

Shaving the World



1.1 Contact Information

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1.2 Submitting Categories

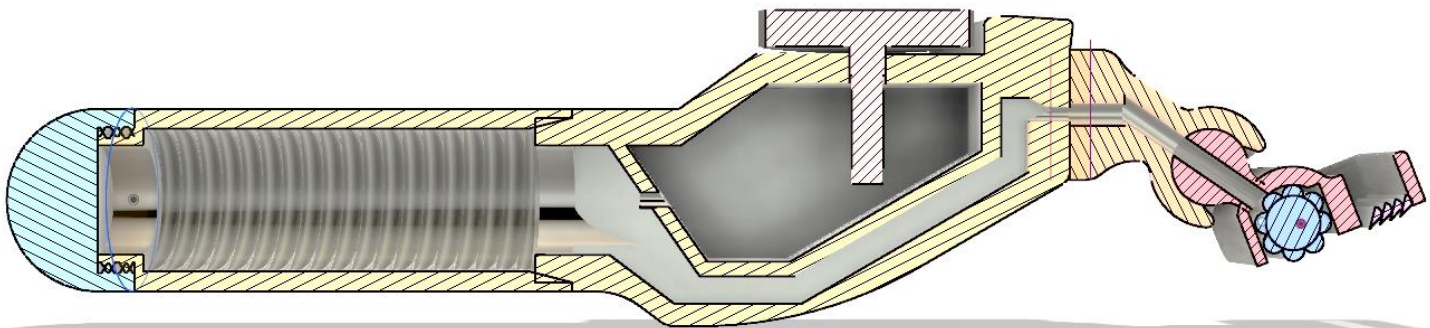
Student Project
Use of Autodesk Fusion 360
Use of Aluminum



**Engineers for a
Sustainable World**
Rochester Institute of Technology Chapter

2.1 Product Description

The EPA estimates that close to two billion razors are discarded each year. These razors end up in landfills largely due to the difficulty and danger associated with recycling the small stainless steel blades. Additionally, disposable razors waste an incredible amount of water during consumer use. We aimed to design a 100% recyclable razor utilizing a completely stainless steel head, while at the same time allowing the razor to perform at the same standards, without using as much water.



The handle and associated components are made of aluminum, and the roller is made of a HDPE plastic which are both recyclable and separable from the blades and housing. This allows for the head to be removed and replaced.

The stainless steel head allows recycling companies to process the blades and the housing as one component, thus reducing the risk to their machines and employees.

The handle cavity allows for the storage of the lubricant/moisturizer of choice. The thumb gear on the top then drives a shaft, forcing the liquid to the head. Here, it is distributed over a roller, which applies the lubricant to the skin just before the blades pass over it, eliminating the need for a constant water source while shaving.

2.2 Product Image



2.3 Illustration of the Product System



3. Reutilization Cycle and Business Model

What happens at the end of the product's life?

At the end of its lifespan, the consumer has two options:

1. Recycle it through their regular recycling company
2. Send it back to the company.

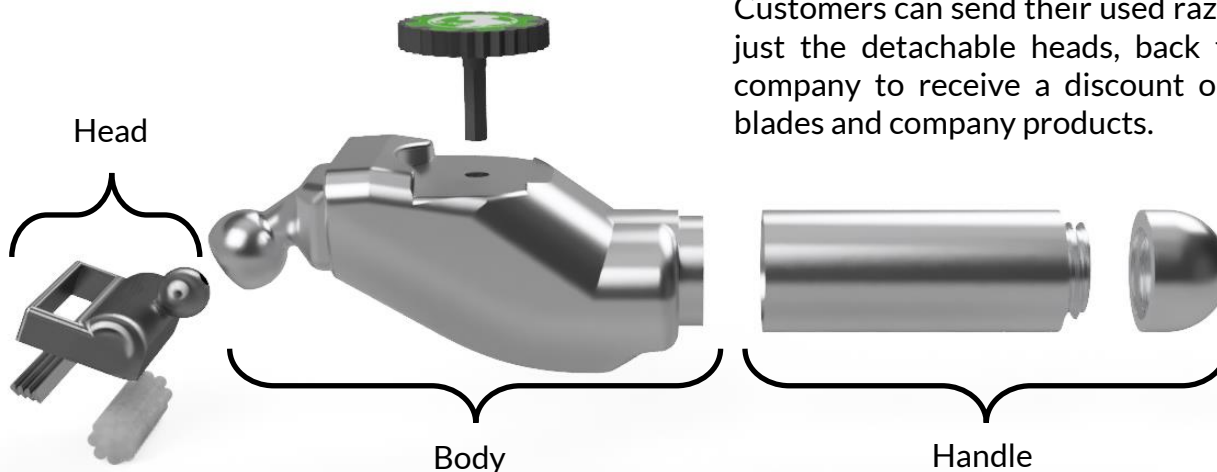
Once the company receives the used razor it will be disassembled so that each component can be recycled in-house. The recycled material will then be directed toward the production of new razors, offsetting the costs of required materials. Any additional material would be purchased from recycling plants.

What infrastructure takes your product from cradle to cradle?

Our razor is able to be remanufactured through our company via a discounted replacement mail program, keeping the product out of landfills while creating a dedicated customer base.

How does it get cycled?

The design doesn't require the entire razor to be replaced at the end of the life. The roller is detachable so customers can keep this, the body, and handle, and replace only the head as needed. Customers can send their used razors, or just the detachable heads, back to the company to receive a discount on new blades and company products.



What is the business model for this system?

This product will be sold initially in-store as well as online, but the replacement program will be carried out both online and via the mail system.

Customers can use the original packaging to return the razor blades to the company initially, and can save the packaging that their new razor blades arrive in to use for additional replacements.

We will grow a customer base attracted to the convenience and functionality of the razor, as well as the price. Getting the razor materials back via the mail program and reusing the packaging will allow us to maintain low costs for the consumers, especially when they receive a discount from the return program.

4. Material Selection

4.1 Overview

Stainless Steel is 100% recyclable and loses no physical properties in the recycling process. Chromium present in the stainless steel creates a film over the surface when exposed to air, preventing the blades from rusting.

Aluminum Alloy 3003 is 100% recyclable, and uses about 5% of the energy required to process new aluminum. It is highly resistant to corrosion and is easily workable.

HDPE Plastic has a high stress crack resistance and won't corrode. It is 100% recyclable and is easy to do so. Additionally, it provides a more cost-effective alternative to manufacturing new plastic.

4.2 Material Reutilization

In the design of our product, we maximized our reutilization score by only using recycled and recyclable materials.

100% Recycled/Renewable
100% Recyclable/Compostable

100 Material Reutilization Score

4.3 Material Health

Stainless Steel: used in blades and blade housing
NFPA Health Score: 0

Aluminum: used in handle and body
NFPA Health Score: 1 (irritation as dust particles)

HDPE: used in roller
NFPA Health Score: 1 (irritation as dust particles)

4.4 Impact Statement

The right material choices allow the product to maintain certain physical properties regardless of how many times the material is recycled.

5. Autodesk Fusion 360

Fusion 360's unique file share system was an essential component in the design of our product. It allowed our group to collaborate more effectively than any of the other 3D CAD modeling software available would permit. It also increased our overall efficiency since we were able to work on and reference multiple components at the same time.

Additionally, Fusion 360 improved our design through the Shape Optimization capabilities of the program, allowing us to minimize the material waste of the razor. This was primarily used towards the head of the razor and near the attaching neck. We had to ignore some of the shape optimizations closer to the handle because we needed to ensure that this section still provided a watertight seal. The reduction in material usage lowers both the cost as well as the overall impact that the razor has on the environment.



FUSION 360

While designing our razor, we utilized both direct modeling as well as parametric modeling. We primarily used parametric modeling in the design of individual components to ensure dimensions necessary for connections would match. Direct modeling was more beneficial in the assembly processes to roughly position the components before defining the joints and relationships between them.