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# MODELING AND ANALYSIS OF COMPOSITE DRIVE SHAFT FOR AN HEAVY VEHICLE AUTOMOTIVE

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## ABSTRACT

*A driveshaft is a rotating shaft that transmits control from the engine to the differential mechanical assembly of a back wheel drive vehicles Driveshaft must work through consistently changing edges between the transmission and center point.*

*The general goal of this undertaking is to show and examine a composite drive shaft for control transmission. Substituting composite structures for regular metallic structures has many points of interest on account of higher particular solidness and quality of composite materials. This work manages the substitution of regular two-piece steel drive shafts with a Composite material's. In this work epoxy cure gum, high quality carbon epoxy is utilized as composite material, The plan parameters were upgraded with the target of limiting the heaviness of composite drive shaft. The outline enhancement additionally demonstrated huge potential change in the execution of drive shaft. In this present work an endeavor has been to appraise the diversion, stresses, regular frequencies under subjected loads utilizing FEA. Facilitate correlation did for alclad aluminum amalgam materials and weight of the shaft is streamlined and stretch power factor found for both Steel and composite drive shafts.*

*The composite drive shaft has many advantages, for example, diminished weight and less clamor and vibration. Be that as it may, on account of the high material cost of carbon fiber epoxy composite materials, rather shabby aluminum materials might be utilized halfway with composite materials, for example, in a crossover kind of aluminum/composite drive shaft, in which the aluminum has a part to transmit the required torque.*

## I. INTRODUCTION

A driveshaft is a pivoting shaft that transmits power from the motor to the differential apparatus of a back wheel drive vehicles Driveshaft must work through continually changing edges between the transmission and hub. Superb (Steel SM45) is a typical material for development. Steel drive shafts are normally produced in two pieces to expand the major bowing regular recurrence on the grounds that the twisting characteristic recurrence of a shaft is contrarily relative to the square of bar length and corresponding to the square foundation of particular modulus. The two piece steel drive shaft comprises of three widespread joints, an inside supporting bearing and a section, which increment the aggregate weight of a vehicle. Power transmission can be enhanced through the decrease of inertial mass and light weight. Substituting composite structures for conventional

metallic structures has many preferences as a result of higher particular solidness and higher particular quality of composite materials. Composite materials can be customized to effectively meet the plan prerequisites of quality, solidness and composite drive shafts weight not as much as steel or aluminium of comparable quality. It is conceivable to make one bit of composite. Drive shaft to dispose of the greater part of the gathering associating two piece steel drive shaft. Additionally, composite materials normally have a lower modulus of versatility. Therefore, when torque crests happen in the driveline, the driveshaft can go about as a safeguard and lessening weight on part of the drive prepare broadening life. Numerous specialists have been examined about cross breed drive shafts and joining strategies for the crossover shafts to the burdens of widespread joints. In any case, this examination gives the investigation of the outline in numerous angles.

The torque capacity of the drive shaft for traveler autos ought to be bigger than 3500 Nm and the central bowing regular recurrence ought to be higher than 9200 rpm to abstain from spinning vibration. Since the central twisting characteristic recurrence of a one-piece drive shafts made of steel or aluminium is ordinarily lower than 5700 rpm when the length of the drive shaft is around 1.5 m . The two-piece steel drive shaft comprises of three all inclusive joints, an inside supporting bearing and a section, which expands the aggregate weight of an automotive vehicle and abatements fuel proficiency. Since carbon fiber epoxy composite materials have more than four times particular solidness (E= ρ) of steel or aluminium materials, it is conceivable to make composite drive shafts in one-piece without spinning vibration more than 9200 rpm.

## II. DIFFERENT TYPES OF SHAFTS

1) Transmission shaft: These poles transmit control between the source and the machines holding power The counter shafts, line shafts, overhead shafts and all mechanical office shafts are transmission shafts. Since these shafts convey machine parts, for example, pulleys, gears and so on., in this way they are subjected to bowing minutes notwithstanding curving.

2) Machine Shaft: These shafts shape a basic piece of the machine itself. For instance, the crankshaft is an essential piece of I.C.engines slider-wrench component.

3) Axle: A shaft is called "a axle", in the event that it is a stationary machine component and is utilized for the transmission of bowing minute as it were. It essentially goes about as a help for pivoting bodies.

4) Spindle: A shaft is called "an spindle", on the off chance that it is a short shaft that confers movement either to a slicing instrument or to a work-piece.

## III. APPLICATIONS

1)Drill press axles bestow movement to cutting device (i.e.) penetrate

2) Lathe axles confer movement to work-piece.

3) Ship Propeller Shaft: Transmits control from gearbox to propeller joined on it.

4) Helicopter Tail Rotor Shaft: Transmits energy to rail rotor fan.

5) Automobile Drive Shaft: Transmits control from primary gearbox to differential apparatus box

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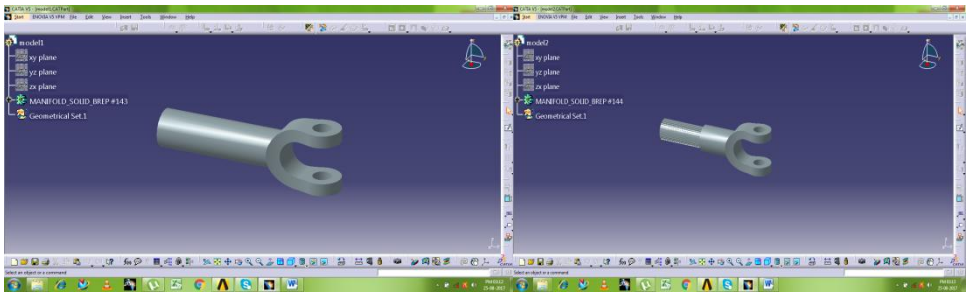
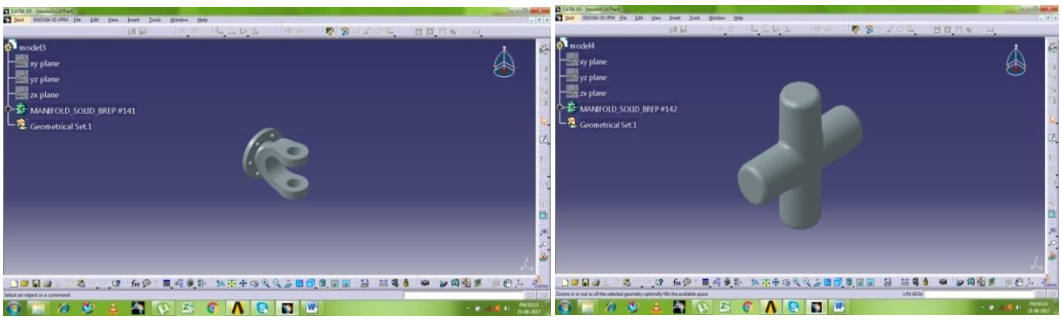
## IV. INTRODUCTION TO CATIA

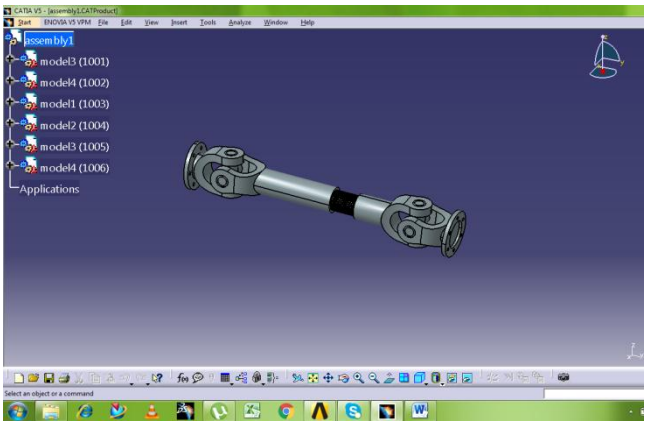
CATIA is a totally automation programming which relates with the mechanical field. It is graphical UI which is definitely not hard to learn moreover the item is feature based and parametric solid illustrating. We can draw 2D and 3D models of an area and in like way the social affair of the parts ought to be conceivable in it.

The shape or geometry of the model or assembling is poor upon the qualities which are suggested as objectives. Modules, for instance, sketcher module used to design 2D illustrations, part layout module is used to diagram the 3D models of geometry, and Assembly work arrangement is used to accumulate the different parts which are pulled in the part plot module. Kinematics is used to give the entertainment or development to the part bodies which are arranged and amassed to some degree and get together layout modules.

**Design of composite drive shaft in catia**




## V. ANALYSIS

### Finite Element Analysis (FEA)

The significant idea in FEA is that the body or structure may be disconnected into more minor fragments of restricted estimations called "Constrained Elements". The main body or the structure is then considered as an

assortment of these parts related at a set number of joints called "focus focuses". Clear cutoff points are approximated the clearings over each obliged section. Such recognized points of confinement are called "shape limits". This will suggest the advancement inside the sections like the development at the focuses of the fragments.

The Finite Element system is a sensible gadget for settling standard and deficient differential relationship in light of the truth it is a numerical gadget, it can manage the capricious issue that can be implied in differential logical announcement from. The usage of FEM is unfathomable as respects the strategy of normal arrangement issues. In light of high cost of taking care of power of years traveled by, FEM has a foundation set apart by being utilized to manage complex and cost essential inconveniences.

Structural Analysis of composite drive shaft

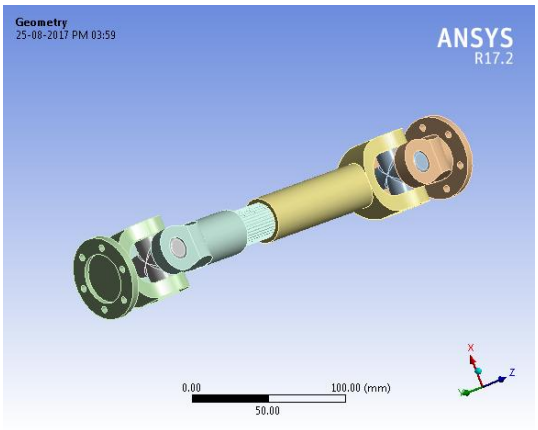
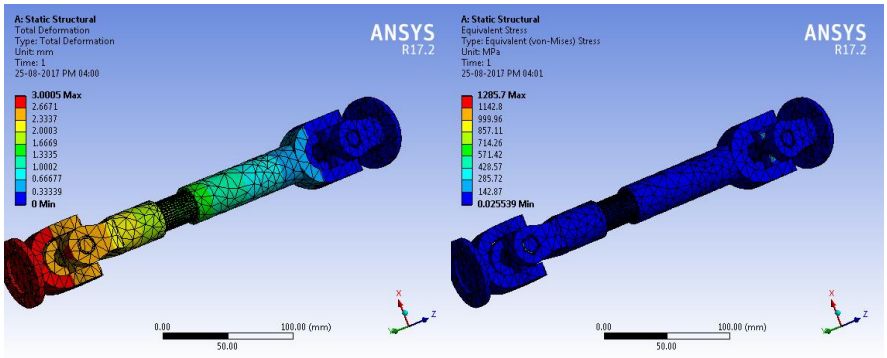


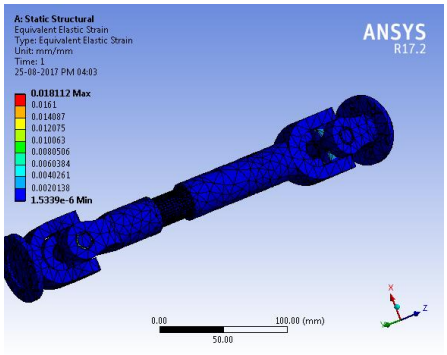

**Fig.Imported model of composite drive shaft in Ansys.**

Material Type : **ALCLAD ALUMINIUM ALLOY**

Total deformation Equivalent stress

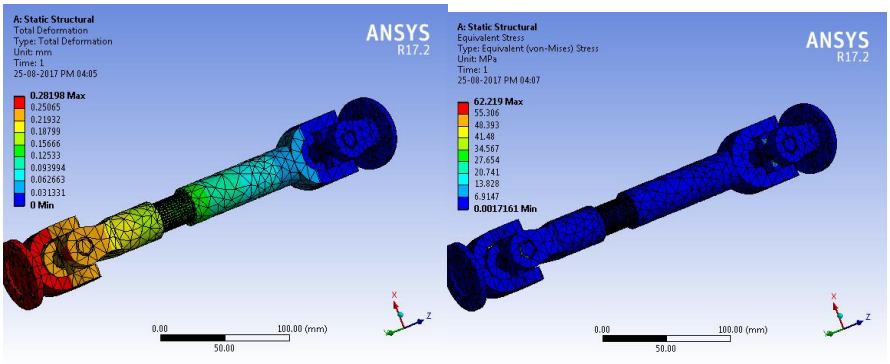



**Equivalent strain**

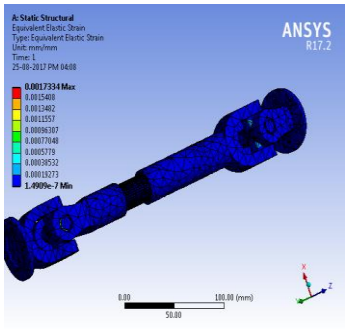



**Material Type : EPOXY CURE RESIN**

**Total deformationEquivalent stress**

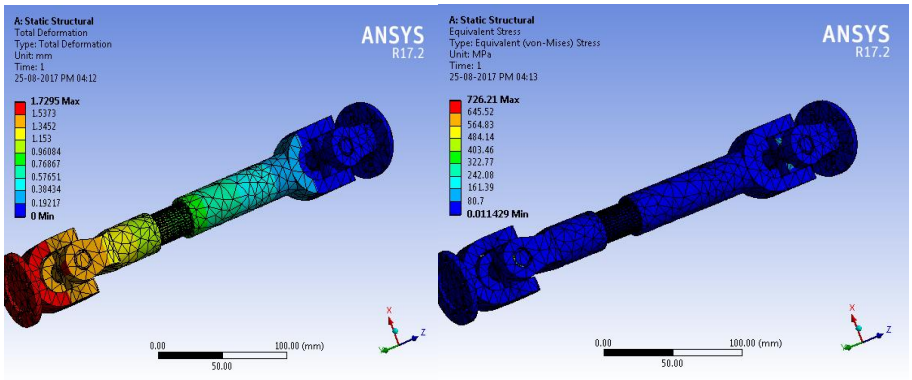



**Equivalent strain**

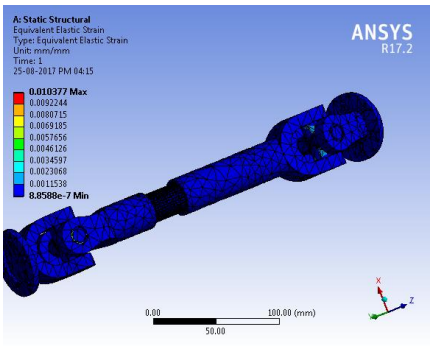



**Material Type : High strength carbon**

**Total deformation** **Equivalent stress**



**Equivalent strain**




## VI. RESULT AND COMPARISON

From the above analysis of drive shaft in ANSYS 17.2the results are collected in tabular form for different materials.We have noticed a change in both temperature basis and static factors

COMPARISON TABLE FOR STATIC STRUCTURE ANALYSIS FOR DRIVE SHAFT

| s.no | name of material | total deformation | equivalent stress | equivalent strain |
|---|---|---|---|---|
| 1 | alclad aluminium alloy | 3.0005 mm | 1285.7 MPa | 1.8112e-002 mm/mm |
| 2 | epoxy cure resin | 0.28198 mm | 62.219 MPa | 1.7334e-003 mm/mm |
| 3 | high strength carbon | 1.7295 mm | 726.21 MPa | 1.0377e-002 mm/mm |

## VII. CONCLUSION

We have designed drive shaft using CAD software namely CATIA V5 and analysis is done using ANSYS 17.01 and static analysis id drawn under required boundary conditions.

we have observed that epoxy cure resin shows good results when compared to other material. In static analysis epoxy cure resin shows lower deformation and less affected to stress and strain factors when compared different materials

By this project we are conclude that by using epoxy cure resin in place of other materials shows good physical bearable properties.

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