# Demeter Renewable Technologies

White Paper

Compact, Consumer-Friendly Food Waste Dehydration System

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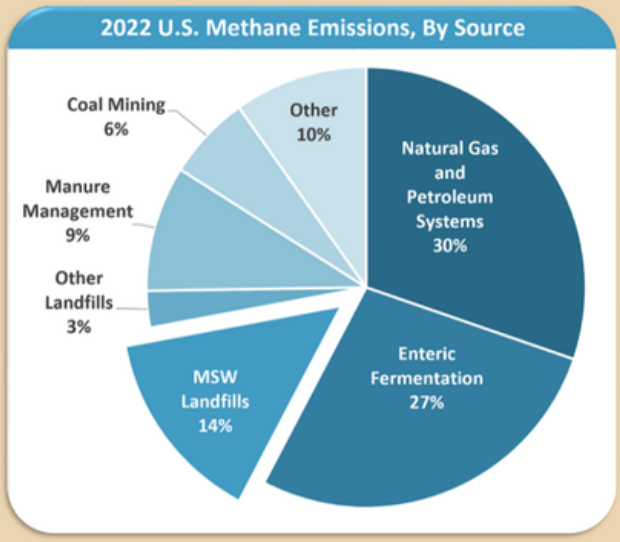
Engineering for Social Innovation
Team 42

## Background and Motivation

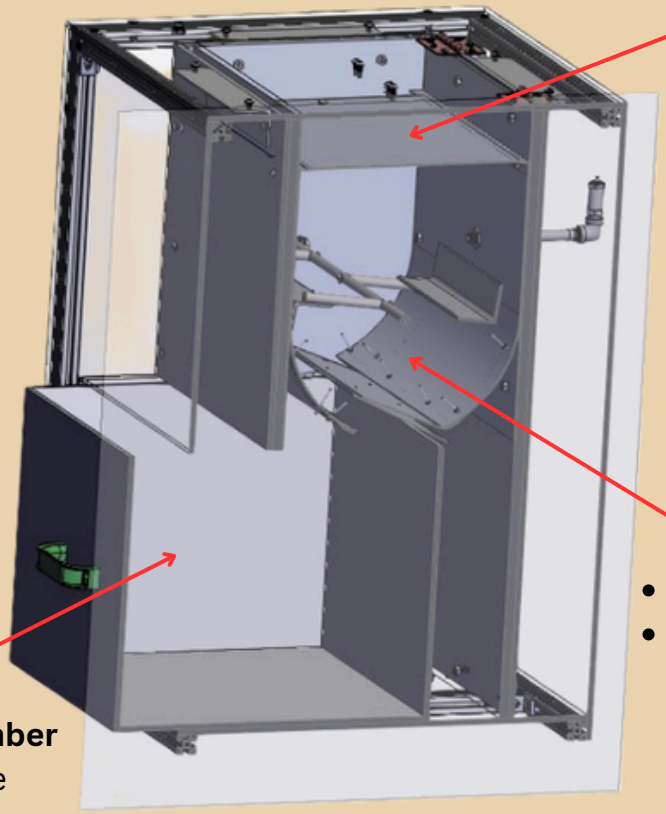
In today's world, it often feels like individual efforts to be environmentally conscious are overshadowed and insignificant. Demeter Renewable Technologies changes that narrative by empowering households to make a tangible difference in reducing methane emissions from landfills. Our innovative solution enables customers to divert food waste away from landfills, addressing one of the leading contributors to methane emissions. By using our product, you're not just reducing waste—you're playing a direct role in protecting our planet and combating climate change.

14% of U.S. methane emissions comes from food waste decomposing in landfills. Redirecting this waste presents an important opportunity to reduce greenhouse gas emissions. Demeter Renewable Technologies is creating the BinOne to tackles this challenge by giving power to the consumer and allowing them to have the ability to transform food scraps into a nutrient-rich soil amendment through an innovative, at-home dehydration process.



# Design Overview

The design has three chambers, and, in these chambers, there are five systems: raw chamber system, mixing system, pressure relief system, heating system, and post-process system. The mixing and heating systems make up the dehydration chamber which processes the food waste into dehydrated soil amendment. The dehydration chamber is composed of 5052 aluminum sheet metal walls, steel mixing arms, flexible heaters and a motor to power a mixer. The aluminum allows for uniform heat distribution around the chamber and insulation is utilized for heat retention to minimize the energy usage. The pre and post processing chambers are made out of a combination of acrylic and sheet metal to store the food waste before and after processing.



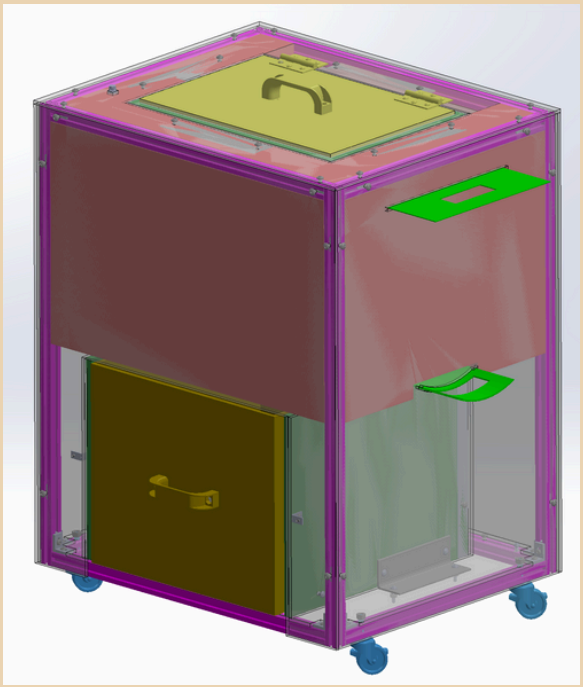
**Pre Processing Chamber**
- Temporary raw food storage

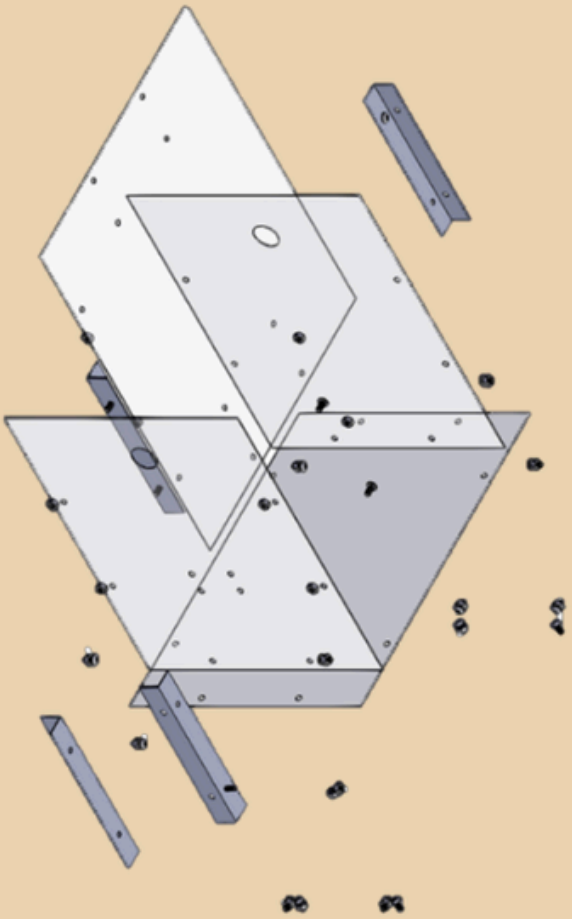
**Mixing Chamber**
- 60% moisture reduction
- 6 hour dehydration time

**Post Processing Chamber**
- 3 month of storage

## Manufacturing and Testing

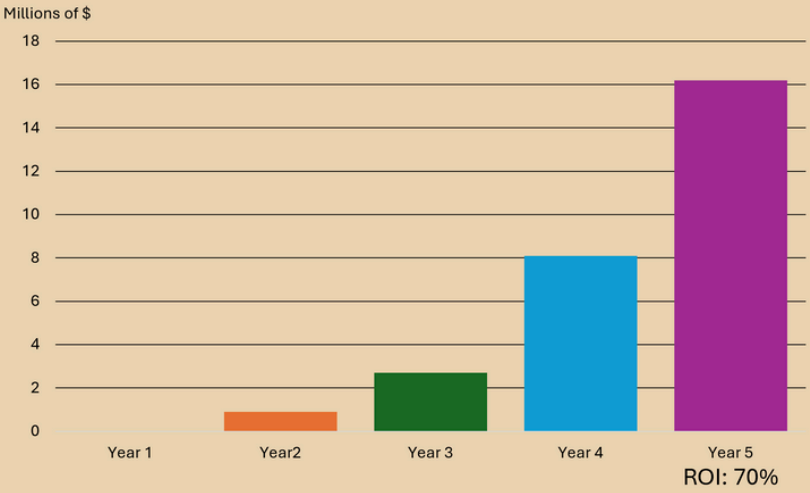
For the testing of the BinOne we have elected three test articles to ensure the safety and reliability of our product to dehydrate food waste.  We will be conducting these test with a custom test rig which will allow individual testing of all electronic components in the product. Our testing rig will be fashioned out of 1/16" aluminum to ensure the test rig will be reflective of our dehydration chamber.





In an effort to reduce manufacturing time, many of the BinOne's components were manufactured via third party vendors.  Our sourcing of low cost materials allowed us plenty of buffer to accommodate the servicing fees. This offloading of manufacturing allowed us the opportunity to spend more time on critical manufactured components such as the mixing chamber, and the supporting angle iron.  These components were manufactured via mills, lathes.

# Business opportunity




***Five Year Projection***

Through extensive research the team found that the target market is the food waste dehydration market which is valued at around $1.2 billion. By year six we plan on capturing 15% of this market giving us an opportunity of $36 million. Our business model focuses on individuals families that care about their environmental impact and have access to a yard or garden.

In order to start the business, the company will need an investment of $1.3 million. This money will be put towards R&D, marketing, manufacturing and IP. Each unit will be sold for $900.

# Competition

BinOne's competitors include Vitamix Food Cycler and Lomi 2, both of which consume significant energy and offer minimal storage. BinOne has a cost per pound of processed food ratio of approximately $84/L for one cycle compared to $153/L for the Mill, $150/L for the Lomi, and $120/L for the Vitamix Food Cycler. BinOne also differentiates itself with a rapid 6-hour dehydration cycle, energy efficiency, and affordability and outdoor usability.

| | Power Consumption Under 200W | Large Storage | Outdoor Use |
|---|---|---|---|
| BinOne  | ✓ | ✓ | ✓ |
| Vitamix FoodCycler  | ✗ | ✗ | ✓ |
| Lomi 2  | ✗ | ✗ | ✗ |
| Mill  | ✗ | ✓ | ✗ |

# Conclusion

Our team consists of six mechanical engineering students with experience in mechnical design, software development, and project management, meaning we have the skillset to bring this product to life. The team has been mentored by two industry professionals with backgrounds in advanced manufacturing and aerospace. Over the past year Demeter Renewable Technologies has dedicated countless hours towards researching, designing, manufacturing, and testing BinOne to create a prototype that will give our team insight to pursue the food waste market. Demeter Renewable Technologies is dedicated towards giving consumers the ability to do their part in saving the planet!

# Team