

Portable Pneumatic Can Crusher

Daniela Orquiola, Samir Julian-Aguilar, Riya Kumar

Problem Introduction

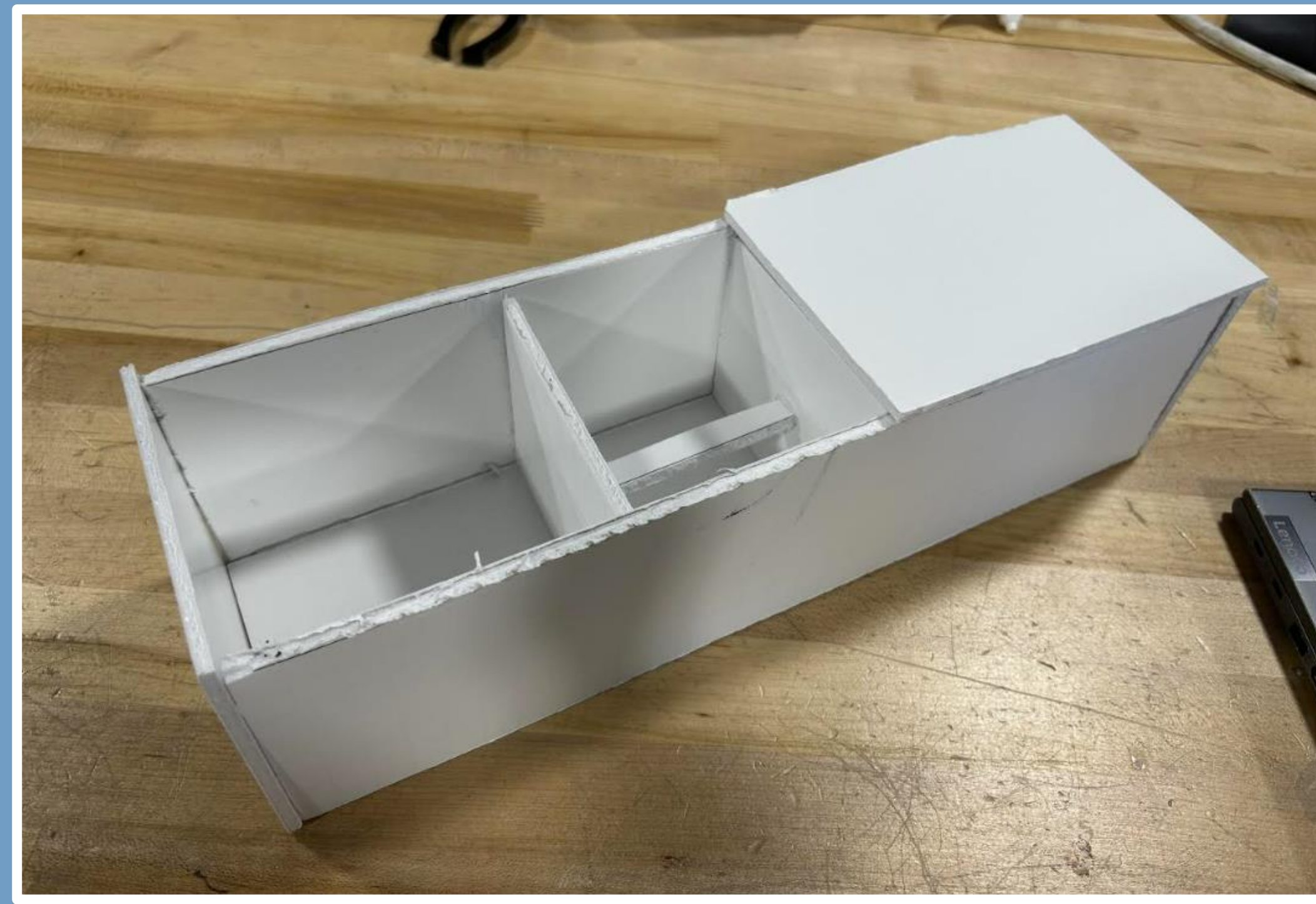
Empty aluminum and steel cans are often littered and discarded carelessly, leading to pollution. This wastes materials and risks affecting local animal populations, harming the environment and biodiversity. There needs to be an efficient way to better store and transport these cans in a convenient way that can be established in homes, restaurants, and stores. This will help increase recycling, energy and natural resource conservation, and lower greenhouse gas emissions.

Our Solution

We intend to build a can crusher that is powered by pneumatics. The user places a can inside a specific area, and a pneumatic piston inside will crush the can. Afterwards, the can will fall into a storage area underneath the crushing area that can be opened to be emptied. The pneumatic piston will be operated by a button, requiring electrical components and programming. The pneumatic piston has many other components that must be stored within the can crusher.

This can crusher will be built into homes, restaurants, etc. to improve conservation and reduce waste. We aim to make this product portable so it can be kept in areas that generate large amounts of waste.

Methodology

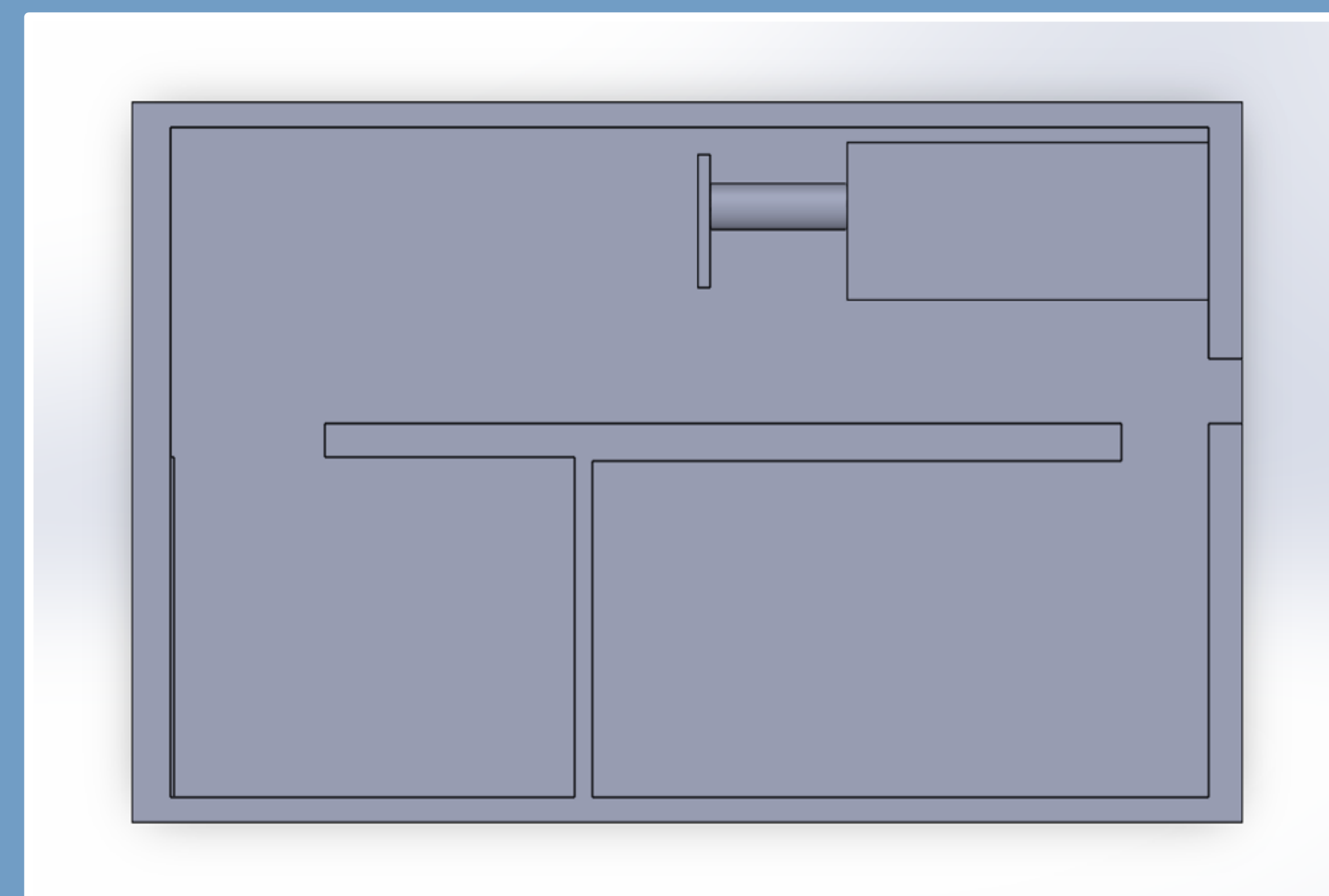
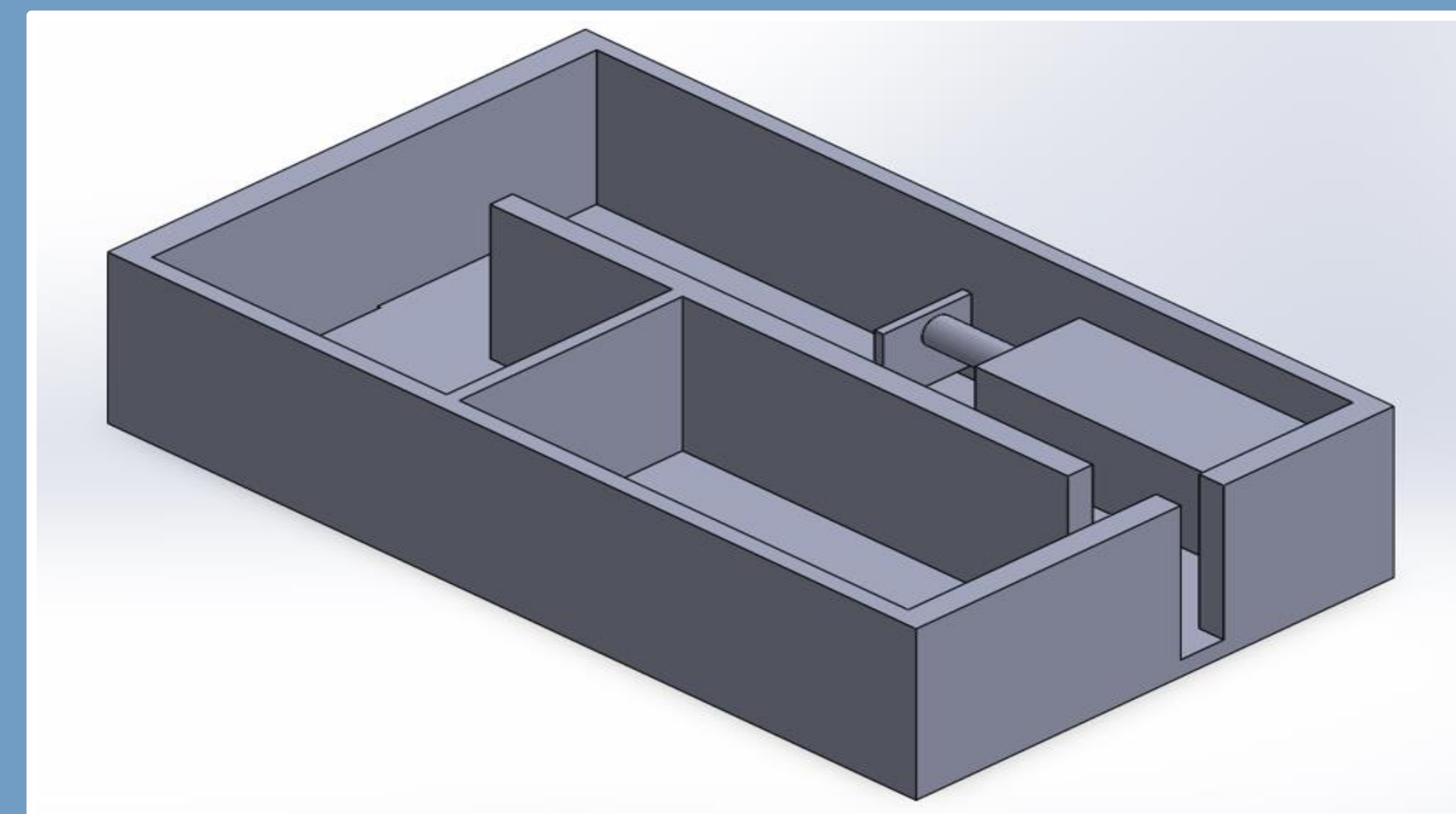


Our first prototype was very simple and low-fidelity, only being made out of foam board. This prototype was based on an existing design and was made to get a rough idea of where we wanted to go next.

Based on this prototype and extra research, we created a list of requirements that our final product must meet, which include: being able to quickly compress cans, being operated by a button, being able to fit in a space not exceeding 3 feet, having a storage area for crushed cans, and having safety features that would prevent hands being crushed or protect the user from any possible malfunctions.

After identifying the requirements for our product, we had to do more specific research to develop a more detailed design. We decided to set up our design with 2 levels. On the top level, we included the pneumatic cylinder. When the can is placed on its side, the pneumatic piston will crush the can, and the can will fall into storage underneath. The hole to the storage is small, so this way, the can only falls in after being crushed. The storage area can be opened so that the crushed cans insides can be emptied. The second level also contains space for extra parts that would need to be present for the pneumatic piston to work. On the other side of the can crusher, we will include more space to contain additional pneumatic parts and any components required for the electrical aspect.

We also needed to determine what parts we would need to operate the pneumatic cylinder. The main parts we would need to include would be an air storage tank, a compressor, a pressure regulator, a pressure relief valve, a pressure switch, and pressure gauges to monitor the air pressure. These would be connected through tubing and threaded fittings, which would then connect to the pneumatic cylinder.



Existing Solutions

First Solution:

Automation replacing manual effort by mechanical power is the focus of this design. The operation remains an essential part of the system with changing demands on physical input as the degree of mechanization is increased. This machine works on the principle of Single Slider Crank Mechanism which is the heart of this machine, and it converts rotary motion into a reciprocating machine to crush the Cans/Plastic bottles. The main aim of this is to study the complete design of Automatic can crusher machine. This design had restrictions from their data beforehand they considered when creating this solution.

Second Solution:

The inspiration behind this design came from the wastages in eateries, canteens of big companies where people gather and consume a lot of canned beverages. So there should be an easy way to dispose of used cans properly during large social gatherings. The Can Crushing machine works with the help of pneumatic single acting cylinder. The machine is portable in size, and as such is easily transportable. A Can crusher is a device to reduce large material object into a smaller volume. The crusher reduces the size or change the form of waste materials so that they can be disposed off or recycled easily. The Can crushing machine is designed to crush aluminum waste cans by 80% reduction in volume.

Future Steps

1. Adding electrical components + programming to power button
2. Using metal instead of wood
3. Taking up less space to store electrical and pneumatic components
4. Space and ability to crush multiple cans at once
5. Expand to include other materials, such as plastic bottles

Acknowledgements

- Thank you, Mr. Rosen and Mr. Huntley, for providing resources and help!
- <https://www.irjet.net/archives/V7/I5/IRJET-V7I5577.pdf>
- https://www.researchgate.net/publication/346843700_Design_and_Fabrication_of_Pneumatic_Can_Crushing_Machine
- https://www.academia.edu/44205225/PNEUMATIC_CAN_CRUSHER
- <https://www.qcr.co.uk/news/can-crushers-how-to-stay-safe-while-using-them/>