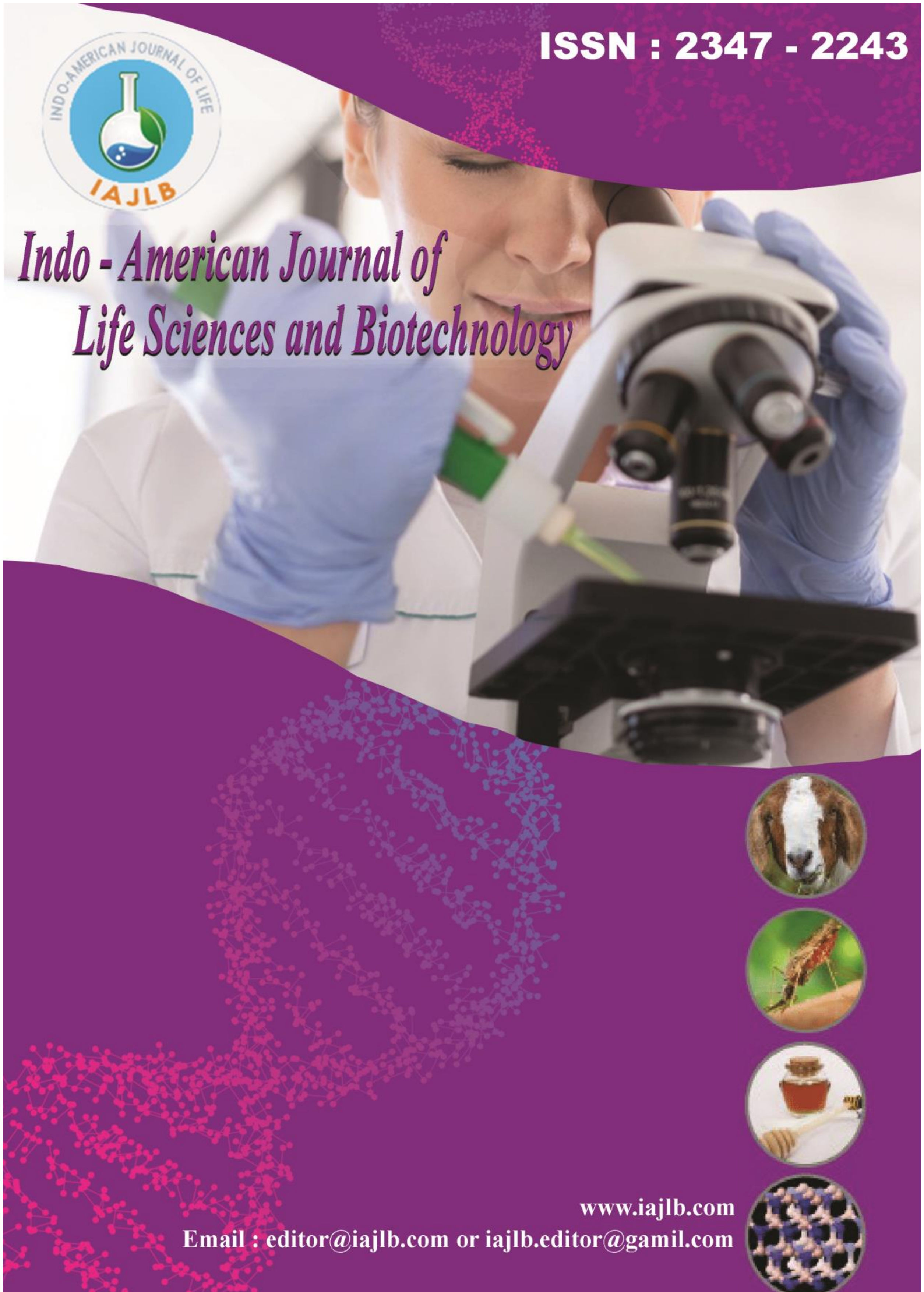
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Modeling Study and Dynamic Analysis of Drive Shaft of an Automobile Using Composites

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Abstract

mechanical component for transmitting torque and rotation, typically used to link other components of the drive train that cannot be connected directly due to distance or the necessity to allow for relative movement between them. Torsion and shear stress on drive shafts are directly proportional to the difference in torque input and load. Therefore, they must be able to handle the stress while avoiding adding too much weight, which would increase their inertia as a result.

A longitudinal shaft may be used to transfer power from an engine/transmission to the opposite end of the vehicle before it reaches the wheels of a car. A central differential, gearbox, or trans-axle can all deliver power to the wheels through a pair of short drive shafts.

Keywords— A drive shaft, a transmission, and composite materials. The Nx Unigraphics and Ansys19.2 software packages

1.**Introduction**

2.Graphite, Carbon, Kevlar, and E-Glass are some of the most extensively utilised composite materials because of their high electrical and precise modulus (modulus/density) and high unique strength (electricity/density). Drive shaft (propeller shaft) applications appear to be well suited to advanced composite materials. In order to increase the torque and rotational speed at which they operate, their elastic housing can be customised. Automobiles, aeroplanes, and spacecraft all use drive shafts. Using composite fabric technology, the automobile industry is able to reduce the weight of structural components without sacrificing the aesthetics or durability of the car. One of the most important goals in vehicle design has been to reduce weight, and this is one of the few ways to achieve this goal. In urban driving, the weight of an automobile and its fuel usage are virtually inversely related.

3.The car's powertrain has various components, including the propeller shaft, which acts as the heart of the gearbox and frequently encounters "disasters" along the way. Fabric and its manufacture and maintenance are the primary causes of this degradation. Instead of a drive shaft, early automobiles frequently employed chain power or belt pressure devices. Some people relied on electric mills, while others

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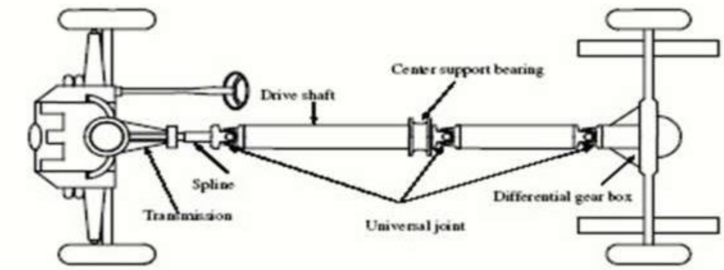
wheels are propelled by electric motors. Consequently, designing a force shaft for a car with an aim weight reduction by no increase in



price to boost energy transfer has become significantly more complex. Drive Shafts

.As a means of exchanging development from one element into another, the phrase "Driveshaft" is used. When it comes to cars, the driveshaft is what connects the engine to the rear axle. Powered by the motor and gearbox, the vehicle's rear wheels are now responsible for moving the vehicle forward and backward. A constant supply of power to the wheels is required from the driving shaft. This torque is transferred through the drive shaft and differential. Functions of the Drive Shaft

The car's drive shafts must also be able to turn at the high speeds necessary to operate the vehicle. With shifting gears and axles, a drive shaft must be able to keep up with these constantly shifting facets. The differential and axles are left behind and lowered as the rear wheels go over potholes in the road. As a result of this movement, the transmission and differential become more friendly. Drive Shafts Made of a Composite Material

There is good quality and high explicit modulus in them. 2 Loss of body fat.Carbon fibre composite driveshafts have a central recurrence twice as high as steel's because the carbon fibre composite material has multiple times the solidness of steel, making it possible to build Additionally, it reduces the wear on the components of the drivetrain and improves tyre traction by dampening vibrations. To reduce the time, stock costs, support, and complexity of a piece of equipment by using a single torque the drive shafts of automobiles in a single piece. The vibration requirements can be met by fabricating each other, therefore the weight, vibrations, and total cost are all reduced.Fuel consumption will be reduced as a result of the vehicle's reduced weight.

They feature a high damping limit, which reduces the amount of noise and vibration they create. 6 They face stiff competition in the area of consumption.a higher limit on torque than a steel shaft Steel shafts have a shorter exhaustion life.

27.Power may be transmitted more effectively with lower turning weights.Figure 1: Schematic arrangement of Drive Shaft of an Automobile

28. Introduction to Composites Materials

A wide range of constructions, including rockets, aircraft, cars and extensions, are built with composite materials. The magnificent features, such as explicit quality and explicit hardness or quality weight ratio and hardness-weight ratio, are the reason why composite materials are widely used in business. Composite materials were originally used in the aviation industry in the 1970s, but they have since spread to a wide range of industries. Car parts made of metal have been replaced with those made of composite materials as the technology has advanced. Cooling towers, syphon sets, aircraft, constructions and automobiles all use drive shafts for power transfer. Typically, drive shafts are composed of steel or aluminium. Since carbon/epoxy composites have a higher explicit flexible modulus than aluminium, they may be used to replace the two-piece metal shaft with a single-piece composite shaft that can turn faster and maintain a greater level of security.

cylinder, it is recommended. When the automotive industry began looking for a way to improve the quality and performance of light trucks, vans, and other high-end vehicles, a new type of driveshaft cylinder was born. One-piece carbon fibre epoxy composite drive shafts are possible because to the materials' many instances of explicit solidity of steel or aluminium. Design Principles for Composites

The use of composite materials to enhance the display of various constructions has become increasingly common. Composites have a superior firmness-to-mass ratio than conventional materials, as well as a higher weight-to-solidity ratio. A variety of mechanical sectors have used these focus points to link composites together to create fundamental components. As a few examples: helicopter blades in aviation design; aeroplane wings; and structural scaffolding in architectural applications Composite materials' basic concepts are discussed in more detail in the adjacent section in an effort to further familiarise ourselves with their behaviour.

A composite material is essentially a half-breed material formed from a number of different materials in order to take use of the fundamental advantages of each in a single supplementary material. At a visible level, the elements do not dissolve one another. To their benefit, well-structured composite materials exhibit the best properties of their individual segments or components, as well as certain properties that neither of the elements has. Quality, weariness life, firmness, temperature-subordinate conduct and conduct, consumption opposition, warm protection, wear obstruction, warm conductivity and weight may all be increased by frame composite materials. These traits are seldom increased at the same time and there's no need to do so, either. In fact, several of the features are at odds with one another, such as warm conductivity vs warm protection. The objective is to produce a material that has only the properties necessary to carry out the task at hand. Composite materials' structure is comprised of two structural hindrances. The strengthening stage and the framework are two distinct components of the system. Strands, particles, or fragments might be used as the fortification stage material. The materials used in lattice stages are frequently available on a continuous basis. Examples of composite frameworks include cement reinforced with steel, epoxy reinforced with graphite threads, and so on. Composite materials have a wide range of uses.

Among the many uses for composite materials are the following:

Automotive: Heavy-duty trailer and truck driveshafts, fibre glass or epoxy leaf springs, rocker arm covers, clutch plates, bumpers, body panels, suspension arms, and steering-system bearings. Doors are also on the list.

All of the components of an aeroplane: the rudders, the rudder bearings, rudder lifters, rudders, landing gear door remote manipulators, and antenna ribs.It's used in propeller vanes and gear boxes, as well as fans & blower valves, strainers, and condenser shells in marine applications.

Storage tanks for liquefied natural gas for alternative-fuel cars, fire-fighting rack bottles subterranean storage, stacks and ducts, etc. are all chemical industry products.

Overhead rail power transmission structures, lighting poles are all examples of electrical and electronic engineering. Fiber optics, tensile members, and power line insulators are a few examples. Using Composites for the Drive Shaft

Composite material structural members can help overcome some of the drawbacks of traditional drive shafts, as demonstrated by recent breakthroughs in the use of composite materials in power transmission. The focus of this investigation is to determine the extent to which this is the case. As a result, familiarity with the drive shaft is required, which is covered in detail in the next section. When other components of a drive train cannot be connected directly due of distance or because of the necessity to allow for relative movement between them, a drive shaft, propeller shaft (prop shaft), or Cardan shaft is utilised to connect them. Torque is transported through drive shafts. Input torque and load differential cause torsion and shear stress on the parts. As a result, they must be robust enough to withstand the strain while also avoiding adding too much weight, which would raise their moment of inertia.

28. Design

Unified Graphics: nx

In 2007 Siemens PLM Software purchased the Unigraphics NX (also known as Siemens nx) high-end CAD/CAM/CAE programming package from UGS Corporation. It's used for a variety of jobs, including design, construction inquiry, and manufacturing the finished plan with the help of incorporated machining components.

NX is a shorthand for SIEMENS has developed the narwhal expansion. NX Unigraphics is often referred to as this. There are components of CAD, CAM, and CAE in this package. This PLM (Product Lifecycle Management) software has cutting-edge planning gadgets and innovation

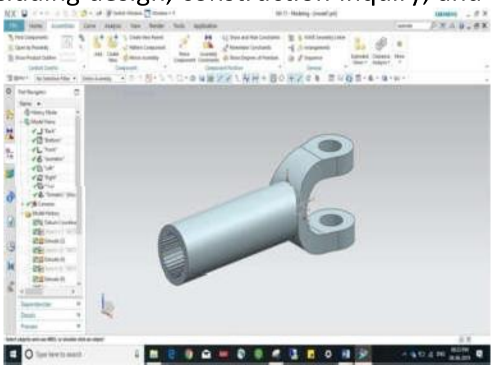


Fig 3.1 Fixed Yoke

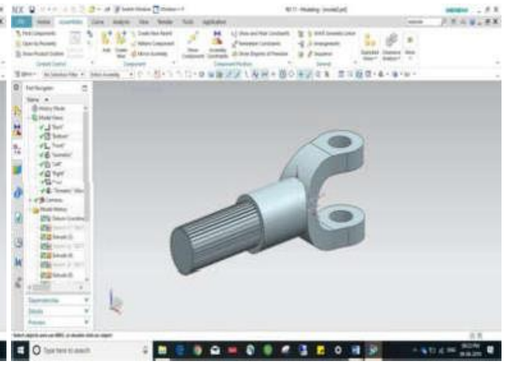


Fig3.2 Slip Joint Spline

Fig3.3 Flange Yoke

Fig3.4 Cross Journal Bearing

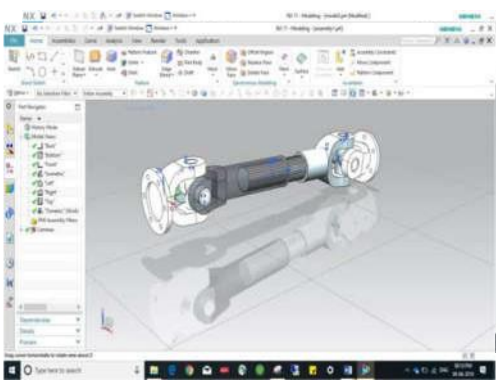


Fig3.5 Assembly of Drive Shaft

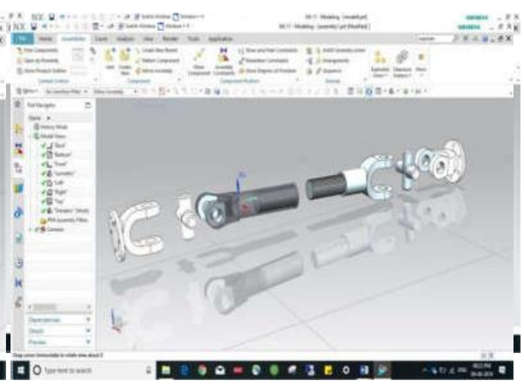
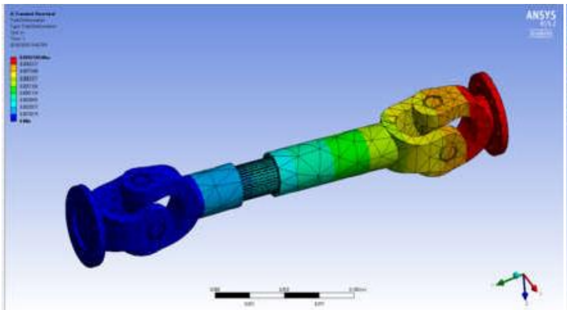


Fig3.6 Exploded View of Drive shaft

28. Analysis Introduction

Designers may simulate connections between all types of controls in material science, including fundamental, vibrational, liquid, heat-moving, and electromagnetic ones using ANSYS, a widely helpful programming tool. As a result of its "pre-preparing" capabilities, ANSYS is capable of importing CAD data and use it to build a geometry. If you want to parameterize your model and automate the process of doing so, the ANSYS Parametric Design Language (APDL) is a great scripting laanguge.

Carbon fibre, epoxy E glass, epoxy resin epoxy, and structural steel were all included in the project's Ansys workbench version 19.2 to calculate their total deformation as well as their equivalent stresses and strains. There are all of the results sorted in descending order on the page below



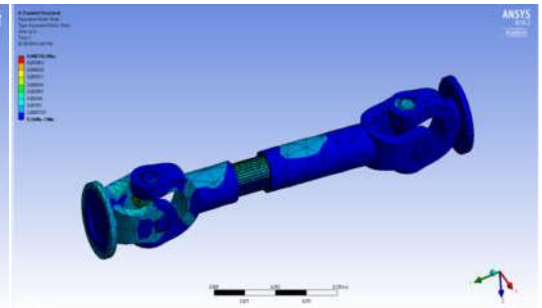


Fig.4.1 Total Deformation **Fig.4.2 Equivalent Strain**

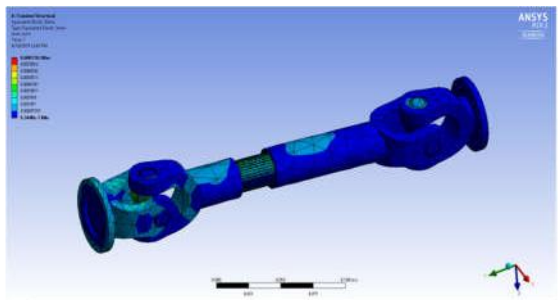
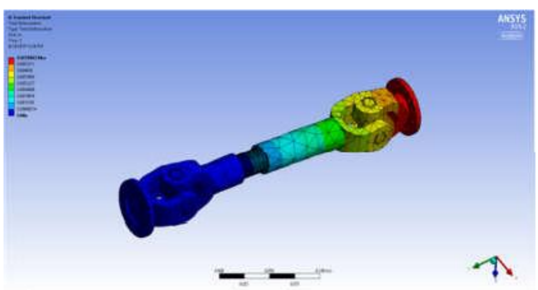


Fig.4.3 Equivalent Stress

2. Epoxy E-Glass



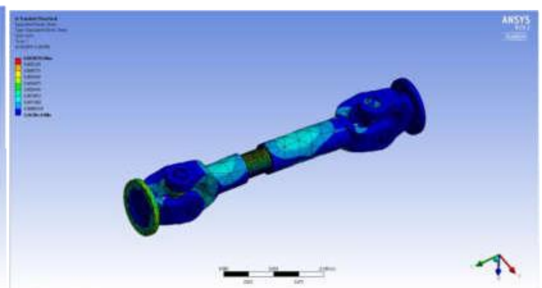


Fig.4.4 Total Deformation Fig.4.5 Equivalent Strain

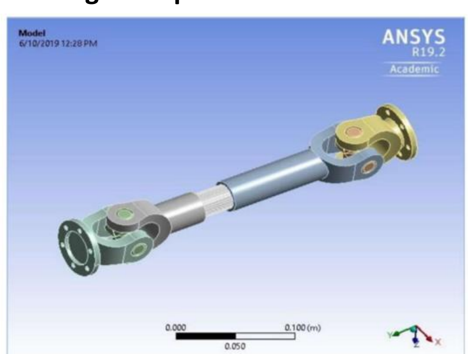


Fig 4. Drive Shaft in Ansys Workbench

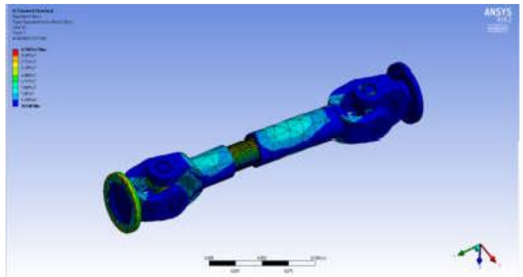
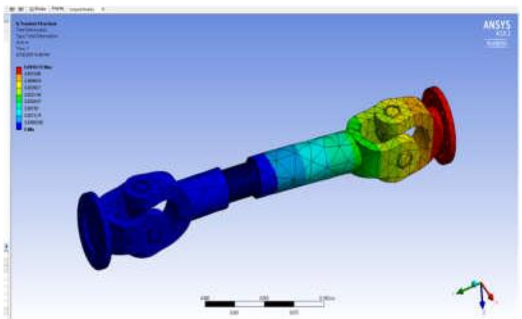


Fig.4.6 Equivalent Stress

3. Resin Epoxy



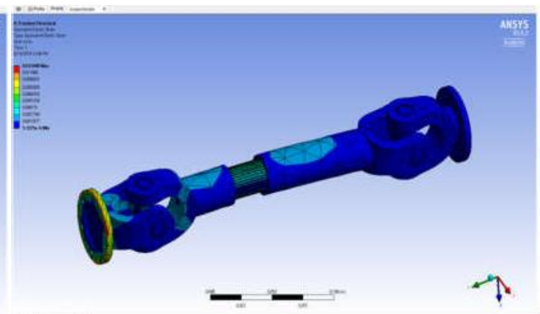


Fig.4.7 Total Deformation **Fig.4.8 Equivalent Strain**

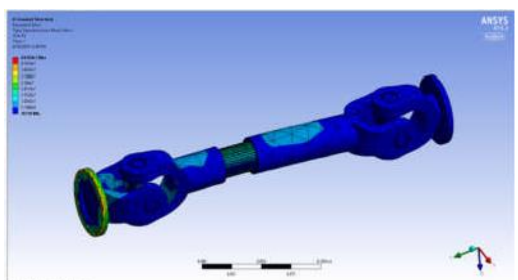
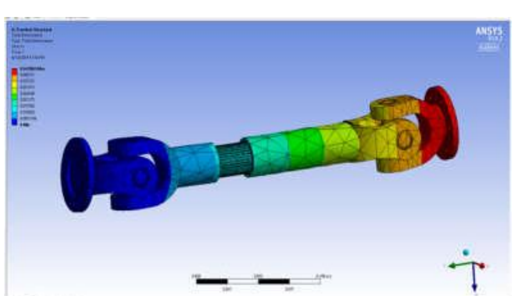


Fig.4.9 Equivalent Stress

4.Structural Steel



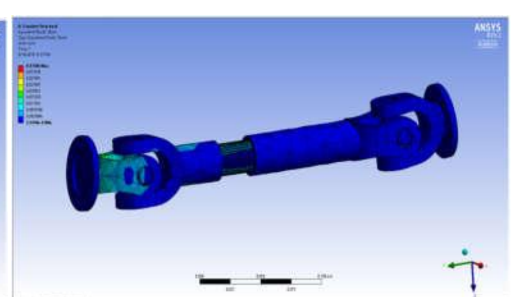


Fig.4.10total Deformation **Fig.4.11 Equivalent Strain**

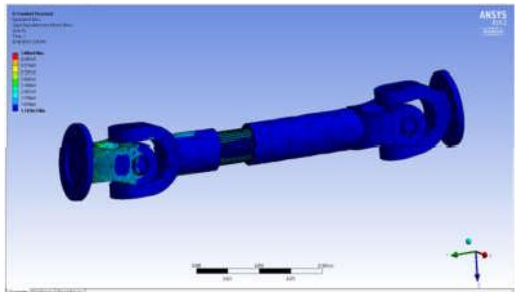


Fig.4.12 Equivalent Stress

TABLE 1: Carbon Fiber

	Minimum [m]	Maximum [m]	Average [m]
Total deformation	0	9.2506e-003	3.271e-003
Equivalent Strain	9.3448e-007	8.7763e-003	9.0579e-004
Equivalent Stress	14839	1.5595e+008	1.5863e+007

TABLE 2: Epoxy e-Glass

	Minimum [m]	Maximum [m]	Average [m]
Total deformation	0.	5.9862e-003	1.5218e-003
Equivalent strain	2.2639e-006	5.8791e-003	1.0866e-003
Equivalent stress	10148	4.7981e+007	8.9553e+006

TABLE 3: Resin Epoxy

	Minimum [m]	Maximum [m]	Average [m]
Total deformation	0.	5.9731e-003	1.0709e-003
Equivalent strain	5.1225e-006	1.2449e-002	1.3156e-003
Equivalent stress	10718	4.6594e+007	4.7179e+006

TABLE 4: Structural Steel

	Minimum [m]	Maximum [m]	Average [m]
Total deformation	0.	4.7869e-002	1.8546e-002

Equivalent strain	2.2438e-006	3.586e-002	2.5229e-003
Equivalent stress	1.7418e+005	7.086e+009	4.7198e+008

5. Conclusion

The findings that follow are based on the work that has just been completed.

Drive shafts made out of carbon/epoxy and high-modulus carbon/epoxy are designed to replace the steel ones in vehicles. 2.

Using Genetic Algorithm for High Strength Carbon/Epoxy and High Modulus, an optimal back wheel drive vehicle composite drive shaft has been planned.

For example, torque transfer, torsional clasping limitations, and typical bowing recurrence. Carbon/Epoxy composites were used to achieve the goal of minimising the weight of the pole.

For the High Strength Carbon/Epoxy and the High Modulus Carbon/Epoxy shafts, the weight investment funds of 85% and 82.26 percent respectively of the heaviest steel shafts were invested.

4 The results obtained are in agreement with the predictions made throughout the investigation.

As a result, it can be concluded that the results obtained via ANSYS are well within the acceptable cut-off points compared to the results obtained from counting.

An audit of the writing in the paper relates to the research into the influence of various modifications in composite crossover material, for example, the number of layers, the thickness of the layer, the layer shred succession and the point-direction-edge-direction.

Different instruments, such as ANSYS and FET, may be noticed in the above writing audit

Tests of overlays, such as an analyzer's torsional test as well as tractable and shear tests, have been successfully completed, and the FEA has suggested that military drive shafts be replaced with a blend of composite materials.

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