BRANDS THAT NEED SAMPLES IN METROPOLISES, POOR AND UP AND COMING COUNTRIES JUST STACK THEM ON THE SHELVES OF MARKETS FOR THE LOW INCOME COMUNITY TO BUY.

Consumer

ONE USE ONLY, THAN STAKEHOLDERS THROW IT AWAY. CONTAINMENT: 0-100G

Recycle

AS A TYPE OF MATERIAL, IT IS TOO COMPLEX TO RECYCLE. SACHETS UNDERMINE THE REUSE SYSTEM. THERE IS NO ECONOMIC INCENTIVE TO COLLECT USED SACHETS THAT HAVE BEEN IMPROPERLY DUMPED. THEY END UP AS TRASH IN LADFILLS WHERE THEY DO NOT REALLY BIODEGRADE AS THEY'RE NOT COMPOSTABLE.

RSA Circular Futures Project

INSIGHT:

By reducing the packaging, the companies would have solved several environment problems related with some production line phases, as well as making more efficient products.

If we optimise its structural and material design, eliminating the unnecessary packaging, we will not only reduce the production costs, but also the pollution related with the machines that are used in this process and with the necessary transport that is used to take the products from the company to the shops. Furthermore, by thinking and changing the wrapping shapes, we will get to a more efficient packaging

'Frugal innovation not only implicates the use of minimum resources, but also means not to add unnecessary accessories'

Miguel, Spain, 58

'Plastic sachets are an important issue to solve. First, the format does not possess sufficient economic value to allow for collection and recycling. Secondly, waste management infrastructure in developing and emerging countries is either poor or inadequate. '



<http://www.sharpservices.com/contract-packaging-solutions/pouches-sachets-and-stick-pack-packaging>

<https://waste-management-world.com/a/unilever-utilises-pyrolysis-to-create-fuel-from-sachet-packaging>
<https://www.unilever.com/sustainable-living/sustainable-living-news/news/Tackling-sachet-waste.html>
<https://www.theguardian.com/sustainable-business/sachet-packaging-low-income-communities-waste-nightmare>



<http://inkstudios.com/work/makeaway-welnes-packaging-design/>

RSA Circular Futures Project

INSIGHT:

Frugal innovation is more than a strategy. It denotes a new frame of mind: one that sees resource constraints not as a liability but as an opportunity – and one that **favors agility over efficiency**. Frugal organizations don't seek to wow customers with technically sophisticated products, but instead strive to create good-quality solutions that deliver the **greatest value to customers at the lowest cost**.

'How Frugal Innovations could be different than standard ideas?'

Agnes, PL, 31

- Too "precluding", innovation rests upon a limited population (engineers, researchers) and aims at a reduced audience (limited high range markets). Whereas innovation could be inspired by a much larger population: employees, clients, suppliers and it could also aim at the "non-clients" beyond the original target.



<http://www.cam.ac.uk/>
<https://hbr.org/2014/12/what-frugal-innovators-do>



RSA Circular Futures Project

INSIGHT:

In order to take the **first steps towards a perfectly circular economy**, influential companies should take serious responsibility to **have their waste recycled.**

Perhaps if every single one of the most influential companies worldwide would be constrained to recycle a minimum of 40% of their produced FMCG's, than after every percent they could get a cut on their taxes.

'Why do we need a third party to deal with others jobs?'

David, US, 41

'Companies willing to pay a premium to take responsibility for their waste pay for the collection and processing of their materials so that they can be sold as a marketable resource.'

www.treehugger.com/corporate-responsibility/industry-recycling-coalitions-when-they-do-work-and-when-they-dont.html



ONLINE CAMPAIGN

The collage shows four identical social media posts from the 'Earth' page, dated February 25, 2017. Each post includes the text: "...But a big step for humanity. Watch this one minute video guide on recycling sachets brought to you by your favourite stars and make a change." Below the text is a carousel of images featuring celebrities: Leonardo DiCaprio, Julia Roberts, George Clooney, and another woman. Each image has a caption: "Little step for a man... Let's 10 second recycle guide". The posts show engagement metrics like "1,004 shares" and "Top Comments".

WITH HOLLYWOOD


Information collection

First of all, we started to collect information about Unilever.

Unilever nowadays has some objectives to achieve related with the circular economy, and we find out really interesting the sachets problem, as Unilever wanted to solve this one by 2015, but right now they achieved the 66% of the objective, as they continue investigating new technologies in both developed and developing countries.

TACKLE SACHET WASTE

Our goal is to develop and implement a sustainable business model for handling our sachet waste streams by 2015.

 We continue to investigate the potential of new technologies in both developed and developing markets. However progress has been slower than we originally anticipated.

OUR PERSPECTIVE

Our aim is to develop a closed loop system for sachet waste. This will allow us to continue to provide the price and convenience of sachets to low-income consumers, while tackling the environmental issues associated with their use. These include litter and recyclability.

In India, we have proved that pyrolysis technology can convert sachet waste into an industrial fuel. However, pyrolysis is still not an established technology and has several limitations, and so our progress has been slower than we anticipated. One limitation is the costs associated with the collection and processing of sachets versus the value obtained for the output product.

To counter this, since 2011, we have been piloting a new technology which we believe can help create a viable business case. In 2015, we completed large scale trials and have placed orders for equipment to build a pilot plant in Indonesia in order to prove the commercial viability of this technology. With this in place, we are around two thirds of the way towards achieving our target.

[> Moving to a circular economy](#)

We enquired into this theme, trying to make the best for both developing and developed countries, and we find out that changing the material to PVA might solve this problem.

We investigated more about this material, as well as we looked into different webpages and media, trying to get as much information as we could. For example:

<https://www.unilever.com/sustainable-living/the-sustainable-living-plan/reducing-environmental-impact/waste-and-packaging/>

<https://www.theguardian.com/sustainable-business/sachet-packaging-low-income-communities-waste-nightmare>

<https://www.theguardian.com/cities/gallery/2015/sep/28/cleaning-up-haiti-safest-water-source-contaminating-in-pictures>

<http://www.planetexperts.com/4-controversial-solutions-to-fixing-the-plastic-pollution-problem/>

<http://www.packaging-gateway.com/features/featurevanishing-packaging-trend-dissolvable-materials/>

<https://www.resealit.com/blog/2016/08/18/research-reveals-customers-prefer-packaging-that-helps-to-reduce-food-waste/>

<https://raahulkhadaliya.wordpress.com/2009/11/24/fmcg-product-packaging-materials-hazardous-waste-source/>

2

Diseño 2: Luz ecológica para bicicleta

Design 2: environmentally-friendly bike light

DESCRIPCIÓN DEL PROYECTO:

Proyecto basado en la elaboración de una luz para bicicletas. El brief para éste trataba de diseñar, tanto por medio de un estudio previo de mercado como por medio de un estudio de tecnologías, una luz, delantera o trasera, a elección del alumno.

En lo que a mí respecta, quise enfocar este proyecto hacia el ámbito de las luces “eco-friendly”, debido a que estos últimos años estas tecnologías se están incrementando con el objetivo de conseguir un mundo más saludable y sostenible.

La luz diseñada destaca tanto por su singularidad de sus formas, como por su funcionamiento. Éste diseño, de formas curvas y colores neutros, se coloca en la parte delantera de la bici, y está formado por varias piezas de plástico ABS y goma, que han sido fabricadas mediante una impresora 3d. Su funcionamiento se basa en un circuito PCB que transporta la luz a una placa de varios leds dispuestos en una matriz de media circunferencia, y se alimenta gracias a unos imanes colocados en el centro de la pieza que, cuando se juntan, se crea un circuito cerrado que permite el paso de corriente a los leds.

La luz consta de dos mitades (en cada mitad se sitúa uno de los imanes), la mitad inferior, la cual está, en su totalidad, formada con plástico ABS opaco de colores planos y blancos, y la mitad superior, que consta de la parte de plástico ABS translúcido que deja pasar la luz de los leds. La parte inferior se quedará anclada a la bici mientras que la parte superior se podrá transportar a cualquier lado, cortando así el circuito, y por tanto, dejando la luz apagada. Una vez se vaya a usar la bicicleta se pueden juntar las partes superior e inferior, permitiendo así el paso de la luz a los leds.

PROJECT DESCRIPTION:

Project based on making a bike light. The brief was about designing a light, either for the front part or the back one, not only by making a previous market research, but also studying the new technologies that are coming out nowadays.

As far as I am concerned, I wanted to have this project focused on the eco-friendly lights, as these technologies are being improved since the past few years, in order to achieve one of the whole world's goals, which is to turn our planet into a healthier and more sustainable one.

The designed light stands out for its shape singularity and for its way of working.

This design with a curve shape and neutral colours, is placed on the front part and it has been constructed by few ABS pieces, apart from a little part made of rubber. Both materials have been produced by a 3d printer. In order to have this light working, there is a PCB circuit that allows the current to go to the LED's only when two magnets pieces are together, as they define the entire circuit (the magnets are the battery's substitutes).

Proceeding with its shape, we could say that it is formed by two half circumferences (in each half there is a magnet), the lower one that has been made by plane and white opaque ABS plastic, and the upper part, which it has the clear plastic that allows the light go through.

The lower part would be stuck into the bike while you can take with you the upper part wherever you want, leaving the lights off, until you use the bike another time so you put the two pieces together, allowing the current to go until the LED's, that means that you will have your lights on.

PDE 2293

B LIGHT K E

Advanced
CAD & CAM

Andrea Sánchez
Vilena



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DETAILED DESIGN	11
DRAFT ANALYSIS	13
PLASTIC MOULDING ANALYSIS	15
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The mod I



3

Technical drawings

NUMBER	NAME OF COMPONENT	DESCRIPTION	QUANTITY
1	Clear_Andrea_2off6	Outer upper part 1. Clear Plastic ABS	1
2	Opaque_Andrea_4off6	LED's support surface. Opaque Plastic ABS	1
3	Opaque_Andrea_5off6	PCB circuit	1
4	Rubber_Andrea_6off6	Insulating rubber	1
5	Opaque_Andrea_3off6	Outer upper part 2. Opaque Plastic ABS	1
6	Opaque_Andrea_1off6	Outer lower part. Opaque Plastic ABS	1

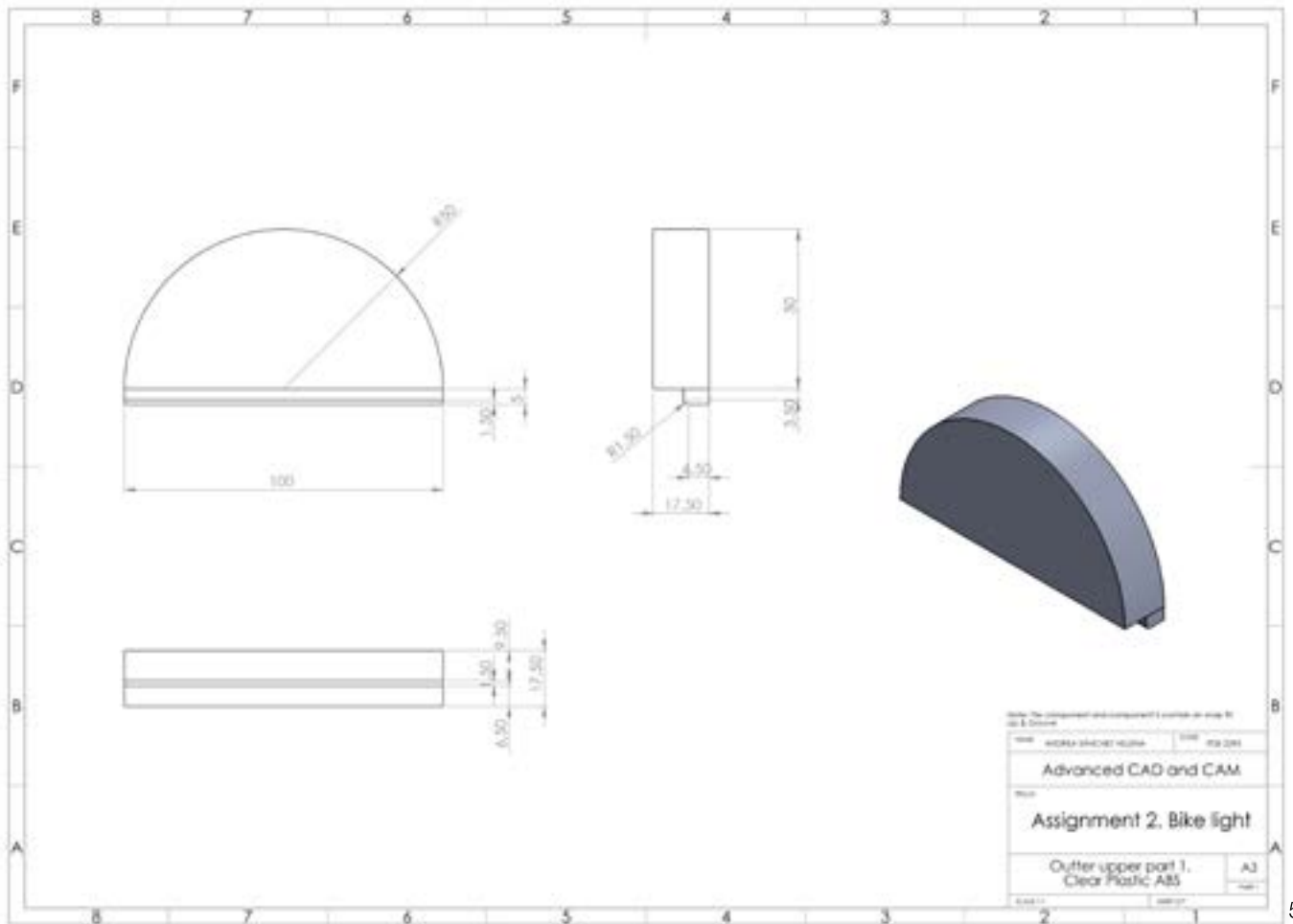
Advanced CAD and CAM

Assignment 2. Bike light

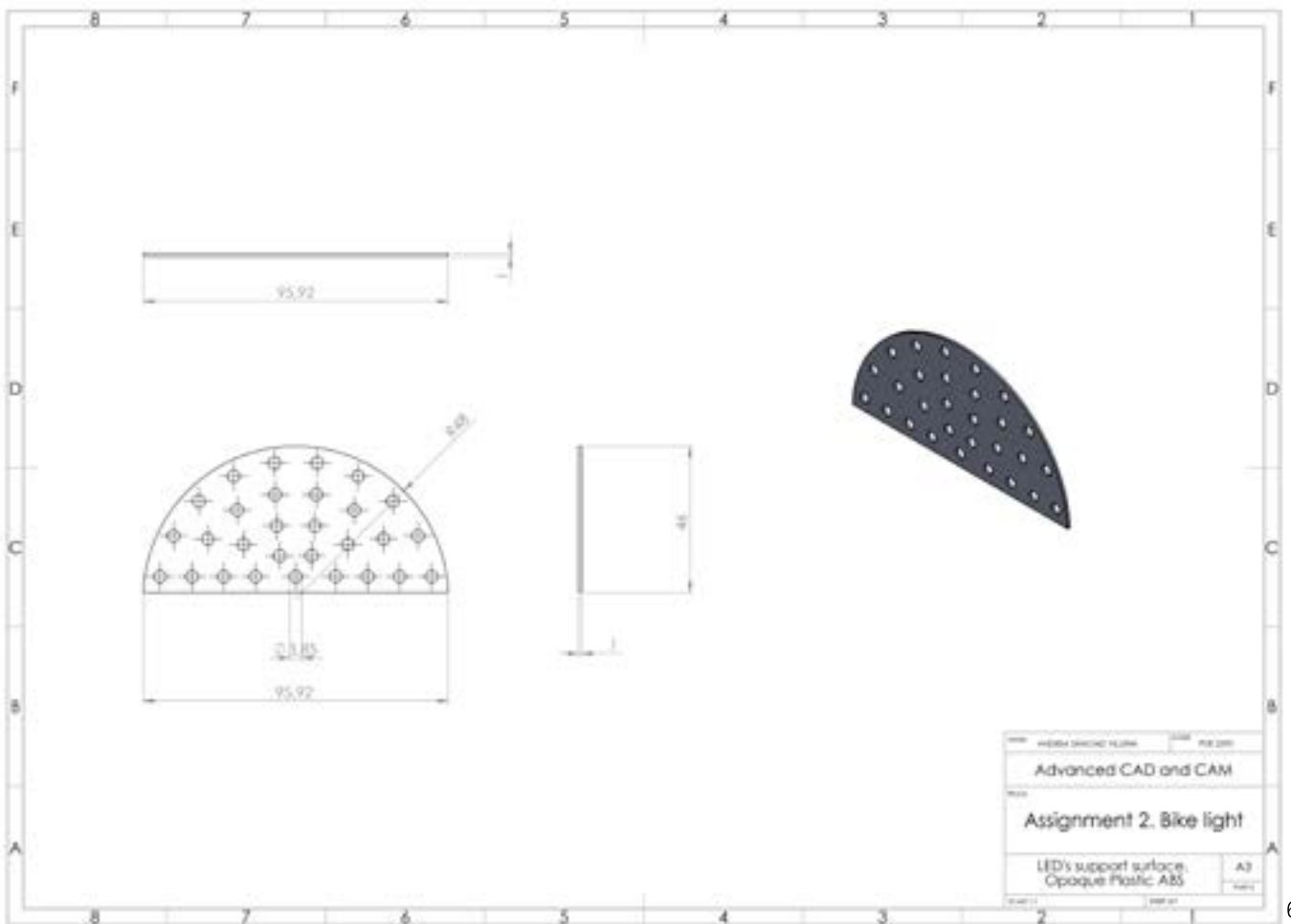
Exploded view

A3

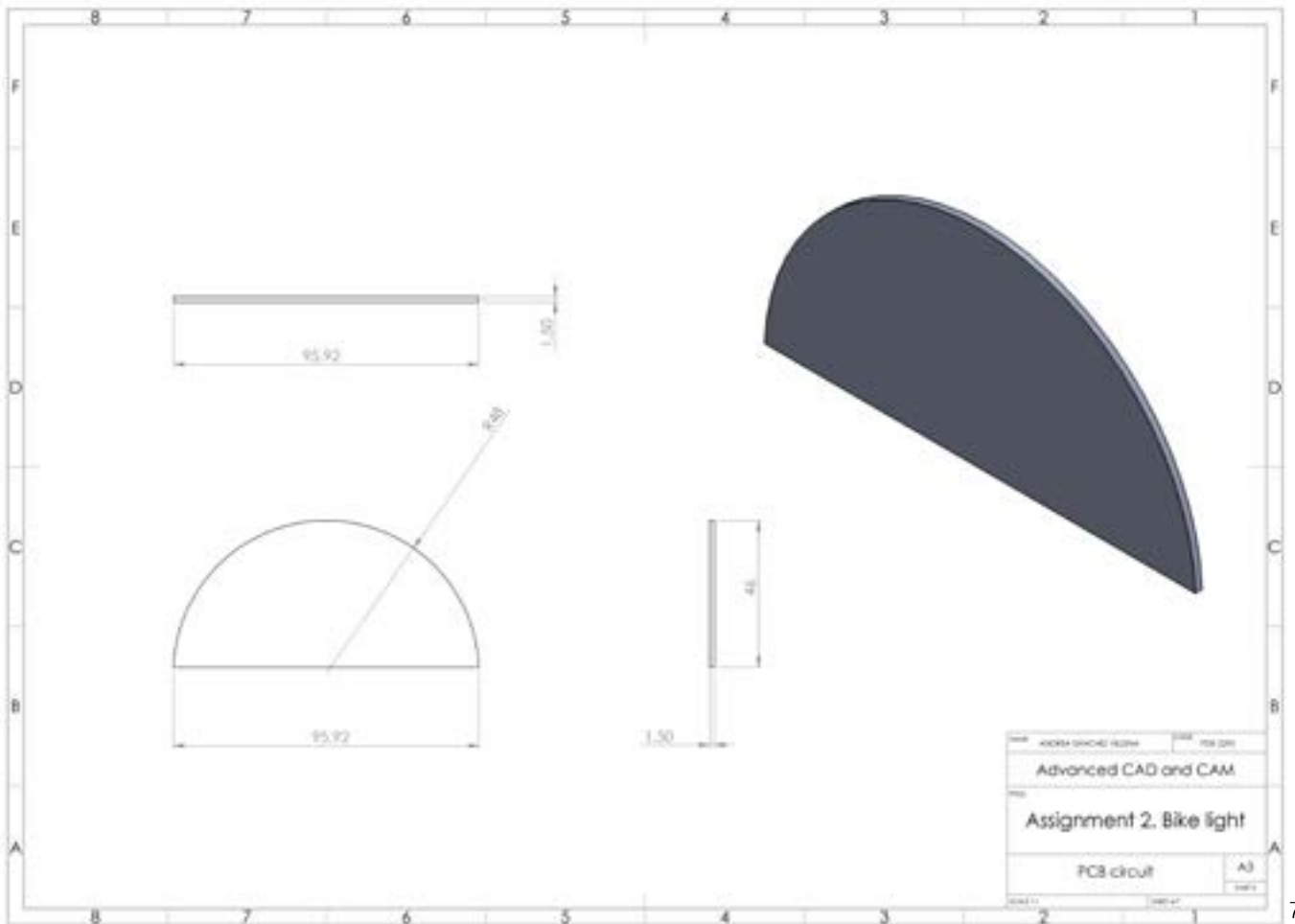
4



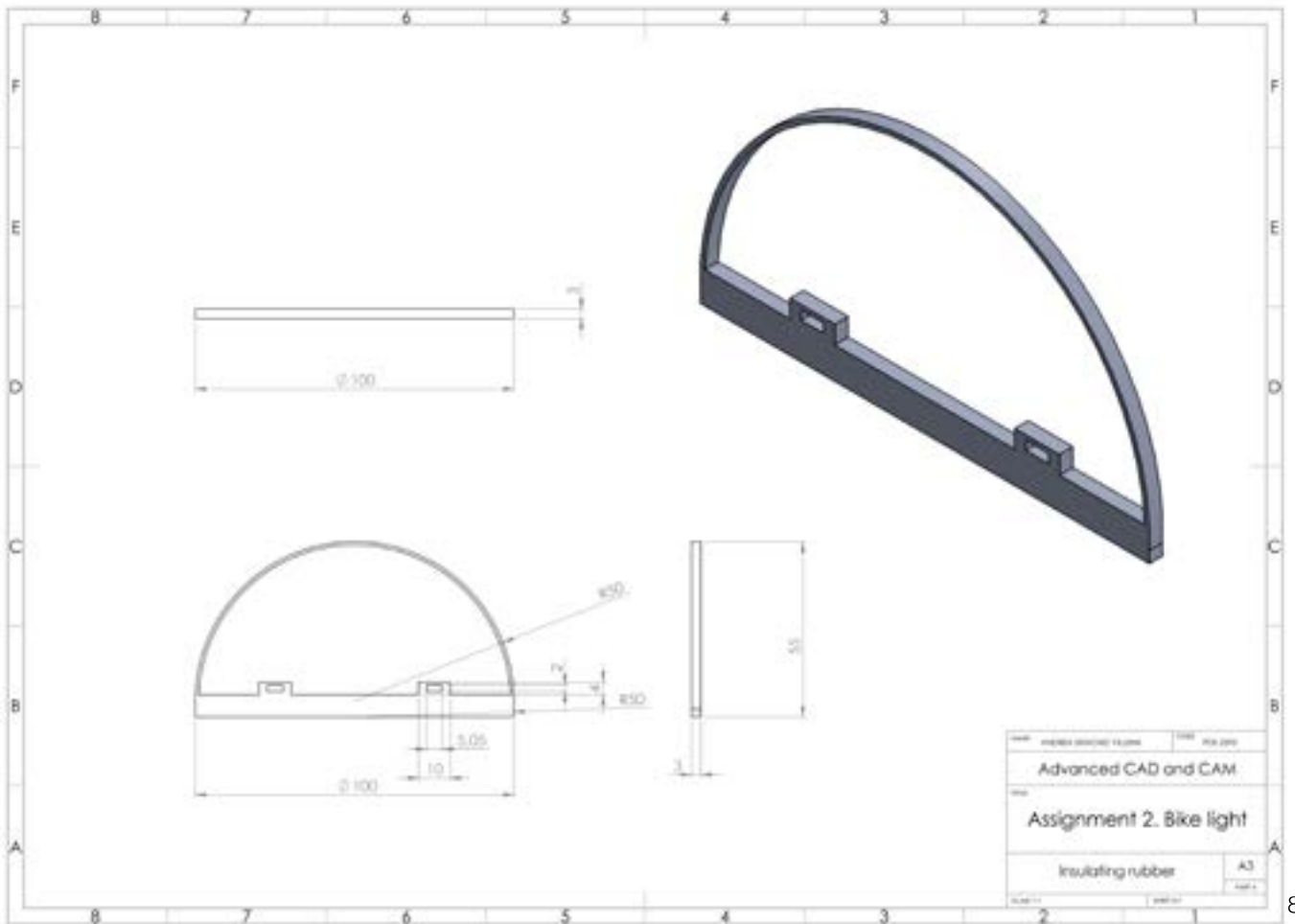
5



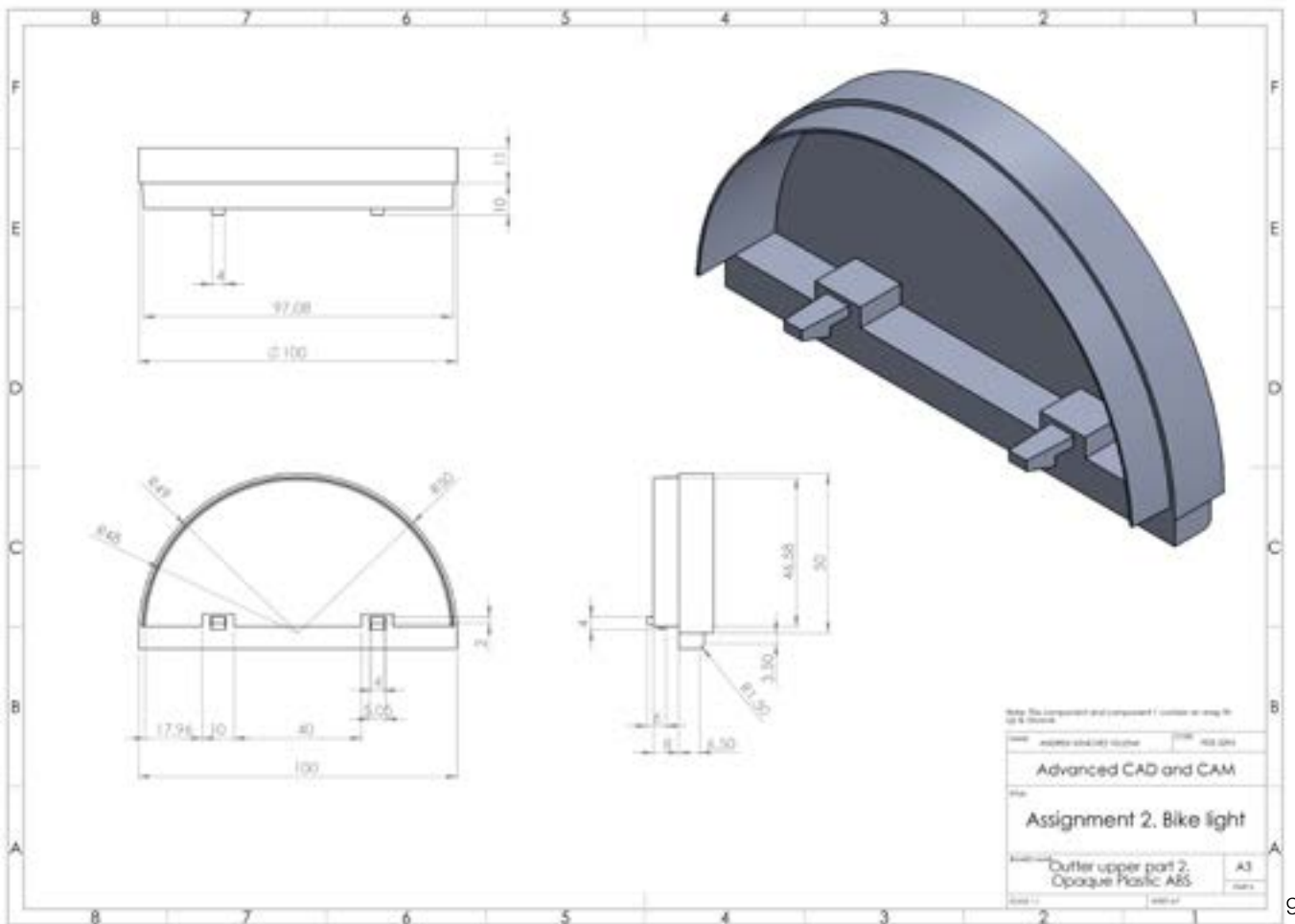
6



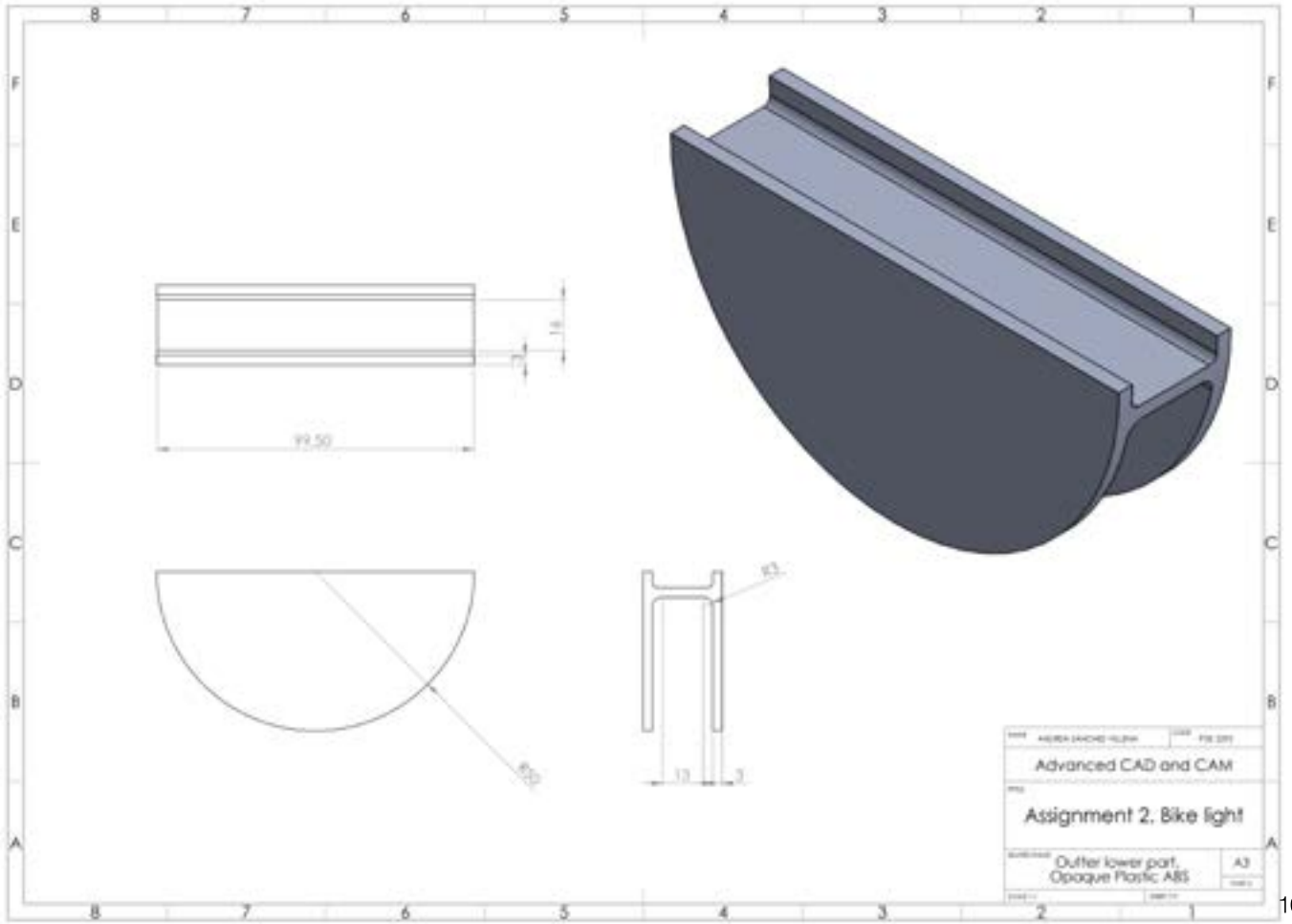
7



8

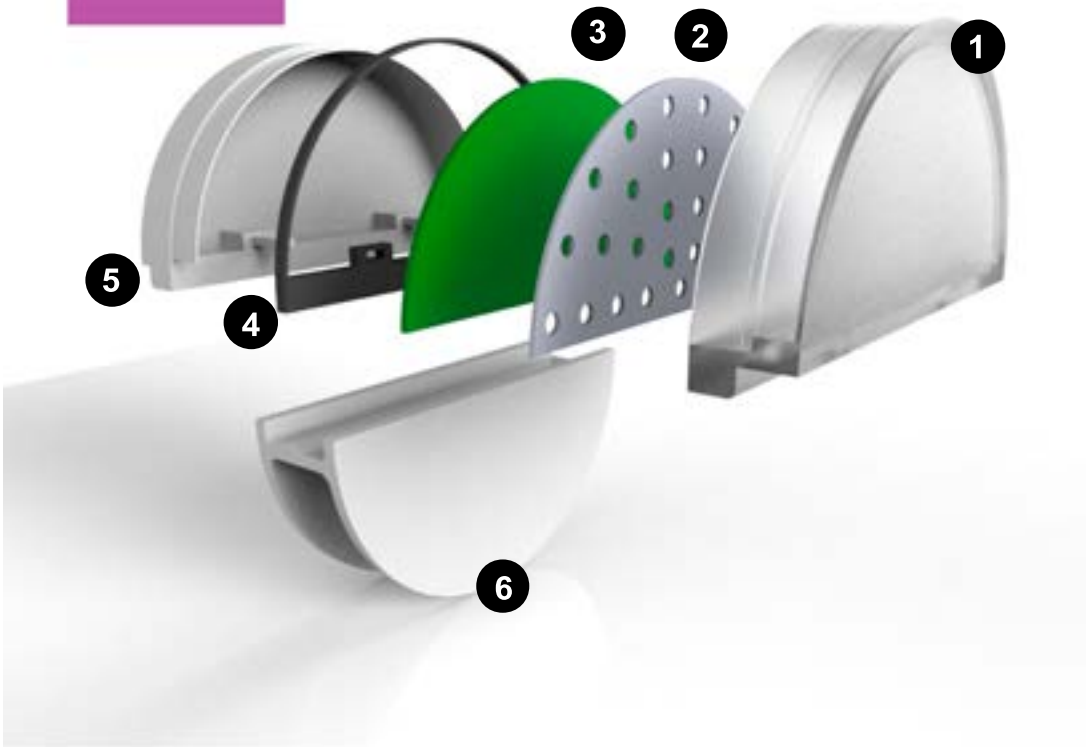


9



10

Detailed design



11



Component 1

Outer part 1, made of clear plastic ABS, allowing the light come through



Component 2

PCB panel, where the circuit is printed



Component 3

LED's support surface, made of opaque white plastic. In each of the holes there is one LED light.



Component 4

Insulating rubber, it doesn't let the rain come through, as well as protecting the two outer parts, so that it doesn't wear away.



Component 5

Outer part 2, made of opaque plastic ABS.



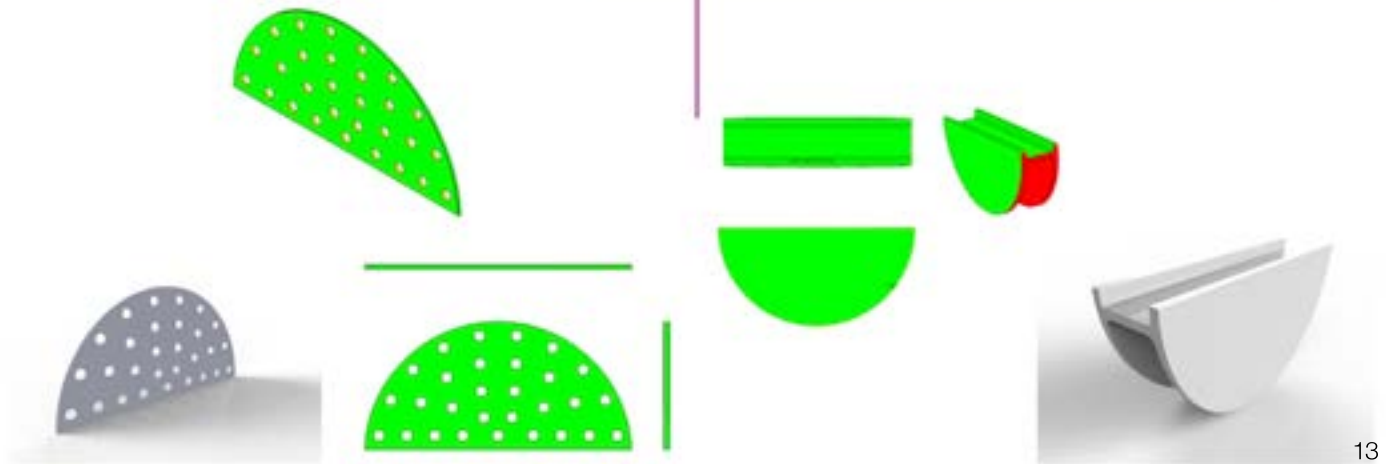
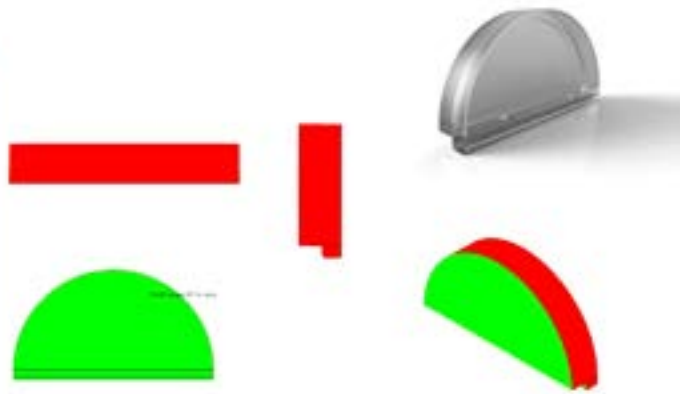
Component 6

Outer lower part, made of opaque white plastic ABS. Is the bracket for the whole bike light.

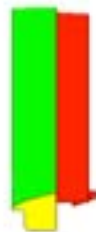
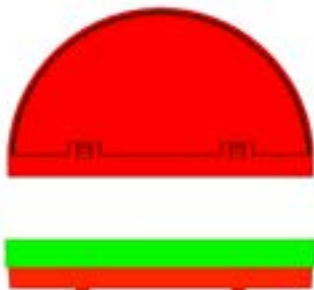
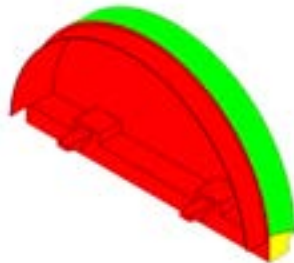
12

Draft analysis

By creating some drafts in each of the components, I managed to avoid faces where the angle of the them is less than the positive reference angle or greater than the negative reference angle. I just have some little parts with the yellow colour, meanwhile the rest are green or red. So by this analysis I can say that, if they were injection moulded components, they might not have problems, just some little details to adjust.



13



14

Plastic moulding analysis

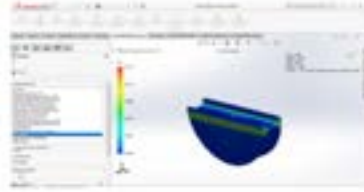


This is the component that has been chosen for making the plastic moulding analysis. This component, at the beginning, was without a radius, but by making this analysis I realise that I had to change it, as its sink marks were above 0.005 mm.

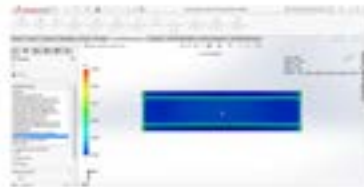
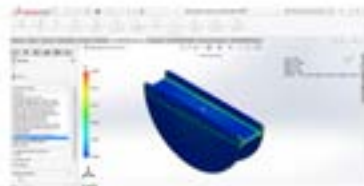
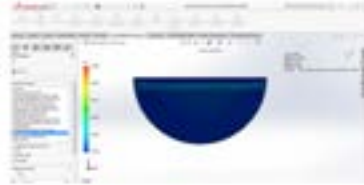


This first image shows the component with a fillet of 0.3 mm, with this radius it also has sink marks above 0.005mm, so I had to change the radius, in order to be a little bit bigger. It happened the same when I changed it to 0.5mm, so at the end, as it is shown in the right pictures, with a radius of 0.9mm, the sink marks were a little bit bigger than 0.005mm, but there weren't red parts in the component.

Filet of 0.3mm:



Filet of 0.9mm:



3

Diseño 3: Jarra estilo Brita

Design 3: Brita style jug

DESCRIPCIÓN DEL PROYECTO:

Proyecto de una jarra de la marca Brita, realizando un estudio de las diferentes partes que la conforman.

Esta marca es conocida por el perfecto uso que le da al agua que sale de nuestros grifos, ya que no sólo sirve para lavar los platos o ducharse, si no que, por medio de unos filtros, conseguiremos que, ese agua que no podemos beber directamente del grifo, por culpa de la cal, podemos beberla, gracias al circuito de limpieza que se realiza dentro de este objeto.

Con el uso de estas jarras podremos evitar la compra de botellas de agua de plástico, en las que, aunque se reciclen, a veces nos encontramos con que una gran mayoría de estos plásticos que usamos día a día acaban como desperdicios en el mar, generando una contaminación brutal, y provocando la extinción de algunas especies marinas.

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1. Total respect of the environment

The sachet, by using it, it vanishes and starts to completely disappear with no-contamination

at all, since it is a special plastic that, mixing it with water (even faster is it being mixed in a higher temperature), starts to disappear until there is nothing.

2. Low fabrication costs and retail prices:

This allows a high consumption not only in low income countries but also in developed economies, as it has a really easy application for sportive topics, trips, etc.

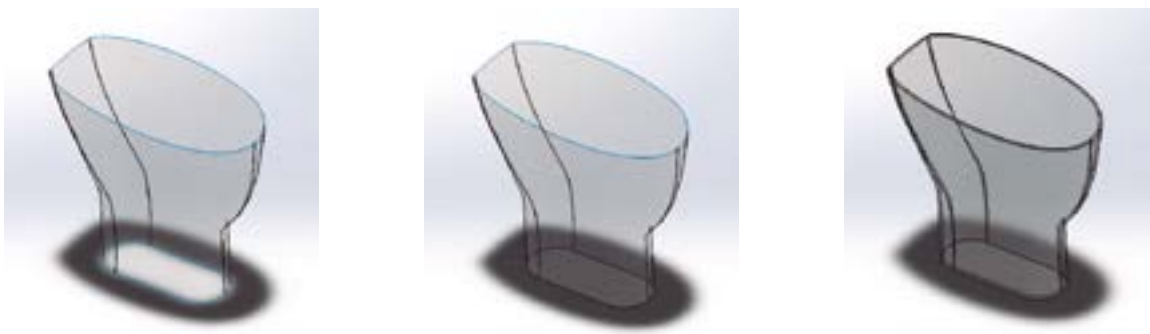
Assignment 1

Bottle project



Andrea Sánchez Villena
Student Number. M00601808

Process Modelling parts





Process Modelling parts



Process Assembling





CONCLUSIÓN:

Afortunadamente en los últimos años estamos asistiendo a un incremento importante de concienciación en materia de responsabilidad social de las empresas productoras de bienes de consumo, así como de los usuarios que demandamos tales bienes, lo que está generando más investigación e innovación tendente a producir con materiales y procesos ambientalmente sostenibles que contribuyen a mejorar el uso de los recursos disponibles. Una pequeña prueba de ello, son los trabajos aquí expuestos que demuestran que, en usos tan diferentes como un elemento de transporte, como es una bicicleta, o el propio uso del agua que bebemos y de productos que utilizamos conjuntamente con el agua en nuestra higiene personal, todos ellos de alto consumo, demuestran que el diseño y la innovación nos sirve para dar una respuesta, con respeto total al medioambiente, a necesidades básicas de nuestra vida diaria.

Creo que es una tarea y un objetivo de todos, y especialmente para nosotros, como futuros profesionales, aplicar procesos y utilizar materiales que den respuesta a las necesidades de los consumidores con absoluto respeto a criterios medioambientales.

