Chain Adapter Kit Write-Up

This year, the VEX Robotics competition presents a new challenge for student engineers through its new game: VEX In The Zone. Our team went to work in early May after VEX Worlds with a plan: to build a well rounded, efficient robot that easily carries mobile goals while scoring cones on it at the same time. This approach required a sort of translational horizontal movement: a subsystem that transferred the cone from outside the robot on the field to inside the robot on the mobile goal. The most ideal solution for us and for many common teams currently was the chainbar. This linkage, connected to two other structures, used chain to enable the structures to be at the same relative rotational position. For the robot, we were able to manipulate this function to keep the cone intake always parallel to the ground.

However, we ran into several problems: to perfectly tension the chain was a very difficult task, and caused unnecessary friction and increased unreliability. As a result, there was the risk of chain snapping, especially towards the middle of the chain-bar, making the system not appropriate for competition use, as one minor contact easily undermine a robot's performance. In our case, we needed to effectively bring together the chain system and durability.

The Online CAD Design Challenge was an opportunity for us to combine the functionalities we needed for our perfect chain-bar mechanism. Using Autodesk Fusion 360 (2.0.3793) we were able to create a custom link that could bring together structural integrity with the use of chain. We based off initial designs from the original VEX links, attaching one end to the link to a screw. The fusion of parts was rough at first, so the parts had to be smoothened to create a cleaner look. While finalizing the first design, we also saw the potential in creating another set that was attached to a female screw connected instead of a regular screw. After final retouching, we finished creating the Chain Adapter Kit.

In the kit comes 4 different parts: a male and female screw connector for both ends of the chain link. This unique connection allowed one end to join a chain linkage while the other end could connect to a standoff or a c-channel. For the robot we had aspired to create, our chain-bar linkage would be modified from our original design by replacing the unnecessary idling chain in the middle with standoffs using the Male Chain Links. This would strengthen the system due to the increased durability in the standoffs as compared to regular chain, while also allowing the use for washers and spacers to adjust the tension within the chain system.

However, as we were able to perfecting our chain-bar design, we realized that the practicality was not limited to just this, but could extend to countless other applications as well. For example, one may decide to use these chain adapters to transfer motion such as in a cascading elevator, which could be easily achieved using the Female Chain Link counterparts. Perhaps a design requires linear horizontal motion that cannot be achieved directly with a rack and gear system, but these adapters allow different methods of attaining the same action. The kit clearly allows for more creativity of builders and robot designers to flourish through the new parts.

Lookinack through the design process after we finished our project, our team discovered the power in 3D computer-aided design. Users can easily exploit the software to channel their imagination to reality. There is a saying that goes as follows, “Sometimes the journey is more worthy than the goal.” In this cag bse our goal, the part we designed is useful in a robotics competition however what we learned from this project is worth more. Because of the increased access to 3D design and printing we can get a headstart on these skills. Most engineers don’t get a chance to learn some of the more advanced skills until later in their education but we were able to work in high school on 3d design, printing, animation, and project management. We all gain the most from the skills we learned and will continue to learn. Our team saw the success in solving a problem for the VEX Robotics Competition, and can easily replicate that same success in creating new, better products for our current generation and for our future. Aspiring to become a mechanical engineer, I want to use 3D printed software as an aid to channel my imagination towards making better products.