Micro Dynamometer – PSU MNE Dept 2

Overview
The goal of this project was to design a micro dynamometer capable of testing a range of small DC motors and generate accurate curves of torque and RPM data. The difficult task was to ensure that the dyno was accurate because the power output is very small for the motors that will be tested. This project will be used in future ME 340 classes at PSU to generate motor specifications.

Objectives
The task was to deliver a calibrated micro-dynamometer prototype capable of testing 1.5V-24V DC motors. The dynamometer must be portable and capable to test up to 20,000 RPM, and 300 g-cm of torque.

Approach
- Because our sponsor provided engineering specifications, the team researched existing products and patents and found that none existed.
- Concepts were generated and a final concept was chosen through a concept-screening matrix. The final design was a combination of different components from each design.
- After meeting with our sponsor, Prof Engel, the team changed the design in order to reduce complexity and provide greater accuracy.
- CAD models and diagrams were created.
- Once the final CAD model was designed we ordered parts.
- Machining on the ordered parts began at the learning factory and included water jetting, drilling, and rapid prototyping.
- Once all the parts were machined, the prototype was assembled and calibrated by measuring the force from the dyno arm to achieve known torques.
- After calibration, testing of the motors began.
- Testing provided graphs for motor specifications and proved that the prototype worked.

Outcomes
- Penn State ME 340 classes will be able to successfully determine the characteristics of DC motors
- An optical encoder provides the desired accuracy and displays the torque on an LCD screen.
- The project resulted in a working prototype of a micro dynamometer that is self contained and portable.
- The project met all the sponsors needs.