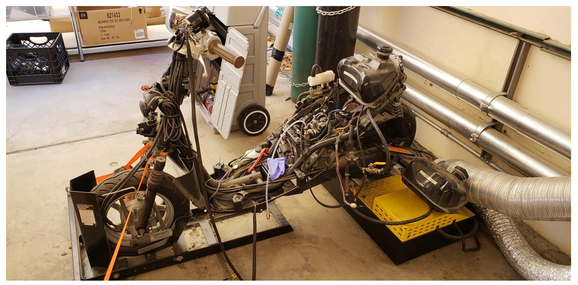
# ADVANCED COMBUSTION:LOW-EMISSION SCOOTER

Team Members: Caleb Pan, Tony Huang, Erik Lopez, Nicholas Ciling, Manny Cardoso
Faculty Advisers: Prof. Derek Dunn-Rankine
Contact: Team Lead Caleb Pan: chengyap@uci.edu

UCI Samueli School of Engineering

## Background/Bigger Picture

As global carbon emissions from fossil fuel increase every year, there is an ever growing demand for renewable energy and a means for low-emission transportation. This project is centered on measuring the emissions from a Yamaha Vino 50cc scooter when using alternative fuels with the overarching goal to develop a low-emission scooter.



## Goals & Objectives

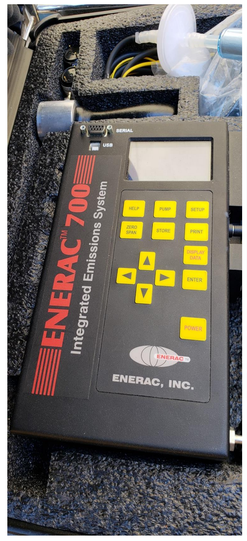
1. Use a test bed consisting of the Vino 50cc Scooter and a Mustang Dynamometer that measures:
   - Air Intake, head, and exhaust gas temperature
   - Fuel consumption,air/fuel ratio, and exhaust composition
   - Forward speed, RPM, and load
2. Modify scooter to measure emission data from biofuels.

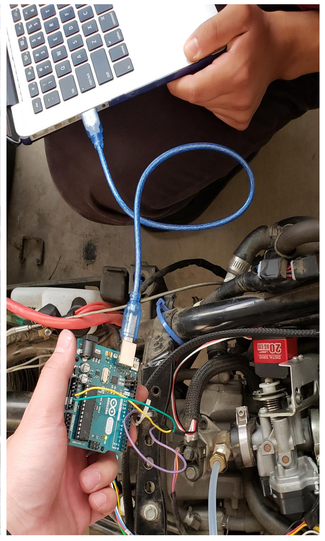
## Requirements

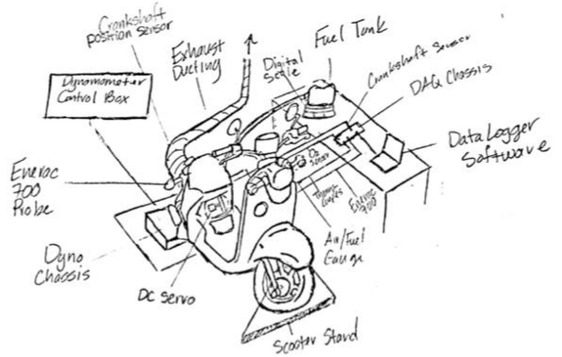
- K-type Thermocouples- Measure exhaust,head and air temperature
- Bosch Oxygen Sensor- measures air/fuel ratio when paired with AFR gauge.
- Enerac 700 Gas Analyzer- Measures composition of exhaust when probe is attached to exhaust port
- Mustang Dynamometer- Measures load, RPM, and speed
- LewanSoul Digital Servo- DC servo to control the position of the air intake valve.
- Aftermarket Data Logger- Data collection hub for various sensors and thermocouples.


## Innovation and Design

The testbed is developed to mimic a full scale dyno shop utilized for performance testing as well as testing the EPA driving schedules(Urban, Stop and Go, Highway)






## Budget

Dynamometer Manual Operation:$0
Servo Motor: $20
Race Technology DL1 Data Logger w/Software
DL1 Data Logger: $1000
Software: Included
AEM Air Fuel Ratio Gauge: $150
K-type Thermocouples: $30
Wiring: $30
Total: $1230

## Timeline

| Milestone # | Due Date | Description |
|---|---|---|
| 1 | 10/23/2018 | Determine design objective - Build an emission testbed for the Vino 50cc scooter |
| 2 | 11/13/2018 | Finalize design plan - budget requirement, equipment requirement, and written report on the final design. |
| 3 | 12/9/2018 | Operate dynamometer and control RPM |
| 4 | 2/22/2018 | Build a ground-up data acqusition system to measure RPM, air,head, exhaust temperature, and air fuel ratio. |
| 5 | 3/15/2019 | Test scooter emissions with gasoline fuel |
| 6 | 6/10/2019 | Modify ignition timing and fuel injector work cycle to measure E85 emissions. |

## Progress/Next Steps

For the throttle system, a 20kg*cm LewanSoul DC servo actuated by an Arduino microcontroller was chosen to control the position of the air intake valve. Dynamometer to be operated manually with options to expand in the future if other data is required from dyno. Data Acquisition will feed the air fuel ratio and temperature sensors to a Race Technology DL1 Data Logger. Next steps are to procure funding, finalize equipment choices, and purchase. This will lead into the assembly and testing phase.