


## Abstract

This is not a required document or a part of our grade. If you want to know what is in the document, just read it. 😊 <3

## Introduction

If you haven't been keeping up with this project, I'll give you a brief summary of what we are and what we are trying to accomplish. We are the Filament Forge consisting of team leader Corey Clark and team members Kaylie McFall, Cameron Coffey, and Vladimir Hollingshead. We are all Electrical Engineering seniors at the University of Tennessee and this is our "Capstone" Project. Our final presentation date for the project is 4/9/25 and our graduation date is 5/3/25.





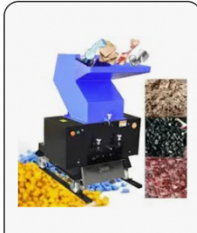
Our project aims to provide a sustainable, cost effective, and efficient way to produce 3D printer filament. This process typically consists of a way to shred the plastic, a way to melt it, and a way to spool it. For an industrial type of machine, you either need to be wealthy or willing to rob a bank to buy just one part of it.



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The college definitely has enough money to supply this for us; I mean shoot, they have enough money just from our team buying parking passes. However, we had a spending max and a granulator would have taken up all of it. This worked out better for us because it's hard to make a cost-effective machine when the starting price is a grand.

The team settled on using a paper shredder to act as a granulator. Corey found a cheap one on eBay and secured the bid. We were going to use a heat gun to melt the plastic but it wouldn't maintain temperature (foreshadowing) so we choose to wire up some band heaters.

Obviously, we can't touch melted plastic so we needed an extruding system to push out the plastic. This was made with an auger attached to a motor. If you want to see pictures just go to our website.

<https://sites.google.com/view/the-filament-forge/home>

When the melted plastic is extruding, it needs to be squeezed to usable filament size so a measured end cap with a hole was attached. Now we just needed a wheel that spun to spool up the filament. This was done with a spinning wheel looking thing and a motor.

Sounds simple.

### Success Story

The shredder did its duty and the band heaters got to temperature thanks to Vlad. Corey got the motors in operation and Cameron got all parts measured and printed to size. [Kaylie did her best to make everything look presentable and made all the videos, the websites, most of the papers, SPENT HOURS PAINTING, etc... Honestly the team would be in shambles without her.] Anyway, with dry shreds, the auger was tested and it worked. The only test left was to actually put all the parts together and go crazy.

### Short Lived Success

Somehow, the relay to help control the switching system for the temperature died (RIP) and the plastic burnt to a crisp. Auger can't spin now and we pretty much used up all the plastic we have been collecting.

### What Went Wrong?

The group did not study PEMDAS clearly because our order of operations for this was not efficient. We overly ambitiously screwed everything down before really making sure everything was correct and spent some time unscrewing and re-screwing.

After wiring the whole system, we decided to fix the extruder piping to better work with the auger. Since everything was screwed down as stated above, we had to unwire everything. The group did not keep great documentation of where the wires were supposed to go and that could have led to us burning out the relay. When we ran the first test, even after noticing the temperature wasn't recording correctly, we decided to just go for it until we realized the plastic was black dust.

Maybe we would have been more careful and more thorough but we had some time mishaps, some our fault, and some not our fault. The school was responsible for ordering parts which led to a month-long standstill where we literally could not do anything. We also didn't meet very much the first semester; in our defense 3 of us had a DREADFUL class, and we did have a lot more paperwork and housekeeping stuff to do with this project.

### Next Steps

In theory, the group is going to clean out the extruding system and get the auger spinning. We will 1. Fix the relay or install a new one or 2. Use an accurate thermometer and scratch the relay. This is really all we need to do and we will be golden.

Truthfully, we have 3 days before presentation, we have other classes, we are all about to graduate, and we're burnout. This project has reached its end and we have come to terms with that.

### Conclusion

Just read the paper man..... We learned a lot, tried our best, what more could we possible need? Sorry for grammatical or spelling errors we are engineers not english majors!

<https://www.youtube.com/@kaylieUTC>