

## P15318 Recommendations for Future Work

### EE Future Work

- The control algorithm needs to be revamped to speed up the response time. This may be done with a PID or a serious overhaul to the current control scheme, since it has been confirmed that the actuator can respond fast enough on its own.
- Integrate the pressure and temperature sensors into the control algorithm so that they play a role in controlling the actuator and ultimately the commanded mass flow rate.
- Look into alternative H-bridges or another PWM scheme to get rid of the voltage offset and increase the dynamics range of the actuator.
- Redesign the PCB to incorporate the mk20dx256vlh7 microcontroller instead of the Teensy 3.1. Although more supporting circuitry would have to be added to the PCB, the overall size and cost of the PCB would be reduced so that it could be incorporated in a production design.
- Add additional software that will limit input voltages above 13.6V down to 13.6V so that the mass flow rate control is not dependent on the input voltage unless it is underpowered.

### ME Future Work

- Machine a housing that can incorporate all of the sensors and electronics.
- Design a new valve using a cam and ball to reduce the overall friction between the moving parts and lower the leak rate.
- Calibrate the MFR control of the device once the control algorithm has the pressure and temperature sensors incorporated into it.
- Design a distribution plate that is easier to be machined and incorporate a separate mount or different mounting pattern so that it could directly attached between a throttle body and air intake. This would allow further testing to see if the induced swirl is effective in mixing the air and fuel.