

# Engine Dynamometer Laboratory



*Among the facilities of Golisano Institute for Sustainability (GIS) is a dedicated laboratory for internal combustion research. The Engine Dynamometer Laboratory is staffed and equipped for investigations of engine performance and emissions resulting from use of biofuels formulated in a variety of blends.*

## Engine Dynamometer:

- Capable of creating constant torque or constant speed conditions for many different engines. Maximum of 350hp and up to 800ft-lbs of torque. This Dynamometer is a Water Cooled Eddy Current Dynamometer which requires a constant supply of chilled water. The Water Cooled Eddy Current style Dynamometers help in settling to a constant speed or torque more rapidly, allowing for more controlled testing.
- Support System:
  - Coolant System to Prevent Overheating
  - Exhaust System(s)
  - Automated Fuel Mixing
  - Charge Air Cooler for all Forced Induction Engines

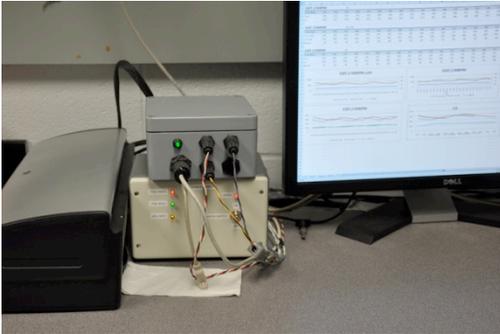


## Control System:

- Custom Control Software by Mustang Dynamometers:
  - Allows for complete operation of the Engine and Dynamometer. Capable of creating specific programs for custom testing. Reads all current data acquisition modules and can record data in real time.
- Data Acquisition Device:
  - Ethernet Based Data Acquisition Device communicates with the control computer. It has Relay Outputs, Digital Inputs and Outputs, Frequency Inputs, Analog Inputs and Outputs and Thermocouple Modules.
- Control Computer and Interface Computer:
  - Control Computer operates in the lab and processes the data being sent to and from the Interface Computer. The interface computer is in the control room where the operator can send commands to the engine, run tests and record data.
- Current Measurements:

- Engine Speed	- Corrected Power	- CO (PPM)
- RPM/sec	- Total Power	- O <sub>2</sub> (%)
- Exhaust Temperature	- BSFC	- Oil Pressure
- Block Temperature	- Efficiency	- Fuel Flow (gall/hr)
- Coolant Temperature	- NO (PPM)	- Total Fuel Flowed per Day
- Throttle Position	- NO <sub>2</sub> (PPM)	- Delivered Fuel Temp
- Total Torque	- NO <sub>x</sub> (PPM)	





- Exhaust System #1:
  - Designed to safely remove exhaust from inside the test facility. Is composed of a Mega-Flow Muffler and exhaust fan suspended above the engine. Additionally the Exhaust system is capable of measuring emissions using the ECOM RACK analyzer directly from the engine. This analyzer has the capacity to measure up to 6 gases, (O<sub>2</sub>, CO, NO, NO<sub>2</sub>, SO<sub>2</sub> and combustibles) with accuracy of  $\pm 2\%$ . The ECOM RACK analyzer also can provide a Smoke Test for analyzing the density of the emissions being produced.
- Exhaust System #2:
  - The second exhaust system is designed to test exhaust equipment efficiency. Incorporates the ECOM RACK analyzer as well as 6500iL In-Line Opacity Meter. This meter calculates the opacity of smoke emitted by a diesel engine (+/- 1%). With two attachment locations, it is possible to measure the exhaust directly from the engine as well as the exhaust after passing through an after-treatment device such as a catalytic converter.
- AHM System:
  - The Asset Health Management (AHM) system is used to monitor the overall health of vehicle systems. AHM can predict future failures for reduced operating costs and longer equipment life. The AHM system provides real time knowledge of the equipment health and minimizes the diagnosis time for component failures. This technology can be implemented on a wide range of vehicle applications. The AHM team can develop an application for your engine or support system.

## Two Cummins ISC 240 Engines:

- Cummins ISC 240 hp Engine
- Peak torque of 600lb-ft at 1300RPM and a governed speed of 2400RPM

## Current Research Charter

- The lab is configured around current Department of Transportation sponsored research into the durability, maintenance, efficiency and emissions of high blend ratios of biodiesel fuel.
  - Prior research has largely focused on low blend ratios – 20% and less. Our research will extend the knowledge base to blend ratios of 90% or more.
  - Further research is planned into engine wear, deposit formation and engine oil change intervals. The lab will also investigate engine performance, efficiency and emissions production at various blends and load/speed combinations.



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