

“Make It Real” CAD Engineering Online Challenge

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Intro

We decided to focus on this year's VEX VRC Robot because we have the most experience with it and have found that many of the high ratio gear driven mechanisms present on the current robot could be easily downsized with a custom gearbox. This includes the front four bar lift which uses a high ratio two motor driven mechanism and the back mogo goal lift which uses a high strength axle driven high gear ratio to produce the necessary force to lift the mogo goal. Because of the large gears this takes up a large amount of space on both the rear of the robot and own the main tower structure of the robot which supports both the conveyor belt and four bar lift (it also houses the battery, brain and pneumatic tank) The back mogo goal lift mechanism takes up valuable space in the rear of the robot which would allow for more adjustment angle of conveyor belt ramp

Our Solution

We decided that the best way to solve this issue would be to design a vex compatible high strength axle cycloidal gearbox. The cycloidal gearbox is perfect for this application because it can produce a very high amount of torque in a compact enclosed gearbox. A cycloidal Gearbox works by having an input shaft drive to an offset cam. This causes the cycloid disk to follow a cycloidal curve as it moves around a set of pins. This causes a high gear ratio to be produced. The power is then transferred to the output shaft by the output disk which is driven by the cycloidal disk. In order to mimic the 84:12 gear

setup we had on our robot, we used 7 teeth on the cycloidal disk, with 8 pins surrounding it to provide the same torque. The Cycloidal Gear would work well in our robot because it could provide the necessary gear ratio to produce the force required to lift a mogo goal. The cycloidal gearboxes would free up space and they would be able to produce higher gear ratio when compared to the existing involute gears.

What We Learned

We learned the benefits of the use of cycloidal gears as well as some of the cons. The benefits of a cycloidal gearbox include: its enclosed and allows for the ability to produce a very high gear ratio for torque while being more compact than traditional involute gears. Cons: There can be a lot of play in mechanism, cycloidal gearboxes are slow to respond, and finally they have to be lubricated to reduce friction.

Bibliography

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- GalcoTV. "What Is a Cycloidal Gear-- a GALCOTV Tech Tip." YouTube, YouTube, 25 Feb. 2020, <https://www.youtube.com/watch?v=fjON6kV9dpA>.
 - Used for information about how a Cycloidal Gearbox works