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Design and Analysis of Two Wheeler Alloy Wheel Rim using Two Different Materials

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***Abstract:** This rim made from an alloy of Cast stainless steel and Cast alloy. There are three steps for these processes are preprocessing, analysis and visualization. The chosen material is Cast stainless steel and cast alloy steel. These metals have also wear resistence as well as anticorrosion properties and also have longer service life. All these analysis will be done with maximum load applied on wheel. The Displacement is at the small expense. This whole step is in safe condition. This whole project has to be done by applying loads and pressure on wheel and for this we are using following materials: - Cast stainless steel and Cast alloy steel. After getting all this result might be possible this material used in future development of two wheeler rim. This project deals with static and analysis of the rim.*

I. INTRODUCTION

On the wheel we are applying force and pressure. After the engine the spoke wheel rim assembly is most imported thing for major weight addition in motorcycle. For avoiding these type of disadvantage we are invented the alloy wheel. While comparing all alloy materials Cast alloy steel is the best of other alloy materials.

A. Why Cast Alloy Steel

I have selected cast alloy steel for this project. Cast alloy steel is light in weight, easily available, and low cost. So, our choice is cast alloy steel the chemical composition is tabulated below in Table.

	Cast alloy steel	Cast carbon steel	Cast stainless steel
Carbon	.25 %	.25 %	.16 %
Manganese	.75 %	1.0 %	1.5 %
Silicon	.80 %	.80 %	2.0 %
Sulfur	.06 %	0 %	.20 %
Phosphorus	.05 %	0 %	.04 %

1) Applying Loads

Mass of Bike, Dead Weight of Bike = 142kg Other Loads = 22 Kg
Load 0 = Total Gross Weight = 142 + 22 = 164 Kg = 164X 9.81 N = 1608.84 N
Load 1 = (164+66) kg = 230 kg * 9.81 = 2256.33 N (Rider) (Average weight of a man = 66kg)
Load 2 = (164+66X2) kg = 296kg * 9.81 = 2903.76 N (Rider + 1 Person) up to 4 persons.

No. of Loads	N	No. of Pressures by Load	N/mm2
Load 0	1608.84	Pressure 0	0.02321
Load 1	2256.33	Pressure 1	0.0324
Load 2	2903.76	Pressure 2	0.0417
Load 3	3551.25	Pressure 3	0.0509
Load 4	4198.74	Pressure 4	0.0601

B. Designing Process

Auto cad and solid work software is used to Design and Analysis of Two Wheeler Alloy Wheel Rim Using Two – Different Materials according to the general dimensions. There after the design is imported into Solid work to analyses the stress, and displacement.

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II. LITERATURE SURVEY

1) *Priya Udasi et al In 2014 [2]:* For this whole project two software has used NX 7.5 and Ansys 13.0 . By using these software we are determine the stress, strain and life of rim. By using these software we will e get our result. By using this software we will get the actual result which we needed, and also this software is trustworthy.
2) *M. Ravichandra et al In 2015 [5]:* The benefit of using alloy wheel is we get lighter weight and also its help the speed of car. The benefit of using alloy wheel we can reduce in fuel consumption because of lighter weight of wheel. Alloy is an best conductor of heat and because of this there is less possibility to failure of brake.
3) *Akanksha Paroha et al In 2018 [15]:* A wheel should maintain structural integrity without any cracks or plastic deformation. Further down a radial load, the asset of the rim usually determines the fatigue life of a wheel, so the stress assessment is mainly focused on the rim. The objective of present study is to investigate based on previous research papers new techniques for fatigue strength evaluation of components with a given surface roughness. The fundamental idea is that finite element analysis of the surface topography will provide better characterization of the surface than current empirical techniques.

III. PROBLEM STATEMENT

The most important thing is selection of alloy materials. Weight and life of wheel and also stress is totally depending upon materials. There are clash among component and assembly processes, due to cost execution, and load. By using this result we can directly show to the industry, because of using these material we can reduce the weight of wheel and also we can increase efficiency and its very cheap to produce.

A. Problem Formulation

The objective of present study is to carry out the analysis of a two wheeler alloy wheel rim of different materials and analyze amid results of analysis, which can be helpful for getting best fitting material for the casting of alloy wheel rim. In the present study 3D model of wheel rim is to develop using AUTO CAD software and the static analysis is done by Solid work software. The results of analysis are noted for making helpful comparison.

IV. MODELING & ANALYSIS

Auto cad is used to create the Model according to the standard dimension. First 2D model is developed and 3d Model is generated in solid work.

A. Analysis Results of Cast alloy Steel

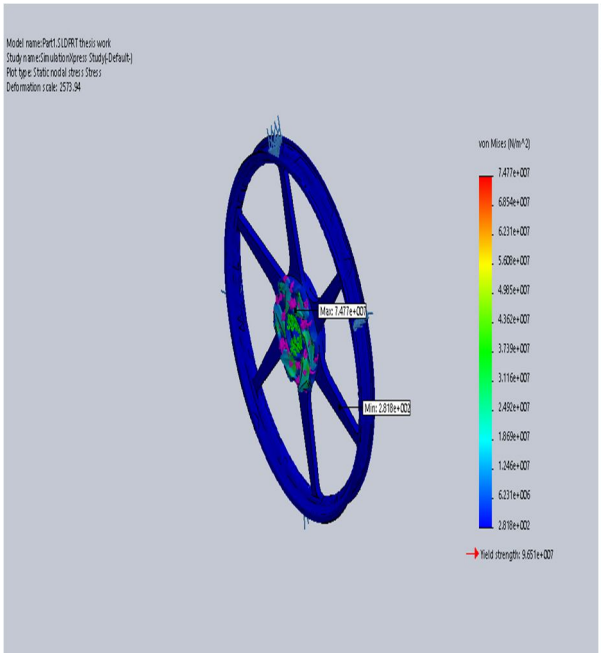


Figure 1: Load and Pressure at 0 of Stress.

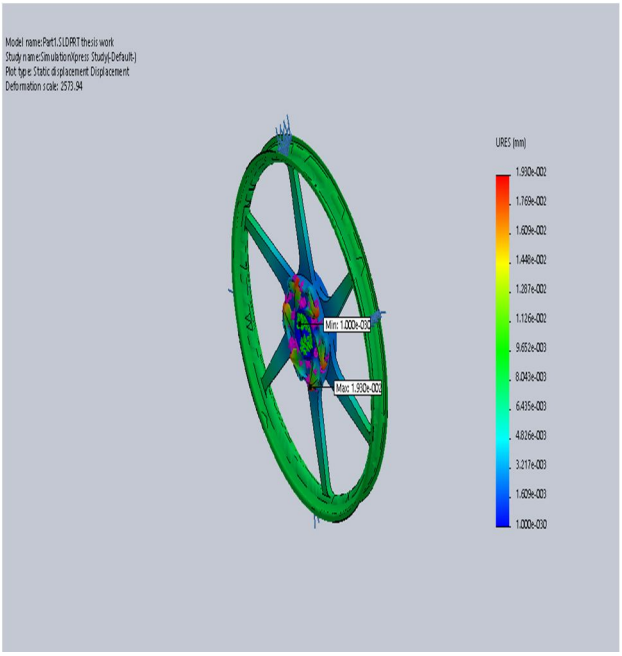


Figure 2: Load and Pressure at 0 of Displacement.

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B. Analysis Results of Cast Stainless Steel

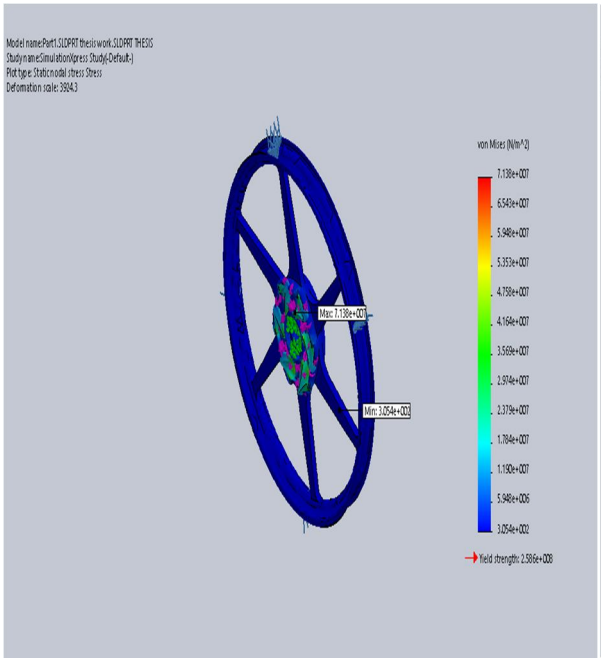


Figure 3: Load and Pressure at 0 of Stress.

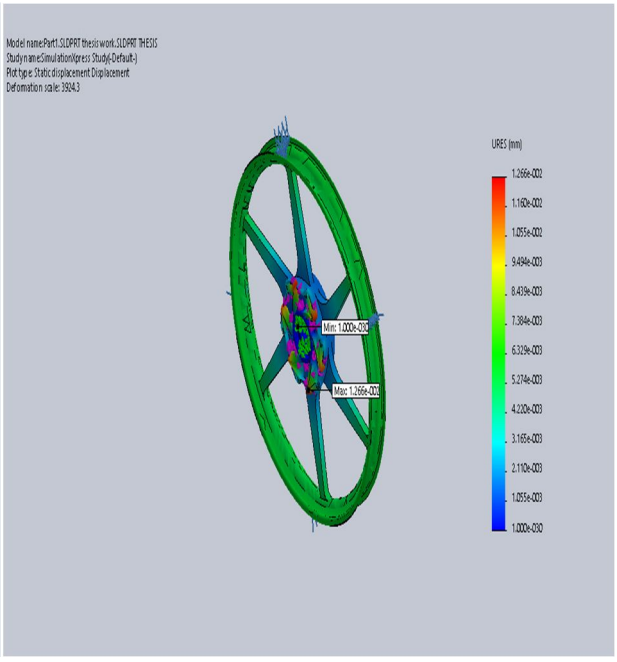


Figure 4: Load and Pressure at 0 of Displacement.

V. RESULTS & DISCUSSION

Comparison of Radial Displacement Results

Load/ Pressure	Cast alloy steel	Cast stainless steel
At 0	0.0381	0.305
At 1	0.0532	0.426
At 2	0.0685	0.549
At 3	0.0837	0.670
At 4	0.0988	0.791

Comparison of **N**on misses stress Results

Load/ Pressure	Cast alloy steel	Cast stainless steel
At 0	12.77	5.461
At 1	17.83	7.623
At 2	22.94	9.811
At 3	28.01	11.975
At 4	33.07	14.14

Weight Comparison Table

Materials	Cast alloy steel	Cast stainless steel
Weight	1375.735 grams	3875.735 grams
Rate/kg	78 / Kg	97 / Kg

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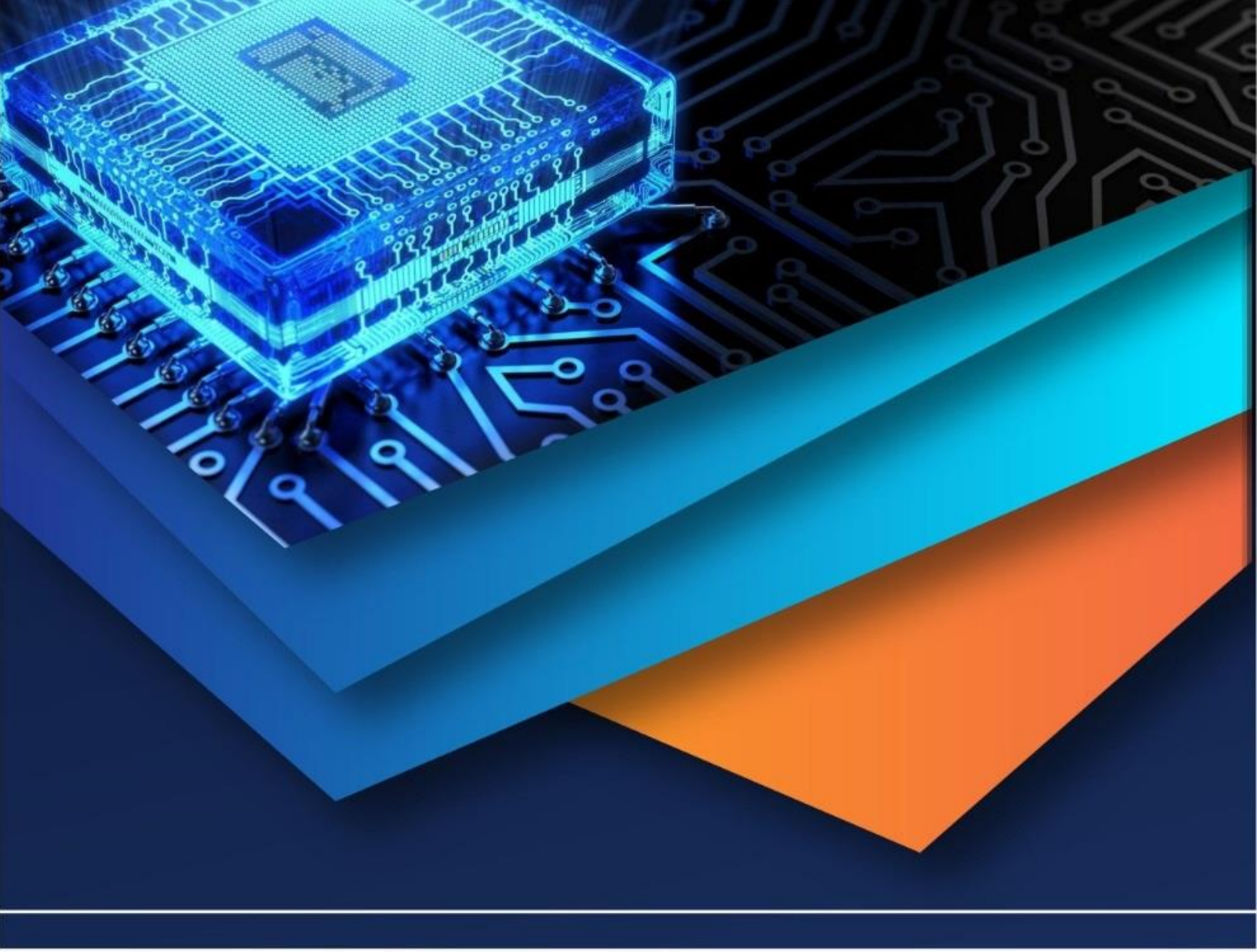
VI. CONCLUSION

So we are comparing the result with the commercial vehicle and after getting the better result so we can make changes in wheel. So we can concluded that Cast alloy steel is the suitable material for this commercial vehicle for the various design. The expected design is modeled using 3D parametric software AutoCAD and Solid Work.

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