

Progress Review 2

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Team F: ADD_IN

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1 Individual Progress and Challenges

This week I had to work on printing the designed coupler and designing the CAD file for a coupler which can incorporate various tubes at the centre of the coupler. These designs were tested and conclusions were drawn based on the tests. Since, we encountered a lot of printing errors I have modified the format to a task-challenge iterative format.

1.1 Printing Designed Coupler

Task1 - Printing designed coupler: The designed coupler was printed using the Makerbot printer without the use of support material.

Challenge1 – Accuracy of printed part: The regions of the printer which were being printed in air were displaced from the printing plane which resulted in the change in dimensions of the parts as shown in Figure 1.1. There was no orientation along which the coupler could be printed without affecting its print quality.

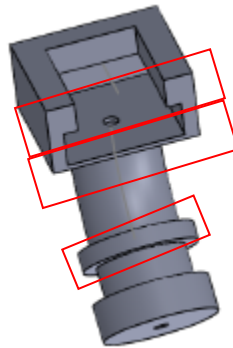


Figure 1.1: Inaccurate Printed Sections

1.2 Grind Inaccurate Printed Parts

Task2 – Manually correct printed part and testing: To correct the printed part Ihsane and I filed/grinded the parts to make them smooth so that they may be used for testing. While testing the old filament drive cracked along its nozzle holding edge because the coupler and nozzle holes did not match due to the print without using support material.

Challenge2 – Cracked filament driver and non-accurate printed parts: The filament drive had cracked and also the support material printing of the Makerbot wasn't in function due to nozzle clogging. However, we took the risk of printing these parts again.

1.3 Multiple Printed Parts to Reduce Inaccuracies

Task3 – Minimize risk of inaccurate printing: To minimize the risk of inaccurate printing in affecting our development time we chose to print variants of the coupler in all possible orientations with variations in the inaccurate region dimensions. We had three different designs with 3mm hole thickness and excess depth for nozzle insertion area. However, the prints this time were also inaccurate but we managed to fit a nozzle and pass the filament across. But this time unexpectedly, the printed filament drive had a smaller height to fit the nozzle and thus there was no way the coupler designed for the old filament drive would fit this.

Challenge3 – Filament drive STL file had a smaller dimension for nozzle insertion: The filament drive had a shorter nozzle holding height in the STL file found online. So, neither the V3a nor the V3b nozzle design fit the new filament drive. So here, we could either modify the current coupler dimensions and print the part or redesign the filament drive on Solidworks with the new dimensions. Since, the former was easier we used it.

1.4 Redesign Coupler to Match New Filament Drive

Task4 – Redesign the coupler: Since, we had found the tube we would be using and the printer was still giving issues with the part accuracy, I redesigned the coupler to have a thicker column region and also with a reduced height so that it fit the filament drive. A view of the 3D part is shown in Figure 1.2. We put this to print on Monday evening hoping to be able to test the next day.

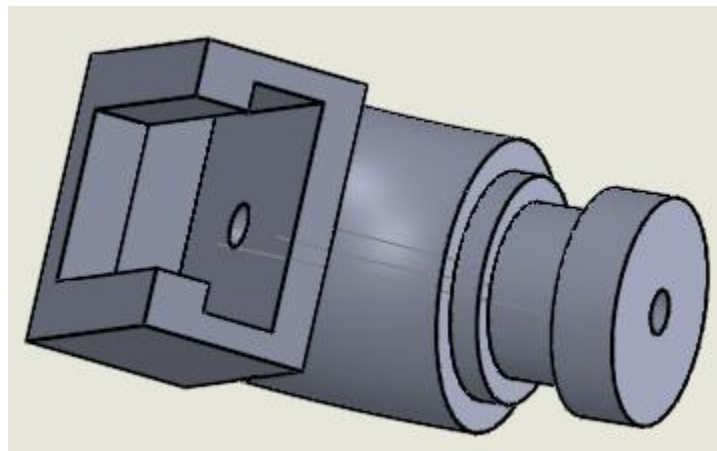


Figure 1.2: Side view of the coupler

Challenge4 – Inaccuracy of parts persist: The inaccuracy of parts persisted and thus we had to grind/file them but only in a few regions as the new design corrected a few errors.

1.5 Testing With and Without Inner Tubing

Task5 – Testing: On Tuesday we finally tested our coupler with the new nozzle, that had just arrived, and tubing to reduce the friction. The results were promising and we now know that kinking is not a problem and the printer can print 360 degrees while simultaneously extruding the filament. However, printing 360 degrees is not a problem but the orientation of the nozzle with respect to the direction of printing is important. Thus we intend to modify the nozzle to avoid this problem. The test results are shown in . Also, we reported the nozzle clogging problem to Stephen who solved it.

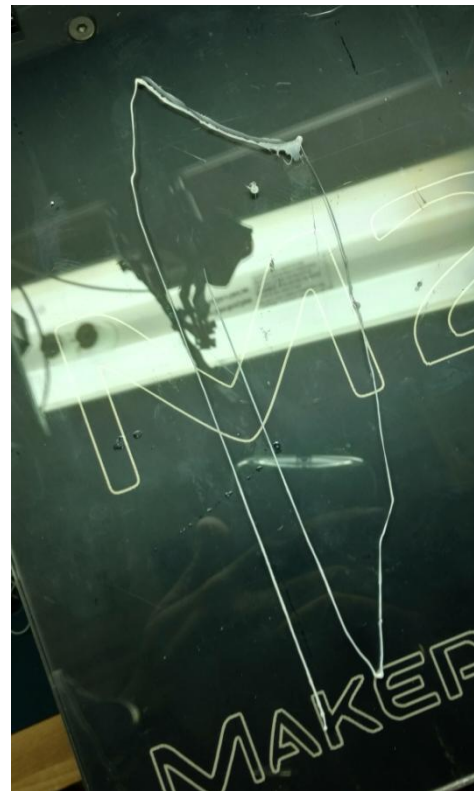


Figure 1.3: Test Results

Challenge5 – Nozzles Clogged Again: To recheck our design and eliminate printed model errors we tried to reprint using support material. However, both the nozzles clogged again mid-way of printing on the Makerbot. So we presented with the parts that we had already printed.

2 Teamwork

- Astha: She worked on inserting the pause commands into the gcodes of two parts formed after slicing and selection of an insertion layer. She also improvised to get the 3D printer

platform to the part insertion position. She has also, started looking into the slic3r code and started understanding sections of it.

- Dan: He worked on generating the gcodes for the two parts separated by a user selected insertion layer. He has also, started looking into the slic3r code and started understanding sections of it.
- Ihsane: He was responsible for printing the parts every night. Also, since the experimenting could not be done by one person we worked together on the experiments. Finally, he has done the calculations for finding the maximum offset of the rotary stage from the axis of rotation.

3 Plan

For the next progress review, I plan to work on the CAD assembly of the filament drive and the nozzle section. Also, I plan to modify the nozzle hotend part to reduce the error. The hotend is intended to replace the coupler. This will reduce the offset error, however, I will have to ensure the design has good heat transfer properties.