

Engine Dynamometer

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Objectives

The team's goal is to reengineer the current engine dynamometer test bench to accommodate a wide range of engines and produce repeatable results for use by the LSU SAE Student clubs.

Customer Requirements

The dynamometer's primary customers are the SAE Student clubs, specifically FormulaSAE, who is the project sponsor. Their requirements include:

- Structurally sound test bench
- Accommodates wide range of engines
- Accommodate for driveline gearing
- Reasonable engine swap time
- Safe to operate and is base isolated
- Reliable
- Ease of use
- Remains within budget

Engineering Specifications

- Accommodate for 10 HP Briggs&Stratton –750 cc 4-cylinder
- Produce repeatable results: 10% standard deviation at max power
- Mitigate Vibration
- Provide Tuning Plan
- Meets LSU ME Department Fire Safety Standard Code
- Remain within FSAE's \$1000 budget

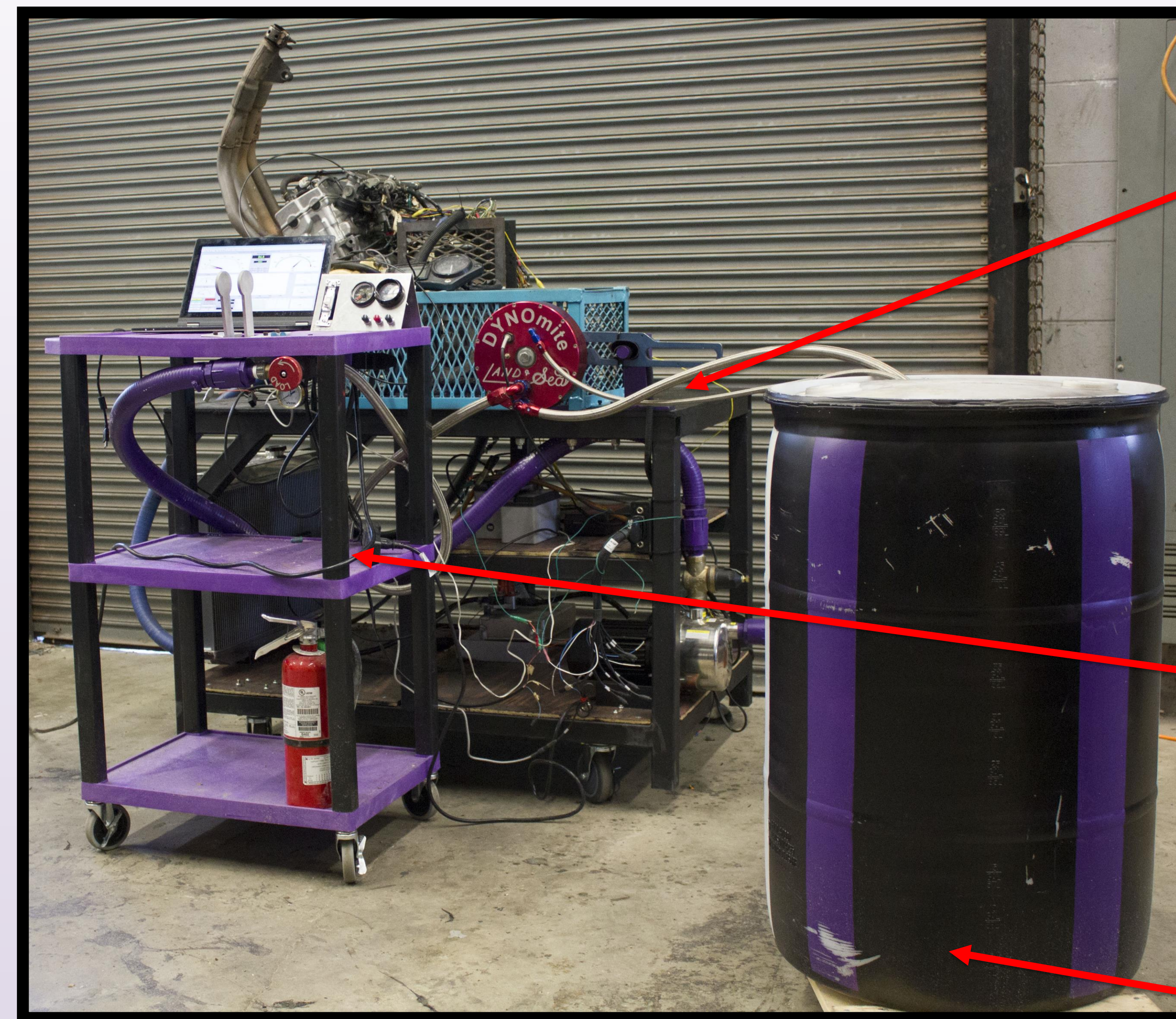


Figure 1: Completely assembled engine dynamometer with unmodified Honda CBR600F4i engine setup

Design

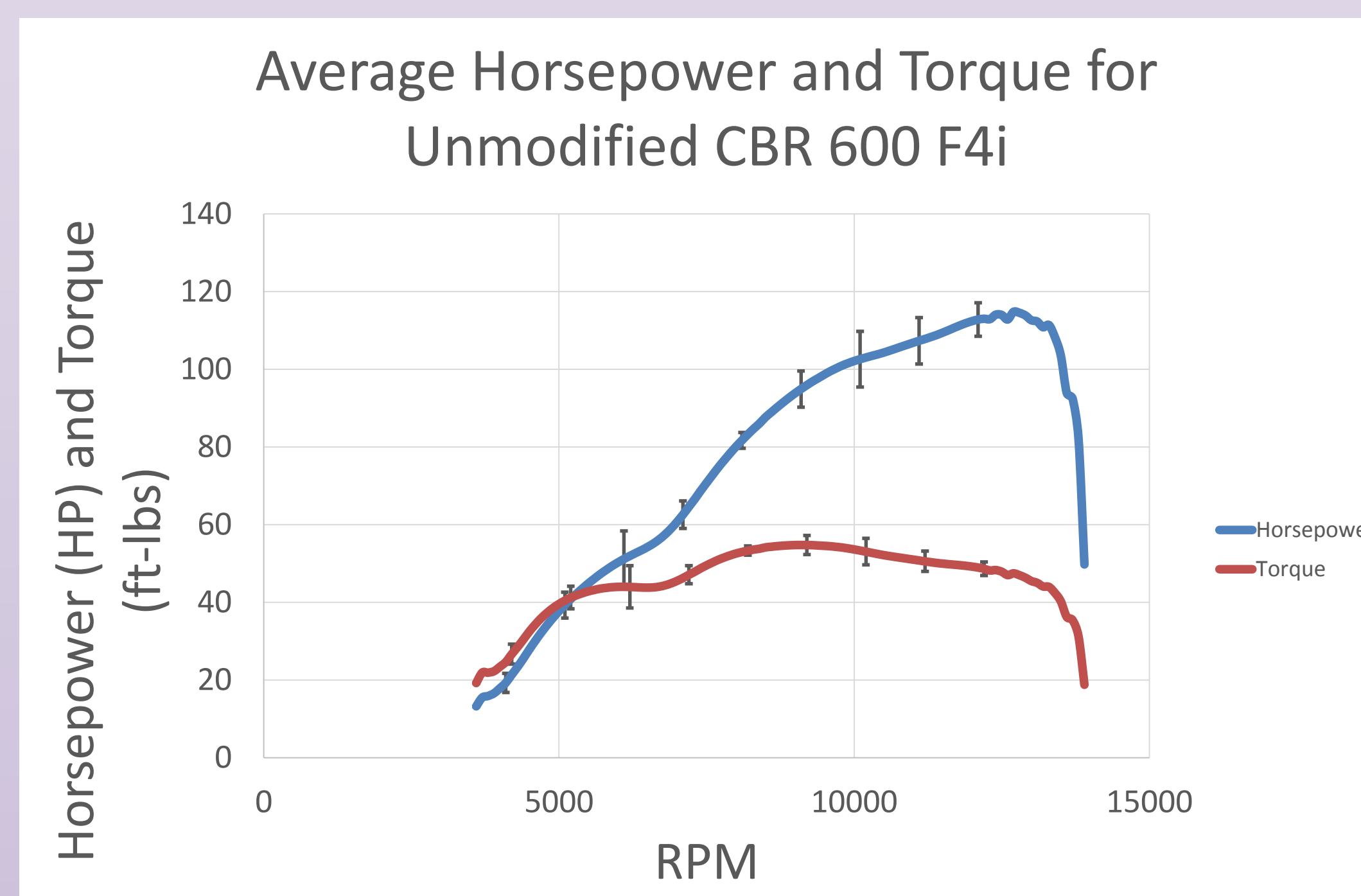
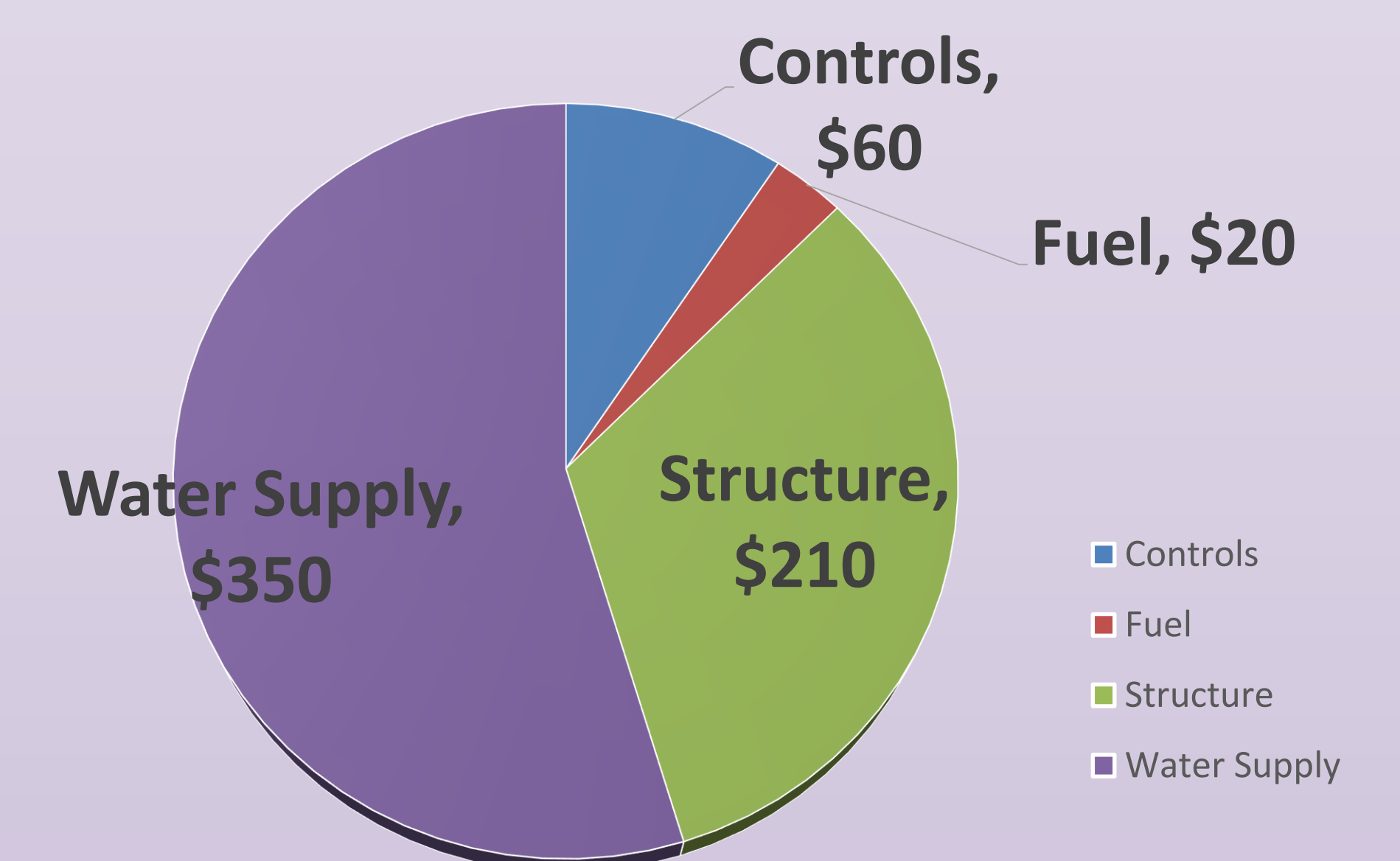
1. Fully equipped test bench with radiator, pump, battery underneath; drivetrain, engine mount, and water brake upon. 5" lockable casters provide easy movement from testing to storage
2. Isolated controls cart with manual throttle control and fire extinguisher upon lockable casters for ease of maneuvering
3. Mobile water drum for water brake

Testing & Validation

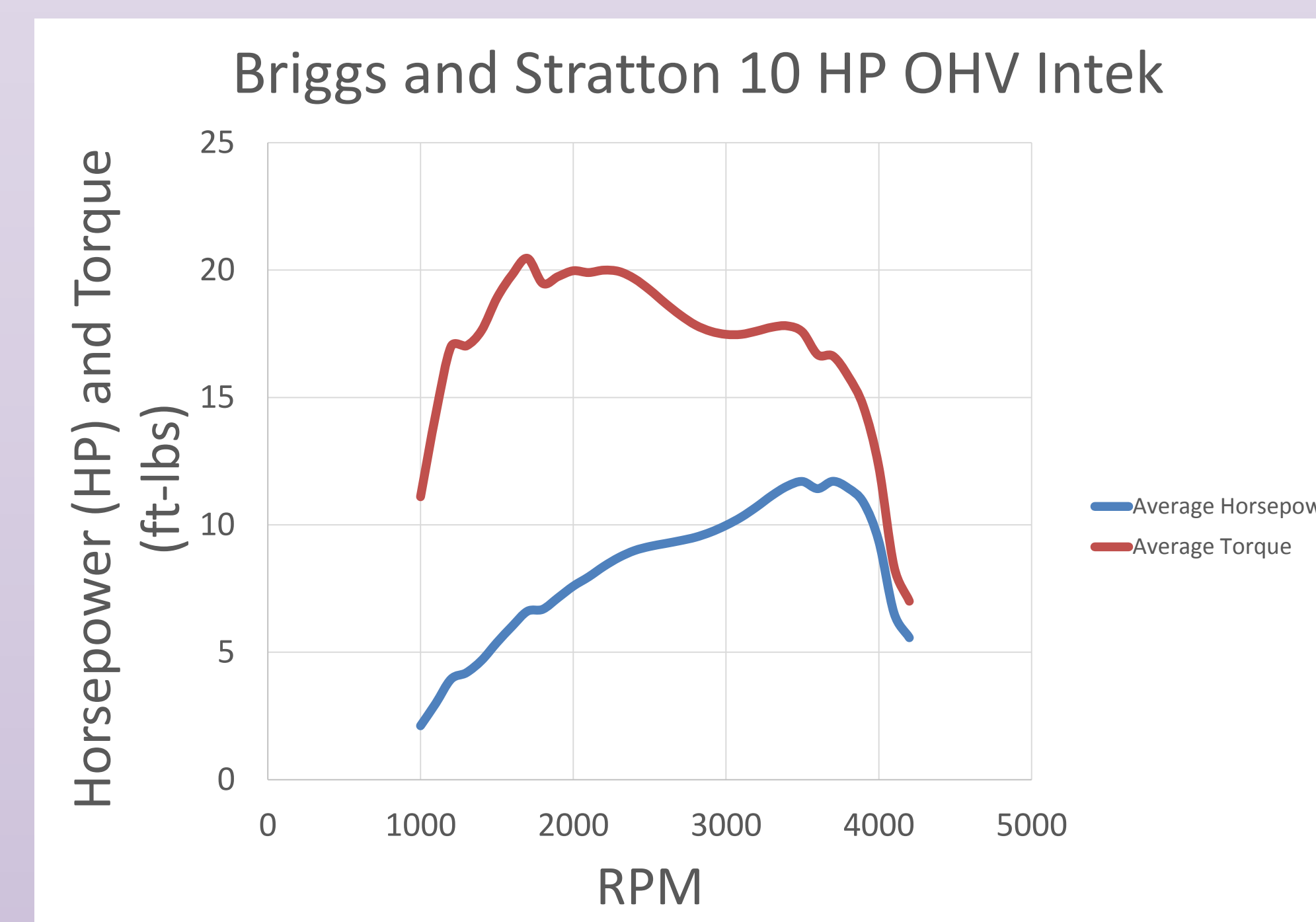
Tests to ensure that the dynamometer operates as expected begins with:

- Test safety features (emergency shut off, Rev-Limiter, etc.)
- Ensure table stiffness
- Compare unmodified CBR 600 F4i engine manufacturer's expectation
- Test unmodified CBR 600 F4i engine for repeatability: conduct 10 pulls at a time and calculate the standard deviation at max power
- Repeatability is achieved if the standard deviation at any given point is less than 10%

Timeline/Budget



- Standard deviation at max power: 1.7%
- Max power = 114 HP at 12700 rpm
- Max torque = 54.77 ft-lbs at 9100 rpm
- Max STD DEV = 5.5% at 6800 rpm



- Proof of concept: this test shows the modularity of the newly engineered engine dynamometer
- Max power = 11.7 HP at 3700 rpm

Conclusion

Team Dynamite was able to produce a safe, functional, and modular engine dynamometer which produces repeatable results to within a 5.5% standard deviation.