Eddy Current Dynamometer

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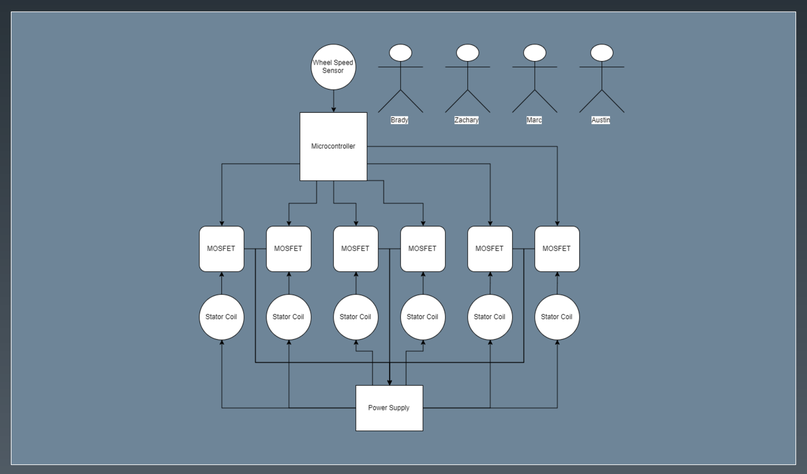
Background

Aztec Racing's powertrain development team is needing a brake dynamometer to analyze horsepower and torque as a result of their intake and exhaust designs. They are also needing the dynamometer to provide resistance to the engine to simulate real world conditions, and use the information to calculate the efficiency of their intake and exhaust designs.

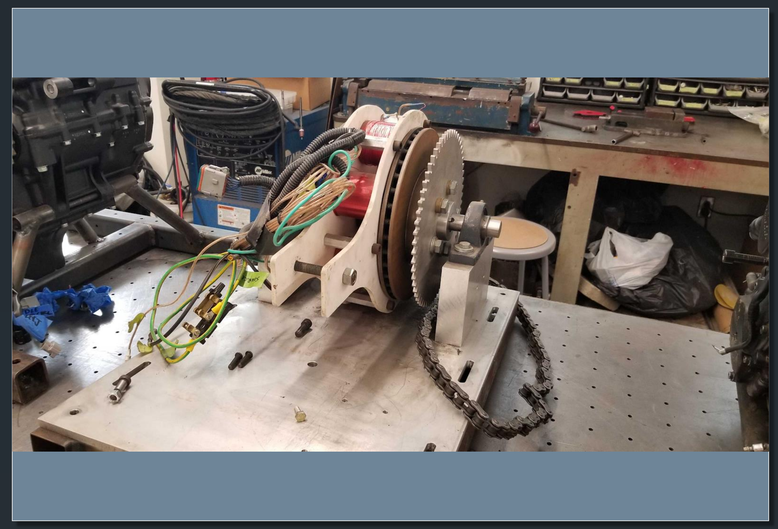
Overview

- Our challenge will be to design and create a control system for the dynamometer that will load the engine of the car in accordance with the requirements set forth by Aztec Racing.

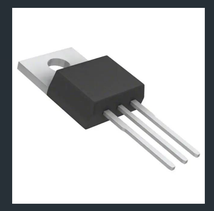
System Block Diagram



Assembly

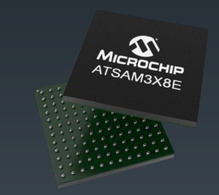


Hardware / Key Components



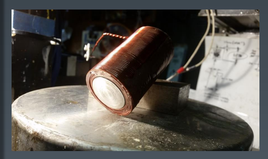
Power Transfer

High voltage/current MOSFET (N-channel) to control current to electromagnetic coil.



Controller

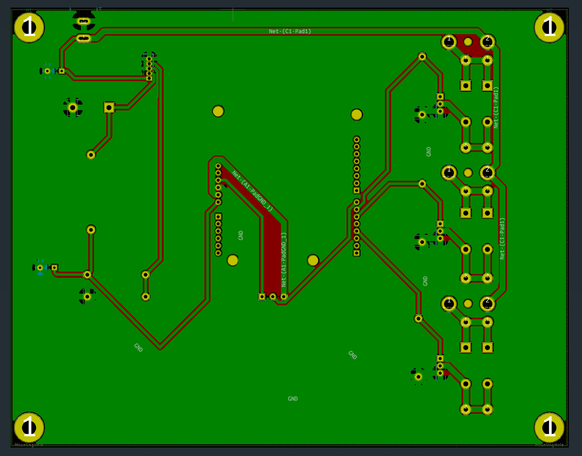
ARM Cortex-M4 based microcontroller to handle multiple real time calculations to control magnetic field through current.



Electromagnet Coil

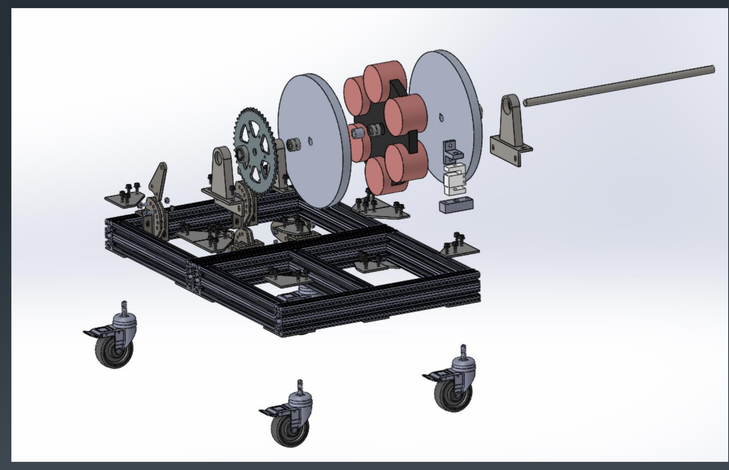
The electromagnet coils are what will generate the electromagnetic field to deliver a braking force through induced eddy currents.

Component Design



- Electromagnets began production before the COVID-19 lockdown, but they are unable to be accessed.
- Prototype PCB design worked for two electromagnets, expanded to the full six but were unable to manufacture pre-lockdown.

Deliverables



- Due to COVID-19, we are unable to have a physical deliverable.
- However, we have a working control system that is expected to work after assembling hardware components and deploying.

Acknowledgements:
Special thanks to Dr. Sridhar Seshagiri for being our main advisor and assisting us with our control system, and to Dr. Chong Kim for assistance with the physics required for proper functionality.

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