MSOE1

V5 Smart Motor 1:1 Cartridge (3600 rpm)

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The Issue:

Early on this season, when we were prototyping various launching mechanisms, we ran into a problem in that we had way too much friction from gearing up the flywheel. Through testing and research, we found that the motor's output at 3600 rpm and gear down from that with the cartridges. We, therefore, decided that the best way to reduce the friction, and therefore increase the rpm and efficiency of our high-speed mechanisms, was to design a 1:1 cartridge for the motors. This would prevent us from gearing down the output just to gear it back up again. We noticed an improvement in the flywheels that we tested them on—they were able to spin faster and transmit more power into the disks, shooting them farther.

Image #1: Printed and Assembled

How is it Used:

This mechanism is used just like any other gear cartridge in the motors. To use it, you just remove the cartridge currently in the motor and replace it with this assembly. For best performance add a .5” ID round radial bearing, with the specific part number, 217-6715. The output shaft is sized for high-strength axels, but can easily be converted to regular strength shafts with high-strength shaft inserts. This makes it highly applicable to many types of designs, not only this year but for years to come.

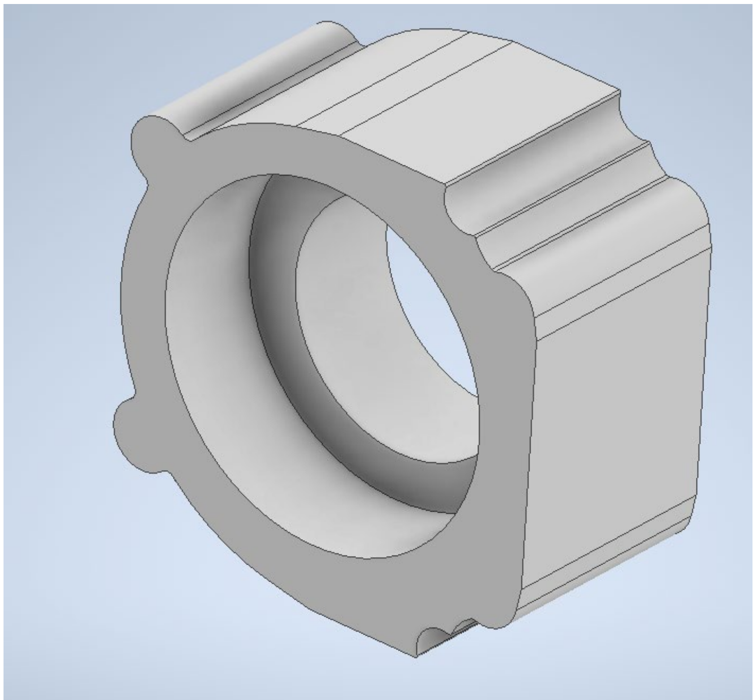

Image #2: Bearing Mount 3D Model

Software:

For this challenge, we used Autodesk Inventor Professional 2023. This is the most up-to-date version of Inventor and we felt that it would be the best software to use for this challenge because many of the members of our team have had training in 3D modeling with it. It also has all of the features that would be required to design this part. The features that we used most in our part are the sketch and extrude tools, but we used rotational patterns, mirrors, and filets to design the part as well.

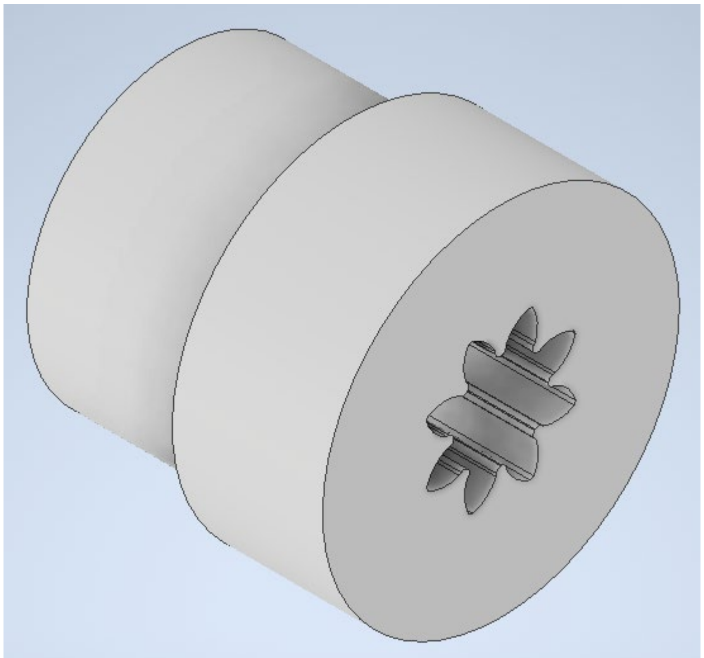

Image #3: Adapter 3D Model

What was Learned:

While completing this challenge we learned the importance of tolerance. It was hard to get the tolerance right for these parts because they have to fit around the output gear of the motors. They are very small and intricate parts that need to mesh perfectly to get the best efficiency from the motor. If it is too tight, it won't fit, but on the flip side, if it is too loose, the motor can wiggle and possibly shake loose. In addition to going through many iterations to find the best tolerance, we printed the parts with an MSLA 3D printer. This allows us to print with 10 times the resolution of a traditional FDM 3D printer. This was our first integration of MSLA parts, and since then we have expanded the use to more and more parts where we need the most precision possible.