

Prony Brake dynamometers:-

(i) Block type dynamometer

(ii) Band " "

(i) Block Type dynamometer:

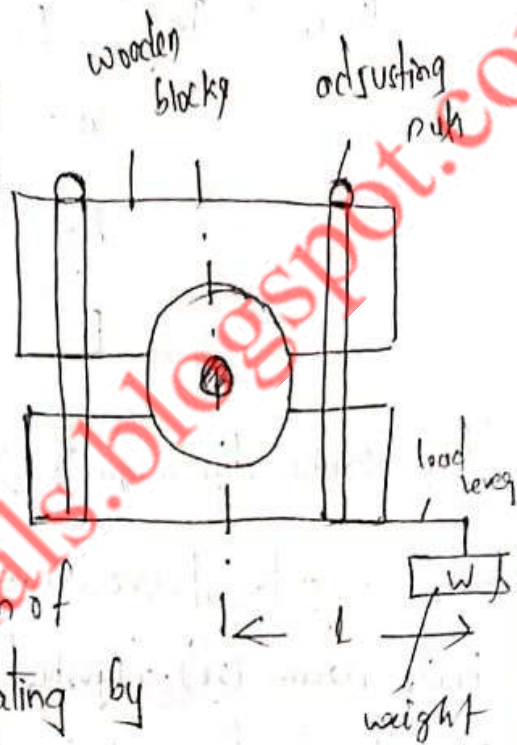
→ It consists of 2- wooden blocks
These carries a lever arm to end
which load will be applied

→ when operate friction b/w the
blocks and the pulley tends to
rotate the blocks in the direction of

rotating shaft. which is compensating by

Torque due to applied load is

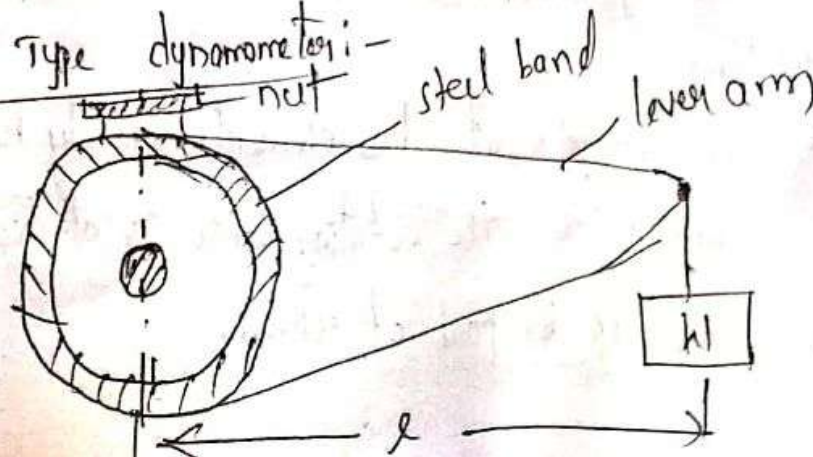
→ the power observed by these type of dynamometers is
independent of the size of block & brakes



$$T = W \times l$$

$$P = \frac{2\pi NT}{60} = \frac{2\pi N W l}{60}$$

(ii) Band Type dynamometer:-



→ It consists of an adjustable steel band to which a fastened (screw arrangement) blocks which are in contact with engine brake drum

→ frictional grip b/w band and brake drum can be adjusted by tightening & loosening the clamps (adjusting)

frictional Torque $T = w \times l$

w - load applied

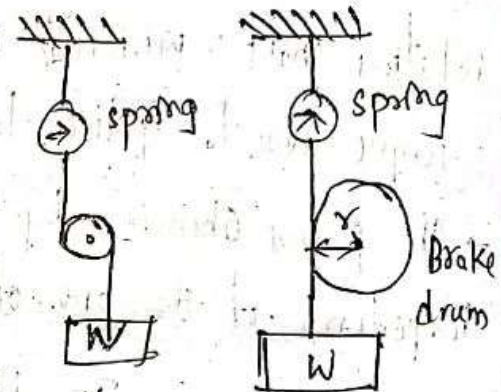
l - length of arm

$$P = \frac{2\pi NT}{60} = \frac{2\pi NwL}{60}$$

Rope Brake dynamometer

→ It consists of one (or) more ropes wrapped around brake drum (or) flywheel

upward end of rope is connected to spring balance downward end is connected to dead weight



Hydraulic dynamometer

→ Hydraulic dynamometers use fluid friction rather than dry friction

→ The unit consists of two elements namely rotating disc and stationary case. The rotating disc is attached to engine shaft which is in pool of fluid.

Brake power

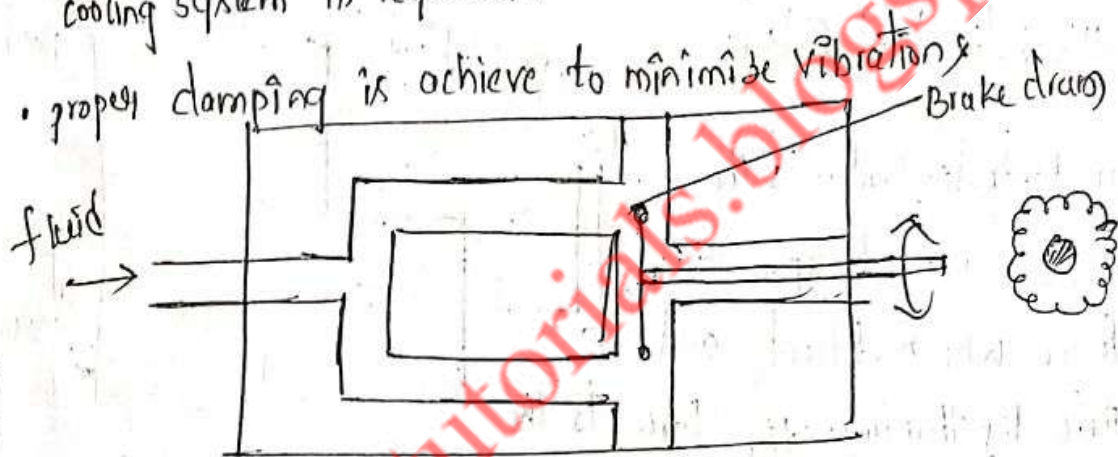
$$P = \frac{W \cdot N}{K}$$

Where W - fluid pressure (or) fluid load

N - No. of revolutions per min.

K - dynamometer constant

- hydraulic dynamometers has the following advantages
- high absorption capacity in a small space at low cost
- constant fluid supply provides cooling effect, no additional cooling system is required.
- proper damping is achieved to minimize vibrations



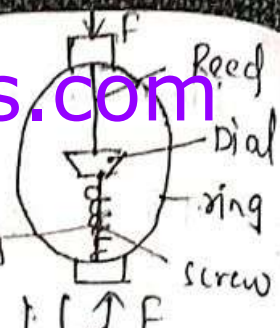
measurement of force:-

- pivot ring (force ring)
- mechanical load cells
- Hydraulic load cells
- strain gauge load cells

Stress ring [mechanical load cells] pivot ring

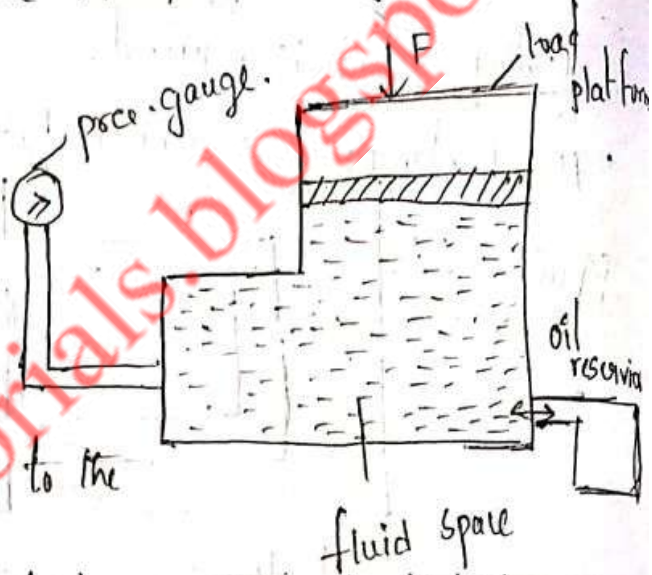
- stress ring is a ring of known physical dimensions and mechanical properties [dia of ring, ultimate strength of ring]

- When an external compressive load is applied to the external surface of ring that results in change its diameter. proportional to applied force F
- the micrometer screw and read are attached to the internal surface of the ring
- dial is used to read the calibrated force is applied
- the device gives precise results for change in temperature



Hydraulic load cells

- In hydraulic load cells the force impressed upon dia. frame which deflects and there by transmit the force to the liquid



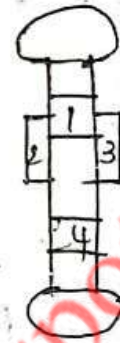
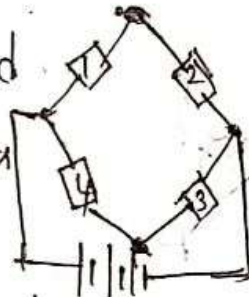
- The liquid medium has confined space, here applied force is proportional to liquid pressure
- The force is directly calibrated on pressure gauge the system has good dynamic response measures load up to 2.5 Mnewtons with accuracy of 0.1%.

Strain Gauge load cells

- The strain gauge load cell converts force (or) weight into an electrical out put.

→ This is achieved by group of strain gauges. A simple load cell consists of a steel cylinder which has 4-identical strain gauges are mounted upon it 2 gauges are along direction of load and other 2-gauges are circumferential to the cylinder i.e. $\perp$ to previous ones

→ The 4-gauges are connected to electrically to the 4- limbs of Wheatstone bridge when there is no load on the coil the 4-gauges has same resistance when load is applied the vertical gauges (2,3) are under goes compression and other two gauges (1,4) are undergoes tension i.e., resistance of gauges (2,3) is decreasing in nature, (1,4) are increase in nature.

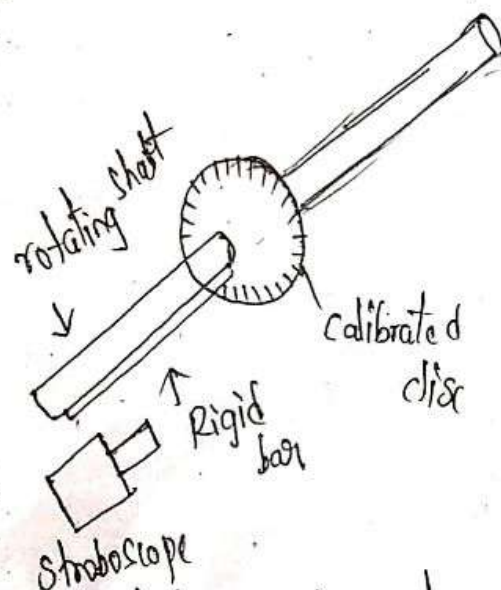


Mechanical Torsion meter:

→ An elastic Torsion bar meter where in the angular deflection of shaft will be measured.

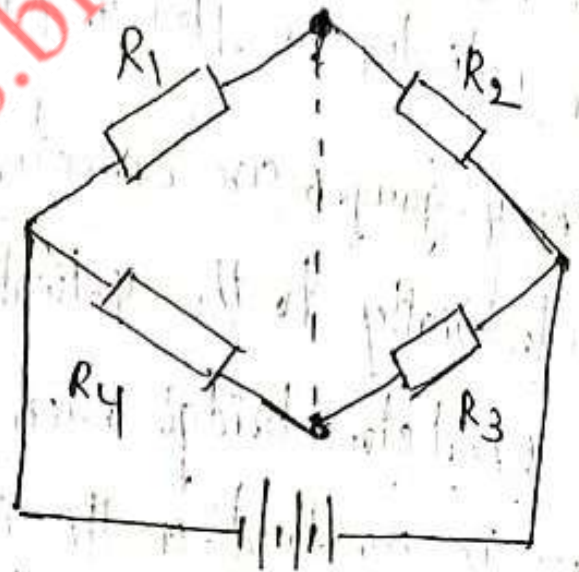
the angular deflection results significant change in Torsion of bar.

the angular twist over fixed length of bar is observed on calibrated disc



The stroboscope viewing the precision measure of twist
the system views a varying angle of vision of twist
shaft and driven shaft

strain gauge torsion meter:-



A general