



# IJRASET

International Journal For Research in  
Applied Science and Engineering Technology



---

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

---

**Volume: 8      Issue: V      Month of publication: May 2020**

**DOI: <http://doi.org/10.22214/ijraset.2020.5057>**

**[www.ijraset.com](http://www.ijraset.com)**

**Call:  08813907089**

**E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)**

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

Tauseef Ahmed Siddiqui<sup>1</sup>, Jitendra Jadon<sup>2</sup>

<sup>1</sup>M.Tech Scholar, <sup>2</sup>Assistant Professor, Department of Mechanical Engineering, Shobhit University, Meerut (U.P).

**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 resistance 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.

## 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

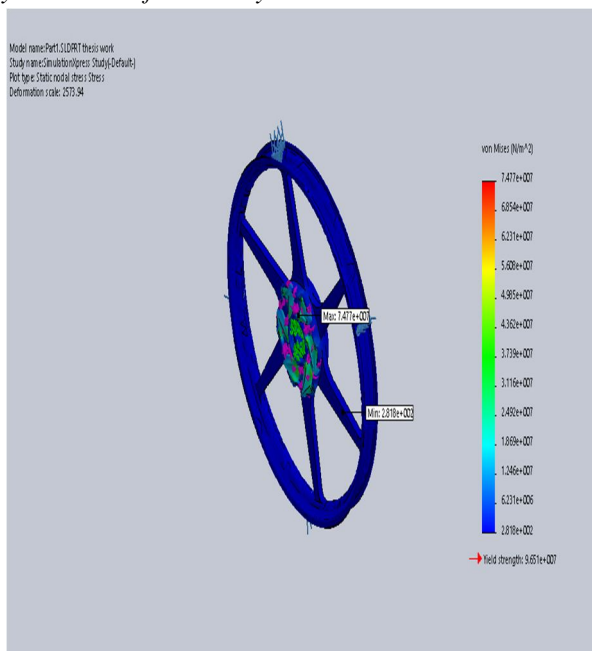


Figure 1: Load and Pressure at 0 of Stress.

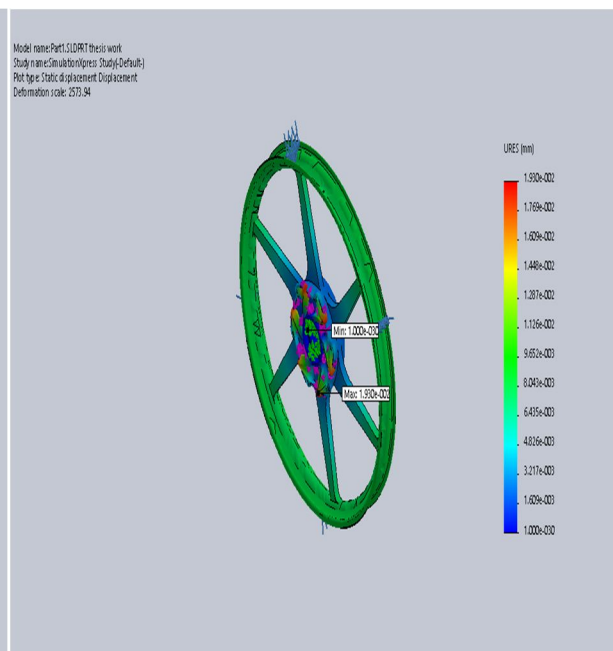


Figure 2: Load and Pressure at 0 of Displacement.

**B. Analysis Results of Cast Stainless Steel**

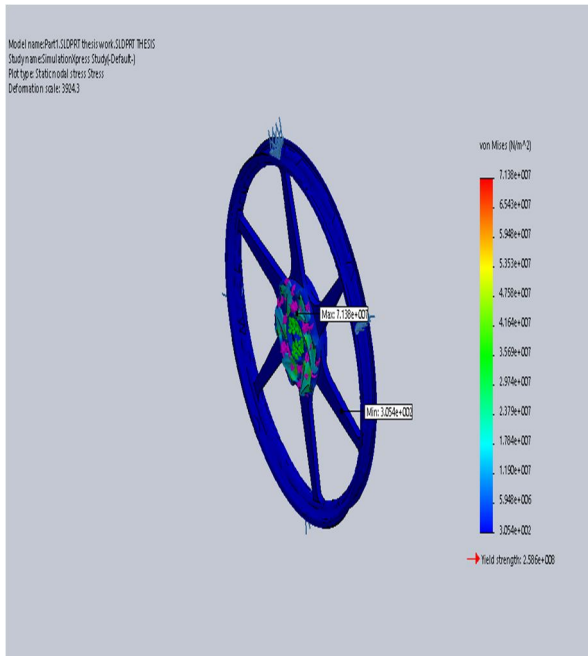


Figure 3: Load and Pressure at 0 of Stress.

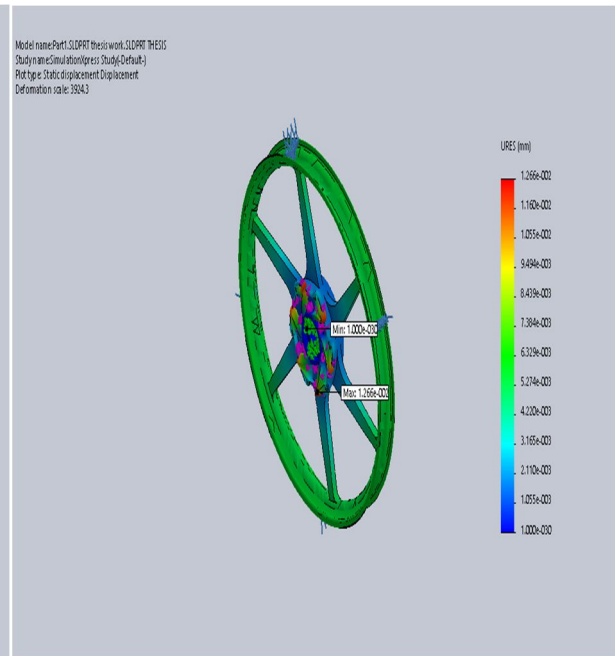


Figure 4: Load and Pressure at 0 of Displacement.

**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 Non 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

## 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.

## REFERENCES

- [1] Saurabh M Paropate , and Sameer J Deshmukh, “MODELLING AND ANALYSIS OF A MOTORCYCLE WHEEL RIM ”, International journal of mechanical robotics and research. ISSN 2278 – 0149, Vol. 2, No. 3, July 2013.
- [2] Priya Udasi, Sanjay Kumbhare, “Design and Analysis of Two Wheelers Wheel with the Replacement of Alluminium Alloy”, International Journal of Recent Technology and Engineering. ISSN: 2277-3878, Volume-3 Issue-4, September 2014.
- [3] Madhu K Sa, Ravi Prakash Mb, & Somashekar H Kc , “Structural Analysis and Optimization of Two Wheeler Alloy Wheel by Using FEA Approach”, International Journal of Ignited Minds.
- [4] Sourav Das, “Desig and weight optimization of aluminium alloy wheel”, International Journal of Scientific and Research Publications. ISSN 2250-3153, Volume 4, Issue 6, June 2014.
- [5] Priya Udasi, Sanjay Kumbhare, “Design and Analysis of Two Wheelers Wheel with the Replacement of Alluminium” , International Journal of Recent Technology and Engineering. ISSN: 2277-3878, Volume-3 Issue-4, September 2014.
- [6] V Sathrudhan Choudhary, “DESIGN AND ANALYSIS OF WHEEL RIM WITH MAGNESIUM ALLOYS (ZK60A) BY USING SOLIDWORKS AND FINITE ELEMENT METHOD”, INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY. ISSN: 2394-3696, VOLUME 3, ISSUE5, MAY-2016.
- [7] K. Arjun Kumar, “Analysis and Optimization of Material For KTM Motorcycle (Duke 390) Front Alloy Wheel”. International Journal of Innovations in Engineering and Technology.
- [8] D. Santhosh Kumar, Jayakumar V, Shajin Majeed, “Model Analysis and Design Optimization of Automotive Wheel Rim”, Journal of Chemical and Pharmaceutical Sciences. ISSN: 0974-2115.
- [9] Gudise Venkateswarlu1,D V S R B M Subhramanya Sharma, “DESIGN AND ANALYSIS OF ALLOY WHEEL WITH DIFFERENT ALLOYS”, International Journal of advance research in science and engineering. ISSN: 2319-8354.
- [10] Sai Krishna Narne, Aditya Talluri, Neeraj Yarra, Sri Ram. N, “DESIGN AND ANALYSIS OF WHEEL RIM WITH SPOKE PATTERNS USING DIFFERENT MATERIALS”, International Journal of Mechanical Engineering and Technology. Volume 8, Issue 5, May 2017, pp. 538–541.
- [11] K. Srinivasa Rao 1, M .Rajesh 2, G.Sreedhara Babu, “ DESIGN AND ANALYSIS OF ALLOY WHEELS”, International Research Journal of Engineering and Technology (IRJET). ISSN: 2395 -0056. Volume: 04 Issue: 06 | June -2017.
- [12] G. Ragul1, C. V Reddy2, V. Jaya Kumar3, Abhijit Roy, Abhishek Samanta1 and C. Sreejith, “DESIGN, ANALYSIS AND IMPACT BEHAVIOUR OF MAGNESIUM ALLOYS (ZK60A) OF LOW PRESSURE DIE CASTING FOR AUTOMOTIVE WHEELS BY FINITE ELEMENT METHOD”, ARPJ Journal of Engineering and Applied Sciences. ISSN 1819-6608, VOL. 12, NO. 22, NOVEMBER 2017.
- [13] NANDIGAM DAYAKARARAO, 2 B.KISHORE KUMAR, “DESIGN AND ANALYSIS OF ALLOY WHEEL ”, International Journal of research in advance engineering technology. Volume 6, Issue 3 MAY 2018.
- [14] Akanksha Paroha1, Prof K.K. Jain, “COMPARATIVE STUDY OF WHEEL RIM MATERIALS USING FINITE ELEMENT ANALYSIS”,International Journal of Innovative Research in Technology. Volume 4 Issue 10 | ISSN: 2349-6002.



10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)