A REVIEW & LITERATURE OF FRICTIONAL & WEAR CHARACTERISTICS OF NON-ASBESTOS BRAKE PAD USING LINK CHASE MACHINE

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ABSTRACT

The frictional and wear characteristics of non-asbestos brake pad were studied using link chase machine. The chase machine is used to perform the test as per SAE J661. The coefficient of friction and wear is an important performance measure in this process. Since long, researchers have explored a number of ways to improve and stable the coefficient of friction and wear rate which is similar to the asbestos material. A large range of different non-asbestos materials are studied by different researchers; all the research work in this area shares the same objectives of achieving the same performance from non-asbestos material as that of asbestos material. The paper reports research on relating to improve and stable the coefficient of friction and wear rate in the end of the paper scope for future research work has been outlined.

Keywords: Non Asbestos Brake Linings, Coefficient of Friction, Wear Testing.

1. INTRODUCTION

Composite materials: composites or composite material engineered or naturally occurring materials made from two or more constituents materials with significantly different physical or chemical properties which remain separate and distinct within the finished structure. Asbestos has been the most widely used fiber in automotive friction material. The excellent thermal stability, miscibility, tribological properties and low cost of asbestos are some of the reason for popularity. In recent years due to increasing health and environmental consciousness. asbestos is no longer considered to be risk free material consequently the use of asbestos in commercial automotive brake linings is not desirably there is need to find suitable replacement for asbestos and yet maintain the desired qualities of good brake linings. this replacement may necessitate the simultaneous used of
different fibers in a hybrid friction composites. Since no single fiber tested so far entirely substitute for asbestos[2] The different tests like coefficient of friction test, fade and recovery, wear test are conducted with the help of link chase machine so that we can understand the behavior of brake lining[4].

1.1 Principle of link Chase Machining
To test friction materials as per SAE-J66 we are making the rectangular sample of 25.4mm*25.4mm which is held in to arm (clamp). The drum is rotated at the desired speed when it achieves the desired speed the brake is applied with the help of hydraulic cylinder due to which there is coefficient of friction between the drum and brake liner it will stop the rotation of speed[1]

![Fig 1. link chase machine](image)

![Fig 2. schematic diagram of link chase machine](image)

1.2 Important parameters of link Chase Machine
1. Measuring the drum temperature
2. Heating the drum
3. Controlling the drum heating rate
4. Cooling the drum.
5. Controlling the drum cooling rate
6. Measuring friction force (1.35 kg max)
7. Measuring Wear Rate
8. Measuring drum rotation speed. (100 to 1000 rpm)
1.3 Procedure of Link Chase Machine

In this type we are making the rectangular sample is hold in to arm (clamp) the drum is rotated at the desired speed when it a chive the desired speed the break is applied with the help of hydraulic cylinder due to which there is coefficient of friction between the drum and brake liner it will stop the rotation of speed.

Following are the test schedule for link chase,

1) Base Line-I
2) Fade-I
3) Recovery-I
4) Wear
5) Fade-II
6) Recovery-II
7) Base Line-II

The test procedure was began with a baseline-I operation of 20 applications, 10 s on and 20 s off. This was followed by fade-I test at the constant speed of 411rpm and load at 540N where frictional force was recorded continuously at 28°C intervals while drum temperature rise to 289°C. Then the drum was cooled to 93°C and frictional force was recorded continuously at 56°C intervals during the recovery-I test. This was followed by a baseline-II, fade-II and recovery-II test similarly to the first, but with temperatures going up to 345°C. In fade-II operation, the friction forces were measured and the COF changing was obtained related to the test temperature. The wear test consisted of 100 applications was conducted at the end of the testing, 20 s on and 10 s off. During this test the friction force readings was taken related to the brake applications. The weight & thickness of the pads for each sample was taken before & after the test & weight loss & thickness loss is calculated.[4]
2. LITERATURE SURVEY

Composite materials: composites or composite material engineered or naturally occurring materials made from two or more constituents materials with significantly different physical or chemical properties which remain separate and distinct within the finished structure.

Peter J. Balu he studied that it was in 1897, 100 Years ago Mr. Herbert Frood an English man who is credited with inventing brake linings, developed first friction material based on hair/cotton, and later started a company called Ferodo Ltd in UK According to Spurr (1972), asbestos becomes dehydroxylated at high temperatures. It tends to transform to forsterite and silica above 810°C. The wear debris contains forsterite or amorphous material. The kinetic friction coefficient (Mk) of asbestos against clean iron is ~ 0.80. The type of asbestos used is important because of differences in cost, properties, and processing Chrysotile is normally used but other asbestos minerals, amonites and crocodolite, may be used. Medical research showed that asbestos fibers can lodge in the lungs and induce adverse respiratory conditions. In 1986, the Environmental Protection Agency announced a proposed ban on asbestos. The ban would have required all new vehicles to have non-asbestos brakes by September 1993, and the aftermarket would have had until 1996 to convert to non-asbestos. Content of asbestos in vehicle brakes varies between about 30-70%. According to Nicholson (1995), the positive characteristics of asbestos are:

1. Asbestos is thermally stable to 500°C above which it produces silicates.
2. Asbestos helps regenerate the friction surface during use.
3. Silicates produced by asbestos are harder and more abrasive that asbestos.
4. Asbestos insulates thermally.
5. Asbestos processes well.
6. Asbestos wears well.
7. Asbestos is strong yet flexible.
8. Asbestos is available at reasonable cost[1]

P Gopal, L R Dhawan and krank D Blum They studied fade and wear characteristics of glass fiber reinforced phenolic friction material using link chase machine the result found that at low temperature the friction material showed relatively high friction range during fade test the coefficient of friction dropped, the wear test show that the specific weight loss per unit load and the sliding distance decreases with increasing applied load and speed but increases with increasing bulk drum temperature at high temperature high wear the parameter used are load, speed, temperature.[3]

P Gopal, L R Dhawan and krank D Blum They studied the frictional and wear characteristics of control without Kevlar pulp and hybrid with Kevlar pulp with phenolic resin containing milled E glass or steel at various counterface speed and temperature are studied with link chase machine the result showed that the Kevlar pulp improved the wear resistance and decrease the coefficient of friction for both types of hybrid composites. It having high frictional stability at high speed it increases overall performance of brake liner.[2]

M.Kermc, M Kalin, J.Vizitin, Z.stadler They studied reduced scale testing machine for tribological evaluation of brake material. The result confirmed that very high temperature that are generated at the ceramic contact is necessary for well controlled condition.[6]

D.Chan, G.W.Stachowaik they prepared the review of automotive brake friction materials and gives possible replacement for asbestos material specially material used for dry and wet friction pads and shoes.[5]

Rukiyer Ertan, Nurettn Yavuz. They studied the effects of manufacturing parameters on the tribological properties and obtaining optimal manufacturing parameter for improved tribological behavior. The manufacturing parameter and tribological parameter such as wear resistance and
frictional stability depend on test temperature and number of breakings, the density are also analysed and it depends upon molding pressure the the moulding pressure increases the density increases. result shows that manufacturing can substantially improve the tribological behavior and manufacturing cost of brake lining.[4]

3. CONCLUSION AND FUTURE TRENDS

Different non-asbestos friction materials have to be replaced with asbestos fibers as it can lodge in the lungs and induce adverse respiratory conditions. So the Environmental Protection Agency announced a proposed ban on asbestos. The ban would have required all new vehicles to have non-asbestos brakes. From this we can see that there are different friction materials available which can be replace by asbestos material. The different test conducted brake liner as per the specification & working condition as per the Europe regulation 90. After the test the characteristic, frictional coefficient, wear behaviour is observed and according to that we will prepared the result. It gives lower emissions and fuel efficiency as environmental regulations become more stringent this shifts towards environment. The wear behaviour of the brake liner is less so the life of liner is more. It gives lower emissions and fuel efficiency as per environmental regulations. It maintains the temperature of the drum & liner so it will not realise the hazardous material in the atmosphere.

4. FUTURE SCOPE

To include the testing for non asbestos brake liner, the dynamic vehicle tests, shear strength and compressibility testing part of the ECE Regulation 90 to our scope of accreditation. To continue building our technicians into a group of highly professional technicians in order to provide a reliable brake testing service that equals that of all the leaders in our industry. It gives lower emissions and fuel efficiency as environmental regulations become more stringent this shifts towards environmentally friends vehicle like hybrid car such as Toyota Prius Honda insight & Ford Escape. The focus on vehicle fuel efficiency and lower efficiency will mean that brakes will have to be lighter and not release any carcinogenic substances in to the atmosphere during the use. This means the choice of brake friction material will need to be more environmental friendly and not include toxic substances such as asbestos. Non-asbestos material is used in front of asbestos. The binders material is also under research to use instead of asbestos. So there is need to develop non phenolic resin binders as current choice is limited. To be in a position to be a recognized testing facility by all the relevant regulatory government authorities who administer the issuing of the European mark of approval. This means that all reports issued by our laboratory will be accepted when submitted as documentation to apply for this mark. To continue operating at competitive costs in order to maintain a strong value for money proposition in the market for both local and international manufacturers. Sealed wet friction brake appear to be the best solution ultimately as the brake is completely sealed from the atmosphere, there is no egress of brake dust nor any harmful constituents to the surroundings. There will be no ingress of foreign particles in to the brake so braking performance inconsistencies that arise when the vehicle is stopping in rain., mud or sand will not be an issue.

5. REFERENCES

1. Peter J Balu compositions, function and testing of friction brake material and their additives prepared for U.S. Department of energy, assistant secretary for energy efficiency and renewable energy office of transportation technology.
3. P Gopal, L R Dhawan and krank D Blum fade and wear characteristics of glass fiber reinforced phenolic friction material.
5. D.Chan,G.W.Stachowaik review of automotive brake friction materials.
6. M.Kermc, M Kalin, J.Vizitin, Z.stadler reduced scale testing machine for tribological evaluation of brake material.