

Progress Review 3

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Team F: ADD_IN

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1 Individual Progress and Challenges

This week I had to work on designing the CAD assembly of the filament drive and the nozzle section. Also, I had to modify the aluminum heater block and bend the nozzle to an angle of 45 degrees. I also had to reduce the nozzle aperture. I also worked on the project management by helping the team summaries the meeting and assign follow up with everyone on their tasks.

1.1 Solidworks Assembly of V3b

To make the bent nozzle design, I first made the V3b CAD assembly. To make the assembly, I first disassembled the V3b nozzle present on the printer. Since, there is no dimensioned drawing of the V3b nozzle available, I had to measure the dimensions of each part. I simultaneously measured the dimensions and made the CAD drawings of each part of the V3b. Finally, I assembled the designed parts as shown in Figure 1.1. To design the assembly I went through the CAD assembly tutorials. The assembly and part design took a lot of time and has been submitted as my CAD assignment for task3-part3.

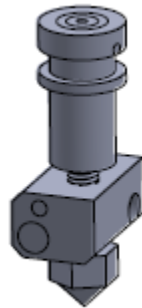


Figure 1.1: V3b Assembly in Solidworks

1.2 Solidworks Design of Aluminum Heater Block:

I had to modify the aluminum heater block, such that it could have the nozzle mounted at a 45 degree angle to the current axis of rotation. I designed it by extruding a 45 degree base on the block as shown in Figure 1.2. However, when Dan reviewed the design he suggested that I keep the extruder base inside the rectangle dimensions as it would be easier to machine it. So, I made modifications to the design by increasing the block dimensions. The final heater block is shown in Figure 1.3.

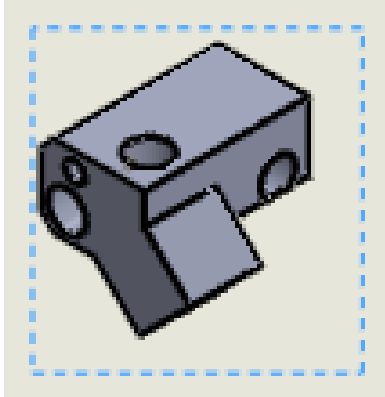


Figure 1.2: Heater block with extension for nozzle inclination

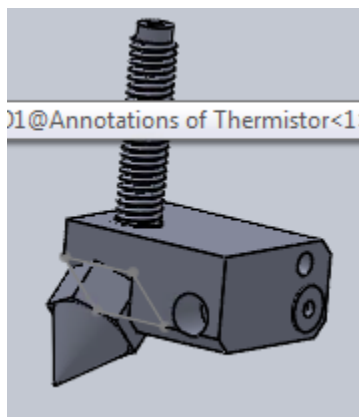


Figure 1.3: Extruder Assembly with nozzle inclined at 45 degrees

The isometric view of the heater block is shown in Figure 1.5.

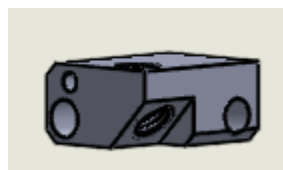


Figure 1.4: Heater Block for Easy Machining

1.3 Nozzle with Smaller Aperture:

To design the nozzle with a smaller aperture I modified the V3b nozzle which was designed for the V3b assembly as explained above. The entire CAD drawing of all the parts has been constrained as to make modifications in future designs is easier. The V3b CAD drawing is shown in the Figure 1.5.

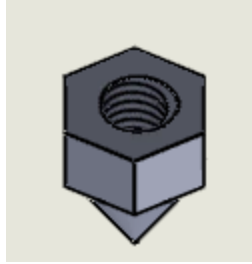


Figure 1.5: Nozzle Aperture at 60 degrees

2 Challenges

The Challenges faced during the course of this week is as follows:

- There are no dimensioned drawings of the V3b extruder assembly and thus I had to disassemble the V3b physically.
- All the parts of the V3b cannot be disassembled and thus I reading the dimensions of the few parts was difficult and some approximations have been made. However, the approximations will not affect the project as the aluminum heater block could be isolated from the assembly. Its dimensions are accurate.
- Also since the barrel had helical grooves its inner dimensions and pitch could not be dimensioned and thus I followed the standard screw measurements for the barrel. We know that the barrel is M6¹.
- Aligning spiral grooves in the assembly was a major concern. Parts cannot be aligned with sketches and also grooves have so uniform reference part to make the concentric or align them. Thus it took a lot of time trying to align the grooves in the assembly. Similar issues occurred while marking the exploded view.
- Managing Time was a concern this week as we had to submit the CV assignment and also my inexperience with CAD took a lot of my time.

3 Teamwork

- Astha: She worked on inserting making the Matlab code for selection of insertion layer more robust and has extended the Matlab code to include the configuration file. The code has also been extended to multilayer selection. She also updated the website. As a part of systems engineering she worked on the requirements mapping to FVE.
- Dan: He worked on trying to make the GUI work. However, since it didn't work he has contacted the developer. He also worked on designing the CAD files which may be used in the FVE. As a part of systems engineering he worked on the modifying the functional architecture and the WBS of the software part. He also gave me a few pointers on designing CAD assemblies with screws and taps.
- Ihsane: He was responsible for checking if the heat transfer properties of the new nozzle design. He also worked on the CAD file designing for the rotary stage which we will use in

1. <http://www.newmantools.com/tech/threadm.html>

future. He found a lot of references to CAD files and designs of nozzles which we can machine in the following week.

4 Plan

For the next progress review, I plan to work on the slip ring selection for the project and also test the machined nozzle. If there are changes needed for machining new block I will make the modifications to the CAD file. I will also start going through the firmware on the Rambo and try and start working on controlling the 4th stepper motor.