

Monday, December 1st 2014

A representative from Michigan Technological University visited our physics classroom to tell us about the Most (Michigan Tech Open Sustainability Technology) Delta 3D printer he had helped to design. He shared with us his experience with building the model and showed us where to find information on how to build ([http://www.appropedia.org/Delta\\_Build\\_Overview:MOST](http://www.appropedia.org/Delta_Build_Overview:MOST)). We paired up into teams of two, and assigned ourselves as 'person 1' or 'person 2' to ensure that equal work was completed for the both of us. We were given kits on assembly, which contained the tools, electrical pieces, and other miscellaneous parts required in assembly. Once we had our kits, we collected pre-printed parts that would be integrated into the design and worked on cleaning them out with an x-acto knife.

Tuesday, December 2nd, 2014

Emily: I began the day by finishing the cleaning on the motor end, a pre-printed part, ensuring that there were clean edges and no odd bumps or un-cleared passages that would hinder the work of the printer. I then began work on the tie rods. Placing the 12 ball bearings (provided in the kit) in paint thinner to clean them, since they are coated with a corrosion inhibitor that may wet the epoxy required later on. While they soaked for roughly 5 minutes, I began to ream the edges of the 242mm long aluminum tie rods so that the ball bearing would sit nicely on them. I then removed the ball bearings from the paint thinner, allowed them to dry on a paper towel, and then placed one on a tie rod to ensure that it was stable. Then, I began to mix the epoxy. This required one part steel-reinforced epoxy and one part hardener. Using a short piece of plastic 3D printing material, I mixed the two, and used the plastic to coat the inside of the tie rod with epoxy. I then dipped one side of the ball bearing into the epoxy and placed it on the end of the tie rod. I repeated this until one side of the tie rods were complete and allowed them to dry overnight

Wednesday, December 3rd, 2014

Emily: I began the day assembling the motor end. With the motor end pieces already cleaned out, I gathered 18 3/4" sheet metal screws, 3 42mm x 240mm linking boards, and the 3mm drill bit and holder. Placing the printed motor end on the inside of the board, so that the screw holes matched with the pre-drilled holes on the boards, I began to screw them together. I manually placed the screw in the hole, and once it became difficult to do it by hand, I turned to the drill bit and holder. Once the screw began to bite into the wood, I used it to screw it the rest of the way down. I repeated this 17 more times, until all of the screws were in place and the structure was complete.

Thursday, December 4th, 2014

*Emily: This day was spent furthering the development of the motor end. Standing the motor end assembly up so that one motor end was facing up, I placed an M3 washer on a M3 14mm socket head cap screw and carefully placed it through the motor mount holes. Then, taking a motor and a pulley, I cleaned out the pulley, placed an M3 nut into each of the nut pockets, and started a set screw into both of the nuts using a hex key, but did not screw it all the way through. Then, I drove the pulley onto the motor shaft. I then tightened the rest screw around the motor shaft. I repeated this process with the two remaining motors. I then pushed the motor pulley side up to match up with the screws placed earlier in the motor mount holes, and began to screw them in with a hex key. I repeated this process with the other two motors. To end the day, I cut the housing and roughly an inch of wire off of the motor ends, and braided the four wires on each motor together. I repeated this for the other two motor ends wires as well.*

Friday, December 5th, 2014

*Emily: I began this day working on the extruder drive. This required cleaning out the drive body, and then placing the Mk7 drive gear on the motor with the set screw on the flat side of the shaft. Then, I placed the MR205z bearing above the gear. Then, I placed the drive body with the conical section facing me. I started the 6mm button head screw in the top left hole, the 35mm screw in the bottom left hole, and then placed the linking rod over the remaining mounting holes. I took the 30mm screws into the mounting holes, and began to tighten all of the screws. I then carefully broke off the shaft from the idler bearing shaft and cleaned it up. Then, I pushed the shaft into the 608zz bearing, and pushed that into the idler housing. I then used the side of the idler housing with two line-openings to mark holes in the fuel line. I then used the 3mm drill bit to drill one of the holes. I pushed a 45mm screw through the hole and began to start the second hole. I then pushed both of the 45mm screws with washers through the fuel line. I then placed the screw/fuel line assembly through the holes on the idler drive body. I started an M3 nut on the end of each screw. This was tricky and took some time to do. I then cut 40mm of the PTFE tubing, and tapered one end off so that the M4 nut would fit around it. I screwed it on several millimeters, reamed the end of the tube where I had cut, and then cut the short end by the nut off with the precision knife. I then put the nut side of the tube into the in-feed side on the drive body.*

Monday, December 8th, 2014

*Emily : This day began with finishing the epoxy on the tie rods and the ball bearings. Mr. Eberly gave a short demonstrative session on how to solder wires. After the completion on the tie rods, I moved on to the end effector. After cleaning out the partially assembled end effector and printed carriages, I mixed the two-part plastic epoxy and grabbed the 3/8" countersunk ring magnets. I placed a magnet in a magnet pocket one at a time to ensure they fit properly. I then took them out, placed glue around the perimeter of the socket, and snapped the glue into place. If any epoxy squeezed over the edges or the middle of the magnet, I took a paper towel and wiped it off. I repeated this step for the other 11 magnets into their sockets.*

*Wednesday, December 10th, 2014*

*Emily: Spent the day conducting a friction lab with the carriage belts.*

*Thursday, December 11th, 2014*

*Emily: Began the day by taking an M3x85mm threaded rod and pushed it through the sides of the motor end guide rod clamps. I then placed an M3 washer and nut on either side. Tightening these took some time, and in some instances, required another nut to hold a place while I used a wrench to work the opposite one on. This required two rods per motor end, one on the top and one on the bottom. I repeated this step for all other motor ends, bringing it to a total of 12 completed times.*

*Friday, December 12th, 2014*

*Emily: Began the day finishing up on the rods from the motor ends. I then moved on to attaching the 605 mm by 60 mm plywood vertical boards to the frame. I pushed M3 50mm screws with a washer through the vertical boards and lined it up with the idler and motor end mount points. I flipped the frame upside down and started M3 nuts on the screws pushing through to secure them. The screws closest to the motors on the bottom (on the top when flipped upside down) were harder and took quite some time. I then shifted focus to the hot end. This included cementing the heating resistor and thermistor and pressing them through the respective holes in the hot end. I then put on the PTFE tubing to insulate the lead and sent it to Shelby to be soldered.*

*Tuesday, December 16th, 2014*

*Emily: Was absent from school today and did not get any work completed.*

*Wednesday, December 17th, 2014*

*Emily: Spent the day sending emails to various newspapers and websites with a press release about 3-D printing in our class and how they have been integrated into our curriculum.*

*Thursday, December 18th, 2014*

*Emily: Taped the mirror to the bottom face of the printer (where the 3-D prints will print onto) and zip-tied the wires and tubing coming from the hot end and fan together.*

*Friday, December 19th, 2014*

*Emily: Focused on some final touches. Re-greased rods, tightened and cut zip ties around cable cords, and attached power adapter.*

*Monday, January 5th, 2014*

*Emily: Now that the power board had arrived, Shelby and I attached it to the frame. I began and completed wiring of motors and hot end elements. We finished wiring, and the construction of the printer was complete.*