# Team 2360X - VEX Compatible Belt Gears

Introduction: After hours and hours of re-running and editing out autonomous, we could never get a 100% accurate run, and we realized it was because of the massive pley within our chain drive. Our team wanted to address and solve the problem of inaccurate autonomous/programming associated with chains. The problem with traditional VEX chains was the increase in pley; the gear themselves would be subject to pley from the motor and/or with a ratio (sprocket to sprocket chain gear ratio) the pley becomes amplified and hours of programming become inaccurate. With this new set of VEX compatible belt gears, robots can achieve greater accuracy while programming and typical robot functions.

Part Explanation:

We created a set of gears, equivalent to the traditional vex gears, that allows the user to use a belt for transmission purposes. Belt drives/mechanisms are among the most accurate due to the high accuracy maintained through a distance between two gears.

To use this part, the driver gear can be attached to a motor to the mechanism of your choice or drive, then the driven gear can be attached to your mechanism output/wheel and with the use of a belt clip and a belt, the part is in use! The VEX compatible axle hole allows a traditional shaft to be used to connect the gear as well as 4 to 4+ holes for screw inserts (giving you access to connections to vex parts), allowing this part to be a true if not better replacement to the sprocket gear and chain.

The current and next paragraphs explain the part(s) in depth. The gear is made to match the different standard gears VEX makes. The shaft slot in the center matches that of the one in standard gears and can fit a VEX EDR axle. The surrounding holes are also meant to mimic that of a standard VEX gear, the hole diameter, and most other general components match that of a traditional vex gear. The parts can be seen as image number [3].

The gear teeth are formed for a tooth-ed belt. This allows for more precise outputs due to a direct mesh with both the teeth and the belt. An image of this toothed belt with the teeth on the gear can be seen in the image document with the number [4]. The toothed belt is made with the STD standard for trapezoidal teeth although slightly modified to accommodate size. When programming a tooth-ed belt allows for more precise movements which in turn allow programming to be swift yet accurate. An example of the use of belt and gear mechanism can be seen in a 3D printer, the small meshing teeth allow the stepper motors to create accurate, detailed prints, while leaving little to no room for error.

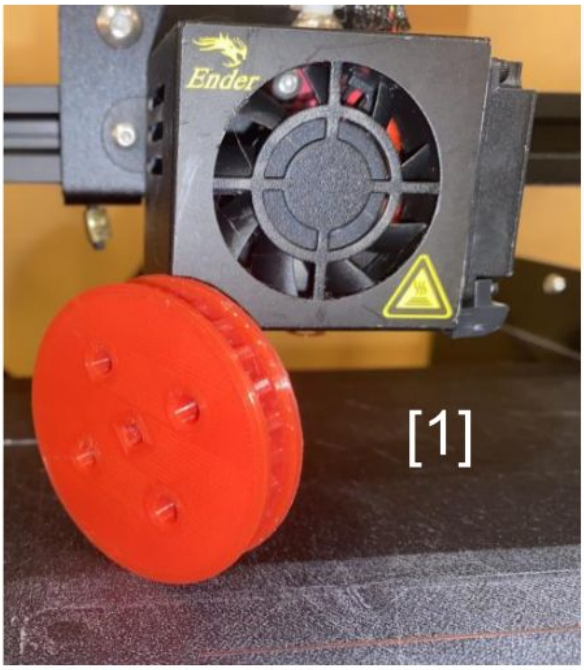
This gear can be used anywhere on the robot where power transmission is required. It can be used in a multitude of situations. It can be used in a drive (however, the drive must be relatively light), short distance scenarios in which gears are not large/adequate enough and a sprocket gear and chain transmission is needed, it can easily be replaced by our gears and a belt. The small components allow this gear to fit into a complete robot like any other gear.

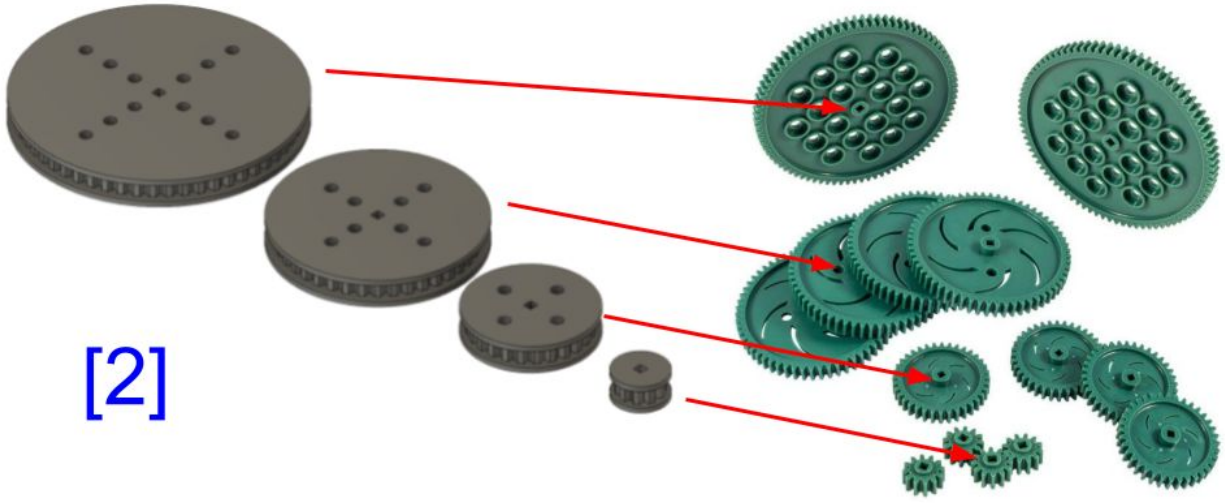
Explanation of how you used Fusion 360, Inventor and/or Tinkercad to create your new part: We used **Fusion 360, VERSION 2.0.93**. We started out by getting the specifications of VEX gears. We then found the necessary specifications to make the teeth of the gear as well. First we started off by greeting the inner tooth-ed structure of the gear, we started by creating a circle in a new sketch, and applied the diameter of a given gear from the VEX specifications. Then using the specifications of the axle we created the slot in the same drawing. We then created the shape of the trapezoid from the STD belt profile using some simple lines and constraints on the initial circle's top. Using the circle pattern function, I selected my three lines for a single tooth and duplicated it around the center of the original circle. After that we extruded the tooth-ed part's length to match specifications (extruding everything but the axle slot)

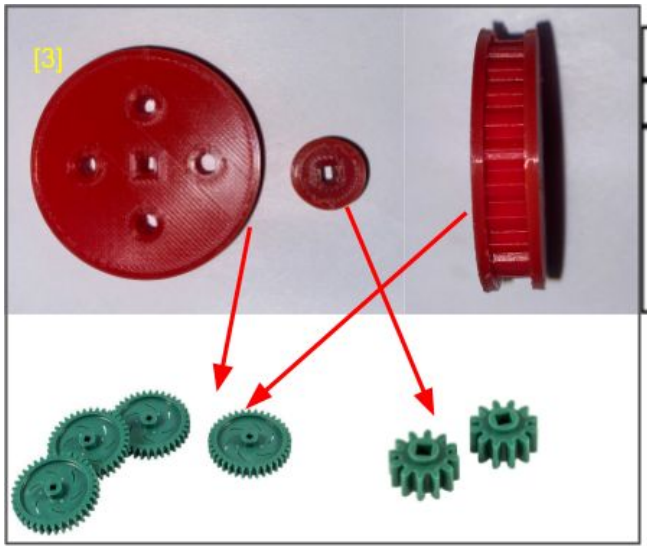
and began making the two identical outside guards with axle slots using two separate sketches to do so and extruding them equally accordingly. Next, 4 holes were made in the centers of two perpendicular planes within the circle and then extruded in the negative direction to create screw holes. After that, the final touches were just a chamfer on the inside of the shaft slot. This process was repeated for each gear made except for the smallest holes and the gears with 4+ screw holes.

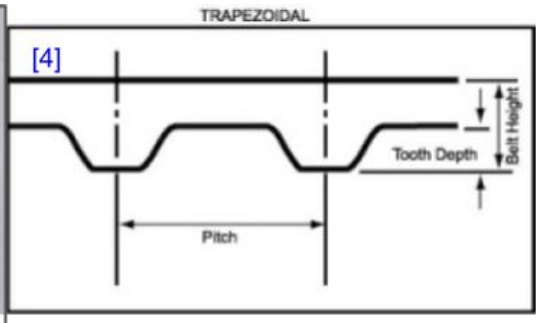
Conclusion: We learned so much about how to use our resources to create efficient solutions to problems we did not know we could fix. Additionally, we learned how to create our one compatible parts, something that always seemed incredibly hard until now. Now we know that instead of waiting for VEX to create a part, we can make it and utilize it. We will definitely be using a 3D design software in the future. We will use it for various robotics competitions as well as use the 3D design software to create a virtual design/plan of our robot before we build it. We will also use it to create vex compatible parts for competitions in the future that allow it, giving us a personalized touch to the added efficiency of our robot. It will definitely help us on our career path as many of us want to be engineers, in engineering, design and design specification is very useful and necessary as this online competition has taught us.

Appendix/Images






Source of image [4] attached