Reverse Engineered PET Machine

Michael Torres Fall 23

Description

I've learned that the entertainment industry is very wasteful. I learned that 3D printing has the potential to be most beneficial for producing high-value props and models. But 3D printing also has the potential to create a ton of waste with failed prints and support material becoming unavoidable trashed. By reverse engineering a PET machine I will fabricate one myself using the skills I have learned when it come to fabrication.

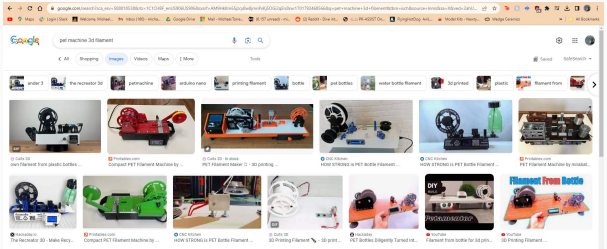
Responsibility

I will be ...

- Modeling and fabricating using Fusion 360 and Cura programs.
- Circuiting electronics and electrical components.

Process part 1

Researching how PET machines are made keeping in mind what parts I would need.



(Polyethylene Terephthalate)

Schedule

Week(s) 1 - 4

Modeling and designing in Fusion 360

(Practice models, 3D files)

- Halfway through, I will start printing and testing.
- At the end of the four weeks, I should have finished the models for the mechanical components.

Week(s) 5

Printing components and testing the fit as well as preparatory design of electrical components

(Prototypes)

- The outcome of this week is the functioning assembly of mechanical components.

Week(s) 6 - 7

Assembly of electrical components.

(Design drawings)

- At the end of these two weeks, the electrical components should be properly assembled to be installed.

Week(s) 8

Electrical components should be installed and functioning properly.

(Design drawings)

- The outcome from these weeks is the functioning assembly of mechanical components.

Week(s) 9 - 10

Setting parameters for the machine.

(Operating instructions)

- This time will be used to dial in the machine so that the plastic bottles are being processed into a usable filament that works properly with the school's printers.

Week(s) 11 - 12

Designing and printing machine housing in addition to accessories.

(Design drawings, Prototype, Final Machine)

- The outcome of this week is the functioning assembly of mechanical components.

Week(s) 13 - 15

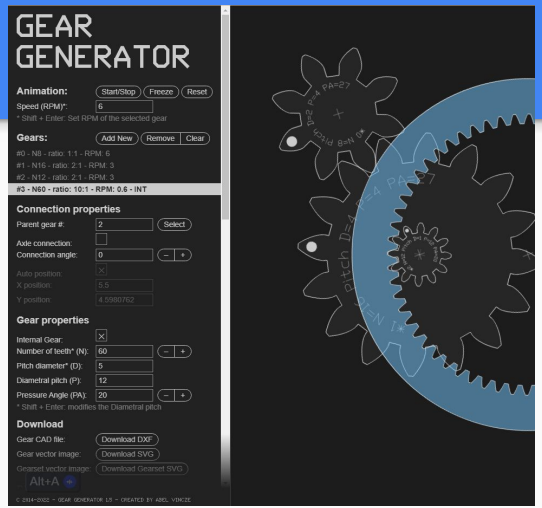
Extra time for printing using filament fabricated.

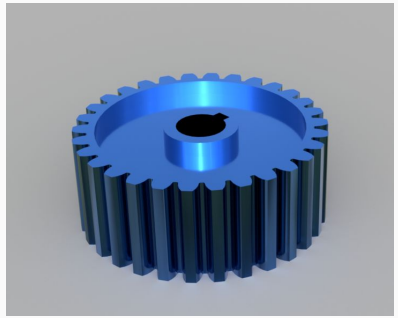
Meeting with Rudy to further break down the milestones for achieving the goal of printing with the filament made with the PET machine.

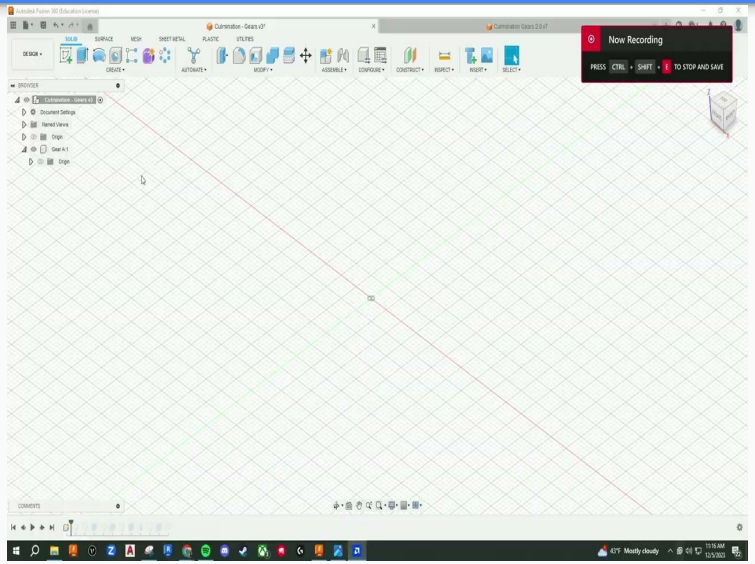
Process part 2

Gears!!

Using GearGenerator.com I was able to simulate the gears I would needed to connect to the motor







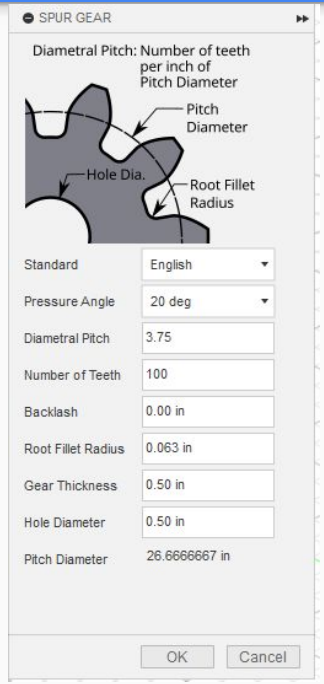
*First gear made manuely

Process part 2 cont..

Gears!!

Fusion 360 has some useful plugins.

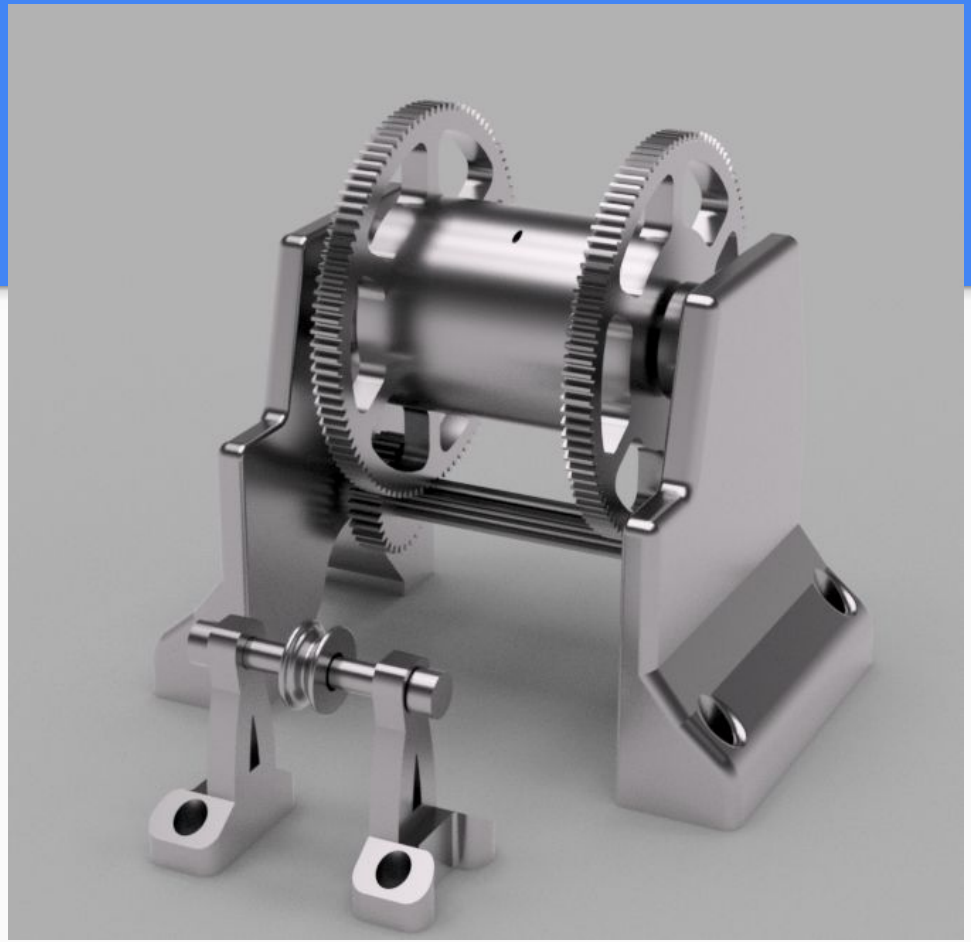
Like the SPUR GEAR tool which made modeling the gears I needed much faster.



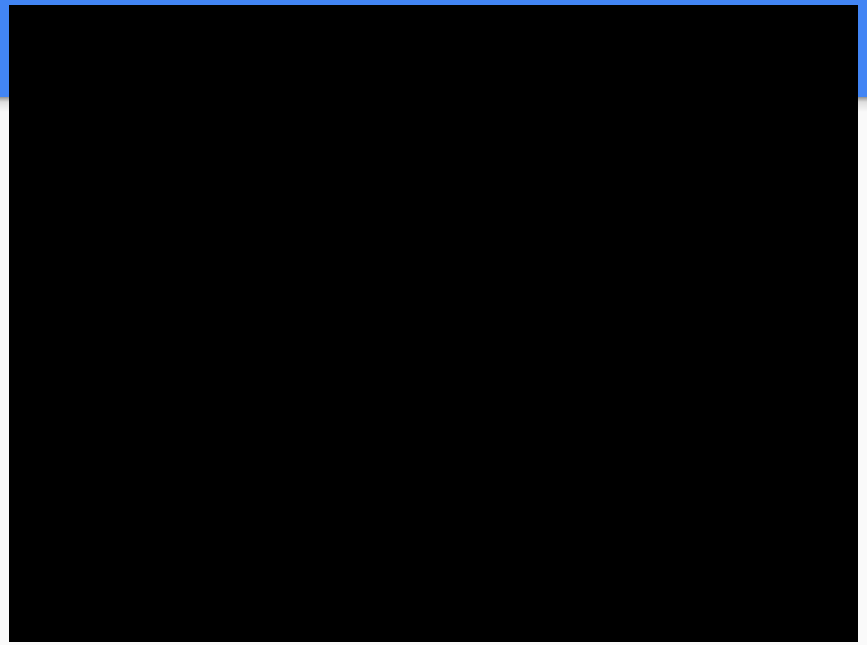
Process part 2 cont..

I needed to make many other parts such as...

- Arms - to hold the gears in place so they rotate without binding up.
- Guide - to guide the filament into the spool attached to the big gear.
- Mount - to hold the motor in place.



Process part 2 cont..



Process part 3

Electronics

The most important parts on my shopping list are...

Culmination Budget				
Filiment Machine				
Michael Torres				
Material	Unit	Quantity	Cost per unit	Total Cost
3D printer aluminum block	block	1	$13.99	$13.99
DC 12V Gear Motor	motor	1	$14.99	$14.99
Power Cord	cord	2	$4.50	$9.00
12v power supply	power supply	1	$4.50	$4.50
Temprature controller	controller	1	$28.98	$28.98
Motor controller	controller	1	$39.98	$39.98
SSR	relay	2	$6.45	$12.90
Heating Element 24v	component	5	$2.00	$10.00
Digital PID Temp controller	controller	1	$19.00	$19.00
			Total Cost:	$153.34

Motor

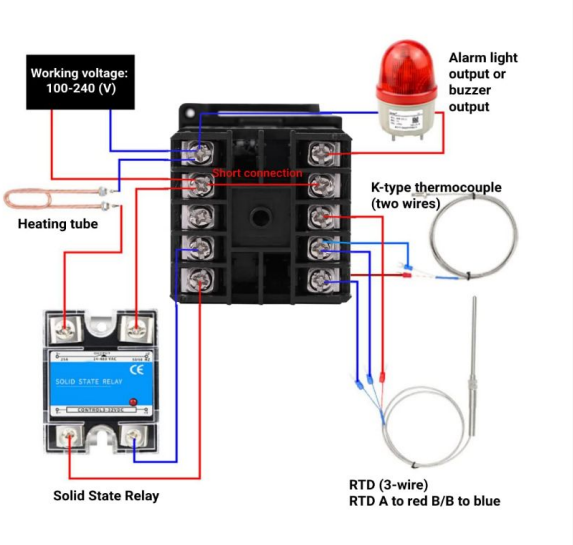
Heating Element

Temperature controller(s)

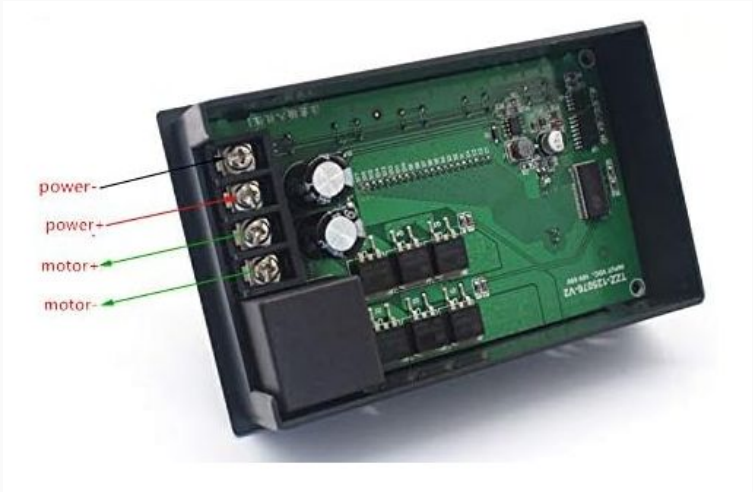
Motor Controller

Process part 3 cont

Electronics

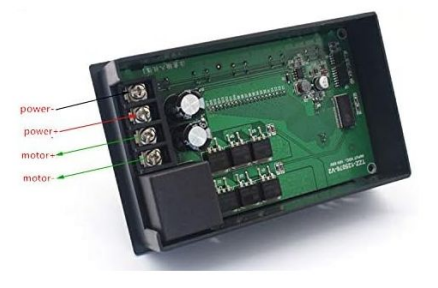


Both the temperature controller and motor controller came with some easy to read diagrams for making the proper connections.



Process part 3 cont

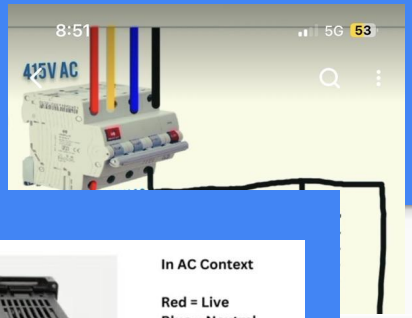
Electronics



The motor was tested and left alone until the whole system was ready to come together.

Process part 3 cont

Electronics



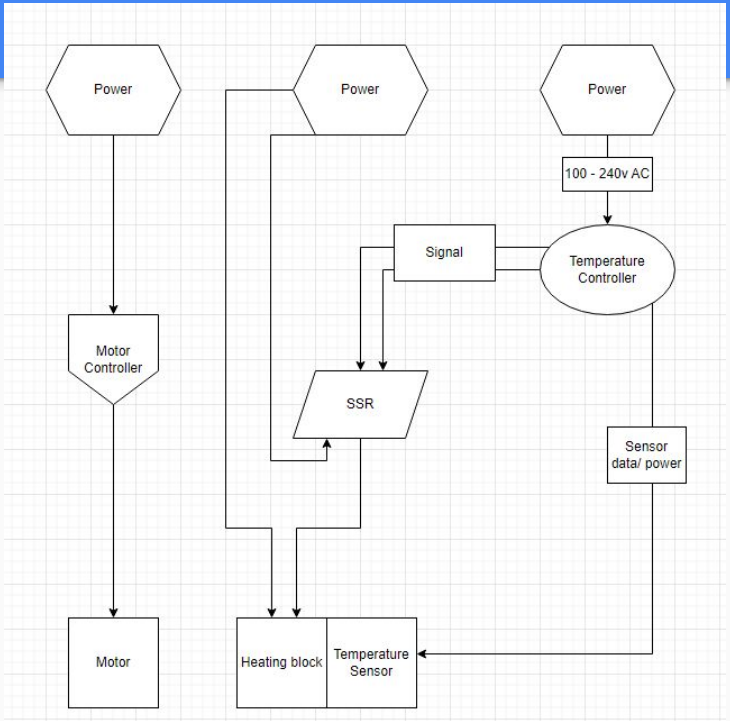
The primary use for the temperature controller is for things like industrial ovens and incubators.

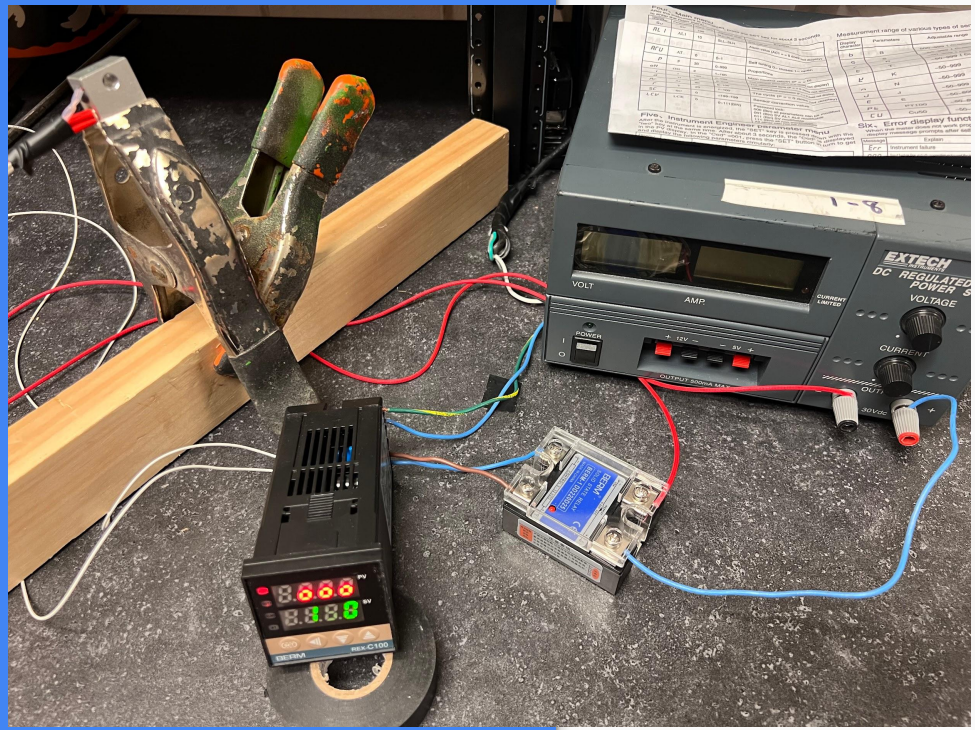
Some diagrams reflected that I can use one or two different power sources so I decided to go with the two, too not over complicate the system.

Process part 3 cont

Electronics

System Diagram

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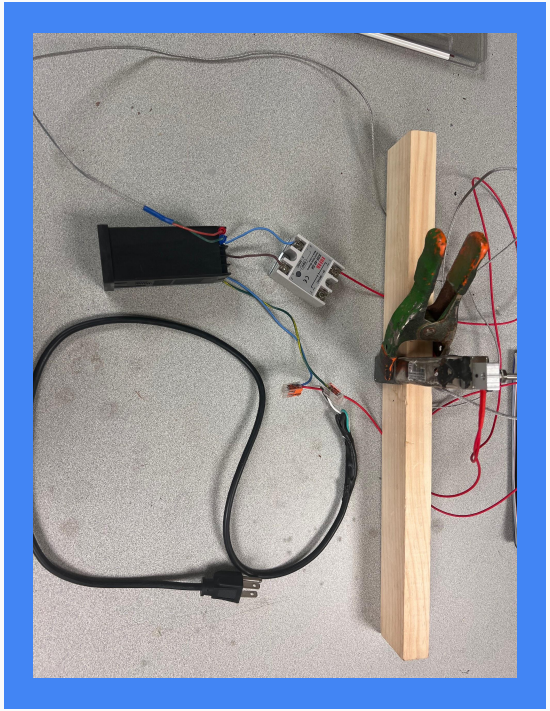
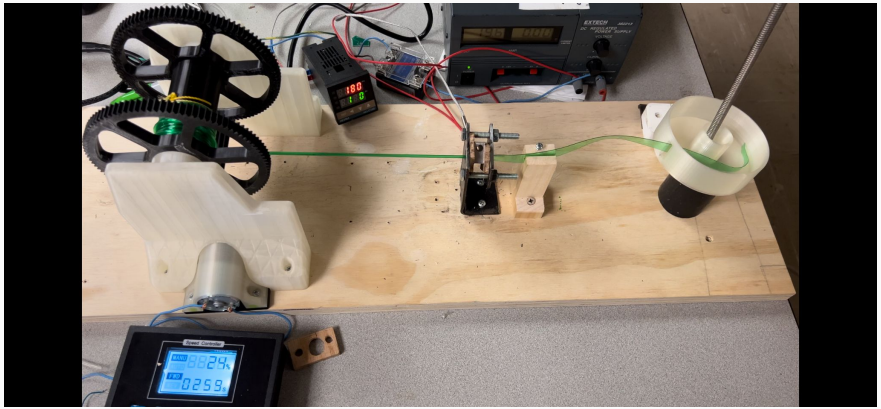


Process part 4

Assembly



There was no plan when it came to assembling the parts together.

Things like the...

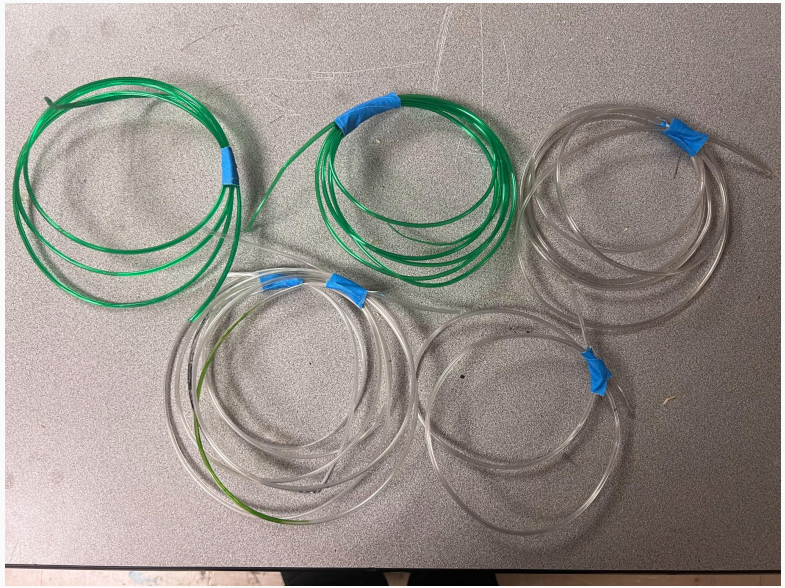
Gears/motor - placed first on one end

Heating block - was placed next

Guide - was left last.

Process part 5

Extruding



When it came to pulling filament it was all just trial and error, some of the parameters were for...

Temperature - Not too hot, not cold

Motor speed - Faster or slower

Along with voltage and current

Process part 5 cont

Extruding

Problems and solutions

Electronics/ wiring

- When I would assemble the temperature controller It wouldn't heat up the block.

Solution: Two power supplies

- The temperature wouldn't stay consistent.

Solution: PID (Proportional – Integral – Derivative) Controller

- After getting a new temperature controller the SSR would not activate properly (caused components to fry).

Solution: A change over from AC current to DC

- After properly mounting the heating block could not reach set temperature

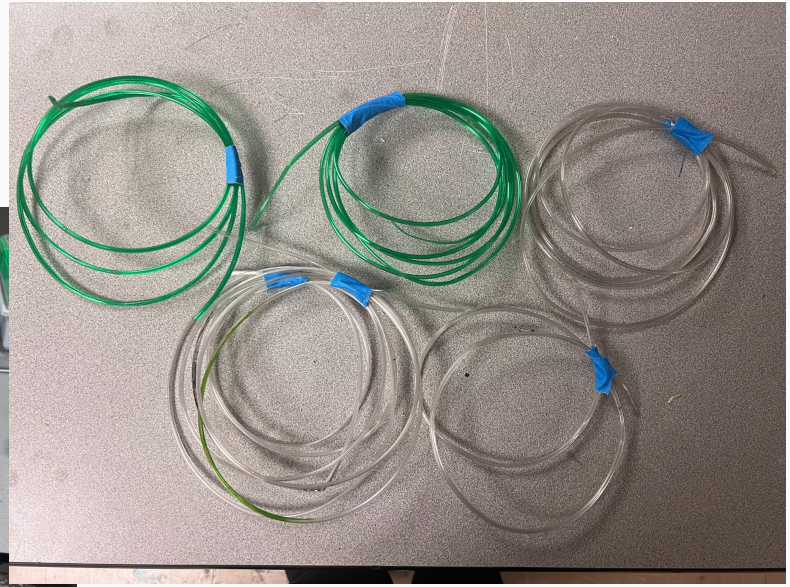
Solution: Oak! (250 - 400*C)

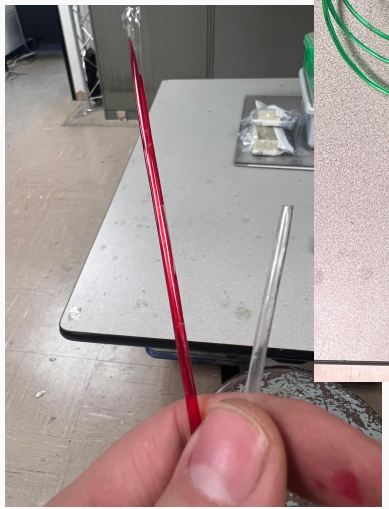
Problems and solutions

Pulling Filament

- Filament was coming out misshapen.

Solution: Raising the the height of the extruding nozzle





Challenges

- No experience with electronics
- No previous fabrication experience
- Constantly needing to wait for new parts
- Time management
- Protizing different tasks

What I learn

- I have greater understanding on how to model in Fusion 360
- I'm more comfortable formatting/arranging files for better quality prints
- I learned how to prioritize certain task over others
- More practice with assembling electronics
- Further developed my creative problem solving skills

Things I would do differently/ to improve

Model and print mounts for electronics

A singular power supply

Redesign gear system to sit lower

I would design a better ribbon cutter

Add Hardware

Redesign the spool to be larger

Thank you!

Any Questions?