



Dyno Tuning

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<http://www.lmengines.com>

Dyno testing

Dyno testing is only useful if the data obtained is accurate. The saying goes “Garbage in, garbage out”. To have value the attention to detail is critical. The same applies to engine design and building. Power gains are incremental, small changes adding up to large power gains.

The fact that power increases are small mandates that all phases of testing are controlled and repeatable

Dyno testing and tuning is a very cost effective method of capitalizing on the small incremental changes that lead to large power improvements.

Goal

The goal of dyno tuning is to optimize engine output from initial design

Summary

Dyno types

- Water brake
- Eddy current Brake
- Inertia wheel

Data acquisition

- Speed
- Accuracy
- Resolution

Data manipulation

- Corrects output from
 - Sensors
 - Transducers
 - Turbines
 - Load cell
- Corrects for weather conditions
 - Barometer
 - Temperature
 - Vapor pressure
- Calculates output using corrected data for
 - Standard horsepower
 - Corrected horsepower
 - SAE Horsepower
- Presents output in a format that is usable by engine designer



The engine dynamometer used at L&M Engines is a Superflow SF 901

Dyno testing myths and misconceptions

Can't do

- Interpret data
- Most cannot simulate drivability
- Some are able to perform acceleration
- Operator and analyzer

Can do

- Obtain torque
- Acquire data - torque, temps, pressure, flow, etc.
- Fuel Regulators

Dyno setup

Set safeties

- Rpm limit
- Oil pressure, maximum and minimum
- Fuel pressure

Prestart

Check

- Fuel pressure
- Fuel leaks
- Throttle opening
- Cooling tower

Initial start up

Monitor

- Temperatures
 - Water
 - Oil
 - Exhaust
- Air – Fuel Ratio



Fuel Pump & Filter

Break In

- Set timing
- Set load on engine
- Set appropriate throttle setting
- Run until temps stabilize
- Shutdown

Post break in

- Inspect for oil or coolant leaks
- Check and set valve lash
- Verify fluid levels
- Rough in ignition timing and air/fuel ratio

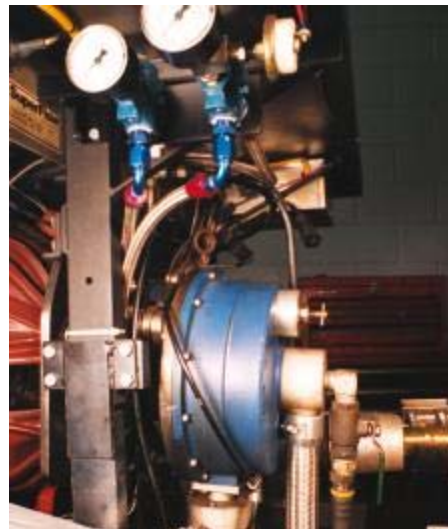
Controls & parameters for testing

Calibrate dyno

- Repeatability
- Carburetor air temperature
- Water temperature in and out
- Oil temperature
- Weather factors
- Fuel totalizers
- Airflow turbines
- Load cell
- Exhaust Gas temperature

Testing

- Verify safety limits
- Set Torque absorber capacity
- Set upper test speed limits
- Set up test program
- Conduct initial pulls
- Observe for any changes or fluctuations
- Monitor data for stability



Load Cell & Torque Absorber

Formulate plan

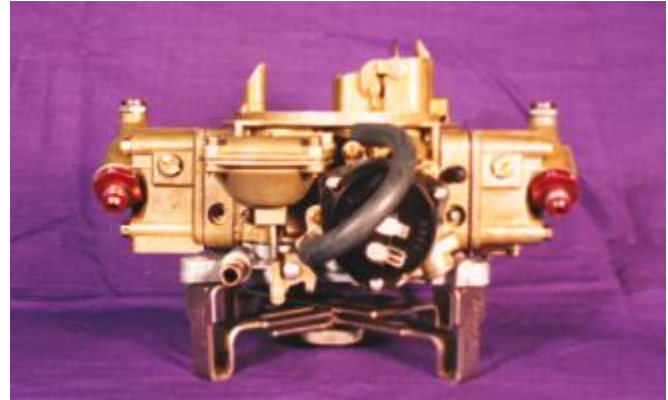
Identify consumption efficiencies

- Present good and bad examples
- BSAC, good 5.00
- BSFC, good 0.50

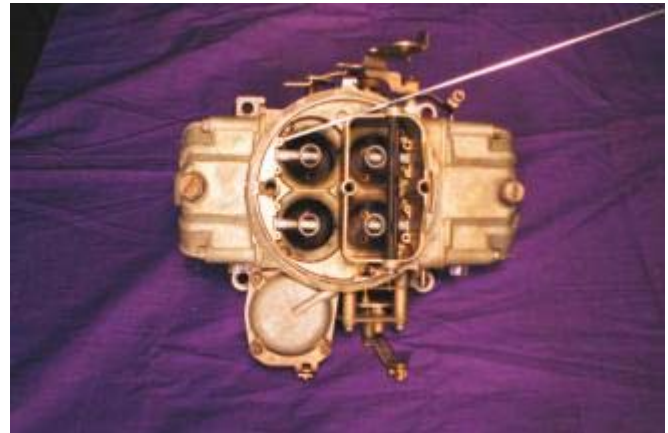
Execute plan

Plan examples

- Rocker change
- Carb change
- Carb mods
 - Air bleeds
 - Jets
 - Power valve
- Cam timing change



Holley Vacuum Secondary Diaphragm



Secondary Air Bleed

Analyze and develop plan to address inefficiencies

Examples

- Fuel map
- Ignition timing
- Valve events
- Spark plugs
- Use modeling programs

Detonation

Detonation must be avoided at all costs. The ability to recognize detonation is a skill that must be obtained by the operator and engine designer.

Detonation is the most destructive phenomenon in the combustion process.

Detonation has to be under control.

Final operations in vehicle

- Spark plug reading is mandatory
- Ignition timing
- Spark plug selection
- Fuel metering