

DESIGN AND ANALYSIS OF ALLOY WHEEL WITH DIFFERENT ALLOYS

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ABSTRACT

The essence of the car alloy wheel gives a firm base on which to fit the tire. Its measurements, shape ought to be reasonable to enough oblige the specific tire required for the vehicle. In this investigation a feel burnt out on car alloy wheel having a place with the disc wheel class is considered. Design in a vital modern action which impacts the nature of the product.

The alloy wheel is designed by CATIA V5 R20 utilizing displaying programming. In displaying the time spent in creating the perplexing 3-D models and the hazard engaged with design and assembling procedure can be effectively limited. So the displaying of the alloy wheel is made by using CATIA .Later this CATIA show is foreign to ANSYS for investigation work.

ANSYS programming is the most recent utilized for simulating the distinctive forces, pressure following up on the component and furthermore to calculate and seeing the outcomes. A solver mode in ANSYS Software figures the anxieties, avoidances, bowing minutes and their relations without manual intercessions, diminishes the time compared with the strategy for scientific counts by a human. ANSYS static investigation work is carried out by considered two different materials specifically Aluminium alloy, Titanium alloy, and Epoxy carbon fibre and their relative exhibitions have been watched separately. In addition to this rim is subjected to structure investigation, a piece of model examination is carried out its execution is observed.

I. INTRODUCTION

The alloy wheel is the external round design of the metal on which within edge of the tire is mounted on vehicles, for example, autos. For instance, in a four wheeler the rim is a loop appended to the external finishes of the spokes-arm of the wheel that holds the tire and tube.

Standard car steel alloy wheel is produced using a rectangular sheet metal. The metal plate is twisted to deliver a barrel shaped sleeve with the two free edges of the sleeve welded together. No less than one tube shaped stream turning operation is carried out to acquire a given thickness profile of the sleeve — specifically involving in the zone planned to constitute the external seat a point of slant with respect to the hub heading. The sleeve is then formed to get the rims on each favor a radially internal round and hollow divider in the zone of the external seat and with a radially external frusta-funnel shaped divider slanted at a point comparing to the standard slant of the rim seats. The rim is then aligned.

To help the barrel shaped rim structure, a circle is made by stamping a metal plate. It needs to have suitable gaps for the middle center point and fasteners. The spiral external surface of the wheel plate has a round and hollow geometry to fit inside the rim. The rim and wheel plate are amassed by fitting together under the external seat of the rim and the gathering welded together.

Alloy wheels are the piece of car where it intensely experiences both static loads and additionally exhausts stacks as alloy wheels have a distinctive street profile.

Nomenclature of Wheel Rim

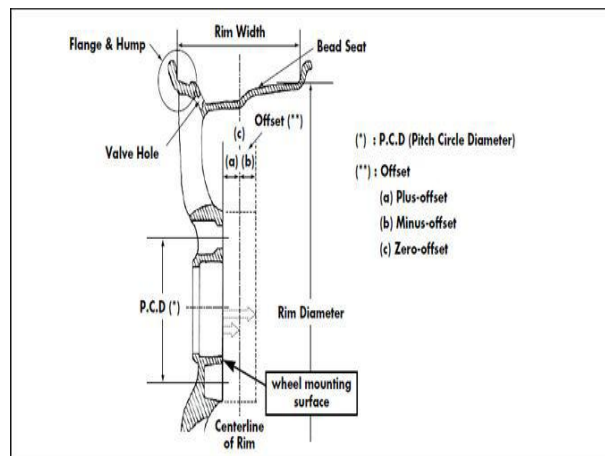


Fig 1: Rim Nomenclature

1. **Wheel:** Wheel is for the most part made out of rim and disc.
2. **Rim:** This is a section where the tire is introduced.
3. **disc:** This is a piece of the rim where it is settled to the hub center
4. **Offset:** This is a space between wheel mounting surface where it is rushed to center and focus line of rim..
5. **Flange:** The rib is a piece of rim which holds the two beds of the tire.
6. **Bead Seat:** Bead sitsuate approaches in contact with the dot face and it is a piece of rim which holds the tire an outspread way.
7. **Hump:** It is a knock what was put on the bed situate for the globule to keep the tire from sliding off the rim while the vehicle is moving.
8. **Well:** This is a piece of rim with profundity and width to encourage tire mounting and expulsion from the rim. Steel and light compound are the chief materials utilized as a part of an amalgam wheel however some composite materials together with glass-fiber are being utilized for unique wheels

II. TYPES OF ALLOY WHEELS

a) Wire Spoke Wheel

Wire spoke wheel is a central where the outside edge some bit of the wheel (edge) and the turn mounting part are associated by various wires called spokes. The present autos with their high quality have made this kind of wheel make old. This sort of wheel is so far used on incredible vehicles. Light composite wheels have making starting late, an outline to offer emphasis to this spoke effect to fulfill customers frame requirements.

Steel Disc Wheel

This is a rim which hones the steel-made rim and the wheel into one by joining (welding), and it is utilized for the most part for traveller vehicles particularly unique gear tires.



Fig.2 Steel Wheel

c) Light Alloy Wheel

These wheels depend on the utilization of light metals, for example, aluminum and magnesium has come to be prevalent in the market. This wheel quickly wind up noticeably standard for the first gear vehicle in Europe in 1960's and for the substitution tire in United States in 1970's. The benefits of each light combination wheel are clarified as beneath.

D)Aluminium Alloy Wheel

Aluminium is a metal with components of phenomenal daintiness, warm conductivity, rust encounter, physical characteristics of throwing, low warmth, machine handling and reutilizing, and so on. This metals fundamental preferred standpoint is decreased weight, high exactness and design decisions of the wheel. This metal is valuable for vitality safeguarding in light of the fact that it is possible to re-cycle aluminium effort Lesley.



Fig.2.4 Aluminium alloy Wheel

e) Magnesium alloy wheel

Magnesium is around 30% lighter than aluminium and furthermore honourable with respect to measure steadiness and effect resistance. However, its utilize is for the most part confined to hustling, which needs the elements of weightlessness and high quality to the detriment of weathering resistance and design decision, and so on contrasted and aluminium.

As of late, the innovation for throwing and fashioning is enhanced, and the erosion resistance of magnesium is likewise making strides. This material is getting uncommon consideration because of the recharged enthusiasm for vitality preservation.

f) Titanium alloy wheel

Titanium is an excellent metal for erosion resistance and quality (around 2.5 times) contrasted and aluminium, however it is sub-par because of machine handling, designing and more cost. It is still in the improvement arrange despite the fact that there is some use in the field of hustling.

g) Composite material wheel

The composite material wheel is not the same as the light amalgam wheel, and it is produced for the most part for low weight. However this wheel has deficient consistency against warm and for best quality. Advancement is proceeding.

III. INTRODUCTION TO CATIA

CATIA is an absolutely mechanization programming which relates with the mechanical field. It is graphical UI which is certainly not hard to learn in addition the thing is highlight based and parametric strong showing. We can draw 2D and 3D models of a range and in like way the get-together of the parts should be possible 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.

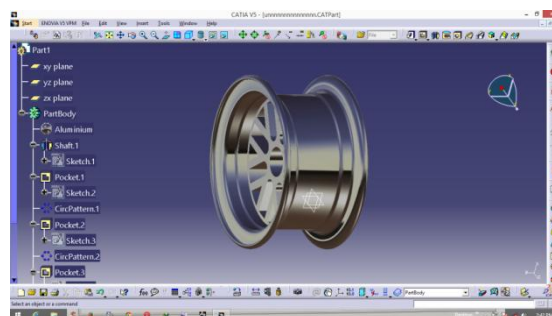


Fig 4 alloy wheel model in catia

IV. INTRODUCTION TO FEA

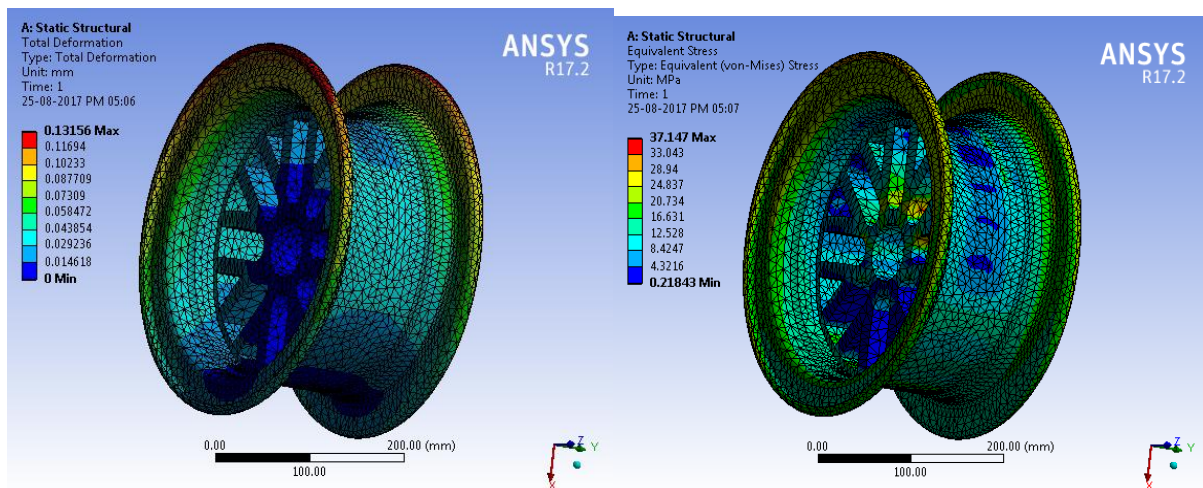
The significant idea in FEA is that the body or structure may be disconnected into more minor fragments of

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.

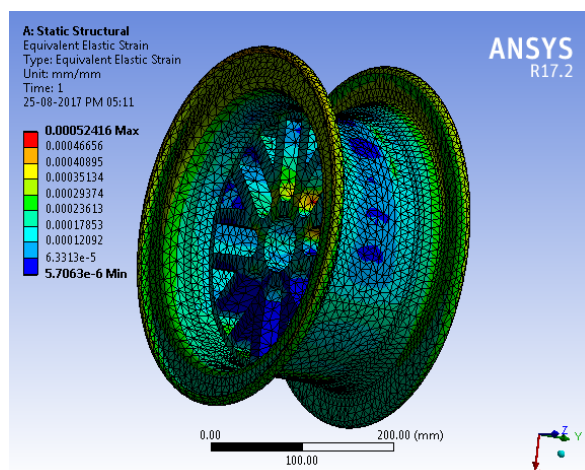
The Finite Element system is a sensible gadget for settling standard and deficient differential relationship in light of the truth it is a numerical gadget, it can manage the capricious issue that can be implied in differential logical announcement from. The usage of FEM is unfathomable as respects the 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.

Material ALUMINIUM ALLOY

Total deformationequivalent stress

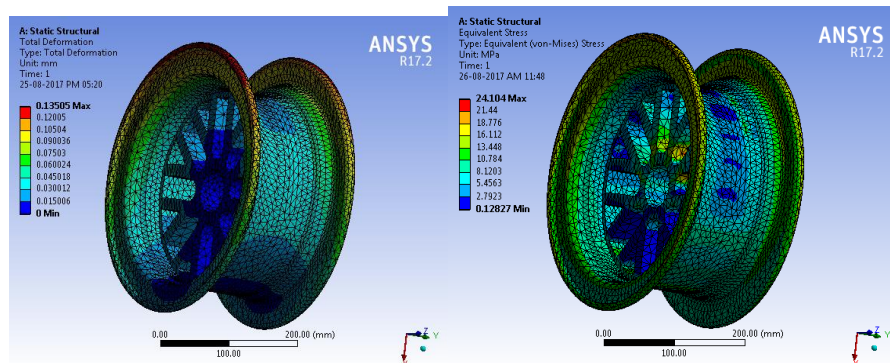


equivalent strain

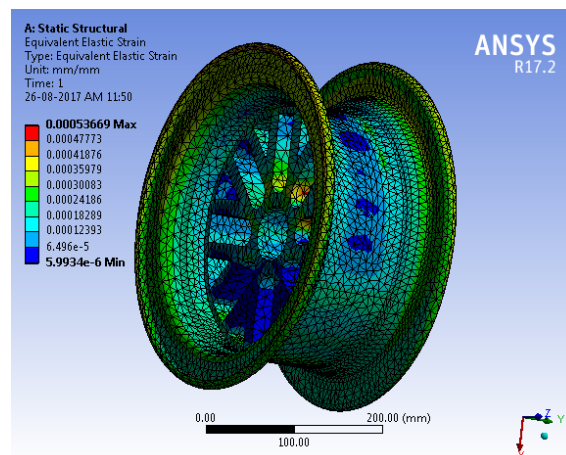


Magnesium alloy

Total deformationequivalent stress

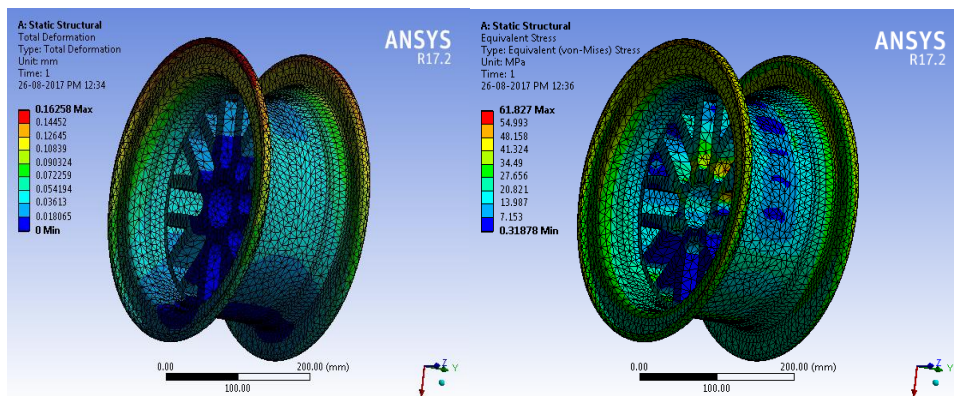


Equivalent strain

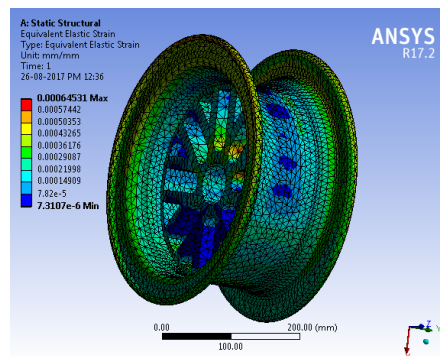


Titanium Alloy

Total deformationequivalent Stress



equivalentStrain



V. RESULTS AND COMPARISON

Analysis is done on imported design from CATIA V5 using static structural and modal analysis workbench under required condition, on different alloy and composite materials.

The results are obtained and compared between different materials under same parametric conditions

Properties	Aluminium alloy	Magnesium alloy	Titanium alloy
Total Deformation	0.13156 mm	0.13505 mm	0.16258 mm
Equivalent Elastic Strain	5.2416e-004 mm/mm	5.3669e-004 mm/mm	6.4531e-004 mm/mm
Equivalent stress	37.147 MPa	24.104 MPa	61.827 MPa

When comparing between alloy materials aluminium alloy has better deformation factors and better strain coefficients But when alloy materials is compared to composite material, composite material has better deformation and stress factors.

VI. CONCLUSION

From the above analysis on imported design from catia V5 we conclude that aluminium alloy has better sustainable properties when compared to another alloy materials, which has better deformation factors and stressNow a days Aluminium alloy is widely used because it has good Equivalent Elastic Strain and deformation coefficientBut composite material has better advantage than aluminium alloy material because of its low weight, low deformation factor and high stress handling properties

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