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Design and Analysis of Differential Gearbox

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ABSTRACT

My Project Design and Analysis of Differential Gearbox especially makes a speciality of the mechanical layout and analysis of gearbox as transmit the power. I had evolved this paintings as my venture with a purpose to get familiar with the technologies in addition to software of theories into realistic work achieved by means of industries. My task carries the design and material choice of the gearbox for exceptional type of cars also. For higher performance, development of power transmit rate is essential phenomenon.

The principal goal of this paper is to carry out mechanical layout of differential tools field and analysis of gears in equipment container. We have taken grey forged iron and aluminium alloy materials for engaging in the evaluation. Presently used materials for gears and gears shafts is Cast Iron, Cast Steel. So, in this paper we are checking because the aluminium can be the alternative material for the differential gear box for mild software motors so, we are able to reduce the burden.

INTRODUCTION

A differential is a device, normally but no longer always employing gears, capable of transmitting torque and rotation via 3 shafts, almost always used in one among ways: in a single way, it receives one enter and provides outputs--this is located in most automobiles--and in the different manner, it combines two inputs to create an output this is the sum, distinction, or average, of the inputs. In motors and different wheeled automobiles, the differential allows every of the using roadwheels to rotate at special speeds, while for maximum cars providing equal torque to each of them.

LITERATURE REVIEW

In this paper, literature has been significantly reviewed involving various studies accomplished via diverse researchers associated with the field of designing and analysis of Differential gearbox. Differential gearbox is an essential part of the automobile i.e. Used for transmitting exceptional speeds, whilst for most automobiles imparting equal torque to each of them.

Muhammad Safuan Bin Md Salleh et al [1]: A differential is a device typically, however no longer always employing gears able to transmitting torque and rotation. It combines inputs to create an output this is the sum, distinction, or[2] common, of the inputs. In vehicles and other wheeled vehicles, the differential permits every of the using wheels to rotate at unique speeds. A car's wheels rotate at one-of-a-kind speeds, in particular whilst turning corners. The differential is designed to power a pair of wheels with same torque at the same time as letting them rotate at exceptional speeds. Up to now, [3]UTeM FV car use differential to send the electricity from engine to tire. But nearly all differential within the market honestly heavy and could effect on engine speed or engine torque. So that, this

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differential isn't suitable for racing [4]vehicle particularly for UTeM FV car. The main intention of this venture is to cognizance at the mechanical layout and analysis on meeting of gears in equipment. Analysis is conducted the use of Solid Work Simulation through varying the materials for gears which include Cast Iron and Aluminum Alloy. In this analysis, the cast iron fabric changed into replace to Aluminium [5] Alloy for decreasing weight of the product.

INTRODUCTION TO CAD/CAM

Four.5.8 Advantages of PRO/E:

- It is much faster and extra accurate.
- Once a layout is finished. 2D and three-D perspectives are simply obtainable.
- The capacity to adjustments in late layout method is viable.

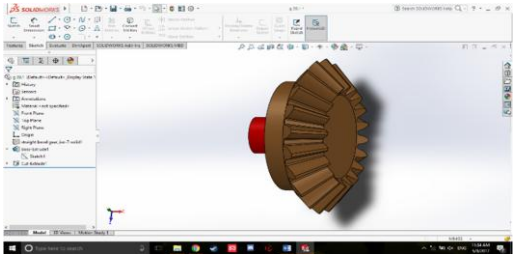

Fig. Bevel gear1

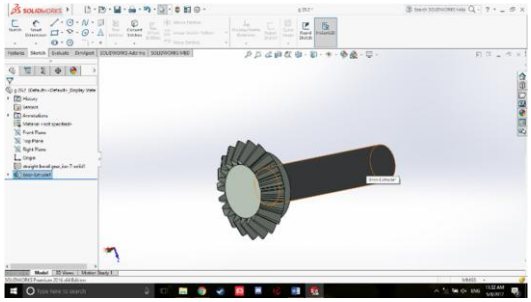

Fig. Bevel gear 2

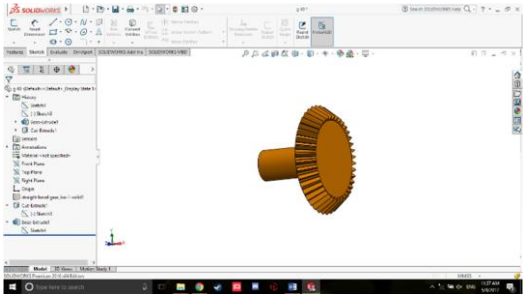

Fig. Bevel gear3

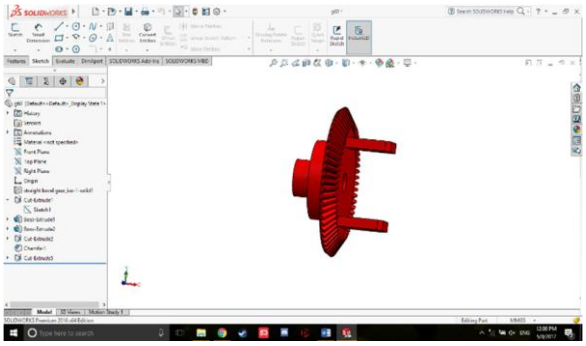

Fig. Bevel gear4

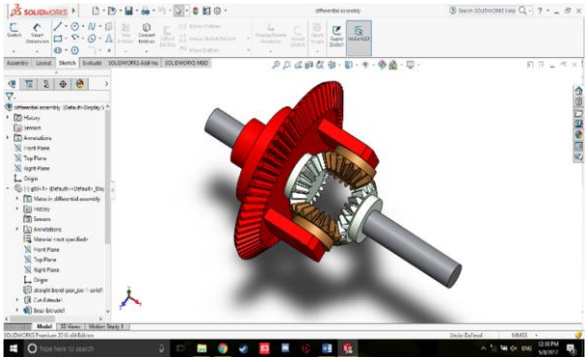

Fig. Final assembly

Engineering Data

We have used two different materials like grey cast iron and aluminum alloy for the analysis of this product.

Density	7200 kg m^-3
Coefficient of Thermal Expansion	1.1e-005 C^-1
Specific Heat	447 J kg^-1 C^-1
Thermal Conductivity	52 W m^-1 C^-1
Resistivity	9.6e-008-ohm m
Young's Modulus Pa	1.1e+011
Poisson's Ratio	0.28
Tensile Ultimate Strength	2.4e+008
Compressive Ultimate Strength	8.2e+008

The Material Properties of grey cast iron

Density	2770 kg m^-3
Coefficient of Thermal Expansion	2.3e-005 C^-1
Specific Heat	875 J kg^-1 C^-1
Young's Modulus Pa	7.1e+010
Poisson's Ratio	0.33
Resistivity	3.63e-008-ohm m
Thermal Conductivity	114 W m^-1 C^-1
Tensile Yield Strength	2.8e+008
Tensile Ultimate Strength	3.1e+008

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The Material Properties of Aluminum alloy

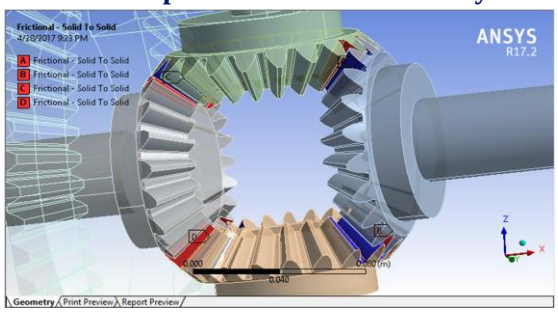


Fig. the frictional coefficient between the mating gears as 0.2. for the frictional or rubbing contact between to test for the thermal conditions.

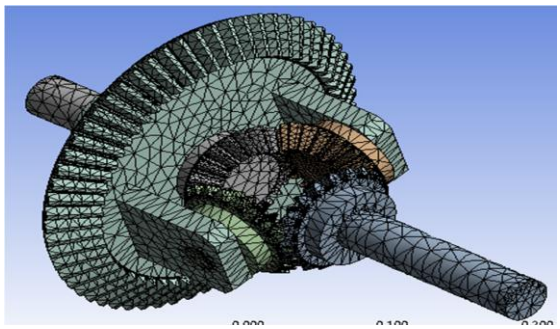
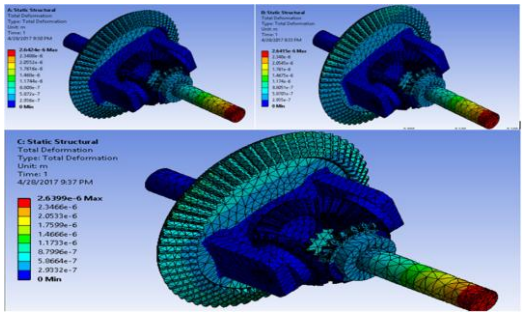
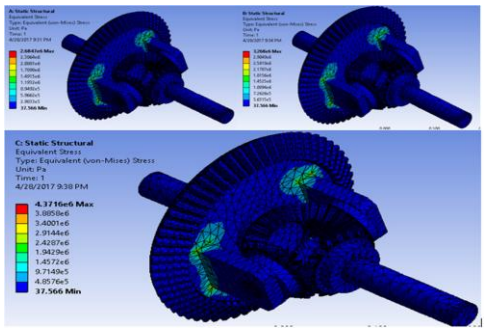


Fig. meshing Part



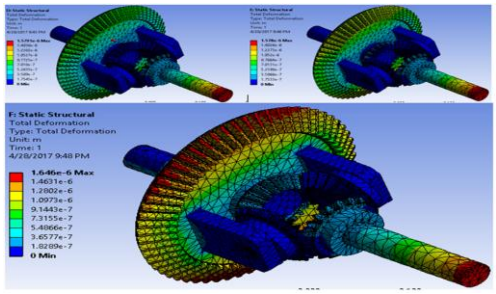
It shows the Total Deformation stress values of the differential gear box at different torques at 190, 235, 320 (N-m) on Grey Cast Iron

Von-Mises Stress of Differential Gear Box:



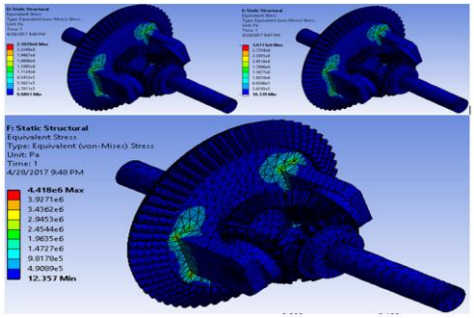
It shows the Von-Mises stress values of the differential gear box at different torques at 190, 235, 320 (N-m) on Grey Cast Iron.

Total Deformation of Aluminum Alloy:



It shows the Total Deformation stress values of the differential gear box at different torques at 190, 235, 320 (N-m) on Aluminium Alloy

Von-Mises Stress of Differential Gear Box



It shows the Von-Mises stress values of the differential gear box at different torques at 190, 235, 320 (N-m) on Aluminium Alloy.

RESULTS & DISCUSSIONS

Total Deformation and Von-Mises Stresses of Grey Cast Iron

S.no	Torque (N-m)	Total Deformation (mm)	Von-Mises Stresses (MPa)
1	190	2.6424*e^-3	20.6847
2	235	2.6415*e^-3	32.681
3	320	2.6399*e^-3	43.716

Total Deformation and Von-Mises Stresses of Aluminium Alloy

S.no	Torque (N-m)	Total Deformation (mm)	Von-Mises Stresses (MPa)
1	190	1.5791*e^-3	25.029
2	235	1.578*e^-3	30.773
3	320	1.646*e^-3	44.18

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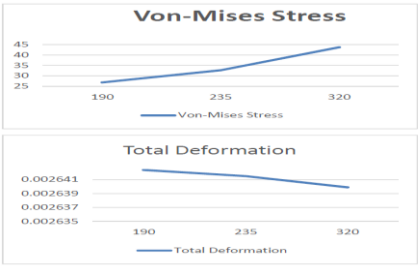
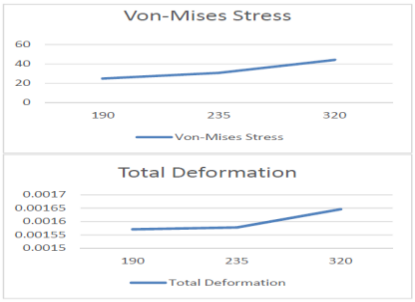
Graphs:

For Grey Cast Iron



For Aluminium Alloy



CONCLUSION

In this undertaking, we've taken the frictional touch among the mating gears as 0.2 to peer does the frictional contact the impact the burden or now not. From, the above outcomes and graphs we found that each gray forged iron and aluminium alloy are top-rated for performing the application of differential gearbox in cars. But, in terms of weight for light utility automobiles Aluminium Alloy is desired.

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