OAK RIDGE NATIONAL LABORATORY
FUELS, ENGINES, AND EMISSIONS RESEARCH CENTER
A U.S. DEPARTMENT OF ENERGY NATIONAL USER FACILITY.

Engine Research Cell 2

Dynamometer:
DC, 150 Hp Absorbing, 140 Hp Motoring, 2000 RPM Base Speed, 6000 RPM Maximum Speed

Dyno and Throttle Controllers:
Dyn-Loc IV Dyno Control
DTC-1 Throttle Control

Data and Control System:
Dyne-Systems Companion with Cell-Assistant Software

- Temperatures (32 pre-wired)
- Pressures (16 pre-wired)
- 24 digital inputs/outputs
- 8 analog inputs, 8 analog outputs
- Timer/Counter Inputs

Fuel Control:
Day-tanks plus in-ground fuel feed for commonly-used fuels. Fuel flow measurement and handling using a positive-displacement fuel metering system.

Combustion Air Control:
Conditioned to maintain constant temperature and humidity with adjustable setpoint. (Maximum air flow is 2000 CFM.) Engine air flow measured with Meriam laminar-flow elements.

Emissions Instrumentation:
Micro-dilution tunnel for dilute samples including bags and filters.

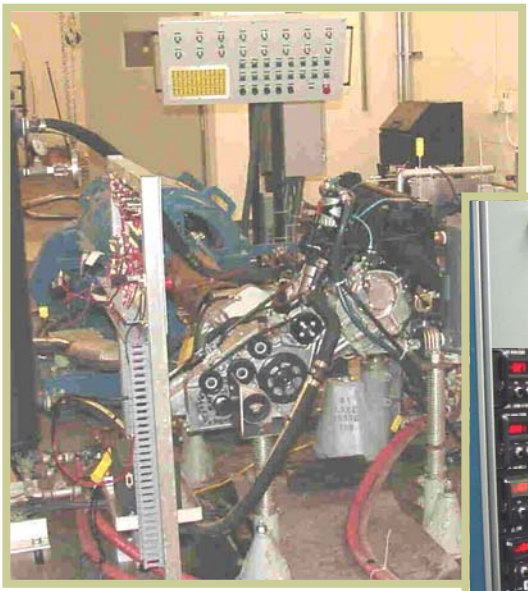
2 flow paths with conventional instruments:

- Heated Chemiluminescence (NO_X)
- Heated Flame Ionization (HCs)
- Non-dispersive Infrared (CO, CO_2)
- Paramagnetic (O_2)

ECM/NGK Air/Fuel Ratio Meters

Celesco Model 107 Smokemeter

More advanced instrumentation is included in a pool shared among engine cells. (FTIR, GC/MS, TEOM, SMPS, SO2/H_2S, etc.)



Currently Installed Engine:

Mercedes 1.7L Diesel controlled using a dSPACE®/Ricardo Rapid Development System (RDS) and MATLAB®/Simulink® block diagram coding. The base engine includes a Bosch common rail fuel injection system. This fuel system, coupled with the RDS, allows control over the number of fuel injection events per engine cycle, the duration and timing of each injection, and fuel rail pressure. In addition to the base engine hardware, an electronic intake throttle and electronic EGR control has been installed. We are currently adding an in-pipe fuel delivery system.

Current Projects:

This engine cell has been dedicated to Lean NOx Trap (LNT) research since its commissioning at the beginning of FY2002. The current project has focused on three objectives: (1) to characterize H_2, CO and HC's generated by the engine, (2) characterize candidate LNT's for performance and degradation, and (3) develop a stronger link between bench and full-scale system evaluations in order to be able to evaluate a new formulation on the bench and then predict how it will behave on an engine. This data is being provided through CLEERS to improve catalyst models. The most recent experiments have been performed using a MECA supplied DOC and LNT. This system was studied using three different fuels and two different NOx regeneration strategies. The results from this study can be found in SAE paper number 2004-01-3023.

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