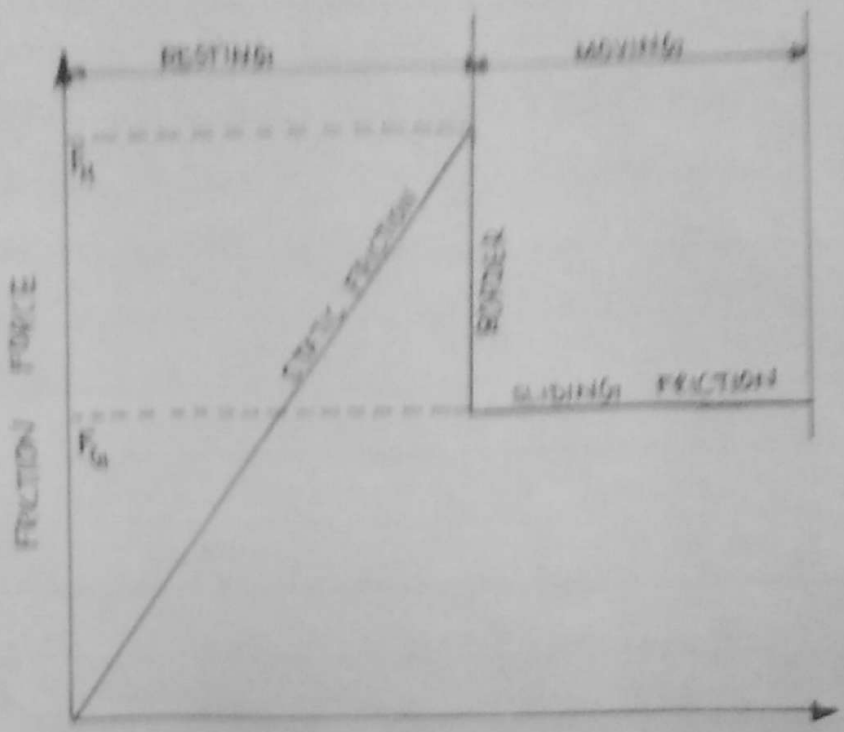

FRICTION DIAGRAM

STATIC AND SLIDING FRICTION

DETERMINATION OF COEFFICIENT OF FRICTION THROUGH STICK-SLIP METHOD

Aim: Determination of friction (Dry and lubricated) through slip stick method.

Theory: Friction is the contact resistance of an object against the force of motion. A distinction is made between static friction (friction at impending motion) and kinetic friction (friction during motion). If an object does not move under application of a force, this means that static friction is present. The object remains stationary until the force reaches a limiting value, whereupon the object will then begin to slide as shown. static friction is calculated on the basis of the following formula:

$$F_H = \mu_S N$$

If the object begins to slide, F_H will fall to F_G. Sliding friction is calculated as follows:

$$F_G = \mu_K N$$

Procedure: (1) Placed weights on the rotating disc.

(2) Adjusted the speed using speed controller in the control panel.

(3) Observed the disc motion. Recorded value at which the

- **Observation Table:**

→ Without Lubricant

SL. No.	SPEED / LOAD	15 rpm		20 rpm		25 rpm	
		Static (N)	Kinetic (N)	Static (N)	Kinetic (N)	Static (N)	Kinetic (N)
1	5 N	2.45	2.35	2.45	2.40	2.50	2.40
2	10 N	3.05	3.05	3.30	3.20	3.70	3.60
3	15 N	5.15	2.55	5.05	4.00	5.50	2.80

→ With Lubricant

SL. No.	SPEED / LOAD	15 rpm		20 rpm		25 rpm	
		Static (N)	Kinetic (N)	Static (N)	Kinetic (N)	Static (N)	Kinetic (N)
1	5 N	2.65	2.30	2.65	2.45	2.90	2.80
2	10 N	3.35	3.05	3.35	3.05	3.30	3.15
3	15 N	5.90	2.40	6.70	3.65	6.70	2.45

- **Calculations:**

→ Without Lubricant (μ values)

SL. No.	SPEED / LOAD	15 rpm		20 rpm		25 rpm	
		μ_s	μ_k	μ_s	μ_k	μ_s	μ_k
1	5 N	0.49	0.47	0.49	0.48	0.5	0.48
2	10 N	0.305	0.305	0.33	0.32	0.37	0.36
3	15 N	0.343	0.17	0.336	0.267	0.367	0.187

We have, $F_H = \mu_s N$

$\Rightarrow \mu_s = F_H / N = \frac{2.45}{5} = 0.49$

$F_G = \mu_k N$

$\Rightarrow \mu_k = \frac{F_G}{N} = \frac{2.35}{5} \approx 0.47$

Similarly, other readings are calculated

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disc is pulled back by the spring force, also recorded the value during rotating motion of disc

4) Repeated several times in order to exclude the possibility of measurement errors

5) Increased load or speed and repeated.

- **Discussions:**

1) From the table it is clearly seen that static friction is higher than the kinematic friction.

2) Dynamic friction decreases with application of lubricant by elimination of contact resistance.

3) By increasing load, the coefficient of dynamic friction decreased.

4) The coefficient of static and kinematic friction changes with speed.

- **Result:** The coefficients of dynamic friction decreases with application of lubricants.

Relevant Graphs on Next Page

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