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DESIGN AND STRUCTURAL ANALSIS OF KEVLAR COMPOSITE DRIVE SHAFT

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Abstract

In the automatable drive many of the parts are used. The drive shaft is one of the major parts used in the automobile. The main aim of our project is modelling and analyzing of the automobile drive shaft. This paper deals with the changing to composite drive shaft from the steel drive shaft. In this work Kevlar /RESIN is used as composite material the design parameters were optimized with the objective of reducing the weight of new composite drive shaft. The design optimization also showed significant potential improvement in the performance of drive shaft. In this current work an attempt has been to evaluate the deformation and mechanical properties under subjected loads using structural analysis. Finally compare with composite drive shaft result with the steel drive shaft.

Key words: Driven shaft, Ansys and composite

I. Introduction

A drive shaft is used to to transmit the power from the engine to the differential unit. The steel is generally used for the drive shaft. If there are two parts are fabricated for drive shafft Steel drive shafts are usually manufactured in two pieces to improve the basic bending natural frequency. The bending natural frequency of a shaft is inversely proportional to the square of beam length and proportional to the square root of specific modulus. If there is three universal joints are consits with the drive shaft and the weight of the vehicle is increased by the centre support bearings. When the inertial mass and weight of the vehicle is reduced the efficiency is increased. So we will choose the composite material. Composite material has many advantages because of higher specific stiffness and light weight. The sample of Composite materials fabricated to efficiently meet the design requirements of strength, stiffness and other mechanical properties. By using the composite material drive shaft made by a single part. So the other connecting and supporting parts are removed. The composite material have lower amount of modulus of elastic.

As a result, when torque peaks occur in the driveline, the driveshaft can act as a shock absorber and decrease stress on part of the drive train extending life.

II. Literature Survey

D.G. Lee,

Manufacture the drive shaft by using carbon fiber and epoxy resign. By using the carbon composite the stiffness of the drive shaft is more than the steel.

- Bhirud

Fabricate the drive shaft by the e glass fiber and epoxy resign to increase the efficiency by reduced the weight.

- Sagar R,

Analysing the carbon composite by using epoxy combination for improve the rotational speed of the drive shat.

- M.R. Khoshravan

Design and analysis of drive shaft coupling by using carbon glass fiber and epoxy to increase ovearall efficiency of the vehicle.

- R. P. Kumar Rompicharla,

Optimization the Drive Shaft of Toyota Qualis by the composite material to increase the stiffness of the drive shaft.

- Harshal Bankar

Optimization of drive shaft by using the composite material. Weight Reduction of Drive Shaft Using Composite Material Boron/epoxy for increase the speed of the vehicle.

- M.A.K. Chowdhuri

Increase the overall efficiency by using of an Automotive Composite Drive Shaft by using Graphite, resign and Aluminium.

- V. S. Bhajantri

Analysis the composite drive shaft by the ANSYS for comparison of both proposed materials (E-glass and S-glass) and exiting material.

- K.D Ghata

The e glass fiber and epoxy composite strength and mechanical properties are analyzed by the ANSYS software. The result of the E-glass fiber is compared with the steel.

III. Selection of Material

Kevlar is commonly made by step by step polymerization or increased polymerization. The two different agents are combined to enhance or in any way another the material properties of polymers the result was compared with the plastic. Composite materials refer to those various kinds of materials that result from joining more than one homogeneous material with various material properties to derive a final product with the mechanical properties and certain convert material. Kevlar-reinforced composite are a category of composite plastics that specifically use Kevlar materials to mechanically improve the strength and another mechanical properties of new material. The method is a tough but similarly un-strong composite material that is reinforced by stronger than present material or Kevlar. The extent that strength and elasticity are enhanced in a Kevlar-reinforced composite depends on the mechanical properties of both Kevlar and method, their volume similar to one another, and the Kevlar length and orientation within the method. Reinforcement of the method arise by defined when the KRC material demonstrate improved strength and other mechanical properties.

Table 1.Mechanical Properties

Description	Kevlar and resin
Density	1.44E^3 kg/m3
Young's modulus	10.2E^6 N/mm2
Passion ratio	0.36

Advantages

By using this composite material power wastage reduced. so the efficiency of the drive shaft is increased

In this method there is single part drive shaft is designed so there is noise is reduced.

By using this Kevlar composite the we will get high RPM in low torque

If there is no use of ball mechanism so the stiffness of the drive shat is increased.

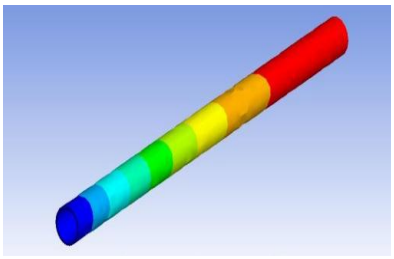
APPLICATIONS

- High Speed
- Medium or Variable Very
- Low rotational Speed

DESIGN TOOL (SOLIDWORKS)

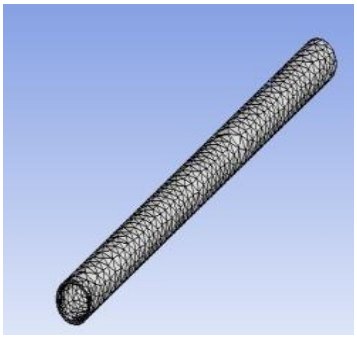
Solid Works is a one of the powerful software which is used to 3D modelling. By using the solidworks software easy to make solid model and simulating that model. Compare with other designing software's like creo,catia the solidworks is more easy to make a 2D solid modelling. analysing also possible in the solidworks software. For new designer or learner are easily absorbed this software. Solidworks software is more user friendly software.

ANALYSIS TOOL (ANSYS WORKBENCH)



The ANSYS Workbench software is used to analysis the solid model which is designed by any designing software like solidworks,catia,creo and etc., The ANSYS software is major analysing software in all industries. In ANSYS software designing also possible. In ANSYS there are number of analysis methods available. They are static analysis, dynamic analysis, CFD analysis. thermal analysis and etc.,

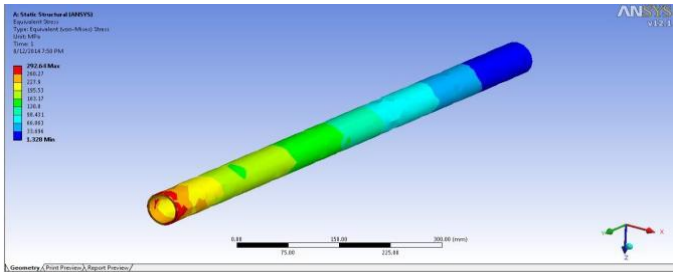
MESHING



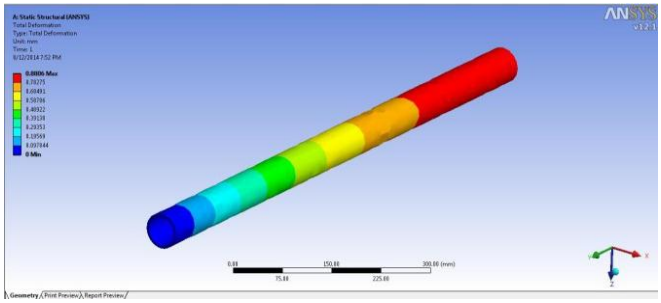
DEFORMATION:

In this paper the static structural analysis done by the ANSYS software. After the modelling in solidworks the model will import to the ANSYS workbench. By the help of ANSYS the mechanical properties of the drive shaft like stress, strain, shear and etc., are carried out. And also deformation of the drive shaft is calculated by the result. The mechanical properties and deformation of the drive shaft which is carried out from ANSYS are shown below

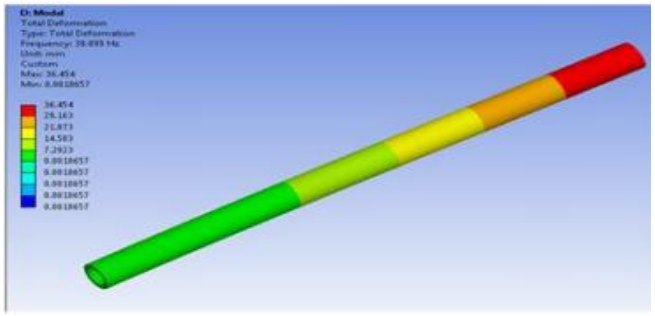
STRESS



DEFORMATION



NATURAL FREQUENCY



Comparison of Composite Shaft with Shaft made up of Steel

Character	Steel	Kevlar
Maximum stress	0.885e+07	0.576e+07
Deflection	0.249e-02mm	0.159e-05mm
Strain	1.954e-05	0.831e-05
Stain energy	0.975	1.121

IV. Conclusion

Kevlar reinforced Composite drive shaft was designed and Analysis by using Solidworks and ANSYS software. The static structural analysis in done in proposed new material . The test specimens are modelled using SOLIDWORKS software and analysed with ANSYS. After defined torque and boundary conditions, the tensional deflections are got from each torque value. And the all results of the new composite material is compared with exiting drive shaft material (Steel). By the comparison the new composite material is more efficient and stiffness than the exiting material.

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