CIMS Center for Integrated Manufacturing Studies
ROCHESTER INSTITUTE OF TECHNOLOGY

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Engine Dynamometer Laboratory Specifications

Engine Dynamometer:

- *Mustang MD-260 Water Cooled Eddy Current Dynamometer*
  - Capable of measuring up to 350 Hp and 1000 lb*ft of torque. The maximum engine speed is 6400 RPM.
  - Adjustable Engine Stand for a variety of sizes and models of diesel engines.
  - Dynamometer able to perform constant speed and/or torque tests accurately by being able to settle on a constant speed or torque more rapidly.
  - Also capable of a variety of tests that can simulate real-world operation by taking into account truck specifications such as weight, tire size and gear ratio.
  - Pre-Programmed Tests Include: Diesel Transient Emissions Test, FTP-75 Driving Cycle Test, Diesel Fuel Highway Cycle Test, Diesel Fuel Urban Cycle Test, and Engine Mapping Test.
  - Test Scripts can be custom made for any application and length of time. Currently the Engine operates on a 24+ hour custom test that is restarted daily.

Support Systems:

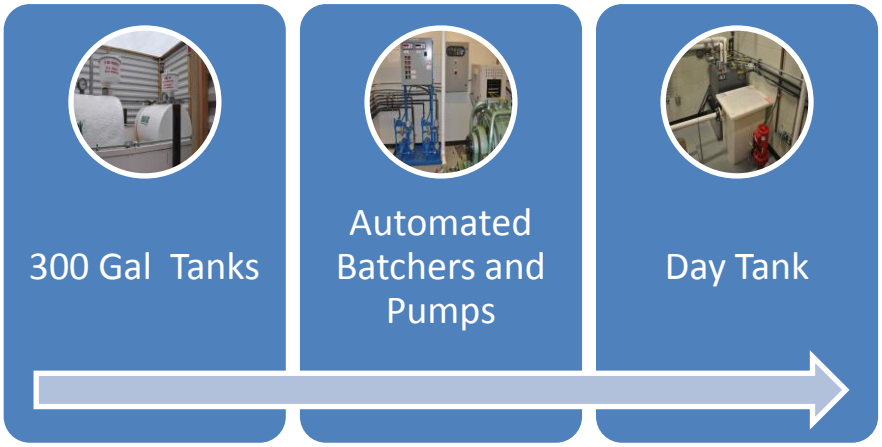
- *Coolant System* uses a tube heat exchanger that cools engine coolant with the chilled water system.
- *Exhaust System* – Two available systems:

  Exhaust System 1 - Designed to safely remove exhaust from inside the test facility. It is composed of a Mega-Flow Muffler and exhaust fan suspended above the engine.

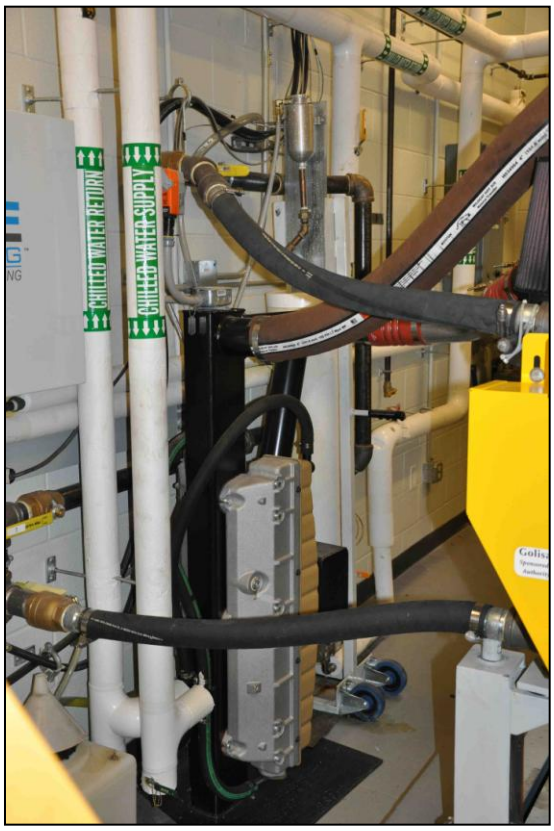
  Exhaust System 2 – Designed to have the ability to insert a catalyst or other exhaust system of the customer's choosing to either run alone or in parallel to Exhaust System 1.

- *Fuel System* utilizes a ***Batcher*** system that is able to automatically mix any blend of Diesel/Biodiesel from two (2) 300 gallon fuel tanks to a 45 gallon indoor Day Tank. The system will pump preset mixture into the day tank automatically once the system senses

the day tank is low. System also has the ability to hold fuel at a constant temperature for more consistent testing.

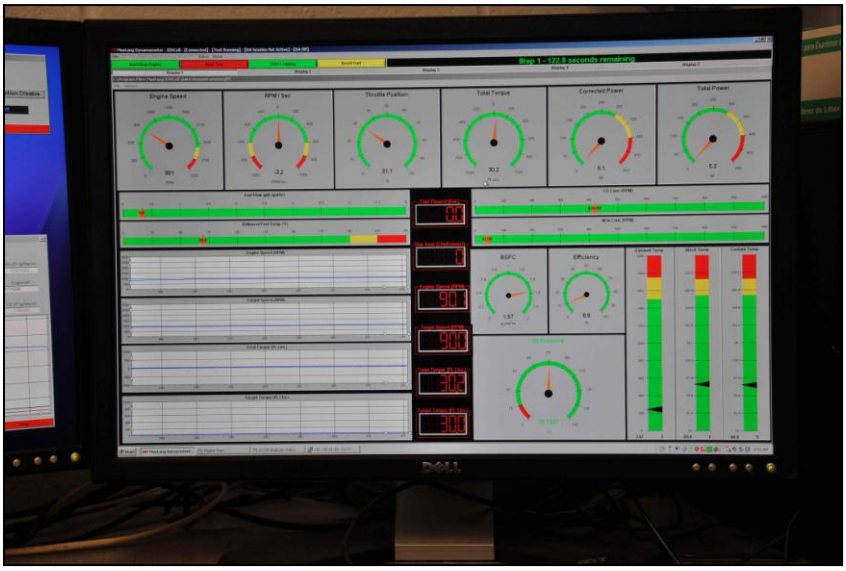


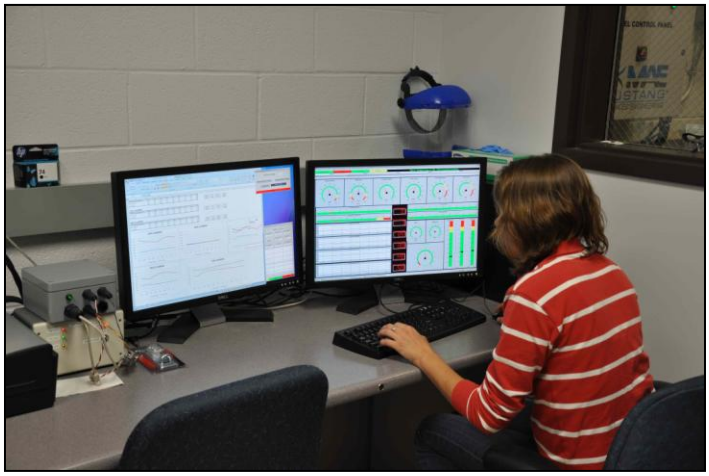
- *Charged Air Cooler* for all Forced Induction Engines removes adiabatic heat added by the compressor, keeping intake air charge at a constant temperature.



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.





- 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.

Data Acquisition System:

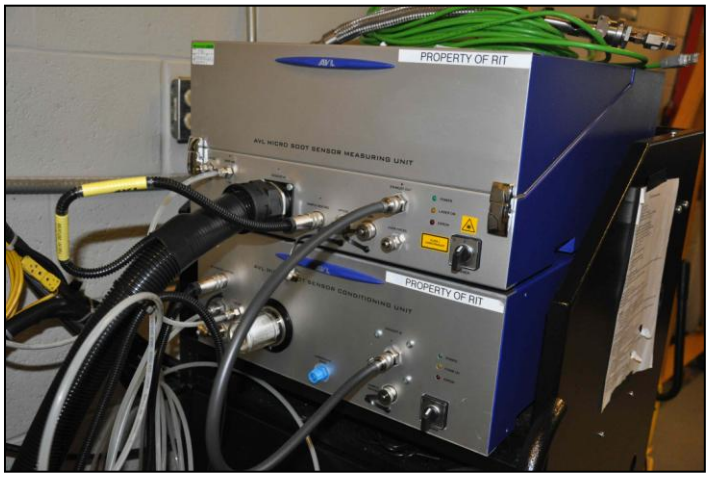
- Ethernet Based Data Acquisition Device communicates with the control computer. It has Relay Outputs, Digital Inputs and Outputs, Frequency Inputs, Analog Inputs and Outputs, and Thermocouple Modules.
    - Current Measured Channels:
        - Exhaust Temp
        - Exhaust Pressure (Before and After Exhaust System)
        - Block Temp
        - Fuel Temp
        - Oil Pressure
        - Fuel Flow Rate (gal/hr)
        - Output Torque
        - Engine Speed
        - Throttle Position
        - Laboratory Temperature
        - Laboratory Relative Humidity
        - Laboratory Barometric Pressure
    - Current Calculated Channels:
        - Engine Acceleration
        - Total Power
        - Corrected Power
        - Engine Efficiency
        - Brake Specific Fuel Consumption
        - Pressure drop across muffler
        - Pressure drop across alternate exhaust device
        - Additional calculated channels can be programmed as needed
    - Spare Channels:
        - 22 Thermocouple Channels

- 8 Channels configurable as Analog or Transducer inputs
- 7 Relay Outputs
- 7 Digital Inputs
- 7 Digital Outputs

- Data collection rates possible with the Mustang data acquisition system are on the order of a few hertz. Slightly higher rates can be achieved, but limit the length of test that can be completed.

Auxiliary Systems:

- ***AVL* Micro Soot meter:**
  - Measures soot content of exhaust gas.



- ***ECOM*** *AC-Plus Emissions Analyzer System*:
  - Measures engine emissions after the engine/before the exhaust system (or after a catalyst if requested) with accuracy of ±2%.
  - Measurements:
    - O_2
    - CO
    - CO_2
    - NO
    - NO_2
    - NO_x
    - C_xH_y
    - SO_2
  - Note: CO_2, CxHy and SO_2 are measured by the ECOM but cannot be transmitted to the Mustang Controller

- Asset Health Management System:
  - The CIMS Asset Health Management (AHM) system is used to record data available from standard engine controllers (such as J1939 or J1708/J1587 compatible controllers). The AHM system also captures all dyno data acquisition parameters in the same data base. Additional data can be collected and stored with this system given addition of the appropriate data acquisition devices.