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DURABILITY AND WEAR ANALYSIS OF NON-ASBESTOS MOLDED LINERS BRAKE PADS UNDER DRY/MOIST CONDITIONS BY USE OF LAB ABRASIVE TEST METHOD

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Abstract - *Disk brakes are in common use in automobiles like bikes, Cars , buses , trucks etc . Various research works has been previously done on the material of disk brake but the brake caliper friction material is of equal importance as it takes part in the braking action. Brake materials have been studied so far as to determine the coefficient of friction, temperature analysis etc, but abrasion behavior of these materials has been seldom studied. Abrasion behavior with a rotating wheel-type apparatus has been examined with angular sand (silica) abrasives as a function of test conditions, namely wheel-type _rubber wheel or steel wheel and environment _dry or wet conditions. Water tends to lubricate the contact between the particles and the test piece, especially with small and/or rounded particles and thus the wear rate is reduced. With larger particles, the presence of water still affects wear, in that two-body abrasion may be favored, cutting enhanced and particle embedment reduced. The steel wheel tends to produce more fragmentation of abrasives, but in the wet environment, this is reduced as the lubricated contact with the test piece results in lower stresses in the particles. The role of water has been shown to be significant in both the rubber and steel wheel tests and affects particle motion and particle fragmentation _depending on particle type, shape and size. and, thus, has a strong effect on wear rates and mechanisms observed. The conditions employed in a test used to simulate service conditions must be carefully chosen so as to mimic the latter conditions as closely as possible and the environment _wet or dry. is a significant parameter that must be considered.*

Key Words: **Dry sand–rubber wheel abrasion; Wet conditions.**

1. INTRODUCTION

The most important component of automobile breaking system is brake pads. The effectiveness of the brakes depends completely on the quality and proper composition of brake pads. The brakes must be strong enough to stop the vehicle within a minimum braking distance or urgently applied brake. A disc brake is a wheel brake that slows rotation of the wheel by the friction caused by pushing brake pads against a brake disc with a set of calipers. The brake disc is usually made of cast iron, but may in some cases be made of composites such as reinforced carbon–carbon or ceramic matrix composites. This is connected to the wheel and/or the axle. To stop the wheel, friction material in the form of brake pads, mounted on a device called a brake caliper is forced mechanically, hydraulically, pneumatically, or electromagnetically against both sides of the disc. Friction causes the disc and attached wheel to slow or stop. Brakes convert motion to heat, and if the brakes get too hot, they become less effective, a phenomenon known as brake fade. Brake pads are designed for high friction with brake pad material embedded in the disc in the process of bedding while wearing evenly. Friction can be divided into two parts. They are: adhesive and abrasive. Depending on the properties of the material of both the pad and the disc and the configuration and the usage, pad and disc wear rates will vary considerably. The properties that determine material wear involve trade-offs between performance and longevity. The brake pads must usually be replaced regularly (depending on pad material), and some are equipped with a mechanism that alerts drivers that replacement is needed, such as a thin piece of soft metal that rubs against the disc when the pads are too thin causing the brakes to squeal, a soft metal tab embedded in the pad material that closes an electric circuit and lights a warning light when the brake pad gets thin, or an electronic sensor. Generally road-going vehicles have two brake pads per caliper, while up to six are installed on each racing caliper, with varying frictional properties in a staggered pattern for optimum performance.

1.1 Literature Review

Disk brakes are in common use in automobiles like bikes, Cars, buses, trucks etc. Various research works has been previously done on the material of disk brake but the brake calliper friction material is of equal importance as it takes part in the braking action. Brake materials have been studied so far as to determine the coefficient of friction, temperature analysis etc, but abrasion behavior of these materials has been seldom studied. Majority of the papers describe and elaborate on the materials and design of the disk brakes and those papers on the pad material focus on the usage of these materials.

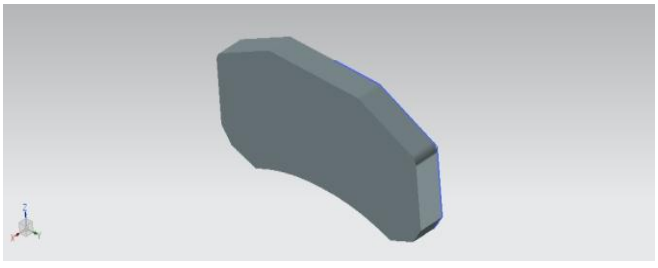
U.D.Idrisa,V.S.Aigbodian(2013),In this paper the authors have studied the use of asbestos fiber is being avoided due to its carcinogenic nature that might cause health risks. A new brake pad was produced using banana peels waste to replaced asbestos and Phenolic resin (phenol formaldehyde), as a binder was investigated. The resin was varying from 5 to 30 wt% with interval of 5 wt%. Morphology, physical, mechanical and wear properties of the brake pad were studied. The results shown that compressive strength, hardness and specific gravity of the produced samples were seen to be increasing with increased in wt%

resin addition, while the oil soak, water soak, wear rate and percentage charred decreased as wt% resin increased. The samples, containing 25 wt% in uncarbonized banana peels (BUNCp) and 30 wt% carbonized (BCp) gave the better properties in all. The result of this research indicates that banana peels particles can be effectively used as a replacement for asbestos in brake pad manufacture.

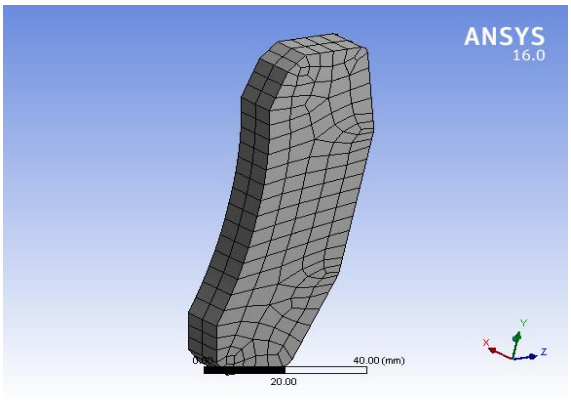
D.S. Yawas, S.Y. Aku, S.G. Amaren(2013),In this paper the authors have studied the development of asbestos-free automotive brake pad using periwinkle shell particles. This was with a view to exploiting the characteristics of the periwinkle shell, which is largely deposited as a waste, in replacing asbestos which has been found to be carcinogenic. Five sets of brake pads with different sieve size (710–125 lm) of periwinkle shell particles with 35% resin were produced using compressive moulding. The physical, mechanical and tribological properties of the periwinkle shell particle-based brake pads were evaluated and compared with the values for the asbestos-based brake pads. The results obtained showed that compressive strength, hardness and density of the developed brake pad samples increased with decreasing the particle size of periwinkle shell from 710 to 125 lm, while the oil soak, water soak and wear rate decreased with decreasing the particle size of periwinkle shell. The results obtained at 125 lm of periwinkle shell particles compared favorably with that of commercial brake pad. The results of this research indicate that periwinkle shell particles can be effectively used as a replacement for asbestos in brake pad manufacture.

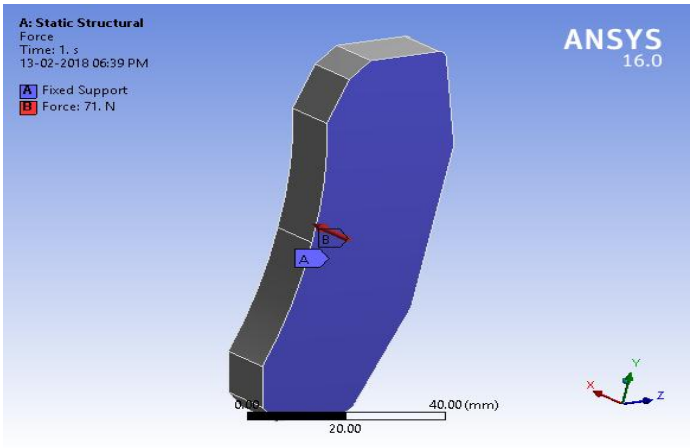
KshirsagarDattatraya P, Prof. V.G.Bhamre(2017), In this paper author was presented a study on disc brake pad materials. During braking both brake pad and disc surfaces wear out , affecting the useful life of braking system as well as its components & behavior. In literature, it is found that asbestos is widely used in automobile disc brake pads. But it is found that it may be to one danger disease called cancer to human being because of its carcinogenic nature. The main aim of this study is to analyze the effect of different material composition on friction & wear of brake pad. The Compo HC AF 693 is a Non asbestos friction material The phenolic resin is also added as a necessary ingredient to hold all the components together. NBR is a good toughened rubber has the organic binder and has a good positive effect or result to improve wear. The fillers barites, vermiculite are selected as fillers to enhance friction in the formulations. Synthetic graphite, Zirconium silicate is used as friction modifier because of their good wear resistant capability.

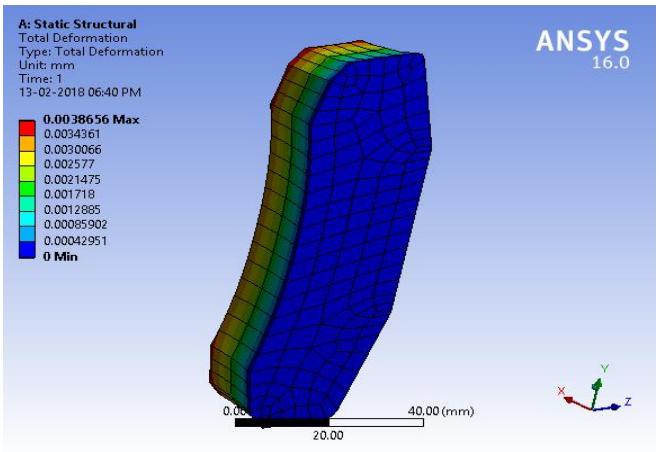
2. DESIGN OF BRAKE PAD

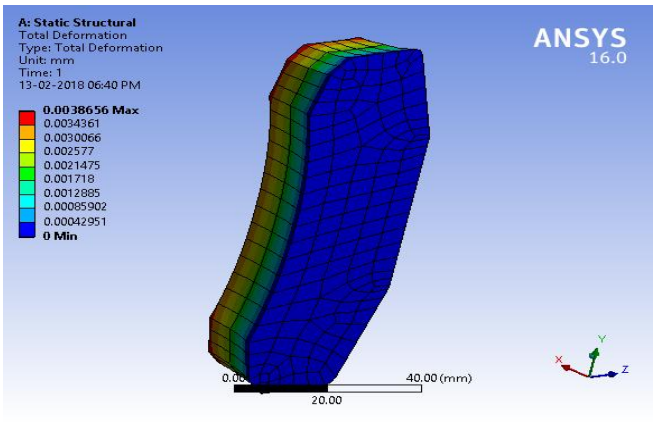


2.1 Analysis of Brake pad









3. CONCLUSIONS

As the maximum stress is 0.03 Mpa which is far below the allowable stress hence the pad is safe.

Deformation is negligible so pad is safe.

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