Down to Earth (DTE):
The Electric Food Composter

Senior Design 2021/2022

Team LANCE

Ciello Magsanide, Amos Jun, Nicholas Godoy, Lansing Laws, Eriko Nugroho

DR 1.1

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QUAD CHART

Down to Earth

Team LANCE: Nicholas Godoy (ME), Amos Jun (ME), Lansing Laws (ME), Ciello Magsanide (ME), Eriko Nugroho (EE)

Objective:

- **To design a machine that is able to break down food products into usable composted fertilizer.**
- **Research shows that about 931 million tons of food is wasted each year. By creating an affordable food recycler, we can help the environment in many ways by targeting homeowners and restaurants/small business, especially in 3rd world countries.**

Concept:

A three-tier machine that uses food products and repurposes it into compost.

Approach:

The machine can break down food and repurpose it into compost by:

1. **Dehydrating and sterilizing food material to reduce the initial mass and combat odors.**
2. **Blending and grinding the dried pieces until a soil-like consistency is attained.**
3. **Cooling and storing the resulting mix to use for gardening purposes.**

Analyses and RRP:

Analyses:

- **Motor Power**
- **Power Consumption**
- **Structural Analyses (Size and Weight)**
- **Heat Production (and Cooling)**
- **Sterilization**

RRP

- **Prototyping and safety testing of the grinder and the blender to make sure the user is safe and the food is properly broken down.**
- **Prototyping and testing the efficiency of the heater to ensure that the food waste is sterilized and heated properly.**

PROBLEM STATEMENT AND RESEARCH SUMMARY

When we waste food, we are not just wasting the food itself, but we are also wasting all the resources that went into growing it. Research shows that about 931 million tons of food goes to waste each year. Where 61% comes from households, 26% from food service, and 13% from retail. According to the UN, between 8-10% of global carbon emissions are linked to unconsumed produce. Furthermore, food waste ends up wasting about a quarter of our water supply in the form of uneaten food or over $172 billion in wasted water in the US alone. Each year, as a country we spend over $220 billion growing, transporting, and processing 70 million tons of food that ends up going to waste. Therefore, food waste burdens waste management systems, increases food insecurity and is a major contributor to the global problems of climate change, biodiversity loss and pollution. Furthermore, a significant percentage of global food waste occurs in developing countries – primarily due to poor infrastructure and dysfunctional distribution networks. Almost half of the food grown or produced in the developing world simply does not make it to the market. And that loss is costing billions of dollars and blighting countless lives.

There are many ways to tackle this problem. First and foremost, we can streamline the supply chain to reduce spoiled and lost food, and we can change the way we eat at home. There are already simple technologies such as better storage bags, which are making a big difference, and rockier solutions like national policies that standardize food labels. Food must move quickly on its journey from farm to table before it spoils. Therefore, we are in the process of having better packaging, transport, and storage in order to tackle food waste. For example, expanding access to refrigeration is an obvious solution but it has its trade-offs because refrigeration sucks up so much energy. However, emerging options include innovations such as solar powered fridges in which are being used to store vaccines in medical centers in Kenya and Columbia. Furthermore, food-tech raised a record $5.7 billion in ‘15 where companies like Apeel, Brightfarms , and KDC are providing much needed solution to cut down on waste and exploit inefficiencies in the system. Also, composting has become a big solution but there is still a lot of room for improvement as millions of tons are entering landfills every year. Policies such as SB-1383, is a California bill, that will divert most organic waste away from landfills by 2025. Despite all these solutions, consumer behavior seems to hold the most promise. It turns out that by simply eating certain foods and avoiding others, we can cut down on a significant amount of waste. Truth be told, technology only goes so far when it comes to food waste.

In terms of our project, we are building our own electric composter. From the release of Whirlpool's Zera Food Recycler and other companies such as Vitamix’s FoodCycler, electric composter could be an attractive composting solution. However, you may wonder why we need to pay for a gadget to do something that Mother Nature does for free. Although you could resort to composting, urbanization is increasing by the minute and billions of people live in apartment complexes, condominiums, or suburban areas without much yard space in which traditional composting could become a nightmare. In order to compete with companies making electric composters, we plan on being able to break up bones in our composter as most electric composters for home appliances are unable to do so. By applying this feature, we are catering to both industrial use as well as home appliances. Furthermore, we plan on making this as energy and cost efficient as possible as we want to cater towards 3rd world countries as well.

INITIAL PROJECT STATEMENT AND CRITICAL FEATURES

Project Statement: To create a machine that will be able to breakdown food waste into usable composted fertilizer.

List of critical features:

1. Heating and Dehydrating

2. Grinding and Blending

3. Cooling and Storage

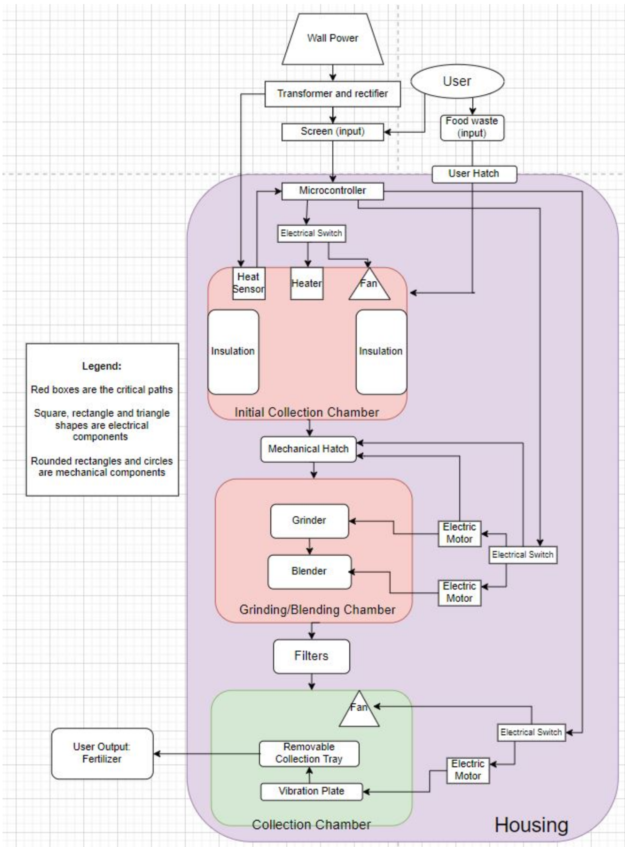
CUSTOMER DESCRIPTION AND PRIORITIES

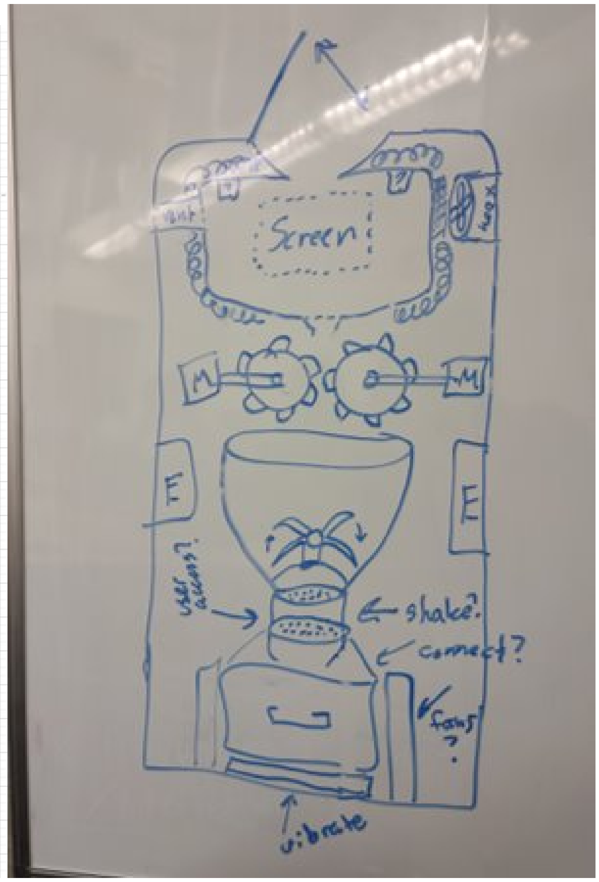
Although we are not creating an industrial size electric food composter, we are creating an electric food composter that will be like a hybrid where it can be used as a home appliance, but also be used in small businesses and restaurants. Many restaurants may already have a composting bin, however natural composting bins take a lot of time. It takes four months to almost one year for food to decompose naturally. With our electric food composter, we are going to cut that time down to somewhere between 12 to 24 hours. Our composter will be more cost efficient if we build the housing and internal components with materials that are cheaper but will still tolerate and hold up to our specified engineering analyses. This will allow home, small business, and small restaurant owners to be able to purchase our electric food composter at a low cost. However, we still want to be competitive with other electric food composters on the market. Our electric food composter will be able to break down bones and shells. Other composters on the market do not have strong enough blades to break down harder materials but with our grinder and blender design we hope to break down small bones, shells and possibly even some larger bones. We will also be working on having our electric food composter take less power to operate. This will help hit our target of third world countries. Our electric food composter will be able to accommodate our customers of homeowners, small businesses, and small restaurants.

Customer Priority	Weighting
User Friendly	20
Safety	16
Reliability	14
Durability	13
Efficiency	13
Power Consumption	10
Cost	8
Size/Weight	6
Total	100

We wanted user friendliness to be the utmost priority as we are focusing on trying to make this machine as convenient as possible for the user. We do not want much interference from the user when the machine is operating, and we are planning to make as much automated as possible. Next is safety, as we do not want to harm the user in any way and want to make the machine so that there are no dangerous situations. Next is reliability as we want the machine to function so the user would not have to replace any parts or make internal changes to the machine for a long time. Then we had durability and efficiency tied as we want the machine to be able to withstand the functions of the components as well as corrosion and any external forces that could be exerted on the machine. Furthermore, we want the machine to be as efficient as possible in terms of how long it takes for the food waste to become usable composted fertilizer and even energy efficiency. Our group thought that durability and efficiency should come after reliability as one of our main goals for this project is to simply have the machine operating properly. Next is power consumption as we want to cater to third world countries where they might not have enough power and we simply want the machine to be operating at the least amount of power possible. We thought power consumption should come after durability and efficiency as minimizing power consumption has a will be a more difficult task than durability and efficiency in terms of our designing and building process. Our next concern was the cost as we want to make this as affordable as possible. We thought that power consumption was a bigger factor as we would rather have better power consumption than having the cost be as low as possible. Lastly, comes the size/weight as we think this is the simplest of our concerns in terms of the design and building process of our project while still making up a significant portion of the final system.

TEAM FINAL DESIGN





For our mechanical side of our block diagram, first we have out user input, this is where we insert food waste, and it will drop into our initial collection chamber. In this chamber we will have a heater and fan to help sterilize and dehydrate the food waste, and insulation will be placed outside of the chamber to help contain the heat from going into other components. Once it is dehydrated it will then drop into our industrial grinder which will be the initial breakdown of the food waste and it will be run by a motor. After the first initial breakdown it will drop into the shredder, blender where it will breakdown the food wastes into smaller particles that will resemble the size of fertilizer. This will also be run by a motor. The food waste will then be dropped through layering filters and into the collection tray in our collection chamber. In our collection chamber we will also have a vibration plate to help the food waste filter through and have it stay level. A fan will also be included in this chamber to help cool the food waste from the heating and grinding. Finally, we have our user output. This is where the customer will be able to take out the collection tray and have fertilizer ready to be used in a garden or be packaged to be sent to agriculture. This will complete the cycle from food waste to compost for it to be repurposed and help the environment.

For the electrical side, the machine is powered by using electricity from a wall electric outlet. The user will operate the screen located on the outside of the housing. This input will be forwarded into the microcontroller and the microcontroller will get the information of the temperature inside the heating chamber via the heat sensor that is located inside the chamber. The heat sensor will always be on to monitor the temperature inside the chamber. The microcontroller will then decide if the heater that is inside the chamber needs to be activated or not. If the temperature is below 130°F, the heater will activate and increase the temperature inside the chamber. We will use 130°F as our lower temperature threshold. When the temperature inside the chamber reaches 150°F, the heater will turn off immediately and we will use 150°F as our upper temperature threshold and we must keep the temperature inside between these two temperatures for the best result. In the next chamber, an electric motor will be used to power the grinder and blender to help with these two components process the food waste. An electric switch will be used to activate the electrical components inside each chamber. After each process is done, the switch will turn on the electrical components in the next chamber and will deactivate the ones inside the previous chamber to lower the power consumption of the machine. In the last chamber, the vibration plate is connected to an electric motor to help vibrates the collection tray.

In terms of the critical path, we represent this through the red filled boxes. In terms of the heating chamber, our risk consists of how the temperature would affect the system as a whole and whether it would be able to fully dehydrate the food waste without losing its nutrients. This also entails how big of a heater we will need, which also gives us the risk of how big we need to make the heating/collecting chamber itself. Furthermore, we need to figure out how long the food will loiter in the device as we need to meet our specs of 14 hours. To mitigate these risks, we simply need many extensive tests runs and calculations. Calculations could include things such as forced air convection which basically forces hot air in something like an oven to circulate throughout it. We could also have burn-in test in which is a set temperature that is held for an extended period. purpose of this is to determine the ability of a part to perform in the conditions of a particular environment. With this test we will have precision temperature control with power measurements. The goal is to ensure the performance of components. Furthermore, to ensure that we have consistency in temperature, we need to manually check our heating chamber to ensure consistency. Lastly, ventilation will also be a problem in design as we need to recall thermodynamics for air ventilation. In terms of the grinding/blending chamber, our main risk is safety and whether it will be able to fully blend the food waste to appropriate size. Another risk to the grinder is cost as using metal could be too expensive which will not satisfy our desire to cater towards 3rd world countries. 3D printing may be too weak to break up bones in which we need extensive test runs to see the possibility of this working in our component. If this is the outcome, we may need to find material that would be cheaper as well as effective to mitigate this risk. Lastly, we want to make sure our motor has enough power through use of thermodynamics in terms of performance and efficiency where we also want to focus more on torque than rpm. In terms of the blender, we need to find the optimal size of the blender blade to see which size and types works most effectively in getting our desired size of fertilizer. To mitigate these risks, we need extensive test runs in which we exercise extreme caution. We also need to see what shape we want to enclose the blender blade within to ensure effective blending. Furthermore, we need to make sure our motor has sufficient power where want to focus more on rpm rather than torque.

ENGINEERING ANALYSIS LIST

- Power Consumption: Calculate the power needed to run the machine by calculating the max electrical power consumption for each component of the whole system and adding them together. We need to know how much electrical power is needed for the UV light, heater, fan, and motors.
- Motor Power: Finding how much mechanical force is required to spin the grinder and blender effectively and relate it to the amount of electrical power needed.
- Structural Analyses: Calculating the structural ability of the machine to make sure that it doesn't collapse when it's running due to the mass and the vibration caused by the component.
- Grinder/Blender Power: Calculate how much power can be produced by the grinder and blender to ensure that it can efficiently do its intended purpose without failing.
- Sterilization: Find how much time needed to ensure sterilization of the food waste to ensure complete and efficient sterilization. Standalone category.
- Heat Production: Need to calculate the heat transfer into the food and how hot the container that is sterilizing the food will get. In addition, figuring out how the machine will monitor the heat and shut off once it has reached the proper temperature.
- Data Acquisition– Measuring the data rate and speed of the sensor reading the heating, cooling, grinding, and blending processes. This will be the standalone analysis.
- Mass distribution: finding the number of mechanical loads and where they are connected to the system.
- Vibration force: Calculating the rate the plate will need to vibrate at, under the fertilizer to avoid any mounds and give the user an easy to dispose final product. The tray should have a flat surface of fertilizer as an end product. (This may also need to be prototyped.)

- Size and Weight: Calculating the appropriate size and weight for each subsystem so that it would be able to hold an ample amount of food waste while fitting all our components within each subsystem.
- Materials: Finding the right materials so that it would be able to tolerate things such as weight, heat, and cost.

RRP

Electrical: Integration of heating device and UV light. In order to succeed we have to make sure that the UV light can remove all, if not, most of the odor produced by the food waste while the heater is processing the food waste at the range of 130 ^{o}F - 150^{o}F. The temperature should be regularly monitored to ensure a successful composting process. We have not previously integrated a Heating device working simultaneously with a UV light before. **For the RRP we propose to build this integrated system and do an observation for future modifications in a closed environment.**

Mechanical: We have never constructed a food recycler which includes heating, cooling, grinding, and blending; the ability to not only construct it but to do so with the appropriate structure to provide for all functions of the food recycler. One main concern would be the gears that will do the grinding/crushing. We will need to continuously test these to avoid any contact or bending stresses. Similarly, the blade in the "blender" portion will need to be tested and prototyped regularly to make sure they are safe and will grind the food to the correct size. **For the RRP we propose to build and continuously test the "blender" until it processes food to an appropriate size.**

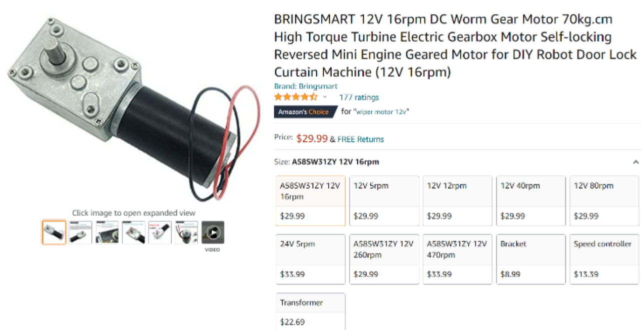
RISK REDUCTION PROTOTYPE DESCRIPTION

We plan to create two primary prototypes:

1. The first would be a functioning chamber similar to the initial collection chamber of the final product. This will give us an opportunity to test whether we can heat the chamber to the correct temperature. This will also test how easy it will be to maintain the desired temperature for the time we need to fully sterilize it. Lastly, we want to fully understand how it will affect the food waste; if it will make the smell not as bad, as well as how mushy or crispy it will make the food as it goes into the grinder and blender.
2. The second would be a model of the grinding and blending system. The primary concern here is to begin testing for safety. We don't want to have any harmful components for either of us as the creators or the users of the final product. We can also begin to see how small we are able to break down the food waste. Testing the filters as well as the overall geometry of the blending chamber to make sure the food flows well.

For the above prototypes we will also be working on the overall flow path of the food waste. For example, we want to test how the food will drop from the heater into the grinder/blender as well as the drop between the blender and the collection tray. Most importantly, we will be constantly checking for any areas that the food starts to jam up so we can figure out the next steps to fix the geometry of the chambers early on.

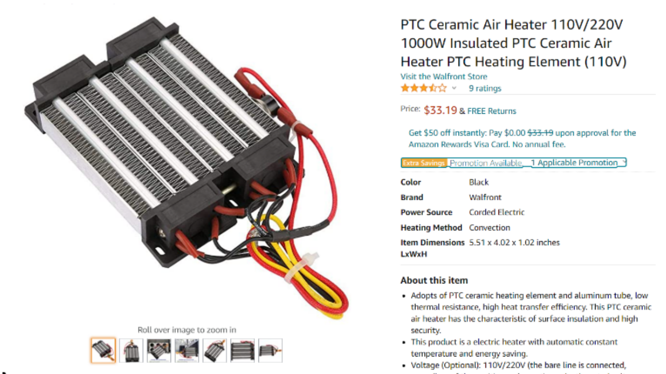
We plan on prototyping the grinder by doing gear analysis where we need to determine the number of gear teeth, overall dimension, torque, and power needed for our grinder to be able to possibly break up bones. Furthermore, we need to create our CAD drawing after we finish our necessary calculations and dimensions. We plan on buying our motors, sensors, heater, fans, electrical switches, microcontroller, insulation, and vibration plate. However, we still need to do more research and analysis for all of these as we are not completely sure what would be the best choice for all the components we need to buy. Furthermore, our EE is still unsure which language he wants to use for our system which relates to our microcontroller, electrical switches, and sensor.



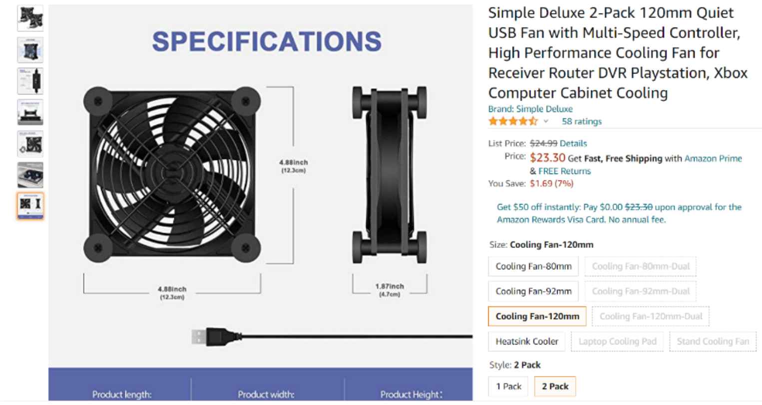
This is a possible motor for our grinder subsystem - https://www.amazon.com/BRINGSMART-70kg-cm-Electric-Self-locking-Reversed/dp/B0774HGZGX/ref=sr_1_5?dchild=1&keywords=high%2Btorque%2Bdc%2Bmotor&qid=1634616451&sr=8-5&th=1

Another possible motor for blender subsystem-

https://www.amazon.com/weelye-Electric-Suitable-Children-Replacement/dp/B08KZJNWM8/ref=sr_1_16?dchild=1&keywords=high+rpm+motor&qid=1634617540&sr=8-16

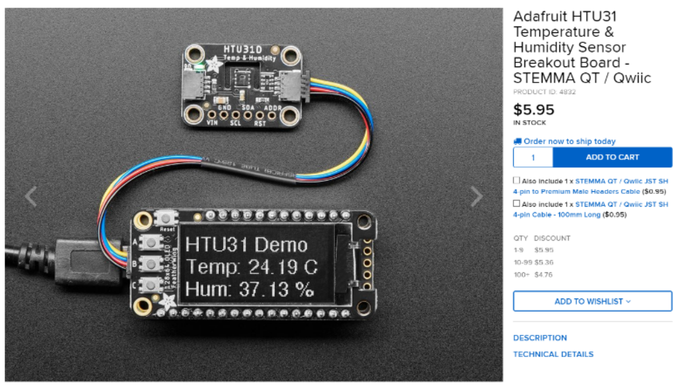


This is a potential heater for our heating chamber- https://www.amazon.com/Ceramic-Heater-Insulated-Heating-Element/dp/B07P438ZKW/ref=asc_df_B07P438ZKW/?tag=hyprod-20&linkCode=df0&hvadid=366383044230&hvpos=&hvnetw=g&hvrand=12287542508224353441&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9033307&hvtargid=pla-790719954180&psc=1&tag=&ref=&adgrpid=75157355966&hvpone=&hvptwo=&hvadid=366383044230&hvpos=&hvnetw=g&hvrand=12287542508224353441&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9033307&hvtargid=pla-790719954180



This is a simple fan we could use for the cooling or heating chamber-

https://www.amazon.com/dp/B0924HQHXC/ref=sspa_dk_detail_4?pd_rd_i=B0924HQHXC&pd_rd_w=Tyw8o&pf_rd_p=54ed5474-54a8-4c7f-a88a-45f748d18166&pd_rd_wg=NCjYV&pf_rd_r=0H2V9DH7EX75X48QSBQW&pd_rd_r=49bb0591-2029-4e27-bd90-1cd37a2ca0f6&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUExR0tOQVJFVkczSFE2JmVuY3J5cHRlZElkPUEwMzg2MDU0MlI4RzVSMUxWWk85OSZlbmNyeXB0ZWRBZElkPUEwNTQ0NDg1MUtGQVRKOVE1MkEzQyZ3aWRnZXROYW1lPXNwX2RldGFpbF90aGVtYXRpYyZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU&th=1



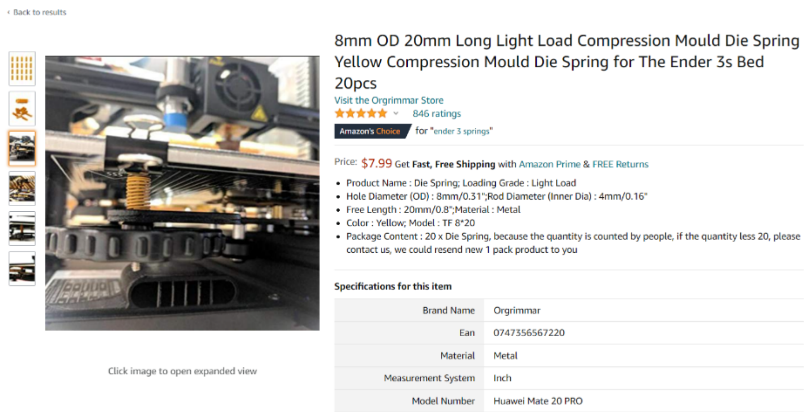
This is a possible temperature sensor for the initial chamber-
https://www.adafruit.com/product/4832

This is an option for the heating chamber heat source-

https://www.adafruit.com/product/1481?gclid=Cj0KCQjwnoqLBhD4ARIsAL5JedLul45a6hGJu-BFElHolsHf07cNL1kcrCX3QOWF_IYBDR4ZEN1tIWcaAtp_EALw_wcB

These are some possible motors for the vibration plate in the collection chamber-

https://www.amazon.com/EUDAX-Generator-Electric-Turbine-Cranked/dp/B078MSFFH5/ref=sr_1_13?dchild=1&keywords=dc+motor&qid=1634618585&sr=8-13



These are springs that would go under the vibration plate-

https://www.amazon.com/Light-Compression-Mould-Spring-Yellow/dp/B07FY47BX7/ref=sr_1_14?dchild=1&keywords=stiff+springs&qid=1634618785&sr=8-14

RISK REDUCTION PROTOTYPE SPECS

Spec ID	Requirement	Threshold (Shall)	Objective (Should)	Validation Method	Why this threshold value	Relates to critical feature(s)
RRP 001	Heating Process	14 hours or less	10-12 hours	Timer	Demonstrates how long it will take to fully dehydrate and sterilize the food waste	1
RRP 002	Heating Temperature	130°F-139°F (+/- 2°)	140°F-150°F (+/- 2°)	Temperature Sensor	Demonstrates ability to generate heat and keep the temperature of the heating chamber	1
RRP 003	RPM of the grinder	10-15 RPM	20-25 RPM	RPM measured or given by manufacturer	Demonstrates ability to grind down food into smaller pieces, as well as pulling the food into the teeth	2
RRP 004	RPM for blender blade	20,000 RPM	30,000 RPM	RPM measured or given by manufacturer	Demonstrates how quickly we can get the blades rotating and if they can break down the food enough to reach the desired size of fertilizer	2

RRP 005	Size of processed food waste	7 mm - 8mm	4 mm	Observation will fit through a filter or strainer	Demonstrates ability to process material into soil-like consistency.	2

Since all of the electrical components are connected and/or controlled by the microcontroller, we have to program it so that the electrical components in each chamber are working in sequence (Heating chamber, Grinding/Shredding chamber, then lastly Collection Tray Chamber) to make the machine power efficient. We are using a screen to take the input from the user, so we have to program it and assign each button to have different tasks (start, pause, or stop). The microcontroller will take the reading of the temperature inside the heating chamber, then decide if the heater inside the chamber needs to be activated or not. Thus, if-else statement is required in the code and/or a while loop for the dehydration process. We also have to put a timer for the whole dehydration process. When the timer runs out, the contents inside the chamber will be transferred onto the next chamber and the microcontroller will deactivate the electrical components inside the previous chamber (excluding heat sensor) and activate the electrical components inside the next chamber (Grinding/Shredding chamber). The electric components inside this chamber and the next chamber work almost the same way, thus coding to activate and deactivate the electrical switch will be needed so that the electrical components can be activated.

REFERENCES

Quora. “What Environmental Problems Does Wasting Food Cause?” Forbes, Forbes Magazine, 29 June 2021, www.forbes.com/sites/quora/2018/07/18/what-environmental-problems-does-wasting-food-cause/?sh=5a7af0d2f7a6.

Smith, Roff. “Even Poor Countries End up Wasting Tons of Food.” NPR, NPR, 28 Sept. 2015, www.npr.org/sections/goatsandsoda/2015/09/28/444188475/even-poor-countries-end-up-wasting-tons-of-food.

“Here's How We Solve the Planet's Food Waste Problem.” Grist, 21 Aug. 2019, grist.org/article/un-ipcc-says-we-need-to-waste-less-food-heres-how/

Rowland, Michael Pellman. “Here's How We Solve Our Food Waste Problem.” Forbes, Forbes Magazine, 28 Aug. 2017, www.forbes.com/sites/michaelpellmanrowland/2017/08/28/food-waste-solution/?sh=6b6ba14f4d17.

Miller, Sam. "Electric Composters: What Are They and How Do They Work?" FoodCycler, FoodCycler, 15 May 2019, www.foodcycler.com/post/electric-composters-what-are-they-and-how-do-they-work.

"Electric Composters: Sustainability Win or Another Unnecessary Appliance?" Earth911, 7 Sept. 2021, earth911.com/home-garden/electric-composters-sustainability-win-or-another-unnecessary-appliance/

APPENDIX

Team Bios

Lansing Laws – I am currently a student at Seattle Pacific University, and I am working towards my bachelor's in mechanical engineering. This is my fourth and final year at SPU where I expect to graduate this upcoming June. I have always liked to work with my hands and create things that are completely new from simple materials. In my free time I enjoy woodworking or model building, studying cinematography, writing short stories and exploring Seattle.

Amos Jun - I am a student attending Seattle Pacific University pursuing a Mechanical Engineering degree in which I plan to receive my degree in June 2022. I chose Mechanical Engineering as I enjoy problem solving in which I live for the moment when I figure something out. I also enjoy hanging out with my friends, going outdoors, sports, music, and being a hype-man. Furthermore, I have developed a new passion for business and meeting new people as I joined a startup company focused on content creators.

Nicholas Godoy- I am currently attending Seattle Pacific University pursuing a Mechanical Engineering degree and expect to receive my degree in June 2022. I'm confident in working with my hands and problem solving, which is why I naturally gravitated towards mechanical engineering. Outside of school, I enjoy meeting new people and cultivating community as a lead residential advisor in the residence halls on campus.

Ciello Magsanide - I am a highly motivated student pursuing a Mechanical Engineering degree and I plan to receive my degree in June 2022. My interest in engineering is driven by my curiosity about how things work and my interest in building and creating. I enjoy hanging out with friends, cooking, baking, and sports. I am also currently working at Seattle Gymnastics Academy as a recreational coach.

Eriko Nugroho- I am a student at Seattle Pacific University pursuing an Electrical Engineering degree and expecting to receive my degree in June 2022. I enjoy cooking, playing video games and riding my motorcycle during my spare time.

Team Mission and Vision

Mission: To create an electric composter that recycles food waste into reusable fertilizer, facilitating waste removal at an industrial level.

Vision: To repurpose food waste to support local businesses, 3rd world countries, and the environment.

Team Contract

Team Contract and Team Assessment System **Team Name: LANCE**

	Mid Qrtr Assessment					Mid Qrtr Comments	End of Qrtr Assessment					End Qrtr Comments
	FEE	EE	ME	MSE	DNME		FEE	EE	ME	MSE	DNME	
Commitment												
See tasks through to completion.												
Communication												
Be open to new approaches and listen to new ideas.												
Avoid placing blame instead discuss the process improvements												
Problem Solving												
Ensure everyone participates.												
Get input from entire team before a decision is made.												
Address concerns in a public and healthy manner												
Handling Conflict												
Choose an appropriate time and place to discuss and explore the conflict.												
Listen openly to other points of view.												
State points of view in a non-judgmental and non-attacking manner.												
Conducting meetings												
Regular meetings will be held out of class at least once a week												
Meetings will begin and end on time.												
Team members will come to meetings prepared.												
Additional Items												
To add incentive, team will go to lunch when completing a goal												

Agreed to:

NAME: Ciello Magsanide DATE: 09/23/21	NAME: Amos Jun DATE: 09/23/21	NAME: Lansing Laws DATE: 09/23/21	NAME: Eriko Nugroho DATE: 09/23/21	NAME: Nicholas Godoy DATE: 09/23/21

FEE: Far Exceeds Expectations **EE: Exceeds Expectations** **ME: Meets Expectations** **MSE: Meets Some Expectations** **DNME: Does Not Meet Exp.**