



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 4, April 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Experimental Investigation on Wear Properties of Natural Fiber Reinforced Composites for Clutch

Subash.S¹, Sureshkumar.R¹, Sureshkumar.G¹, Syedmasood.K.S.A¹, Sivakumar.P²

U.G Student, Department of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India¹

Associate professor, Department of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India²

ABSTRACT: The clutch which is an important component of automobile has advanced technologically over the period of time. Looking back at the history of the clutch facing, it becomes apparent that the technological advancement of the clutch has had very little impact on clutch facing technology. Earlier asbestos was used as friction material in single plate dry friction clutch. The asbestos has impacted environment because of its non-biodegradable material and is harmful to human health. So recently kevlar49/Epoxy material is used as friction material. But it has its own disadvantages. So it is time to consider use of any other environment friendly and non-hazardous friction material as clutch facing material. One option is to use Natural Fiber / Epoxy resin composite as new... In our project we choose natural fiber replacing the asbestos the natural fiber materials like rice husk, coconut fiber, luffa fiber Composite materials are continuously gaining more importance in the field of engineering. In this project we have focused mainly on natural fiber reinforced polymer composite materials. This natural fiber composite is having some special advantages such as high strength to weight ratio and stiffness. These fiber composites are also claimed to offer environmental advantages such as lower pollutant emission and replaces metals because of their high strength-to-weight ratio and stiffness properties. This work concentrate on fiber extracted from rice husk, coconut stem fiber, luffa fiber (Natural fibers) as a reinforcement for the Polyester matrix. These fibers have some added advantage such as low cost, lesser weight. The most important advantage of this fiber is that the wasted fiber can be used effectively (recycling)

KEYWORDS: Non-biodegradable , Epoxy resin , Lower pollutant , Natural fiber , Recycling

I. INTRODUCTION

In order to conserve natural resources and economize energy, reduction of wear has been the main focus of automobile manufacturers in the present scenario. Weight reduction can be achieved primarily by the introduction of better material, design optimization and better manufacturing processes. The introduction of composite materials was made it possible to reduce the weight of clutch plate without any reduction on wear capacity and stiffness. Since, the composite materials have more elastic strain energy storage capacity and high strength to weight ratio as compared with those are being replaced by composite clutch plate. Now a days clutch facing materials using asbestos material such as Kevlar, Ceramic, Organic. These materials are hard to buy a replacement. Cost of this method is high. Earlier asbestos was used as friction material in single plate dry friction clutch. The asbestos has impacted environment because of its non-biodegradable material and is harmful to human health. This asbestos fiber can be associated with three serious and often fatal diseases. Two of these, lung cancer and asbestos affect the lungs while third mesothelioma is rare form of a cancer that affects lining of thoracic and abdominal cavities. Natural fiber belongs to the earliest known cultivated plants, which have intrinsic properties: low weight, cost, high specific strength, and specific stiffness. These properties have made them particularly attractive to many and varied industrial uses. That's why we changed the clutch facing material.



II. RELATED WORK

[1] Amar K. Mohanty, Manjusri Misra, Lawrence T. Drzal - Natural Fibers, Biopolymers, and Bio composites Natural/Biofiber composites are emerging as a viable alternative to glass fiber composites, particularly in automotive, packaging, building, and consumer product industries, and becoming one of the fastest growing additives for thermoplastics.[2] M. G. Jacko,S. K. Rhee - Brake Linings and Clutch Facings Future brakes must satisfy health standards, and most vehicle manufacturers have moved toward removing all asbestos from brakes.[3] Kabir MM, Wang H, Lau KT, Cardona F - Chemical modification of natural fiber for composite material – The overall mechanical properties of natural fiber reinforced polymer composites are highly dependent on the morphology, aspect ratio, hydrophilic tendency and dimensional stability of the fibers used. The effects of different chemical treatments on cellulosic fibers that are used as reinforcements for thermoset and thermoplastics are studied.[4] R.S. Prakash1*, N. Madhan Kumar2 , J. Sabareesh2 , C. Sadeesh2 , C. Sanjay2 – Behavior of clutch plate lining using jute fiber Clutch plates are usually made of cast iron and high carbon steels. The cast iron has high compressive strength, low tensile strength and low ductility. Clutch lining material is made up of asbestos.

III. METHODOLOGY

First we collecting natural fibers(rice husk, coconutfiber,luffa fiber). And then we make a die for moulding process. Then we make a mould that is we mixed a natural fibers and epoxy resin and hardener. It creates a curing process. After mixing we conduct a compression moulding process.after that we take tensile test, hardness test, impact test. Then we take a readings and get the results.

Tensile test:

| TEST NAME: TENSILE | | | | |
|--------------------|------------------------------|----------------|---------------------------|----------------------------|
| SPECIMEN | CROSS SECTIONAL AREA (Sq.cm) | PEAK LOAD (kg) | TENSILE STRESS (kg/Sq.cm) | ELONGATION BRAEK POINT (%) |
| MIXED FIBER | 2.500 | 247.3750 | 98.9500 | 1.5599 |

Impact test:

| TEST NAME: IMPACT TEST (CHARPY TEST) | | | |
|--------------------------------------|-------------|---------------------|--------------------------------|
| EX.NO | SPECIMEN | ENERGY ABSORBED (J) | CHARPY IMPACT STRENGHT (J/mm2) |
| 1. | MIXED FIBER | 56 | 0.32 |

Charpy impact strength = Energy absorbed / Cross sectional area of the specimen

$$\begin{aligned}
 &= 56 / (\pi r^2) \\
 &= 56 / (176) \\
 &= 0.32 \text{ J/mm}^2
 \end{aligned}$$

Brinell hardness test:

| TEST NAME: BRINELL HARDNESS TEST | | | | |
|----------------------------------|--------------|-------------------------------|----------------------------|------|
| SPECIMEN | LOAD IN (kg) | DIA OF BALL INDENTERS IN (mm) | DIA OF INDENTATION IN (mm) | BHN |
| MIXED FIBER | 27 | 10 | 3 | 3.73 |

$$\begin{aligned} \text{BHN} &= P / \pi Dh \\ \text{BHN} &= P / (\pi D/2) (D - (D^2 - d^2)^{1/2}) \\ &= 27 / (\pi * 10/2) (10 - (10^2 - 3^2)^{1/2}) \\ &= 3.73 \end{aligned}$$

IV. RESULT

By taking test (tensile, hardness and impact) on rice husk, coconut fiber luffa fiber and mixed fiber specimens. The mixed fiber specimen has good results that other three fiber composites. Since the mixed fiber specimen has good results, we use mixed fiber specimen for making the clutch facing material



V. CONCLUSION

Research projects should be initiated which focus on newly identified issues of major concern to society. An inventory with the addition of Natural fiber in polyester resin Natural fiber composite the Mechanical properties has been found to increase with increase in Natural fiber particles. This increase is attributed to hollowness of Natural fiber particles & strong interfacial energy between resin & Natural fiber. In our project having different composition of specimens (polyester resin, natural fiber) Rice Husk, Coconut Fiber, Luffa Fiber, Mixed Fiber. Rice Husk specimen having 60% resin, 40% fibre, Coconut Fiber specimen having 60% resin, 40% fibre. Luffa Fiber specimen having 60% resin, 40 % fiber. Mixed Fiber specimen having 60% resin, 20% rice husk, 13% Coconut Fiber, 7% Luffa Fiber. Mechanical properties tests (Tensile, Impact and Hardness) are conducted on the specimens and analyze the result. Specimen Mixed Fiber composition provides enhancing the mechanical properties and absorbs more strength due to the better bonding strength between the polyester resin & Natural fibers for Clutch facing.

REFERENCES

- 1) M. G. Jacko, S. K. Rhee, Brake Linings and Clutch Facings, 2008
- 2) de Andrade Silva F, Chawla N and de Toledo Filho RD, Tensile behavior of high-performance natural fibers, 2008
- 3) P.J. Herrera-Franco, A. Valadez-González, Mechanical properties of short natural fiber reinforced composites, 2008
- 4) Venkateshwaran N and Elayaperumal A., A study on hardness and flexural properties of kapok/sisal composites – 2009
- 5) Kabir MM, Wang H, Lau KT, Cardona F, Chemical modification of natural fiber for composite material, 2010
- 6) Naheed Saba, Mohammad Jawaid, Othman Y Alothman Othman Y, Alothman Advances in epoxy resin, natural fiber-reinforced composites- 2015
- 7) Prof. Jignesh J. Patell, Mr. Kaushal R. Ajmera2, Mr. Raghav K. Thanki3 Mr. Rohit B. Maitar - Analysis of Single Plate Clutch 2015
- 8) Marty S Kanarek Henry Anderson, Mesothelioma from Asbestos Exposure in Brake Mechanics, 2018



INNO  **SPACE**
SJIF Scientific Journal Impact Factor

**Impact Factor:
7.512**

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details