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IMPACT ANALYSIS ON COMPOSITE PROPELLER SHAFT

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Abstract:The present work carried out in the design of automobiles, the industry is exploring composite material in order to obtain reduction of weight without significant decrease in vehicle quality and reliability. Composite materials have been used in automotive components because of the properties such as low weight, high specific stiffness, corrosion free ability to produce complex shapes, high specific strength and high impact energy absorption etc. This is due to the fact that the reduction of weight of a vehicle directly impacts its fuel consumption. Particularly in city driving the reduction of weight is almost directly proportional to the fuel consumption of the vehicle. In this project the entire drive shaft assembly of light utility vehicle was chosen and analyzed by replacing it with composite materials. This work deals with the analysis of conventional drive shaft with Glass Epoxy. The torsional characteristics of Glass reinforced Epoxy composite shafts with twisting moment or torque were investigated using simple torsion testing machine. The analysis is carried out using ANSYS.

Keywords: Composite materials, Propeller shaft, Torsion testing.

1.Introduction

Glass Fiber is one of the most common fibers in the composites industry. The main reason for its use is the relatively low costs involved as glass fiber is significantly cheaper than carbon fiber, for example. This makes glass fiber attractive for the production of large composite structures like boats, wind turbines and so on. Additionally, glass fiber is available in various grades. The E grade is the most common one, but also R and S are available. Both R and S grades have better mechanical properties but are more expensive compared to the E grade.

2.Selection Of Materials And Process Drive Shaft

2.1 Functions of Drive Shaft

A drive shaft, propeller shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them. Drive shafts are carriers of torque. They are subject to torsion and shear stress, equivalent to the difference between the input torque and the load. They must therefore be strong enough to bear the stress, whilst avoiding too much additional weight as that would in turn increase the First, it must transmit torque from the transmission to the differential gear box their inertia. During the operation, it is necessary to transmit maximum low-gear torque developed by the engine. The drive shafts must also be capable of rotating at the very fast speeds required by the vehicle. The length of the drive shaft must also be capable of changing while transmitting torque. Length changes are caused by axle movement due to torque reaction, road deflections, braking loads and so on. A slip joint is used to compensate for this motion. The slip joint is usually made of an internal and external spline. It is located on the front end of the drive shaft and is connected to the transmission

2.2 Analyzing the Bearing – Step by Step Procedure

1.The 3D model of the drive shaft is designed by using pro-e software and it is converted as IGES format.

2.The IGES (Initial Graphic Exchange Specification) format is suitable to import in the ANSYS Workbench for analysing

3.Open the ANSYS workbench

4.Create new geometry

5.File – import external geometry file – generate

6.Project – new mesh

7.Defaults – physical preference – mechanical

8.Advanced – relevance centre – fine

9. Right click the mesh in tree view – generate mesh

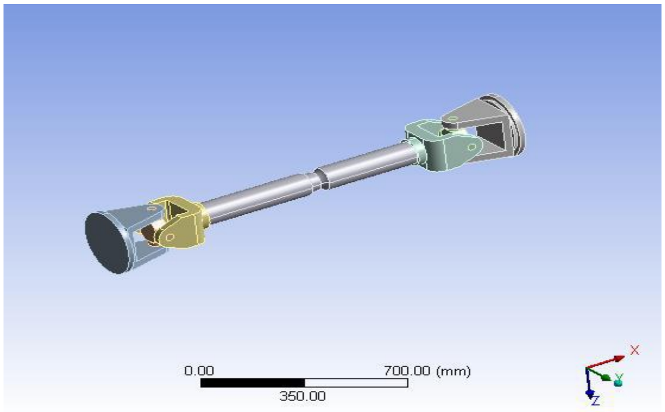

Fig.2.1 Model Creation

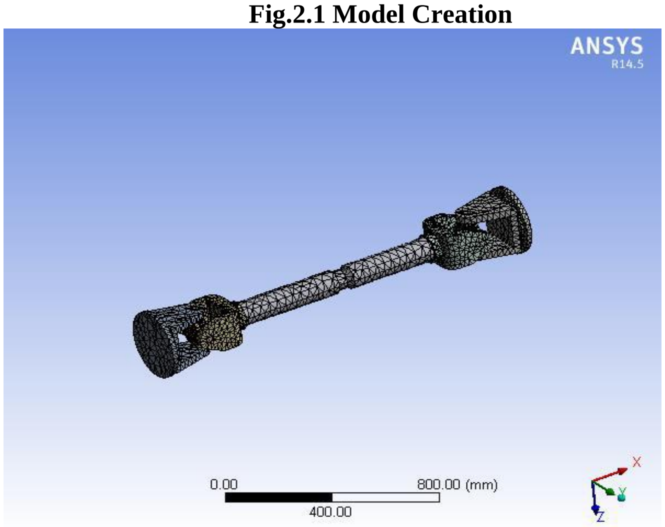

Fig.2.2 Meshing

10.Project – convert to simulation – yes

11.Select the all solid in geometry tree

12.Definition – material – new material

13.New material – right click – rename – SM45c steel

14.Enter the value of the young‘s modulus, poisons ratio, density and etc.

15.New analysis – transient structural Flexible dynamic – right click – insert – fixed support

16.Select the inner circular face of the drive shaft

17.Geometry – apply

18.Flexible dynamic – right click - insert – rotational velocity – select the face to define the velocity direction

19.Geometry – apply

20.Provide the value of the rotational velocity to 6207 rpm

21. Flexible dynamic – right click - insert – moment – select the face to define the moment direction and select the all surfaces to the moment load

22.Provide the value of the moment 350N.m

23.Then define the solution

24.Solution – right click - insert the total deformation, equivalent elastic strain, and equivalent stress.

25.Right click the solution icon in the tree – solve.

26.To capture the figure use the option new figure in tool bar.

27.The all results are taken in a picture – and save it to the required folder in the system KK. The all readings are tabulated

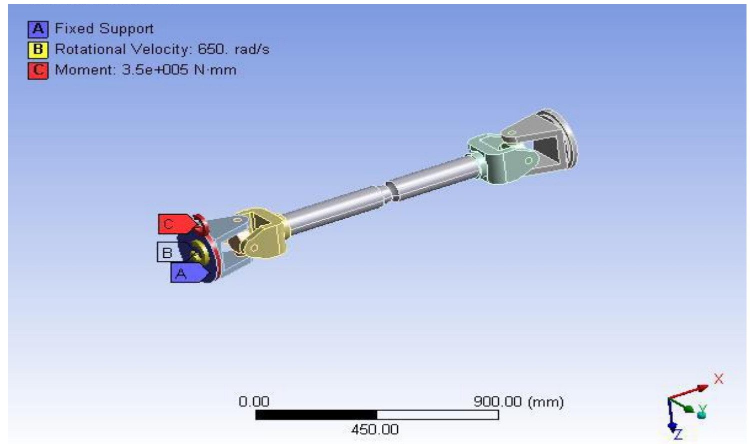

Fig.2.3 Input Values Applied on the Propeller Shaft In Ansys Workbench

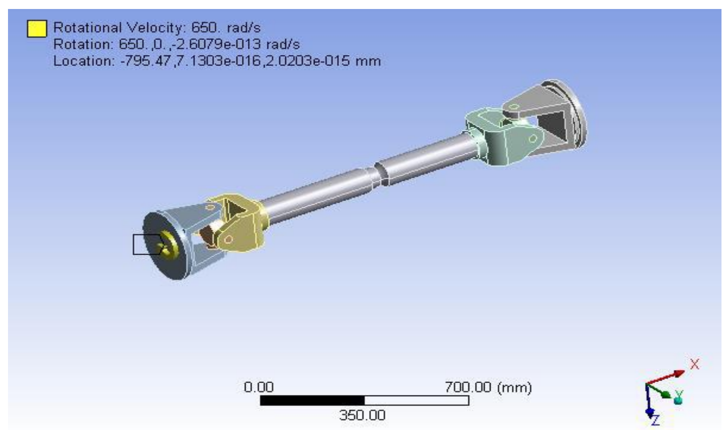

Fig.2.4 Rotational Velocity Applied on the Propeller Shaft in Ansys Workbench

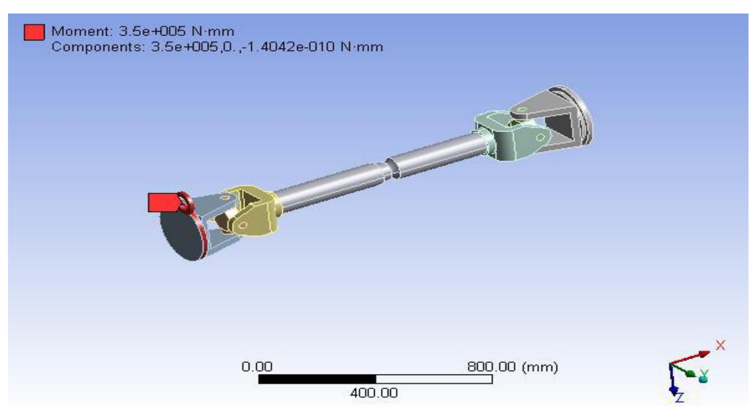

Fig.2.5 Moment Applied on the Propeller Shaft In Ansys Workbench

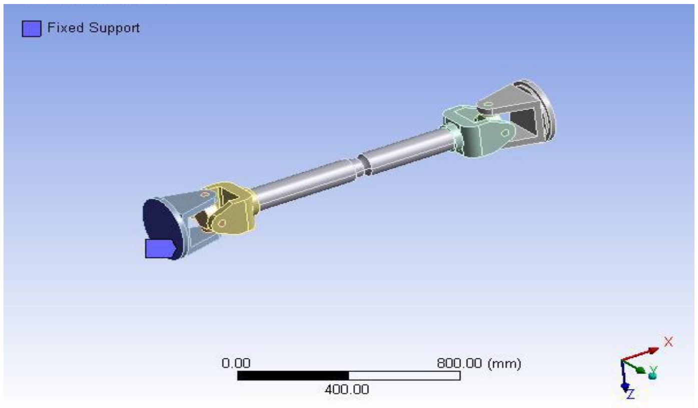

Fig.2.6. Fixed support defined on the propeller shaft in Ansys workbench

3.Results for conventional model (sm45c) Total deformation*:*

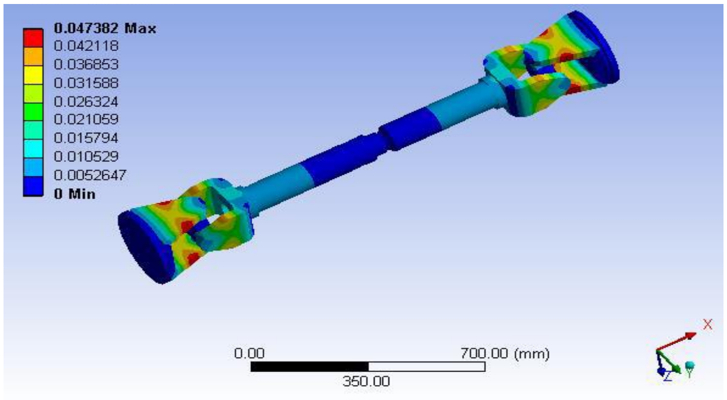

Fig.3.1 Results for conventional model (sm45c) Total deformation

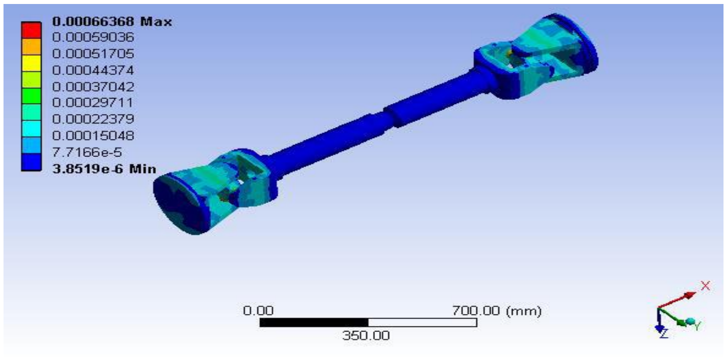

Fig.3.2 Equivalent Elastic Strain

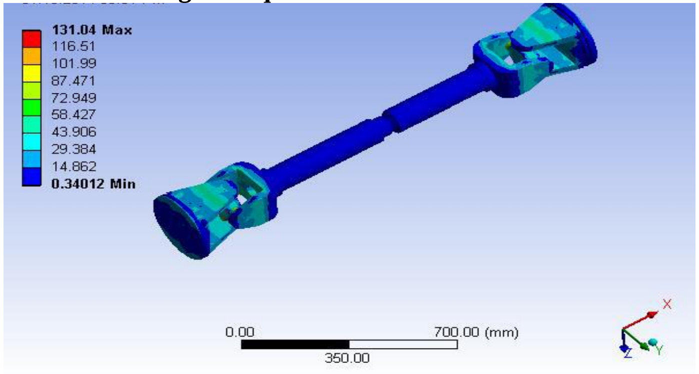

Fig.3.3 Equivalent Stress

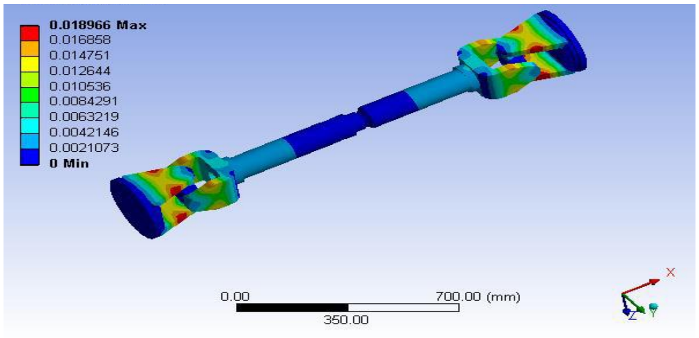

Fig.3.4 Results for optimised model (glass fibre) Total deformation

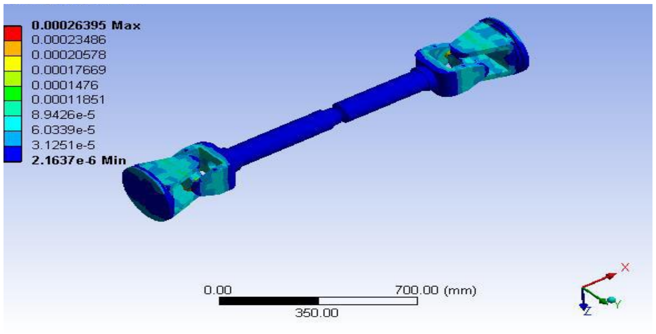

Fig.3.5 Equivalent Elastic Strain

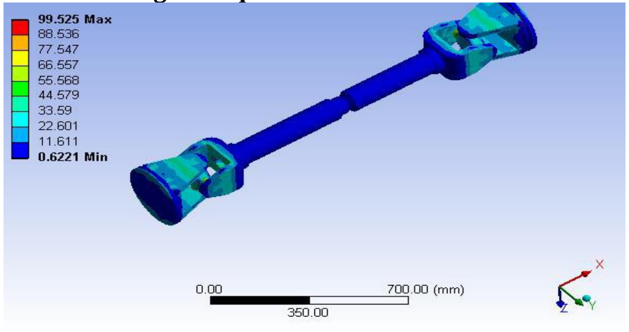

Fig.3.6 Equivalent Stress

3.1 Results and Comparison Of Above Materials

Table: 3.1 Results and Comparison Of Above Materials

S. NO.	PARTICULARS	TOTAL DEFORMATION (mm)	EQUIVALENT ELASTIC STRAIN (mm/mm)	EQUIVALENT STRESS (MPa)
1	CONVENTIONAL MODEL (SM45C)	0.047382	0.00066368	131.04
2	OPTIMISED MODEL (GLASS FIBRE)	0.018966	0.00026395	99.525

4.Conclusion

Experimental results from testing the propeller shaft under rotational velocity and moment are listed in the Table. Analysis has been carried out by optimizing the material such as glass fibre. The results such as total deformation, equivalent elastic strain and equivalent stress for each material are determined. Comparing the optimized materials and the conventional material, glass fibre material has the low values

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of total deformation, stress and strain. Hence it is concluded that glass fibre material is suitable for the propeller shaft. The project carried out by us will make an impressing mark in the field of automobile. While carrying out this project we are able to study about the Study about the analysing software (Ansys) to develop our basic knowledge to know about the industrial design.

5. References

1.Vicente Sanchez-Galvez, Laura Sanchez Paradela and Francisco Galvez (2014), ‗Analytical simulation of high speed impact onto hybrid

2.Vicente Sanchez-Galvez, Laura Sanchez Paradela and Francisco Galvez (2014), ‗Analytical simulation of high speed impact onto hybrid.

3.Pathalinga Prasad, Santhosh Kumar S and Sridhar N Shastry (2013), Fabrication and Characterization of Tensile properties of Laminated Composites-Effect of Fibre Orientation‗, International Journal of Engineering Research and Technology, Vol.-2, Issue-9, pp. 456-458.

4.K. P. Ashik, Ramesh S. Sharma, "A Review on Mechanical Properties of Natural Fibers Reinforced Hybrid Polymer Composite," Journal of Minerals and Materials Characterization and Engineering, vol. 3, pp. 420-426, Sept. 2015.

5.Tasnim Firdaus Ariff, Muhammad Ezurin Jalil, Rubina Bahar, "Design Improvements in the Inner Shell of a Motorbike Helmet Using Coconut Fiber Composite," Handbook on Emerging Trends in Scientific Research, pp.59-64.

6.B. Murali, D. Chandramohan, S.K. Nagoor Vali and B. Mohan, "Fabrication of Industrial Safety Helmet by using Hybrid Composite Materials," Journal of Middle East Applied Science and Technology (JMEAST), pp.584-587, 2014.

7.Stephen Natsa, Dr. J. O Akindapo and Dr. D. K Garba, "Development of a Military Helmet Using Coconut Fiber Reinforced Polymer Matrix Composite", European Journal of Engineering and Technology, Volume 3 No. 7, 2015.

8.Bernd Fuernschuss, Everson Kandare, Anton Sabo, Toh Yen Pang "Rethinking the safety of jockey helmets: a statistical comparison of different composite laminate helmet shells", Procedia Engineering 147, pp.507 – 512, 2016.

9.V. C. Sathish Gandhi, R. Kumaravelan, S. Ramesh, M. Venkatesan, "M. R. Ponraj, Performance Analysis of Motor Cycle Helmet under Static and Dynamic Loading", Mechanics and Mechanical Engineering Vol. 18, No. 2, pp.85-96, May 2014. [9] Alessandro Cernicchi, "Virtual Modelling of Motorcycle Saftey Hel-mets: Practical Problems", 6th European LS-DYNA Users' Conference, pp.223-232.

10.Rajasekar.K, Ashokkumar.K, Narayanan.L, "Design and Analysis of Industrial Safety Helmet using Natural Fibers", International Journal of Innovations in Engineering and Technology (IJIET), Vol.5 Issue 3, pp. 31-37, June 2015.