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Experimental Investigation of Kevlar and Coconut Fibre reinforced with Epoxy Resin using Clutch Plate

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Abstract

Automobile Clutch plates performance on contact conditions at the pad to disc interface. The aim of this study is to analyse the effect of different material composition on friction & wear of Clutch Plate material. The review of paper is to represent a general study on the alternative material for the clutch plate material. In the present work, Kevlar and coconut fibre reinforced epoxy composites were developed. The effect of fibre loading varying from on the mechanical properties of fibre epoxy composite was studied. The study of mechanical properties of the composites was also investigated.

Keywords: Clutch Plate, Composites.

1. Introduction

In order to converse 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 elastics strain energy storage capacity and high strength to weight ratio as compared with those are being replaced by composite clutch plate.

1.1.Honeycomb Structure

Honeycomb structures are natural or manmade structures that have the geometry of a honey comb to allow the minimization of the material used to reach minimal weight and maximum strength. A honeycomb structure provides a material with least density and relative high compression properties and shear properties. The honeycomb sandwich construction is one of the most valued structural engineering innovations developed by the composites industry. Used extensively in aerospace and many other industries, the honeycomb sandwich provides the following key benefits over conventional materials

- High stiffness
- Durability
- Production cost savings
- Very low weight

Hexcel began developing honeycomb over 40 years ago, and now supplies a range of high-performance honeycombs, prepregs and redux film adhesives all ideally suited to the manufacture of honeycomb sandwich constructions.

Hexcel is also the leading supplier of lightweight Honeycomb sandwich panels. This guide explains how to design and manufacture honeycomb sandwich panels, from materials selection and analysis of mechanical properties, through to production methods, and includes basic sample calculations for simple constructions. More complex calculations may require

computer modelling which, although mentioned briefly, is beyond the scope of this publication.

2. Literature Survey

Investigation of composite clutch plate in the early 60's failed to yield the production facility because of inconsistent fatigue performance and absence of strong need for mass reduction. Researches in the area of automobile components have been receiving considerable attention now. Particularly the automobile manufactures and part makers have been attempting to reduce the weight of the vehicles in recent years. Emphasis of vehicles weight reduction in 1978 justified taking a new look at composite spring. Studies are made to demonstrate viability and potential of FRP in automotive structural application. The Development of alit flex suspension clutch plate is first achieved.

Based on consideration of chipping resistance base part resistance and fatigue resistance, a carbon glass fibre hybrid laminated spring is constructed. A general discussion on analysis and design of constant width, variables thickness, and composite clutch plate is presented. The fundamental characteristics of the double tapered FRP beam are evaluated for clutch plate application. Recent development has been achieved in the field of materials improvements and quality assured for composite clutch plate based on micro structure mechanism. All these literature report that the cost of composite clutch plate is higher than that of steel clutch plate Hence an attempt has been made to fabricate the composite clutch plate with the same cost as that of steel clutch plate

Material properties and design of composite structures are reported in many literatures. Very little information is available in connection with finite element analysis of clutch plate in the literature, then too in 2D analysis of clutch plate Ballinger C.A. Getting Composites into Construction, Reinforced Plastics, 1995. Composite clutch plate in the early 60 failed to yield

the production facility because of inconsistent fatigue design and analysis of composite clutch plate in light vehicle International Journal of Modern Engineering Research (IJMER) performance and absence of strong need for mass reduction. Researches in the area of automobile components have been receiving considerable attention now. Particularly the automobile manufacturers and parts makers have been attempting to reduce the weight of the vehicles in recent years. Emphasis of vehicles weight reduction in 1978 justified taking a new look at composite springs. Studies are made to demonstrate viability and potential of FRP in automotive structural application. The development of lit flex suspension clutch plate first achieved. Based on consideration of chipping resistance base part resistance and fatigue resistance, a carbon glass fibre hybrid laminated spring is constructed. A general discussion on analysis and design of constant width, variable thickness, and composite clutch plate is presented.

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solution technique using genetic algorithms (GA) for design optimization of composite clutch plate (Rajendran I et al,2002).

3. Composite Materials

Composite materials are materials made from two or more constituent materials with significantly different physical or chemical properties, that when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure. The new material may be preferred for many reasons: common examples include materials which are stronger, lighter or less expensive when compared to traditional materials.

Typical engineered composite materials include:

- Composite building materials
- Reinforced plastics
- Metal Composites
- Ceramic Composites

Composite materials are generally used for buildings, bridges and structures such as boat hulls, swimming pool panels, race car bodies, shower stalls, storage tanks, imitation granite and cultured marble sinks and counter tops. The most advanced examples perform routinely on spacecraft in demanding environments.

4. Composite Building Materials

Concrete is the most common artificial composite material of all and typically consists of loose stones (aggregate) held with a matrix of cement. Concrete is a very robust material, much more robust than cement, and will not compress or shatter even under quite a large compressive

force. However, concrete cannot survive tensile loading (i.e., if stretched it will quickly break apart). Therefore, to give concrete the ability to resist being stretched, steel bars, which can resist high stretching forces, are often added to concrete to form reinforced concrete.

5. Reinforced Plastics

Fibre-reinforcement polymers or FRPs include carbon-reinforcement polymers or CFRP, and or GRP. If glass-reinforcement polymers ossified by matrix then there are thermoplastic composites, short fibre thermoplastic, or long fibre-reinforced thermoplastics. There are numerous thermoset composites, but advanced systems usually incorporate armed fibre and carbon fibre in an epoxy resin matrix. Shape memory polymer composites are high-performance composites, formulated using fibre or fabric reinforcement and shape memory polymer resin as the matrix. Since a shape memory polymer resin is used as the matrix, these composites have the ability to be easily manipulated into various configurations when they are heated above their activation temperatures and will exhibit high strength and stiffness at lower temperatures. They can also be reheated and reshaped repeatedly without losing their material properties. These composites are ideal for applications such as lightweight, rigid, deployable structures rapid manufacturing and dynamic reinforcement.

6. Problem Identification

6.1.Problem identification clutch plate

The gearbox has two rotating shafts one that drives the motor and another that powers a separate device. The clutch is the connector between the two shafts, which enables them to spin at the same time, together. In addition, the clutch also decouples the two shafts, which enables them to spin at different speeds. In a vehicle, the clutch is what is used to regulate the power to the engine and to control the transfer of power from the vehicle's engine to both the transmission and the wheels. Essentially, the faster the engine goes, the more adjustment is

required before the clutch connects to the wheels, which allows your vehicle to switch to a different gear. This is a simple explanation of what happens whenever you change gears. Regardless of whether you drive an automatic or manual, the principle is basically the same.

The clutch system in a car is based on friction between the flywheel and pressure plate, and eventually these parts will begin to wear and the clutch will need replacing. Nevertheless, there are common clutch problems, and if you can identify a problem early, it could just save you a lot of money.

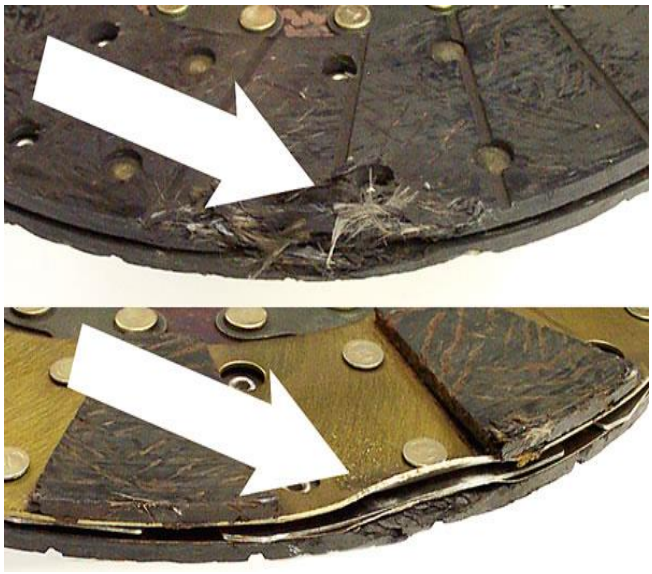

Figure 1: Clutch Plate

A car that is driven smoothly, without towing extra loads, can get over 100,000 kilometres out of a clutch. When a vehicle is thrashed, or is constantly dealing with extra loads, the clutch will wear out much faster. Once the friction materials on the clutch parts start to wear out, instead of engaging tightly and spinning together, as they usually would, the two parts spins at different speeds and caused increased wear.

7. Result

Table 1: Mechanical Properties of Tested Components

SI NO	Tested Parameter	Sample 1For CSC+FF
1)	Tensile Strength, N/mm2	35
2)	Impact Energy in J/mm2	60
3)	Hardness, HRR	68

8. Conclusion

Traditionally natural fibers are used to make high strength ropes in South India. The results found that the mechanical properties have a strong association with the dynamic characteristics. Both of the properties are greatly dependent on the volume percentage of fibers. The composite having a Kevlar and coconut volume of showed a significant result compared to old clutch plate. It has been noticed that the mechanical properties of the composite's material such as tensile strength, hardness and toughness etc.

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