**Multidisciplinary Senior Design Project**

**GE 497**

**College of Engineering**

**Valparaiso University**

**Valparaiso, Indiana**

**System Design Requirements**

**for**

**TEAM PROJECT**

**TEAM PP & FAAFO**

**Date: 8/31/23**

| Prepared by: | **SEATE** |  |
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**Honor Code Statement**

I have neither given or received, nor have I tolerated other’s use of unauthorized aid.

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TEAM MEMBER TEAM MEMBER

\_\_\_\_\_**Mikey Pinchok**\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TEAM MEMBER TEAM MEMBER

\_\_\_\_\_\_\_Ethan Storer\_\_\_\_\_\_\_

TEAM MEMBER

**Goal Statement**

Modify a stock Ender-3 3D printer to inexpensively use plastic pellets for build material and provide documentation to hobbyists for straightforward replication.

**Objectives**

In order to meet our goal, the system shall

1. Be an Ender-3 3D printer modified to use pellets instead of filament
2. Include published work instructions for the modification process so that hobbyists can replicate the process.
3. Include a time study on each step in the conversion process
4. Have its performance compared to the original printer
5. Fit inside the trunk of a car
6. Require simple and straightforward steps to be installed on a stock Ender-3 3D printer
   1. Use “off the shelf” components whenever possible
   2. Use connectors, not solder, to minimize failure of electronic components
   3. Use fasteners, not glue. Glues are difficult to control and messy.
   4. Avoid melting/grinding/cutting to make parts fit. Only use tools that most hobbyists have easy access to.
   5. Avoid machining. Drilling is an acceptable process.
   6. Utilize the fewest number of tools possible.
   7. Any part requiring special skills (welding, soldering, or machining) to construct or assemble should be quoted from at least three vendors, and justified by the team in a meeting.

**System Requirements (for now)**

The system shall print a Calibration Cube with a <5% statistical difference between the dimensional tolerance and print time of a stock Ender-3.

The system shall accept pellets of PLA, PETG, ABS, and TPU.

The materials necessary to make the modification shall cost less than $350.

The system shall cooperate with the safety features of the Ender-3.

The system shall fit in the trunk of a 2016 Honda Civic.

The system shall weigh no more than 69 pounds.

The system shall take less than 7 hours to construct.

When printing a boat, the system shall be at least 90% accurate compared to an unmodified Ender 3.

* We will compare dimensions and surface roughness of both models

Notable challenges:

Does the ender’s thermistor have enough heat to melt pellets at the rate needed to extrude plastic?

Can the power supply handle more thermistors?

Retraction will be limited. Print quality of part geometries with lots of separate surfaces along the x-y plane will have stringing up the wazoo.