

IC Engine Testing

Dr. Md. Zahurul Haq

Professor
Department of Mechanical Engineering
Bangladesh University of Engineering & Technology (BUET)
Dhaka-1000, Bangladesh

zahurul@me.buet.ac.bd
<http://zahurul.buet.ac.bd/>

ME 417: Internal Combustion Engines

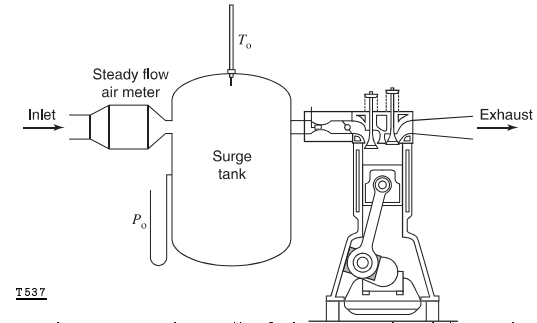
<http://zahurul.buet.ac.bd/ME417/>



Measurement of Air-Flow Rate

Steady-flow air meter:

- ASME Orifice
- Laminar Flow Meter
- Critical Flow Nozzle
- Turbine Meter
- Hot Wire Meter

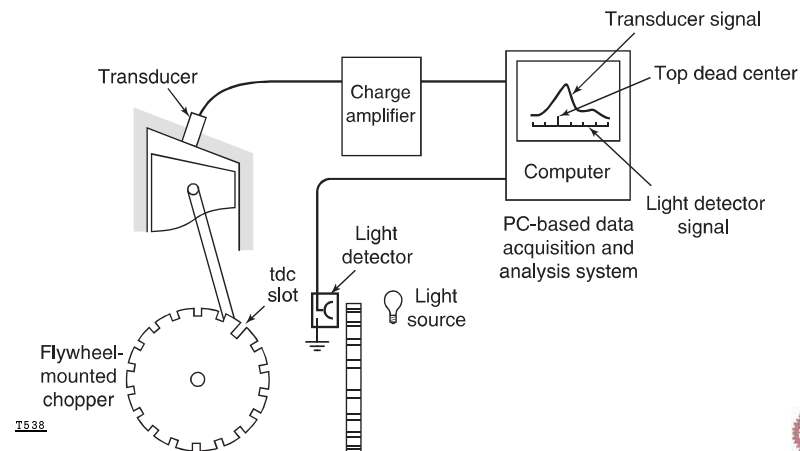


T537

Airflow in the engine is unsteady or periodic. All of the air to be delivered to the engine is metered by a steady-state airflow meter located upstream of a surge tank. The volume of the surge tank be at least about 250 times the displacement volume of the engine.



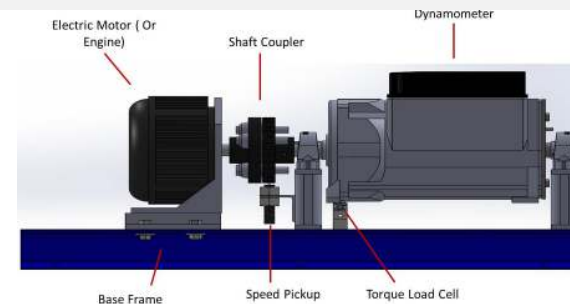
Measurement of In-Cylinder Pressure



T538



Engine Dynamometer for Measuring Engine Power



T941

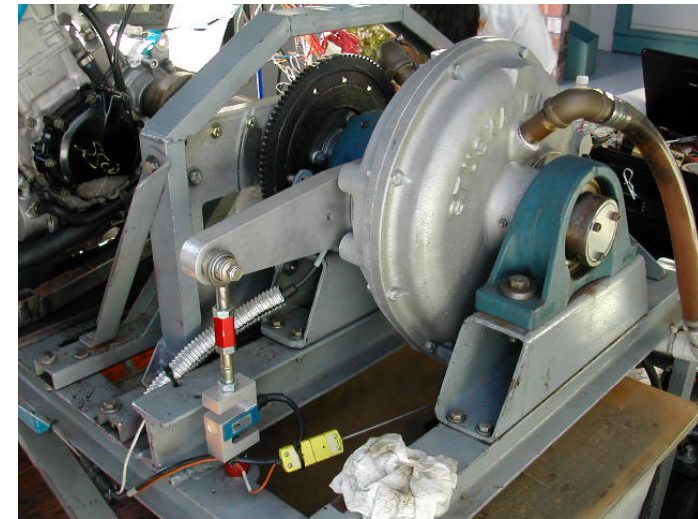
Dynamometer is an instrument to measure engine power, and it must have the following elements:

- 1 A means for controlling torque
- 2 A means for measuring torque
- 3 A means for measuring engine speed
- 4 A means for dissipating the power.



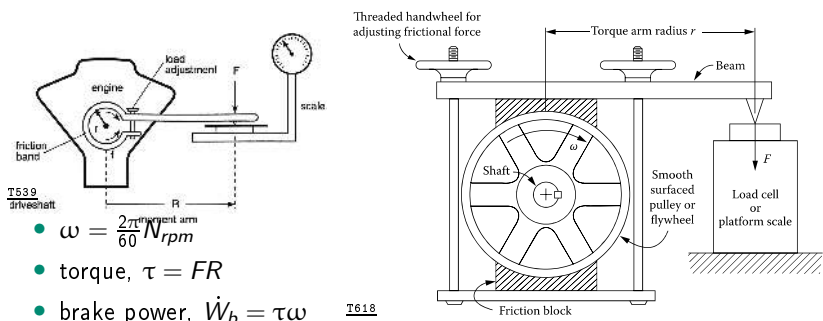
Dynamometer Types

- Absorption Dynamometer:** are widely used to measure engine power; and engine power is dissipated to heat in such devices.
 - Mechanical dynamometer:** depends of dry friction to convert mechanical power into heat, e.g. Prony brake.
 - Hydraulic dynamometer:** uses fluid friction for dissipating mechanical power.
 - Eddy-current dynamometer:** requires an electrically conductive core, shaft, or disc moving across a magnetic field to produce resistance to movement.
 - Alternating Current and DC Generators:** Cradled AC and DC machines are employed as power absorbing elements in dynamometers. The power produced in such dynamometers may be dissipated as thermal energy using resistive loads.
- Transmission Dynamometer:** passive devices placed at appropriate location within a machine or between the machines, simply for the sensing of the torque at that location.

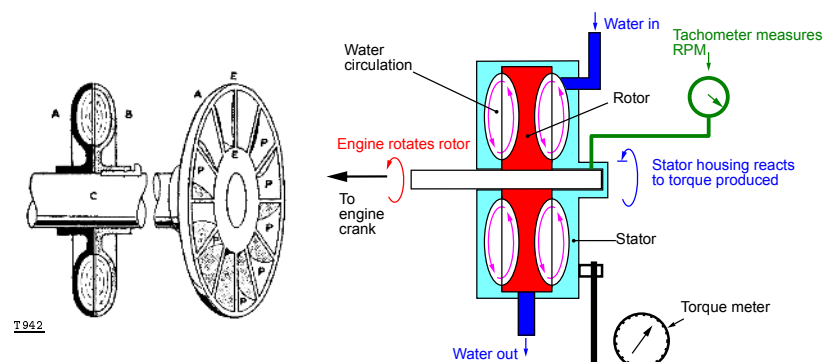


T939

Mechanical Dynamometer



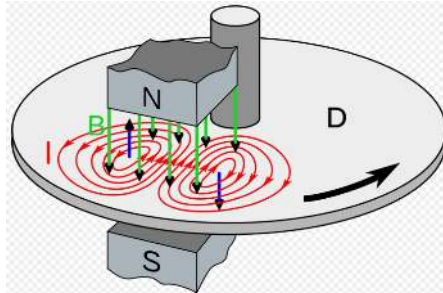
Hydraulic Dynamometer



T942

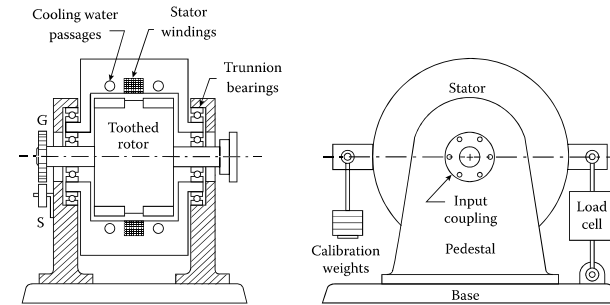
Viscous shear type brake is useful for high speeds, & agitator type unit is used over a range of speeds and loads. Water brakes may be employed for applications up to 7450 kW. The load absorbed by water brakes can be adjusted using water level & flow rates in the brake.

Eddy Current Dynamometer



T943

An eddy current brake consists of a conductive piece of metal, either a straight bar or a disk, which moves through the magnetic field of a magnet, either a permanent magnet or an electromagnet. When it moves past the stationary magnet, the magnet exerts a drag force on the metal which opposes its motion, due to circular electric currents called eddy currents induced in the metal by the magnetic field.



T911

The following are the main advantages of eddy current dynamometers:

- High brake power per unit weight of dynamometer.
- They offer the highest ratio of constant power speed range.
- Level of field excitation is below 1% of total power being handled by dynamometer, thus, they are easy to control and operate.
- Development of eddy current is smooth hence the torque is also smooth and continuous under all conditions.
- Relatively higher torque under low speed conditions.



Chasis Dynamometer

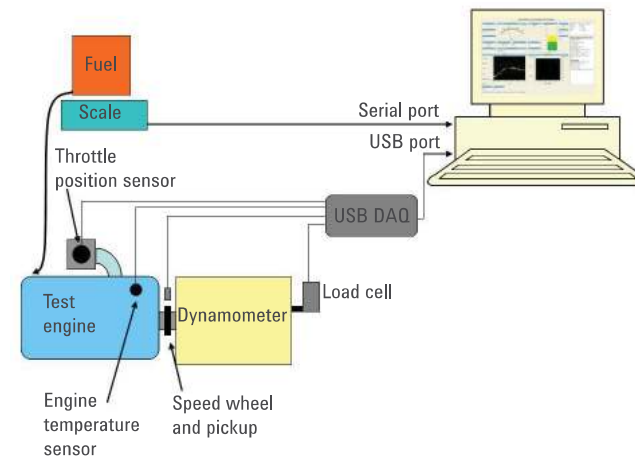


T542



Engine Test-Bench

Integrated Engine Testing



T540



