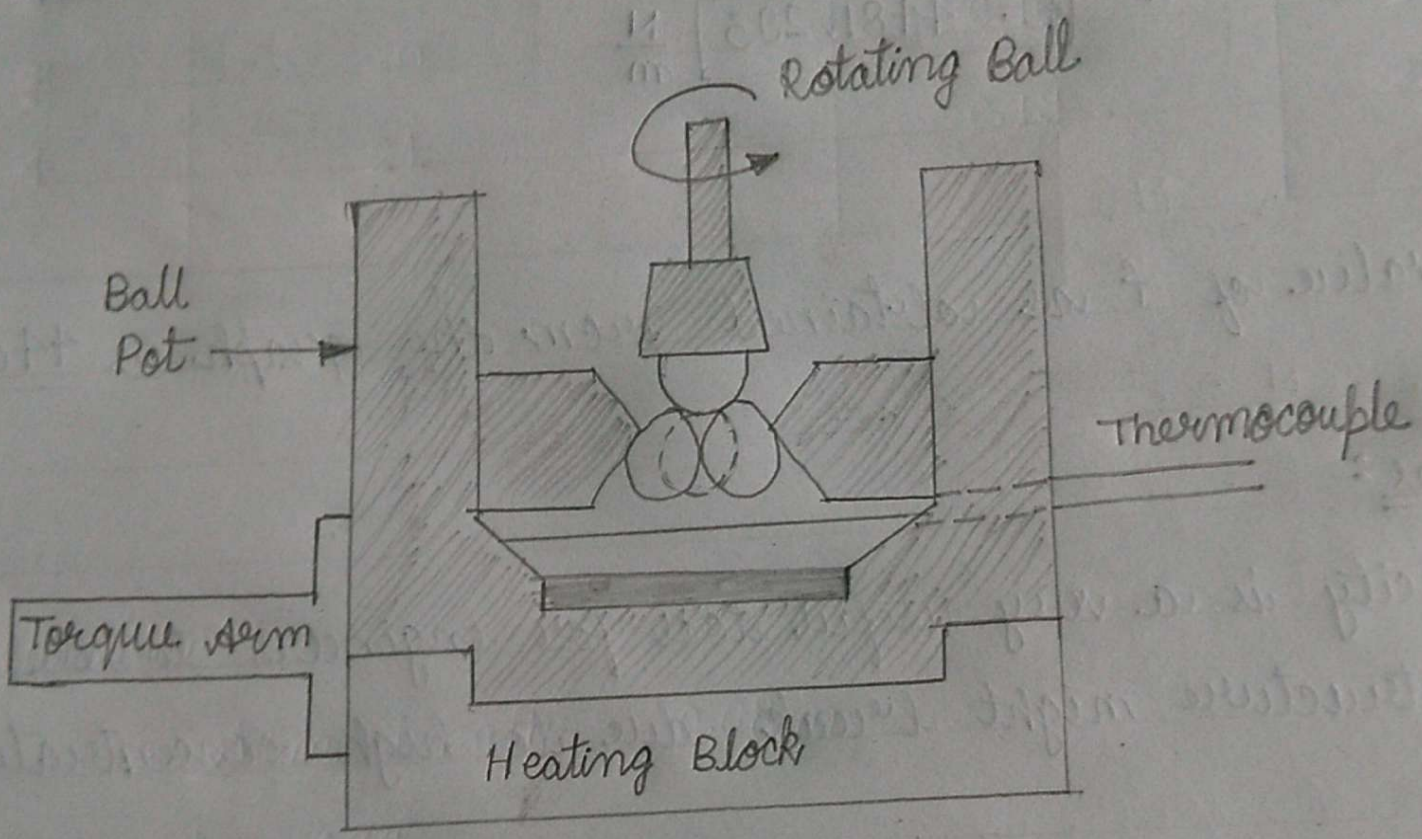


FOUR BALL TESTER

DATE
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# SCAR DIAMETER STUDY IN FOUR BALL TESTER

**Aim of the experiment:** To determine the wear preventive characteristics of lubricant oil in sliding steel on steel application. It is not intended to predict wear characteristics with metal combination other than steel on steel.

**Apparatus:**
- Four Ball Tester (Model - TR-30L)
- Microscope.

**Theory:** The four ball wear test valuates the protection provided by engine oil under different conditions of pressure, temperature and sliding motion. The size of scar left on fourth ball as a result of test determines the amount of wear protection the lubricant provides. The smaller the wear scar, the better the protection. The four ball test puts one rotating ball against three fixed balls in ball pot. The test is used to control the wear and tear ability of lubricating oil.

Light loads are applied for wear test producing a circular wear scar on each ball and average wear scar diameter is determined and plotted against frictional force.

**Procedure:**

◉ Observations:

Least count of Microscope = 1um

RPM: 1200 Time: 60s

| LOAD (kg) | SCAR DIAMETER (um) | FRICTIONAL TORQUE (Nm) | FRICTIONAL FORCE (N) |
|---|---|---|---|
| 2 | 14 | 0.11 | 1.315 |
| 3 | 20 | 0.15 | 1.875 |
| 4 | 21 | 0.19 | 2.375 |

◉ Calculations:

Arm length = 0.08m

• For 2 kg load,

$$\text{Frictional force (N)} = \frac{\text{Frictional Torque (Nm)}}{\text{Arm length (m)}}$$

$$\therefore F = \frac{0.11}{0.08} = 1.375\ N$$

• For 3 kg load,

$$F = \frac{0.15}{0.08} = 1.875N$$

• For 4 kg load,

$$F = \frac{0.19}{0.08} = 2.375$$

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1) Cleaned the steel balls with acetone properly and dried them
2) Putted the three balls in the ball pot and locked it under a torque of 70 Nm using a torque wrench.
3) Now fixed the fourth ball into the drive shaft.
4) Poured test lubricant into ball pot and then placed it into the machine.
5) Temperature of test lubricant is monitored and controlled by connecting heating apparatus.
6) checked the apparatus if it is locked and putted the loads.
7) setted the times to 1 minutes and waited till the temperature reached a certain value.
8) Now started the machine and took the readings for frictional torque.
9) Took out fourth ball and measured the scar diameter from one of the three fixed balls.
10) Repeated above procedure for different loads.

## Results and discussions:

- The graph between scar diameter and load; theoretically scar diameter should increase as load increases.
- The applied load Vs frictional force graph is linear.
- We applied lubricant to reduce the frictional force between balls.

Relevant graphs on Next Page →

# FRICTIONAL FORCE Vs LOAD

SCALE : On X axis, 1 cm = 0.5 kg
On Y axis, 1 cm = 0.2 N