Automated Composter

Department of Mechanical Engineering
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SDSU | College of Engineering

Project Objective:

Design and build a larger scale automated composting system. It will have an automated mixing mechanism that turns the compost for aeration based on either time and/or temperature of the compost, and be able to measure, monitor, and maintain temperature and moisture content for optimal composting.

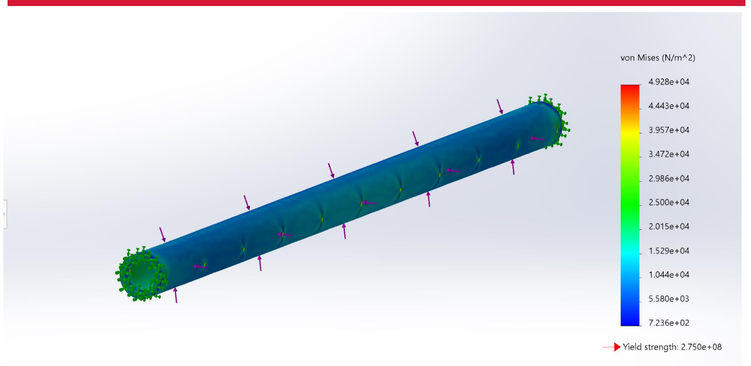
Composting Background:

Composting is the decomposition of organic materials by microorganisms. Matter such as yard waste and food scraps are carbon based, the breaking down of these materials results in **compost**, a stable soil rich in nutrients. Microorganisms feed on these organic materials, using carbon and nitrogen to reproduce and water to digest materials. The ideal conditions for composting include temperature around 130-160°F, an aerobic environment, and 45-60% weight of moisture content.

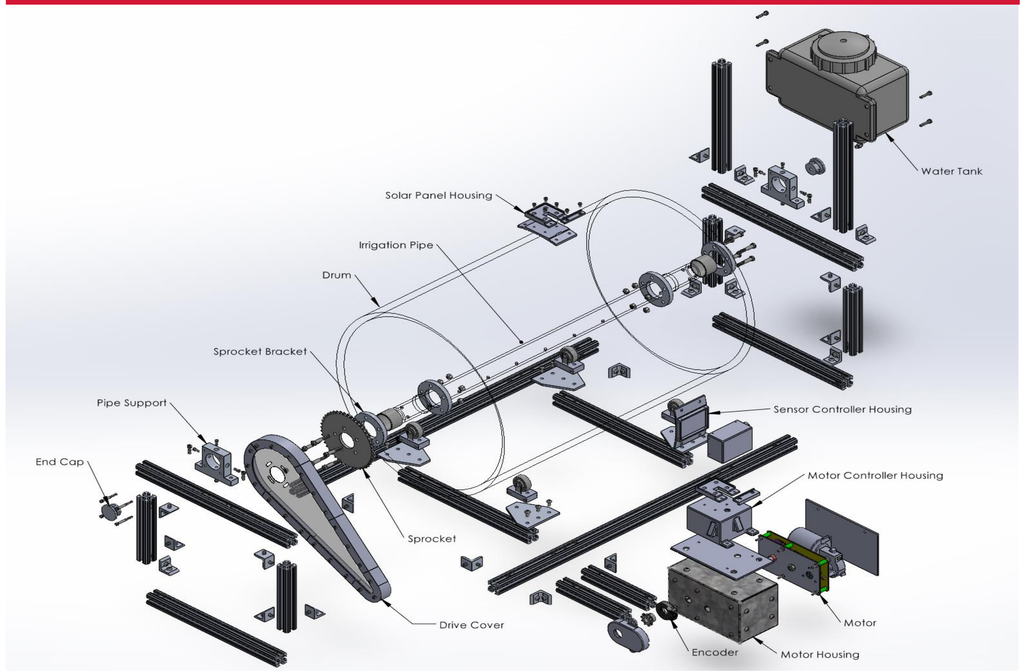
Project Specifications:

- Automatically turn compost
- The composting drum has a 45–80 gallon capacity
- Measure moisture and temperature content
- Full rotations for a turning cycle should not exceed 3-4x to minimize moisture and nitrogen loss
- The temperature will be maintained between 130-160 °F
- The composter turns at 130-160°F or 2-4x a week
- Monitoring of temperature and moisture will be available in the form of a data log or real time display
- Mobile enough to easily be moved by 1-2 people
- The drum will be weather and corrosion resistant
- Include water reservoir for maintaining moisture content
- The water reservoir should be large enough that it only need to be refilled 1-2 times a month

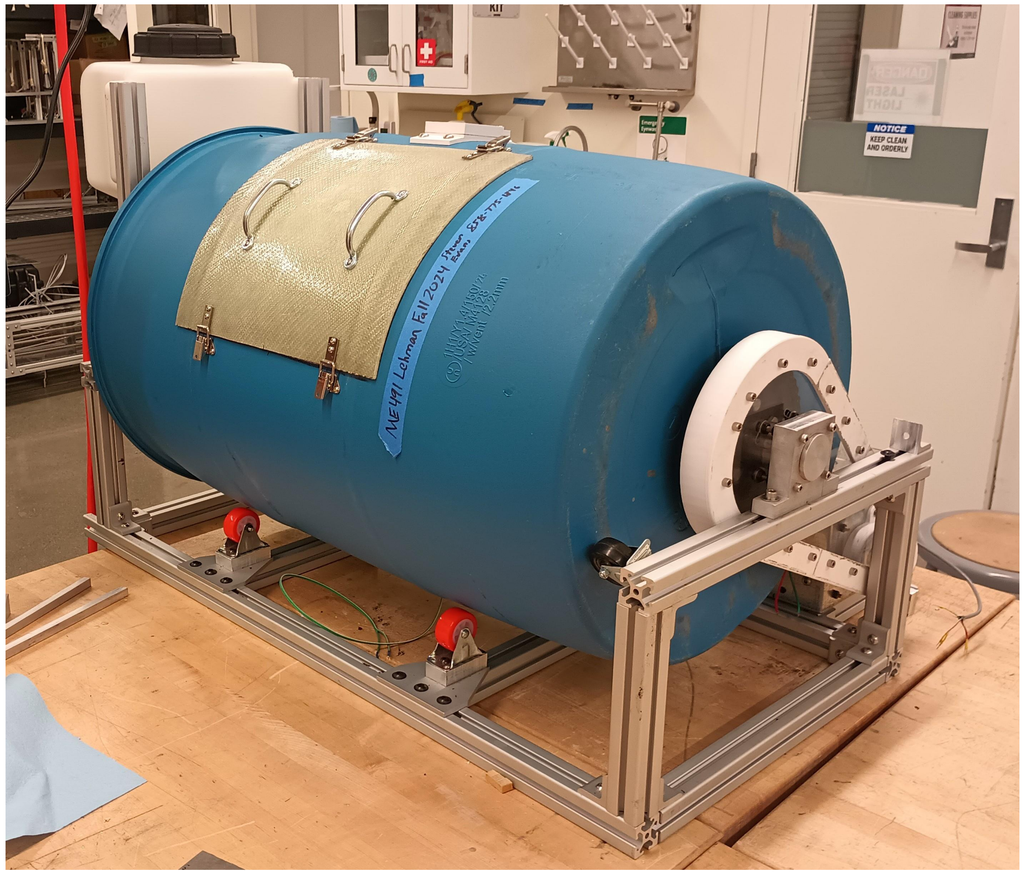
Simulations:



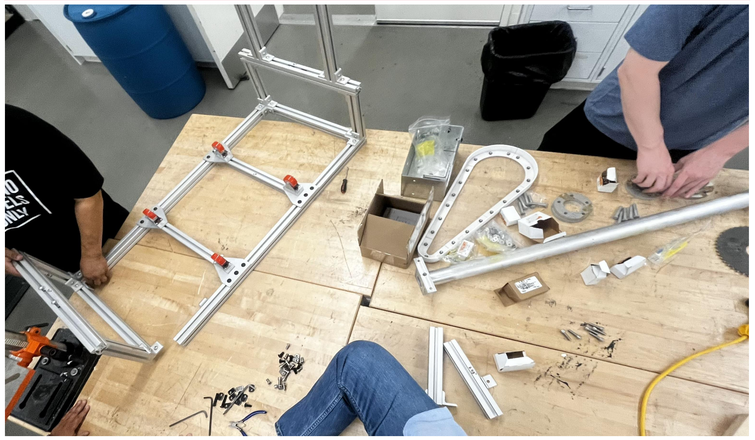
Annotated Exploded View:



Final Composter:

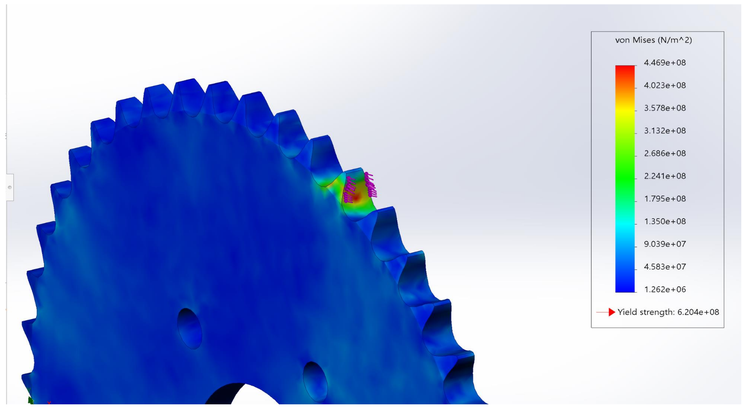


Manufacturing:



Frame: 1.5" T-slot Aluminum Framing
Pipe, Endcaps & Supports: 6061 Aluminum
Motor Housing: 1/16" Galvanized steel sheet
Motor: Makermotor PN00113 Rotisserie Motor
Encoder: Digital E3 Optical Encoder
Drum: 55 gal. HDPE
Door: Molded Fiberglass
Controller & Panel Housing: 3D Printed ASA
Sensor Mounts: Aluminum L-bracket
Drive Cover Base: 1/16" Polycarbonate Sheet
Drive Cover Flange & Encoder Cover: 3D Printed ASA
Chain: Steel ANSI 40
Water Tank : 2.5 gal. Tank
Valve: Stainless Steel Manual Ball Valve
Microcontroller: Arduino Uno R4 Minima
Thermocouple: K-type & Max6675 Amplifier
Moisture Sensor: Watermark 200SS
Wireless: nRF24L01 Wi-Fi module
Motor Driver: Cytron MD10 shield
Battery: 3.7V 1200mAh battery

Simulations:



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