Effect of Adequate Pressure on Motor Brake For Time

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Abstract- *Brakes are one of the most important safety appliances. In this study, asbestos-free brake pads were studied for braking efficiency. Investment in new production techniques and design technology has enabled to lead high quality brake liner.Higher demands on safety has become stringent for requirements on the new braking pad composition. An attempt is made through this project to incorporate braking time.*

Keywords- Quenching agents, Brake pads. fail-to-safe, impeccable(keywords)

I. INTRODUCTION

The brakes are used to control speed by converting kinetic energy to heat and this heat is then degenerate to atmosphere. A common understanding about brakes is that brakes squeeze against a drum or disc, and the pressure of the squeezing action slows the motion. It should be highly unaffected to wear and has outstanding thermal conductivity, so as to get consistent performance. It is obvious that efficient design of braking systems is to reduce accidents. The brake disc withstands a large number of braking operations and is sensitive to pressure applied by pads, surface hardness of pads, temperature generated on pads, surface roughness, moisture and oil absorption capacity & load on liner. The brake linings having a longer life span and potential can reduce “brake fade” problem. In this study, the brake lining is made from asbestos-free material .The abrasives proportion used in brake friction material depends upon surface hardness and stickiness and other quenching agents. The lining must be capable of persisting high temperatures without excessive wear, subsequently the lining is the portion of the braking system which transforms the vehicle's kinetic energy into heat.

Brake linings are manufactured of a moderately soft but tough and temperature-resistant material with a high factorof dynamic friction naturally mounted to a solid metal support using high-heat adhesives or rivets. The complete assembly together with lining and support is then frequently called a brake pad or brake shoe. These pads are of two categories commercial and racing.The friction coefficient "μ" for commercial brake pads is usually in the low range. The friction coefficient "μ" for racing pads is high range with excellent high-temperature behavior.

II. MOTOR BRAKE

Brake motors provide the means of slowing or stopping the driven equipment effectively and safety in a short time period. The brakes are single disc type, fixed on the non-drive end of the motor. They are spring applied electrically released units, which provide fail-to-safe operating features such that on distraction, or failure of the power supply, the brake will engage and arrest the load.

The common frames used in industrial application with motor diagram is as follows:

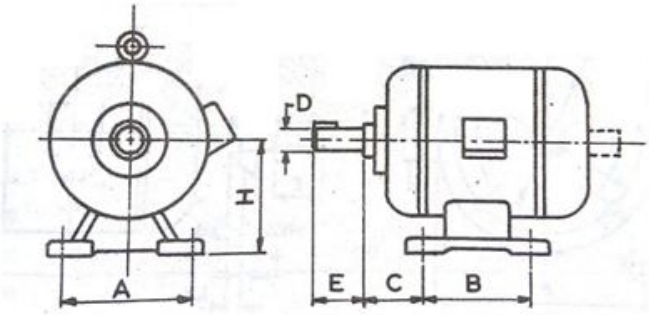


Fig 1 Foot Mounted Motors [12]

Table 1 Frame Details [12]

Frame No	H	A	B	C	D	E
71	71	112	90	45	14j6	30
80	80	125	100	50	19j6	40
90	90	140	100	56	24j6	50
100	100	160	140	63	28j6	60
112	112	190	140	70	28j6	60

III. MODES OF OPERATION

Braking is done on various modes. These are dependent on the application and braking necessities so that the selected brake should meet the application requirements.

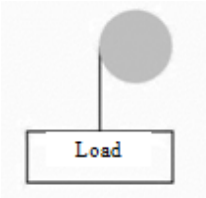


Fig 2 Holding [1]

Holding:

A. Thisapproach is where the brake is used to grip the fixed load as shown in Fig 2.

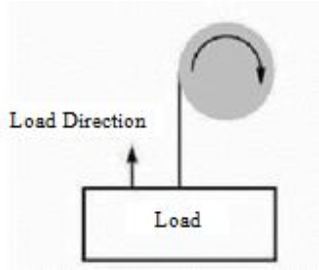


Fig 3Load assisted braking [1]

Load assisted braking:

B. This braking mode is where the load is supporting the braking action as shown in Fig 3.

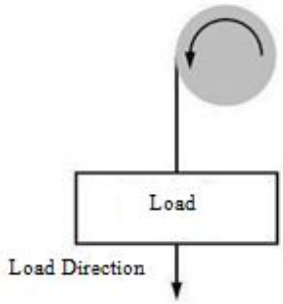


Fig 4Over hauling braking [1]

Over l Load Direction

C. This braking mode is where the load is acting in contradiction of the braking action as shown in Fig 4.

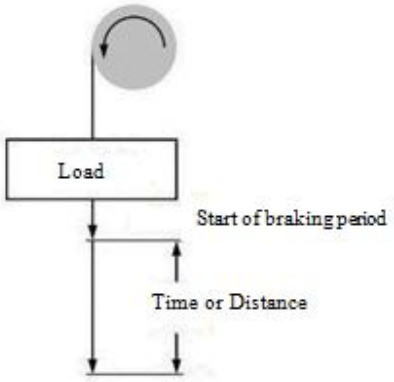


Fig 5 Soft stop braking [1]

IV. METHODOLOGY

The brake liners were tested on a setup, for pressure applied, temperature treatment on liner and surface hardness, temperature generated on liner surface.

Pressure Applied:

The brake liner efficiency depends upon the pressure applied by the liner to friction disc. The pressure should be in such a way that it should be maximum at actual work but should be jerk free. This pressure can be found by performing test at various pressures. The test results were noted and plotted for study purpose.Friction pads are especially used in such brake systems in order to absorb the kinetic energy of a machine. Friction is greatly affected by pressure applied. Therefore, research is conducted on generating the braking force by using pneumatic force. However, pressure development needs to improvement in efficient braking.

Surface hardness:

The surface hardness can be varied by temperature treatment on liner. This hardness can be determined by the Shore D Hardness tester.

The pneumatic pressure is supplied by compressor, which is measured by pressure controller on compressor and setup. This pressure can be brought in working condition by On/Off Knob. The brake liner disc is mounted on brake disc holder. Motor drives the Driven pulley and this transmits power to Braking Disc. The brake is applied on braking disc and the stopping time is recorded.Brake liner was tested on following setup:

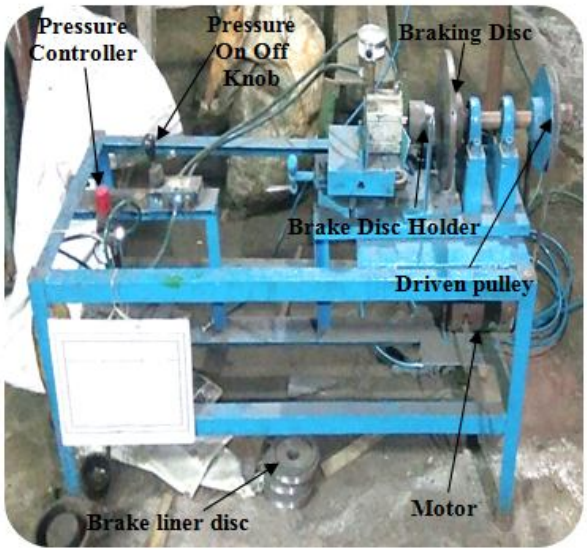


Fig 6 Set up for Brake Liner testing [10]

Fig 7 Brake Liner Disc [10]

V. MATERIAL CONSTITUENTS

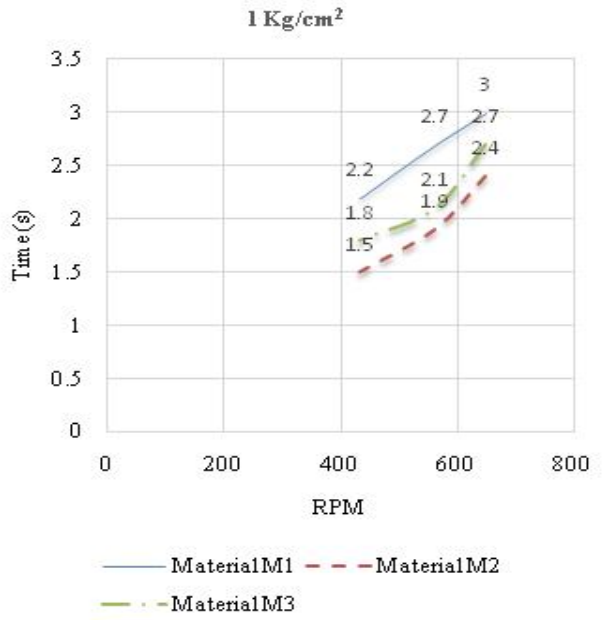
The major constituents of materialsare Rubber, Wool, Metal fines, Various Resins, Slag and quenching agents. Among these material Resin &Slag are the most important constituents which determine properties of brake material. In present study two different material where created by adding percentage of Resin and Slag named as M2 & M3, where M1 is the present material used in company. Due to copyright of reference industry actual configuration is not disclosed in current work, but can be found out by contacting reference no 10.

VI. TEST RESULTS

The three varieties of material were tested with specific rpm, pressure and time required to stop was noted for 71 frame size. All the observations are formulated in a table. The table and graphs are as follows:

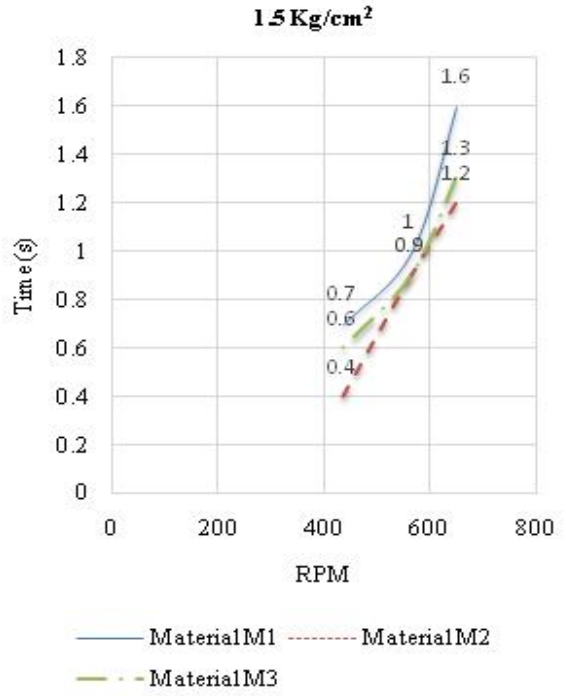
Table 2 Observation Table.

Pressure Kg/cm^2	rpm	Time (Sec)		
		M1	M2	M3
1	648.9	3	2.4	2.7
1	562.3	2.7	1.9	2.1
1	433.3	2.2	1.5	1.8
1.5	648.9	1.6	1.2	1.3
1.5	562.3	1	0.9	0.9
1.5	433.3	0.7	0.4	0.6
2	648.9	1.1	0.9	1
2	562.3	0.8	0.7	0.8
2	433.3	0.3	0.2	0.3



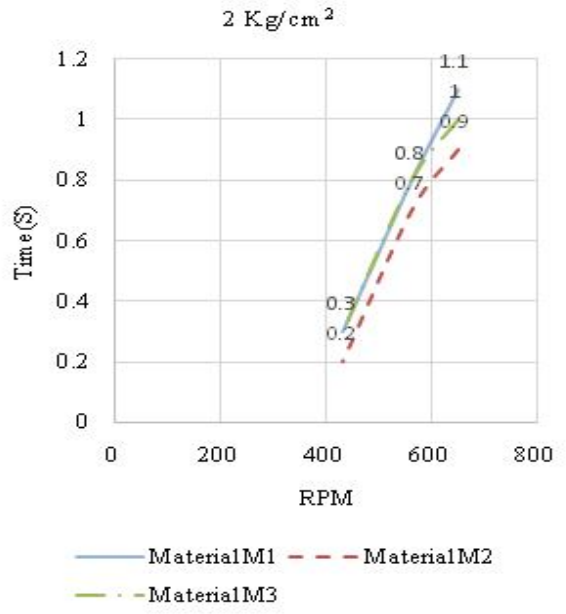
Graph 1: Time vs. rpm at 1 kg/cm^2 for 3 material

This graph shows that material M1 stopping time is linear but greater than M2& M3.The material M2 is effective material.



Graph 2: Time vs. rpm at 1.5 kg/cm^2 for 3 material

This graph shows that material M1 stopping time is parabolic but greater than M2 & M3. The material M2 is nominal material.



Graph 3: Time vs. rpm at 2 kg/cm^2 for 3 material

This graph shows that material M1 and M3 stopping time is almost same but greater than M2.

VII. CONCLUSION

From this study it was observed that Material M2 is the impeccablematerial at all pressure for 71 frame size.The material efficiency can be stated as M2 > M3> M1. The results showed good performance due to which the vendor gave approval to M2 material.This study shows proportion of Resin is inversely proportional stopping time with same hardness. The stopping time is more effective when the Slag is mixed with Resin.

Future SCOPE: Thematerial can be further improved and checked for heavy application such as EOT and marine works. The material used are most durable compared to the available brake material in the marketwhich can be further developed by improving the quenching agent and temperature treatment.

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