Manufacturing Methodology of Parts Production and Design Enhancement for Additive Repair Robot Retrofit

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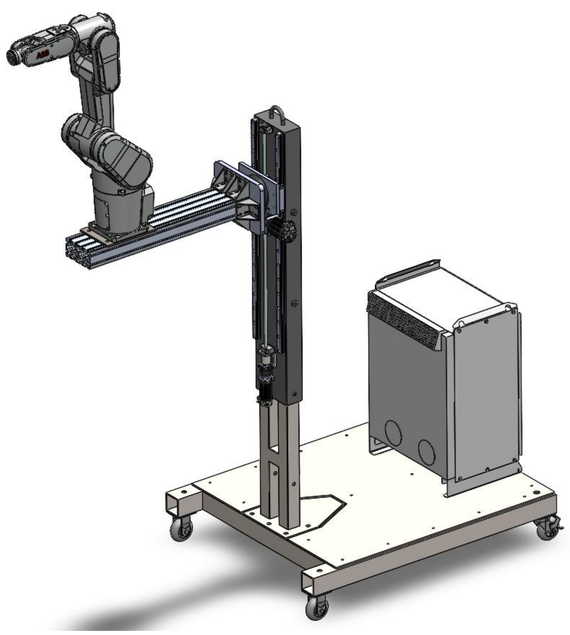
Introduction

At the beginning of the internship, a system was inherited that had been fit to an ABB IRB 120 robot arm, about 100 pounds lighter than the ABB CRB 1300 that needed to be attached and significantly smaller. Refitting the larger robot arm onto the system required more work than initially thought, including designing and fabricating spacers and brackets for new components. Also necessary was adding different motors to the system so that it could all be powered by one software, but the motors needed adapter plates and brackets in order to fit onto the system.

Design

The project required use of SolidWorks to design brackets and adapter plates, which brought with it a bit of a learning curve. Once designed, the files were exported as DXF files to be used in the water jet software. After cutting out the pieces, the holes are tapped (threaded) if appropriate. To the right are 4 pieces that were designed in SolidWorks and then water jetted out.

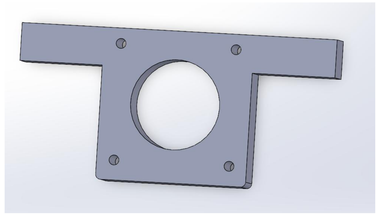


Full SolidWorks assembly of the system

SolidWorks Creations

Motor Bracket

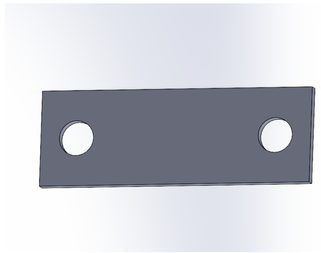
1.



A newer, larger motor needed way to attach to the system

Worm-Gear Spacer

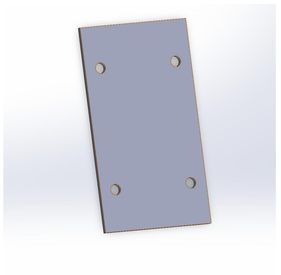
2.



Because of larger motors, the large central gear of the system had to be spaced out from its original position

Ball-Bearing Track Spacer

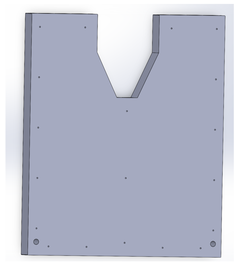
3.



To match with the larger motor and spaced worm-gear, the slides on the track needed a spacer

Counter-Weight Platform

4.



Heavy diamond-plate steel platform to provide a counter-weight to the robot arm and a platform to attach the controller

More on Fabricated Pieces

1. A new bracket was needed to support the larger motor that would be used to turn the larger central gear. It had to have a larger footprint but still fitting onto the original holes to attach it.
2. The larger motor pushed the whole system out, meaning the central gear had to come out with it, accomplished by this spacer.
3. The track that the extrusion moves along also had to come out, accomplished by this spacer.
4. The arm is heavy and puts a lot of torque on the whole system, so a counter-weight was needed to balance it. It additionally functions as a platform on which we can attach things like the control box.

Results

- Robot arm is attached to the rest of the system, along with new motors and controller box
- Robot and control box are wired up, and main power cable has been put together
- Tool-changer has been fitted to the wrist of the robot via adapter plate
- The system is complete, needs software and power to do any testing

General Skills

- How to use a drill press
- Familiarized myself with the water jet
- How to use a magnetic drill
- How to size out drill bits, taps, and bolts
- How to tap holes

CAD Skills

SolidWorks:

- Sketching outlines
- Extruding, Extruded Cut
- How to use the Hole Wizard when planning on tapping holes in the future
- Creating relations in a sketch

Acknowledgements

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