International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 3 Issue 8 ǁ Aug. 2015 ǁ PP.66-69

Analysis of Temperature Effect in Friction Product

Jain Tony B [1], Bhagyashree Panda [2], Sanjib Kumar Das [3]
(1). Department of Mechanical Engineering, NM Institute of Engineering and Technology,Bhubaneswar , Odisha
(2). Department of Mechanical Engineering,Aryan Institute of Engineering and Technology Bhubnaeswar , Odisha
(3). Department of Mechanical Engineering,Capital Engineering College,Bhubaneswar,Odisha

ABSTRACT- *The friction industries was developing the different quality of brake lining and brake pads each with their own unique composition, still now performing the very same task and claiming to be better than others. As a result, the automotive brake friction material based on continuous research replace the asbestos step by step and the brake friction product market was moving to the asbestos free material. This experiment work to verify the thermal effect in friction material. The specimens prepared from aftermarket commercial vehicle brake lining. The samples are Non Asbestos Organic category.*
Index terms- *Brake; Automotive brake friction materials; brake pads; brake shoes; braking; brake lining;*

I. INTRODUCTION

The friction industries was developing the different quality of brake lining and brake pads, each with different composition of Resin,filler and abrasive material,yet performing the very same task of performance and wear to be better than others.This investication explain about temperature effect in brake lining(Figure.1).


Figure:1


Figure:2

A drum brake (Figure:2) is a brake that uses friction material caused by a set of shoes that press outward against a rotating cylinder-shaped part called a brake drum.Driver give the pressure on the brake pedal, brake fluid is effectively pushed against the pistons of the slag adjuster, which in turn forces the scam against the brake shoe. This is clamping action of the brake shoe retards the rotational movement of the brake drum and the axle that it is mounted on.The temperature was increased in drum and brakelining,when the brake was applied.Normally the design of the brakes affects heat flow, reliability and noise characteristics.
The present paper tries to expose the influences of the different temperature such as 100,150, 200,250,300 and 350 degree centigrade to the cross breaking strength(CBS), Wear resistance and Frictional stability are key performance requirements for brake lining. Automotive brake linings are usually made of various ingredients such as binder, filler, friction modifiers and reinforcement.

The essential component in a braking system are brake drum (rotating part) and brake lining which is the stationary part to press against the brake drum to slow or stop the rotation. Brake linings are designed to withstand stable, humidity, wear and reliable friction force. Brake friction materials have evolved signifi-cantly over the years. They have gone from asbestos to organic to semi-metallic formulations. Each of these materials has proven to have advantages and disadvantages regarding environmental friendliness, wear, noise and stopping capability.

Glass fibers have been used as reinforcing Fibers from the mid 1970s. Being physically strong when bonded together with resin, the glass Fibers are suitable for use as reinforcing Fibers as they also exhibit thermal resilience [3]. Typical glass has a melting point of 1430 °C [2]. Steel Fibers have also been shown to increase friction coefficient fluctuations [1],Some brake pads contain oxidized or phos-phatized Fibers, resulting in improved fracture toughness and strength [4].While braking, pads are in direct contact with the braking drum and transfer the pressure of 0.2 MPa during soft braking and 1.0 MPa in extreme condition. steel and copper fibers have a higher strength to withstand the function of direct and sliding contact of the brake drum.

Graphite in the flake form has improved lubrication properties [5], while graphite in the powder form is able to dissipate heat generated during braking more effectively [6].However, the bonding strength between graphite and phenolic resin is very weak, so graphite cannot be used too liberally in phenolic resins, leading to low shear strengths [7]. Cashew particles, fall off the friction surface easily, leaving behind large pores that eventually crack [8]. Also, certain brake friction material manufacturers use cashew or rubber particles as under layer material because their low thermal conductivity prevents heat from transmitting to the backing plate of the brake friction material [9]. Cashew particles are help to reduce fluctuations in friction coefficients, especially at elevated temperatures [10].

II. EXPERIMENTAL WORK

Sample Preparation and Testing method

This test is to determine the ultimate stress, due to bending of a specimen with a rectangular cross section which is regular throughout the supporting length. The width of the specimen shall not be less than 10 mm and shall be uniform throughout the gauge length with a tolerance of +/- 0.25 mm. In the case of linings exceeding 50 mm width, a specimen 50 mm wide shall be cut from the centre of the lining and the cross-breaking strength measured across the specimen. The ambient temperature of the environment, where test is conducted, shall not exceed 40°C.The mean width and mean thickness of the specimen shall be determined by at least three measurements across the lining. The specimen shall be placed with the concave surface upwards, symmetrically across two parallel supports with 3.2 :t 0.125 mm radius supporting edges(Figure:3).

Table :1

Table:2

The length of the supports hall be at least the width of the specimen. For specimens up to and including 6.5 mm thickness, the supports shall be set 25+/- 0.25 mm apart. For specimens of greater thickness than this, the supporting length shall be 100 +/- 0.25 mm(Figure:4). If a specimen tested on the 25 mm support length fails to break when the load reaches 2250 N, a new specimen shall be taken and tested on the 100 mm support length.

The load shall be applied squarely across the width of the specimen by means of a third block, with 3.175 +/- 0.125 mm radius bearing edge, which is parallel to and mid-way between the supporting blocks. The load shall be increased steadily so that the specimen fractures in 5 to 15 seconds. The load in Newton at failure shall be noted. Any tests in which the fracture occurs at rivet holes shall be disregarded. The cross breaking strength of the specimen shall be computed as follows:

Cross Break Strength : (1.5 W *L) / (B*D*D)

W = load at failure in Newtons

L = gauge length in mm

B = mean width of specimen in mm

D = mean thickness of specimen in mm

Table :1

TEMP	Time	CBS in Mpa
100	30S	21.9
150	30S	20
200	30S	18
250	30S	12.1
300	30S	10.5
350	30S	8.8

Table:2

TEMP	Time	CBS in Mpa
100	30MTS	41.3
150	30MTS	35.3
200	30MTS	33.9
250	30MTS	25.9
300	30MTS	25.2
350	30MTS	22.5

III. RESULT

Figure :3

Figure :4

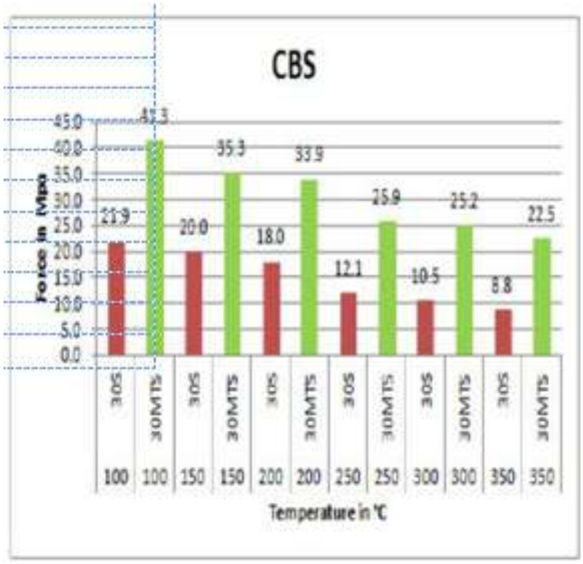

Figure :6

CONCLUSION

The Cross Break Strength of friction product is an one of the important parameter for designing the formula. The results are conforming the temperature influence the mechanical properties of friction product. The study result explain, each temperature stage the brake lining CBS was 50% less comparative after cooling of 30mts(Figure 6).If the temperature increase, both condition at 30s and after 30mts CBS coming down(Table 1). Understanding from the result, when driving with brake apply condition the lining and drum temperature will increase, its leads to reduce the brake lining physical properties and its lead to rivet loosening and broken the brake lining when apply the heavy brake after loose physical properties.

REFERENCES

[1] Jang, H., Lee, J. S. and Fash, J. W. Compositional eff ects of the brake friction material on creep groan phenomena. Wear, 2001, 251, 1477–1483.

[2] Avallone, E. A. and Baumeister III, T. Marks Handbook for Mechanical Engineers, 10th edition, 1997, pp. 6–142 (McGraw-Hill, New York).

[3] Marzocchi, A., Jannarelli, A. E. and Garrett, D. W. Friction materials for brake linings and the like. US Pat. 3967037, 1976 (United States Patent and Trademark Office).

[4] Samuels, G. J. Friction composition and friction element fabricated thereform. US Pat. 5516816, 1996 (United States Patent and Trademark Office).

[5] The exfoliation of vermiculite. Report 23, Western Australian Mining and Petroleum Research Institute, 1989.

[6] Booher, B. V. Pultrusion method of making brake linings. US Pat. 5156787, 1992 (United States Patent and Trademark Office).

[7] Komori, T., Miyake, S. and Senoo, Y. Brake friction material. US Pat. 4954536, 1990 (United States Patent and Trademark Office).

[8] Kinouchi, S., Hara, Y. and Yamaguchi, J. Friction material composition, production of the same and friction material. US Pat. 6372817, 2002 (United States Patent and Trademark Office).

[9] Nakagawa, M. Disk-brake pad. US Pat. 6193025, 2001 (United States Patent and Trademark Office).

[10] Jang, H., Lee, J. S. and Fash, J. W. Compositional eff ects of the brake friction material on creep groan phenomena. Wear, 2001, 251, 1477–1483.