

VEX Make It Real CAD Challenge

Submitted by Team 820A DeltaTech

Created with Fusion 360 (v 1.29.6) and Tinkercad (v 3.7)

While building a robot for the last several competitions, we found that we were constantly sawing gears in half to meet space requirements and our design specifications. This practice has left our team with drawers full of mangled, useless, half-cut gears when the specific competitions are done. The biggest problem with our current practice of sawing these gears in half is the lack of accuracy we have while sawing, which naturally results in imperfect cuts, damages to the holes in the middle of the gear, and reduces the overall structural integrity of the gear, all of which being sadly irreversible. Cutting a full gear in half usually only yields us with one half of the gear, as the other half is usually too damaged for further use, thus aimlessly wasting 50% of the gear. This is why the North Toronto C.I. Robotics, Team 820A DeltaTech has created a half gear as our entry for the VEX Autodesk Competition component. We feel that our newly remodeled half-gear has the potential to be a perfect new VEX part, due to its versatility and potential design applications. This part will prevent us from destroying full sized gears, and it becomes incredibly useful when design specifications only require half of a gear.

Our half gear has been carefully designed to be compatible with all similar VEX grade gears to seamlessly integrate into our robot design while saving us and many other teams from wasting plastic and creating waste that will ultimately end up in landfills. This gear would be utilized to enable efficient use of the space within a VRC competing robot, or to allow more complex gear systems within the 18-inch restrictions. This simple, yet incredibly useful half-gear component has the potential to be used in any design that only require a half-gear. For example, the half-gear can see promising application in the building of a scissor lift system, where only half of the gear is required and allows a much more compact and efficient lift system on a VRC robot. This reduces weight and space limitations, and allows for a more efficient use of the VEX motors and places less strain on them, hindering and in some cases preventing burnout.

The half-gear we designed combines the fundamental qualities of the expertly designed full gear with the uncompromising usability of a semi-gear. The gears diameter dramatically increased to improve strength and overall usability without a compromise in performance. We are introducing a new way to use gears that provides a more intuitive and immediate connection in the robot yet still familiar. Our gear was expertly crafted using Fusion 360 (v 1.29.6) and Tinkercad (v 3.7) design software using some of the most advanced techniques to engineer the most innovative semi-gear for VEX ever. Each ridge on the semi-gear was extruded and modified from a cylinder in the model environment to seamlessly integrate into the VEX ecosystem. Every corner of the gear was inspected using the inspect function to perfectly match

existing VEX gears. Altogether, this gear was elegantly engineered to optimize both performance and durability, marking a milestone in the evolution of the semi-gear. This carefully designed half-gear is not only useful when only half-gears are required, it solves the issue of wastefully cutting full sized gears and it is a necessary component to the VEX product line.

Our team has not only gained experience in using the Fusion 360 and Tinkercad software, but also discovered its advantageous potential. In the future, our team can take advantage of such CAD software to maximize our success by using the CAD software to easily redesign our robot without the need for any specific parts. A common problem our team faces is having to wait on parts being ordered in, whereas with Autodesk CAD, we can immediately render any part and add it to the rendering of our robot. This will save us hours of valuable build time and make it easier to decide which parts we need to buy in the future. As well, 3D modelling the robot can help us visualize the design of components better, and allow us to plan ahead to see how well a new component will fit. This can effectively prevent us from wasting time and experimenting parts with trial and error. The more time we save, the more time our team has to focus on building our robot better, programming it, and testing it, which ultimately boosts our performances at competitions. As many of us wish to pursue a career in computer science and other STEM programs, 3D modelling can be a perfect way to create a realistic design for any projects to products we wish to take on. 3D modelling can prevent an unnecessary waste of time, energy, and money, all crucial components to a project's effectiveness in school or in the workplace. The efficiency Autodesk CAD would give to our team's building process could save us hours of time, increase productivity, and allow our team to reach our goal of competing at VEX worlds.