Make It Real CAD

By: Mustang Robotics 507B

What Is Our “Make It Real CAD” Part?

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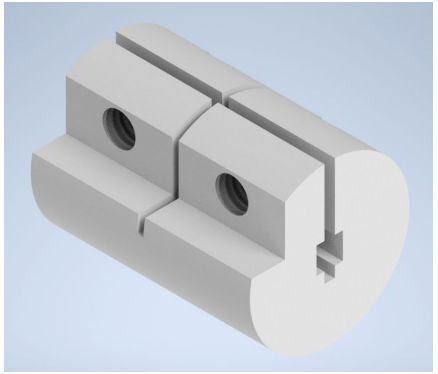
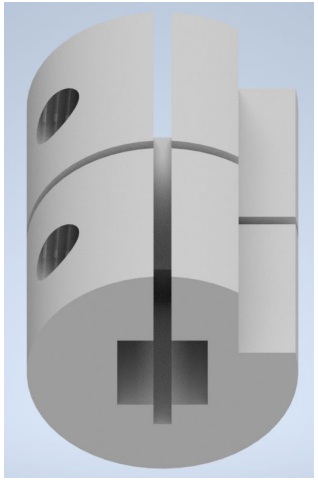
The piece our team wish was a VEX part is a small shaft adapter that is meant to connect regular shafts to other high strength shafts. Our part is designed to work similarly to how a shaft collar connects to a shaft, securing it in place for the robot’s use. We plan on creating our shaft adapter by designing a part that will have two sides for the different shafts: one side will be for regular shafts to be inserted and the other side will be fitted for a high strength shaft. To secure each shaft in the adapter, we plan to have it tightened and secured by a screw and nut.





Why Did We Make Our Shaft Adapter?

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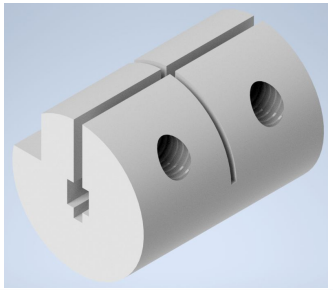
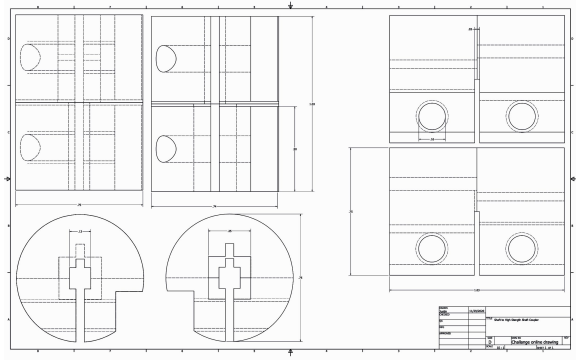
We designed this piece to provide a way to link regular shafts to high strength shafts as we consistently faced the problem of not being to do multiple actions as multiple parts were not compatible with the high strength shafts. This provides engineers with more options to utilize sensors, driven mechanisms, etc. Our adapter allows you to connect your high strength shafts to a regular shaft that can then be used with sensors such as potentiometers. Thus, teams can now measure the rotation of high strength shaft driven systems using potentiometers. This idea was inspired during Tower Takeover when we wanted to utilize potentiometer on our lift, which used high strength shafts, in order to program macros to increase tower-placement efficiency. However, we were unable to do this efficiently as we couldn't use potentiometers on our high strength shafts. Moreover, we designed our part to be space-efficient, only being 1.025 inches long and user-friendly. Teams of all levels of experience can use it as you simply have to put the two shafts in the adapter and tighten the collar with 3/32 screws.





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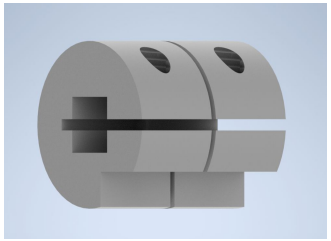
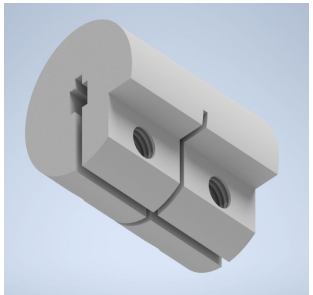
Our shaft adapter was designed, scaled, and tested on Autodesk Inventor Professional 2020 (Build:310, Release:2020.2). Our part is a shaft adapter as it would allow the user to use a high strength shaft and a regular shaft together. To create this piece, we first decided to draw our part and then turn it into a CAD that resembled two fused VEX high strength clamping shaft collars. Although with this design we could only connect two high strength shafts in our part, so we had to discuss a way to adjust one of the adapter's sides so that it could also secure a regular VEX shaft. After doing some research on the specific sizes of the shafts, we realized that the sides on the clamping shaft collar that fit the high strength shafts were approximately .25 inches while we needed one side to be only .125 inches (to fit a regular shaft). As a result, we decided we could simply adjust the size of a opening for a high strength shaft to fit a regular shaft size, we did this by decreasing the collar's opening by a factor of two. Thus, we divided the .25 inches opening (the original size of the clamping shaft collar that fit the high strength shafts) by two which would equal .125 inches (the new size for a regular shaft to fit in the clamping shaft collar). In other words, using Autodesk Inventor Professional (Build:310, Release:2020.2) we were able to select the shaft collar and expand its inner portion until the shaft opening was only half of its original size (.125 inches from .25 inches). Once we had finished designing our part we tested our it with an animation that showed how the two different sized shafts could be easily secured and be used together with our adapter.





What Have We Learned About 3D Designing?

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During this online challenge, all of 507B was able to gain a greater knowledge in 3D designing and printing. The majority of us had very little experience using CAD, so we did a lot of learning to overcome our struggles. We did this by reviewing many online resources: youtube tutorials on the basics of CAD to increase our 3D designing skills, which we then applied to our project. In the end, when we 3D printed our part, we realized that our design was successful thanks to all our efforts to learn and perfect our part through trial and error. To continue, as we conclude our project, we can now reflect on this experience and realize that this challenge has provided us with limitless opportunities. For example, in the future we now plan to CAD our entire robot before we start building as we have realized that it could save us a large amount of time and result in the creation of the most successful design. We will also not need to restart from the beginning as much as before because we will be able to fix minor problems before we even start building. 3D designing made our team stronger and gives us an advantage over other teams. In addition, we have recently realized that 3D designing and printing has grown to be a needed skill in many careers including engineering, chemistry, research, architecture, etc... and opportunities may present themselves due to our advanced skills in 3D design. In conclusion, through our journey designing, testing, and perfecting our dream VEX part, we were able to create our shaft adapter and gain invaluable skills in 3D designing which will be invaluable to us in the future.