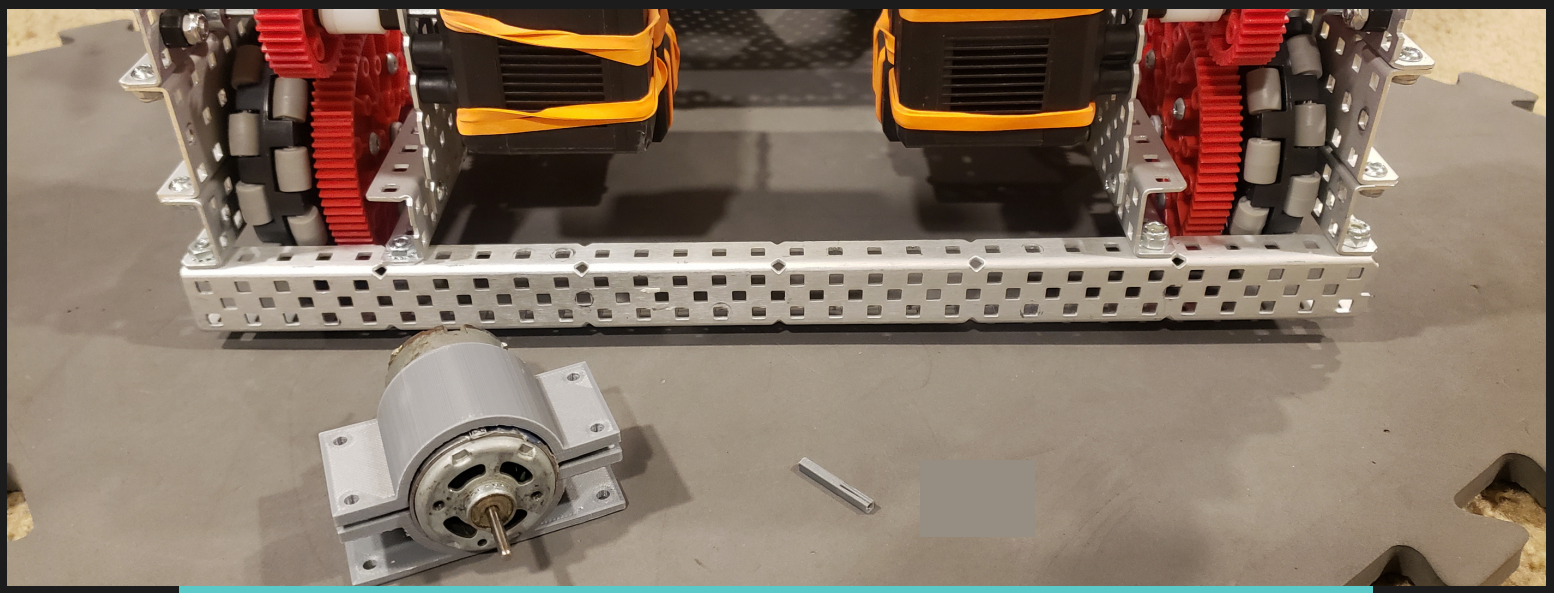
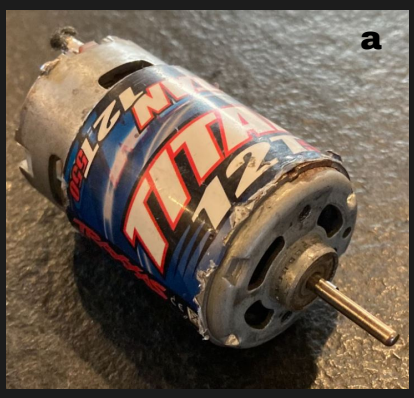
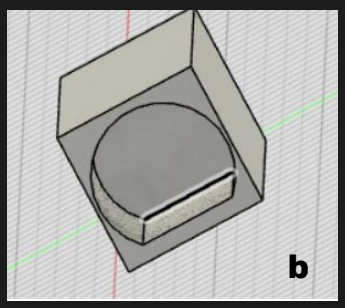
ON-BOARD ALTERNATOR / STATOR CLAMP



VRC HIGH SCHOOL - CAD ENGINEERING CHALLENGE SPONSORED BY AUTODESK

SUBMISSION BY: TEAM 717A | HARRISBURG, PA
DESIGNER / 3D MODELER: DIEGO V, SCRIBE: ANA J, FABRICATOR: JONATHAN B

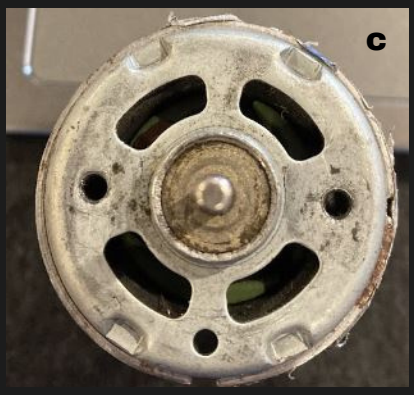


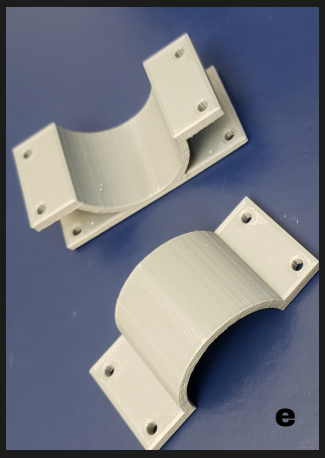


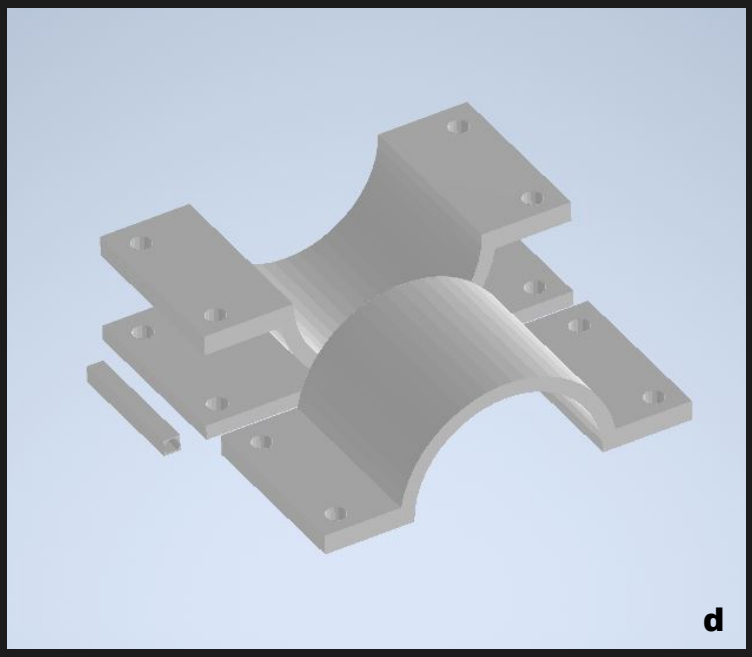
INTRODUCTION

As any team that has ever competed at a VEX Robotics tournament knows, one of the most vital components to bring is a battery to power the robot. Without a battery to give power, the robot cannot do anything on its own. That battery also must be plugged into an outlet to be charged, which takes time that cannot always be spared. What if the amount of energy drawn from the battery by the robot could be reduced, and as a result - the battery would not need to be charged so often? That is exactly what our on-board alternator/motor would do We have devised a clamp that will be able to attach this device to a robot.

a - view of the motor
b - This is the coupling adapter to go on the end of the motor







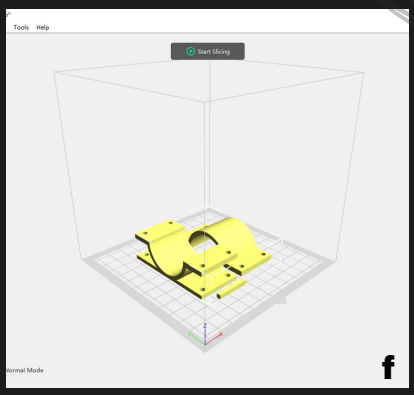
c - view of the end of the motor showing shaft shape
d - Smooth shaded view of clamp before 3D printing
e - 3D printed model of clamp

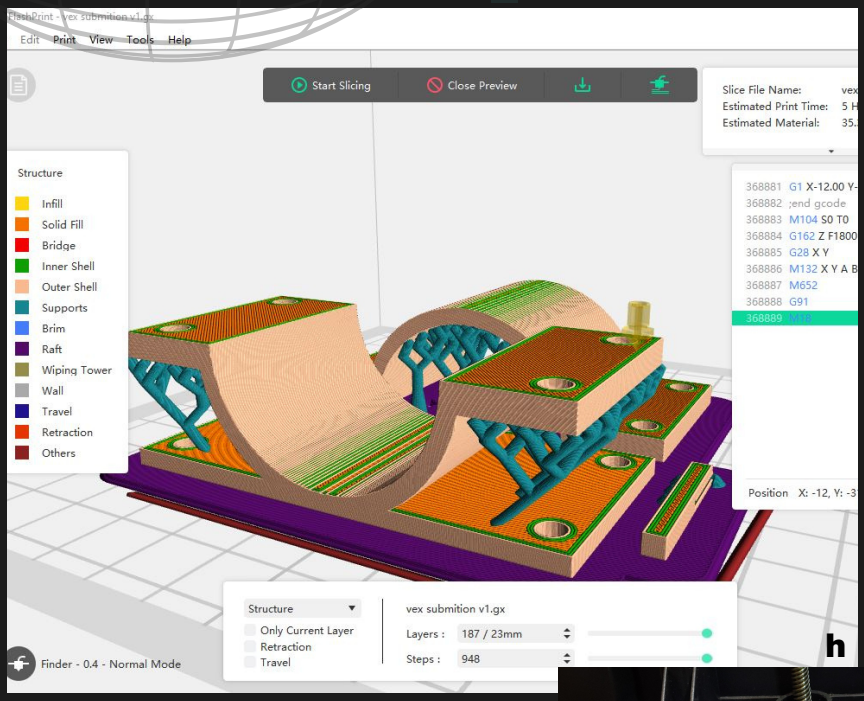
DESIGN SOLUTION

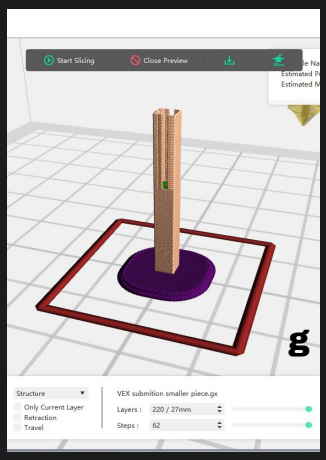
Team 717A's design idea this year is a clamp that would hold a small alternator and motor designed specifically to be secured onto a VEX VRC robot. An alternator is a device that converts physical movement into voltage and current using electromagnetism. The voltage and current are either stored for later use or made directly available to the device. The most common uses of alternators are in automobiles and electrical power generating plants.

Our team's design is a clamp that attaches a small alternator onto a motor on a robot. This helps the battery last longer, resulting in less charging.

This idea came up when our team was discussing issues with power last year. The team only had two batteries to use during a competition, so the batteries were almost always dead by the end of the day. We thought about ways we could make the energy last for longer, and this looks like it could be a viable and helpful solution.







f,g,h, - images from fabricating parts

i - first draft 3D print of clamp

CAD / 3D PRINTING

The clamp design has 3 parts.

1 / **Base Plate** - This is a 3 inch long by 1.4 inch wide base with an integrated 1.5" in diameter concave housing for the motor to sit in. There is also an integrated base plate attached to use to secure the clamp to the robot. There are eight 1/8" dia holes drilled into the four corners of the plate for fastening. The base plate is an 1/8 of an inch thick.

2 / Cover Plate - This component is also 3 inches long by 1.4 inches wide with an integrated 1.5" in diameter concave housing to secure over the the motor. There are four 1/8" dia holes drilled into the four corners of the plate for fastening. The cover plate is an 1/8 of an inch thick.

FABRICATION

3 / **Motor Adapter** - The third component is a 1/8 inch square by 1 inch long shaft-like motor adapter. The motor adapter is used to change the motor shaft size , to mount onto a gear.

For the design and fabrication of this clamp we used the following:

TO DESIGN:

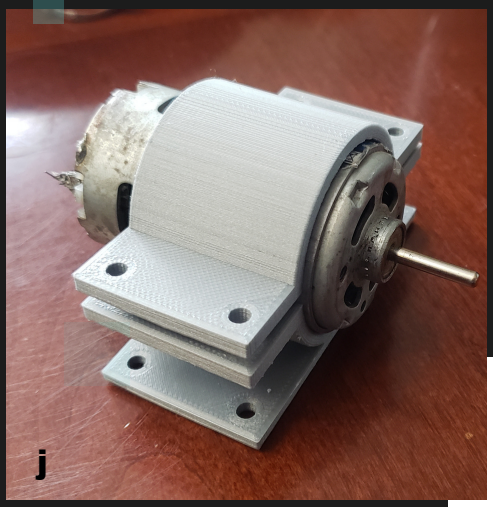
- Autodesk Fusion 360 version
- Autodesk Inventor 2023

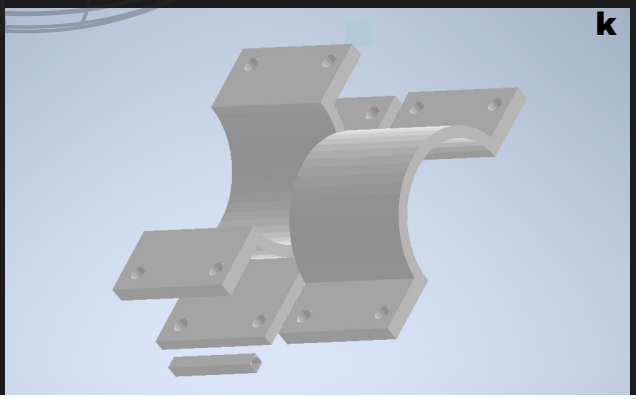
TO FABRICATE

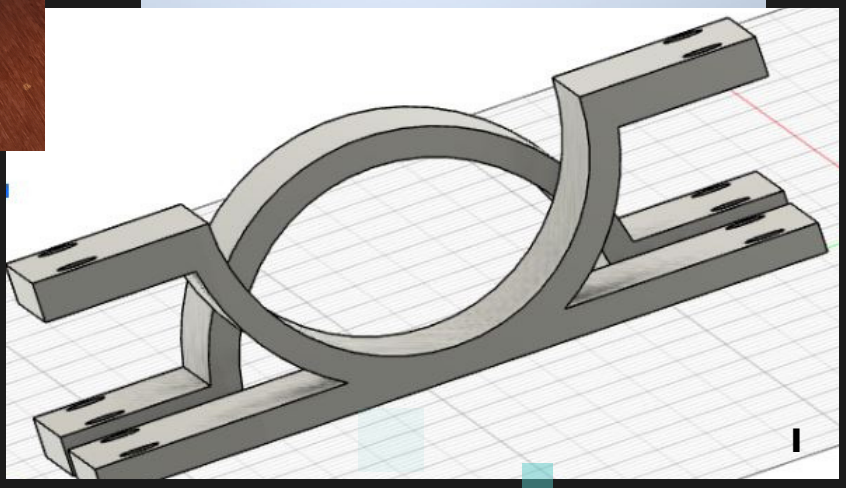
- Flashforge 3D Printer Finer 3 Series
- Hatchbox PLA 1.75mm (Color: True Silver)

TO REPORT:

- Microsoft Word
- Canva for Teams







j - view of clamp around motor
k- 3D modeled view of clamp
l - 3D modeled view of clamp

CONCLUSION

One of our team members thought about our problem and realized that an idea to modify his four-wheeler car. He realised that he had the idea to impove our problem but it was just ready to apply to a four-wheeler, not a robot. The four wheeler has no stator or alternator (it's really too small for one) so he decided to make one that could be mounted on the back axle of the robot.

The clamp is designed to mount onto a 3 X beam aside the drivetrain with the motor adapter on the shaft Geared up to a minimum of 1:2 ratio, it should produce the 12 volts needed to keep it at a steady rate to power the robot. The robot will take power from the battery to start and stop, but while it is in motion, the drivetrainwill run requiring minimal excess output from the battery itself to keep the motor running.
We believe this noval solution is worth exploring some more and so our hope is that this clamp design provides a means to further explore the motor's usage on our robot.

We learned that using 3D modeling software like Autodesk's Fusion 360 and Autodesk Inventor, one can protoype new ideas fairly quickly and accurately. With the ability to 3D print these virtual models, we learned that bringing ideas to life is well within our reach. We look forward to using the skills we have learned in the future.