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# STATIC ANALYSIS OF TRUCK WHEEL RIM USING ANSYS SOFTWARE

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**Abstract**

This paper presents the displacement and stress profiles for a truck wheel rims under various loading conditions. The analysis is done by using two materials: Al 6061 T6 and forged steel and for two trucks: Eicher 10.59 XP (4-wheeler) and Tata SFC 909 EX (6-wheeler) have been considered for the analysis. Using ANSYS 16.0, the paper finds that the designed wheel rim can be used for both the trucks. It is found that the maximum displacement in forged steel rim is less than Al 6061 T6 wheel rim for all the loading conditions. On comparing the masses, the mass of Al 6061 T6 rim to be 20.091 kg less than the mass of forged steel rim. It is found that the Al 6061 T6 is a better material for manufacturing of wheel rim from the perspective of mass optimization while forged steel is a better material when only maximum displacement is considered.

**Keywords : Truck wheel rim; Static analysis; Radial load; Axial Load; Von-mises Stresses**

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## 1. Introduction

Trucks have been the basic backbone of the world's workforce for decades. They are big, powerful and can get you through the roughest of terrains. But the truck can't perform its functions without properly functioning wheels. Wheel is a significant structural member of the vehicular suspension system that supports the static and dynamic loads encountered during vehicle operations. Since the rims, on which trucks move, are the most vital elements in a vehicle, they must be designed carefully. Safety and economy are particularly of major concern when designing a mechanical structure so that the people could use them safely and economically. Style, weight, manufacturability and performance are the four major technical issues related to the design of a new wheel and its optimization. In the real service conditions, the determination of mechanical behavior of the wheel is important, but the testing and inspection of the wheels during their development process is time consuming and costly. For economic reasons, it is important to reduce the time; spent during the development and testing phase of new wheels. For this purpose, Finite Element Analysis (FEA) is generally used in the design stage of product development to investigate the mechanical performance of prototype designs.

This work therefore involves finding the stresses and displacement profiles for different truck wheels popular in the market due to static loads. Furthermore, this study aims to reduce the stresses, displacements and mass of the truck wheels by using different materials for the rims of the truck wheels. The present study involves modeling of the wheel using SOLIDWORKS 2016 and the analysis is performed on the modeled component using ANSYS 16.0**.** Analysis that is performed typically includes static analysis**.**

## 2. Literature Review

Several studies have investigated the performance of wheel rims using Finite Element Analysis. Torgall and Mishra (2012) investigated the various failures that may arise in the wheel rim. With the help of ANSYS, their study calculates maximum and minimum deflections and Von Misses stresses to predict the failure regions of the rim. Deepak et al. (2012) designed a parametric model for an alloy wheel by collecting data from reverse engineering process from existing model of Ford Fiesta. Their study considered Aluminium, Zinc and Magnesium materials for the analysis. On the basis of analysis, they concluded that Aluminium alloy is the best material for the model of wheel rim. Paropate et al. (2013) designed an alloy wheels by using in two wheels from existing model of pulsar 150CC. They considered Aluminum, Magnesium, Carbon fiber and Thermoplastic resin for the present model and concluded that Thermoplastic resin is best material for wheel rim but cannot be used due to its high manufacturing cost. Theja et al. (2013) determined the safe stresses and pay loads for a typical alloy wheel configuration of Suzuki GS150R using finite element analysis. They concluded that the stresses induced in 4-Spokes Alloy wheel are less as compared to Al-Alloy of the 5 and 6 Spokes. Furthermore, it finds that the weights of the Mg alloy with 4-Spokes wheel is less as compared to Al-Alloy of the 6, 5and 4 Spokes.

Prasad et al. (2014) computed the displacement, Von-misses stress and stress intensity of wheel rims made of aluminium alloy and forged steel. They used CATIA and ANSYS to study the behaviour of rims for static and dynamic loads. They found that the displacement in the aluminium alloy wheel rim is more; compared to forged steel wheel rim. Furthermore, they found that the aluminium alloy wheel rim is subjected to more stresses in comparison to forged steel wheel rim. On the basis of these findings, they concluded that forged steel should be preferred as a material for manufacturing of the wheel rim. Ganesh and Periyasamy (2014) designed a parametric spiral model for an alloy wheel used in four wheelers by collecting data from reverse engineering process from an existing model. In addition, they analyzed the parametric model on four conditions namely load case bending, load case centrifugal, load case pressure and load case vertical. On the basis of the analysis, they concluded that the spiral design of wheel rim is safe under the loading conditions considered. Das (2014) optimized the mass of an Aluminium alloy wheel rim and reduces it to 50% of the existing value. He stated that the five arm structure is the optimal output of the solver and computes the maximum stress generated by applying radial, axial and bending loads on it. On the basis of this analysis, the paper concludes that the damage region is around the rim flange.

Kale et al. (2015) presented various materials; which can be used for wheel rims and their properties such as thermal conductivity, corrosion resistance, price as well as advantages and disadvantages of materials. They found that forged steel can be used for light as well heavy duty vehicles such as trucks, tractors, trolley, scooter, and bikes. In addition, they found that heat dissipation and corrosion resistance of Mg and Al alloy is better; compared to Steel C1008 and forged steel. They concluded that Steel C 1008 and forged steel are best materials for heavy duty vehicles wheel rims. Sabari et.al (2015) studied the comparative study of car wheel rim materials for its deformation. In his study, he considered two materials namely Carbon steel and Aluminium alloy. By changing load and cruising speed of rims, the study analyzed graph of maximum displacement against speed plotted and finds that as speed increases displacement of both material increases. The paper concludes that displacement in alloy wheel rim is more than the steel.

Borase and Deore (2016) investigated the effects of tyre air pressure in conjunction with the radial load on tyre rims. They also used finite element analysis to calculate the stresses in the wheel rim and compared it with experimental results. From the experimental and finite element results, they concluded that the aluminium rim stresses are concentrated in the bead seat areas, the well and the safety hump.

This section presents the contribution of various researchers in the area of wheel rims. It is found that displacement and stress profiles of a truck wheel rims are subjected to three different loading conditions namely radial load (with inflation pressure), centrifugal force and axial load conditions. The static analysis for two materials: Al 6061 T6 and Forged steel and for two trucks: Eicher 10.59 XP (4-wheeler) and Tata SFC 909 EX (6-wheeler) is done. Using this analysis, we identified the best material for manufacturing of wheel rims. This paper presents the study of displacement and stress profiles of a truck wheel rims for various loading conditions.

## 3. Design of wheel rim using SOLIDWORKS

Mangire et al. (2015) designed a wheel rim based on the dimensions; specified in Table 1 and same dimensions are considered for analysis in this paper.  .

**Table 1 Dimensions of rim**

| **Dimensions** | |
|---|---|
| Outer diameter | 450 mm |

| | |
|---|---|
| Hub hole diameter | 150 mm |
| Bolt hole diameter | 20 mm |
| Rim width | 254 mm |

The 3D model of wheel rim is also made using SOLIDWORKS 2016. The final view of wheel rim is shown in Figure 1.

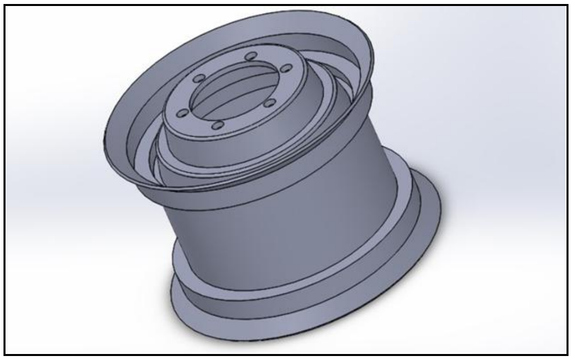


**Figure 1: Isometric View**

**4. Materials Used**

In the present study, two different materials are used for the static analysis of wheel rims. The study aims to find the best material for the wheel rim on the basis on a number of factors such as displacement, Von-misses stresses and weight. The composition and properties of these two materials are given in Table 2.

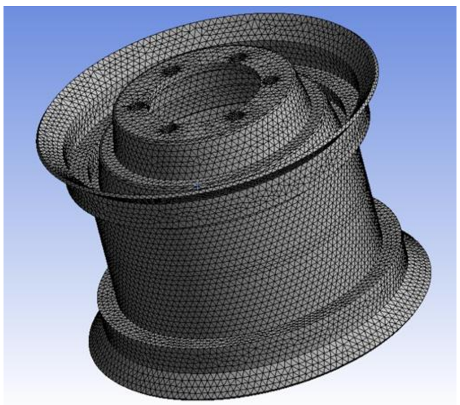
**Table 2: Mechanical Properties of materials**

| Properties | Al 6061 T6 | Forged Steel |
|---|---|---|
| Young's Modulus (GPa) | 68.9 | 200 |
| Poisson Ratio | 0.33 | 0.285 |
| Density (kg/m3) | 2700 | 7850 |
| Yield Strength (MPa) | 275 | 415 |

**5. Finite Element Analysis**

Finite element analysis is a computerized method which is used to predict the reaction of a product to physical effects such as real world forces, heat and vibration. It shows whether a product will break, wear out, or work the way it was designed. In the product development process, it is used to predict what is going to happen when the product will be used. It works by breaking down a real object into a large number of finite elements. Mathematical equations help predict the behavior of each element. A computer then adds up all the individual behaviors to predict the behavior of the actual object.

In the present study, finite element modeling and analysis is carried out using ANSYS 16.0. For the body (excluding holes), tetrahedron element of size 9e-3 m is used for meshing with 120037 nodes and 63143 elements. For the holes, tetrahedron element of size 3e-3 is used for meshing. Figures 2 and 3 show the meshing for the entire body and the holes respectively.



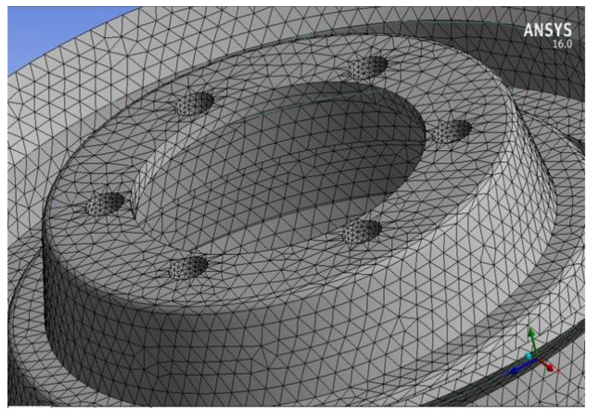



**Figure 2: Full mesh (Tetrahedrons 9e-3 m)** **Figure 3: Mesh Size changed at holes (3e-3 m)**

**6. Mathematical relations for load calculations**

In the present study, two loads are considered for the analysis of wheel rims; namely radial load (with inflation pressure) and axial load. The description and formulae for these loads are written below.

*6.1 Radial Load with inflation pressure*

The radial load in each wheel is due to the mass of the car. In static condition, this radial load is assumed to be evenly distributed between the wheels of the vehicle. Let '**M'** be the mass of the vehicle and '**n**' be the number of wheels of the vehicle.

We know that,

$F=M*a$ (Newton's Second Law of Motion)

$F_{wheel} = (M*a)/n$

Worst case radial load will happen when one side of the vehicle is lifted off from the ground slightly. In this case, the entire load of the vehicle will be on two wheels.

$F_{worst\ case}= 2*(M*a)/n$

The inflation pressure is a constant load and is independent on the rotation of the wheel. This pressure is small as compared to other loads. This acts along with the radial load on the rims of the vehicle. The value of this pressure varies from vehicle to vehicle.

*6.2 Axial Load*

When a car turns along a circular path, centripetal force acts on it which is directly proportional to the square of velocity and inversely proportional to the inverse of radius. This centripetal force is approximately equal to the axial load when the car turns.

$F_c = (M*v^2)/r$

Where v is the velocity of the vehicle and r is the turning radius.

Worst case axial load will occur when the centripetal force is equal to the frictional force due to the load i.e.

$(F_c)_{\text{worst case}} = (M*v^2)/r = \mu*M*g$ $(\mu = 0.9)$

This equation can also be used to calculate the turning radius at a particular speed without slipping. This axial load is evenly distributed among the wheels of the vehicle.

$(F_c)_{\text{wheel}} = (F_c)_{\text{worst case}}/n$

## 7. Load values for different trucks

Two trucks, one 4-wheeler and one 6-wheeler, are considered for the research. The gross weights of the trucks are shown in Table 3.

**Table 3: Gross weights of trucks considered**

| Truck | Gross Weight (Tons) |
|---|---|
| Eicher 10.59 XP (4-wheeler) | 5.9 |
| Tata SFC 909 EX (6-wheeler) | 9.05 |

The maximum radial load, maximum axial load, maximum toque load and inflation pressure for the trucks are shown in Table 4.

**Table 4: Loads for different trucks**

| **Truck** | Maximum Radial Load | Maximum Axial Load | Inflation Pressure |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Eicher 10.59 XP | 28939.5 N | 13022.75 N | 413.685 KPa |
| TATA SFC 909 EX | 29593.5 N | 13317.07 N | 482.633 KPa |

**8. Static Analysis**

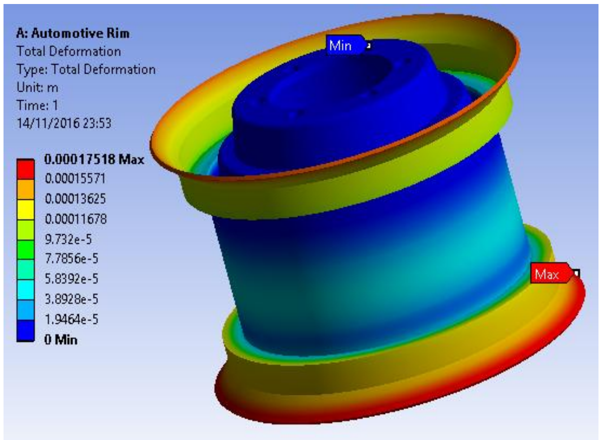
Static analysis is carried out in three different loading conditions. In the first condition, radial load superimposed with inflation pressure is considered for the analysis. In the second condition, the rim, which is fixed at the bolt holes, is given an angular velocity. In the third condition, axial load is applied for the analysis. The displacement and stress contours for each loading condition are obtained. In every loading condition, two trucks and two materials are taken into consideration.

*8.1 Radial Load condition (with inflation pressure) for Eicher 10.59 XP*

Boundary conditions are to be considered in order to do finite element simulation. In this loading condition, the following boundary conditions are used:

1. Radial load of 28.939 KN along with inflation pressure of 413.685 KPa is used.
2. All the bolt holes are fixed i.e. translation and rotation in X, Y and Z directions is zero.

The displacement and stress contours for Eicher 10.59 XP for Al 6061 T6 and Forged steel are shown below. Figure 4(a) and 4(b) show the displacement profiles while Figure 4(c) and 4(d) show the stress profiles.



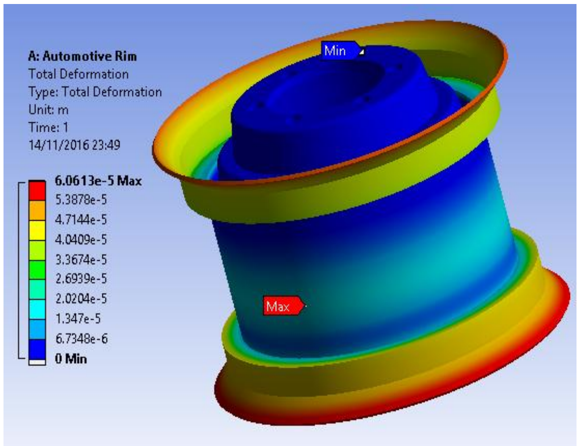
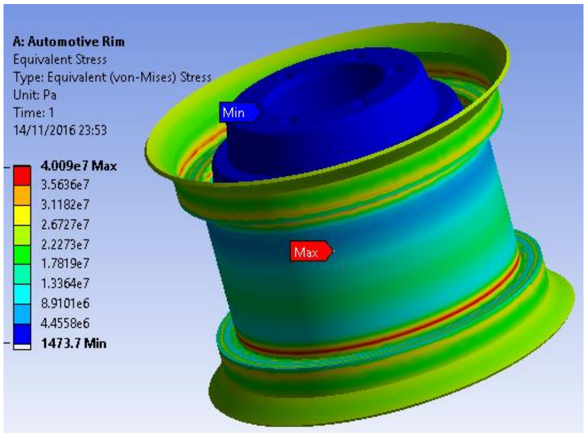




**Fig 4 (a): Displacement: Al 6061 T6** **Fig 4 (b): Displacement: Forged Steel**



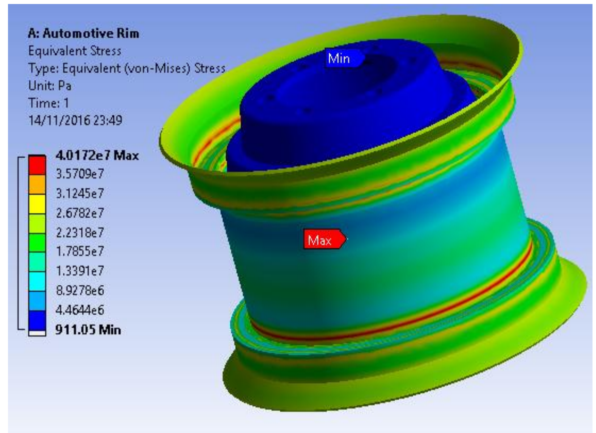




**Fig 4 (c): Von-mises stress: Al 6061 T6** **Fig 4 (d): Von-mises stress:**

**Forged Steel**

Figure 4 (a) & (b) show the displacement contours of the wheel rim under radial condition for Al 6061 T6 and forged steel respectively. In case of Al 6061 T6, it is noted that the maximum displacement is at 17.518e-5 m. The FE analysis reveals that the rim flange has the maximum displacement. In case of forged steel, it is observed that the maximum displacement is 6.0613e-5 m and it occurs in the rim flange. On comparing the Figures 4 (a) and 4 (b), it is found that the displacement is more in Al 60601 T6. Figure 4 (c) & (d) show the stress profiles under the influence of radial load and inflation pressure. In Al 6061 T6 wheel rim, the maximum stress in the wheel rim is 4.009e7 Pa and the minimum stress is 1473.7 Pa. The maximum stress observed by the wheel rim is in bead seat region and the minimum stress is felt in the hub region. The maximum stress in Al 6061 T6 is below its yield strength. In forged steel wheel rim, the maximum stress is 4.0172e7 Pa and the minimum is 911.05 Pa. The maximum stress in forged steel is below its yield strength. In both forged steel and Al 6061 T6 wheel rims, the regions of maximum and minimum stress are the same area. On comparing the two figures, the FE analysis reveals that the maximum stress is slightly more in forged steel wheel rim.

*8.2 Radial Load condition (with inflation pressure) for TATA SFC 909 EX*

In this loading condition, the following boundary conditions are used:

1. Radial load of 29.593 KN along with inflation pressure of 482.633 KPa.
2. All the bolt holes are fixed i.e. translation and rotation in x, y and z directions is zero.

The displacement and stress contours for TATA SFC 909 EX for Al 6061 T6 and Forged steel are shown below. Figure 5(a) and 5(b) show the displacement contours while Figure 5(c) and 5(d) show the stress contours.

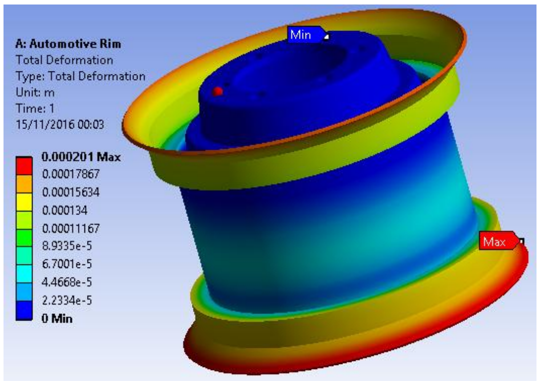



Fig 5 (a): Displacement: Al 6061 T6

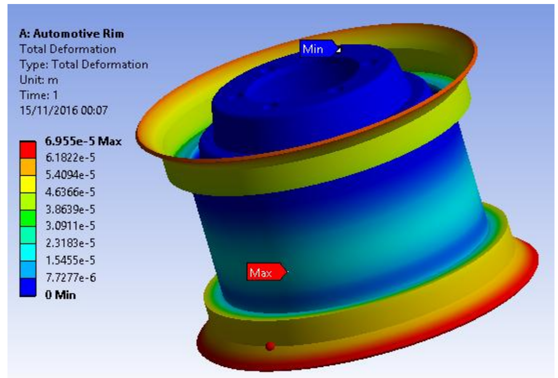



Fig 5 (b): Displacement: Forged Steel

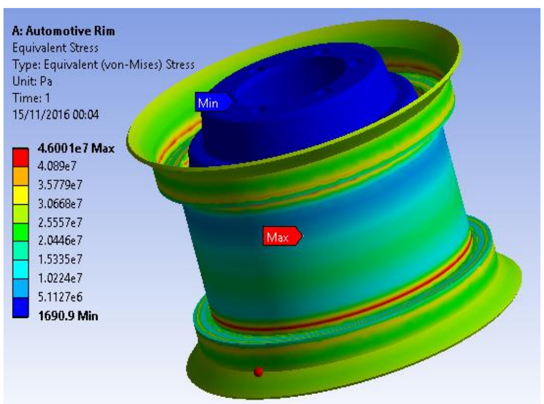



Fig 5 (c): Von-mises stress: Al 6061 T6

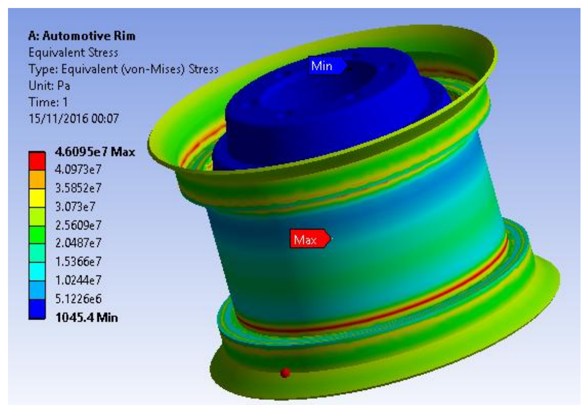



Fig 5 (d): Von-mises stress: Forged steel

Figure 5 (a) & (b) show the displacement contours of the wheel rim under radial condition for Al 6061 T6 and Forged steel. It is noted that the maximum displacement is found is 20.1e-5 m for Al 6061 T6 material. The FE analysis reveals that the rim flange has the maximum displacement. In case of forged steel, it is observed that the maximum displacement is 6.955e-5 m and occurs at the rim flange. On comparing the Figures 5 (a) and 5 (b), it is found that the displacement is more in Al 60601 T6. Figure 5 (c) & (d) show the stress profiles under the influence of radial load and inflation pressure. In Al 6061 T6 wheel rim, the maximum stress in the wheel rim is

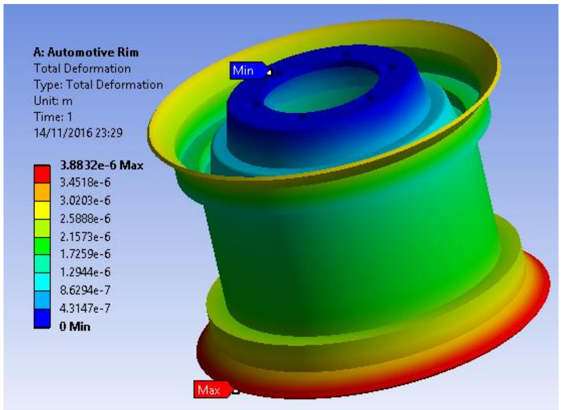
4.6001e7 Pa (less than yield strength) and the minimum stress is 1690.9 Pa. The minimum stress is felt in the hub region. In forged steel wheel rim, the maximum stress is 4.6095e7 Pa (less than yield strength) and the minimum is 1045.4 Pa. In both forged steel and Al 6061 T6 wheel rims, the regions of maximum and minimum stresses are the same. On comparing the Figures 5 (c) & (d), the FE analysis reveals that the maximum stress is slightly more in forged steel wheel rims.

*8.3 Centrifugal force condition (Angular velocity condition)*

The following boundary conditions are used for centrifugal force analysis:

1. Angular velocity in X direction is zero, Y direction is 83.76 r.p.s. and Z direction is zero.
2. All the bolt holes are fixed i.e. translation and rotation in x, y and z directions is zero.

The displacement and stress contours for Al 6061 T6 and Forged steel are shown below. Figure 6(a) and 6(b) show the displacement contours while Figure 6(c) and 6(d) show the stress contours.



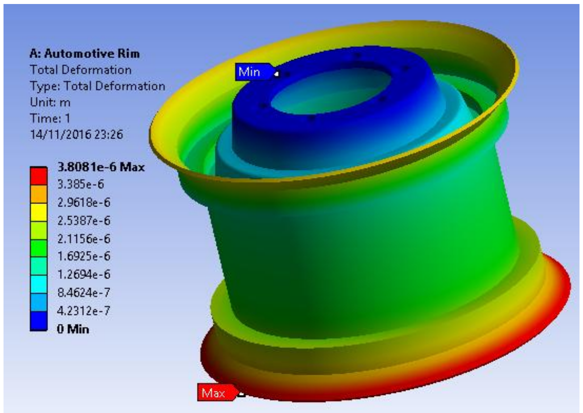
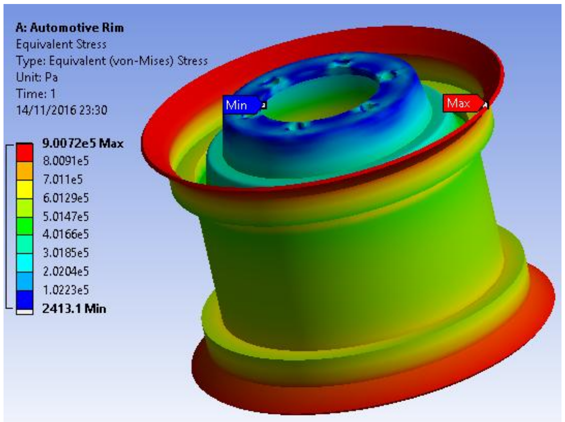




**Fig 6 (a): Displacement: Al 6061 T6** **Fig 6 (b): Displacement: Forged Steel**



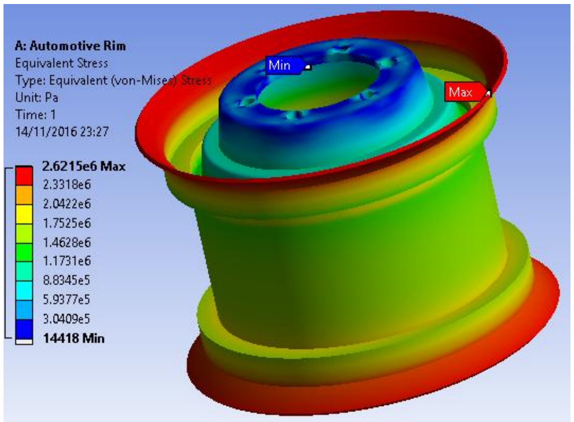



**Fig 6 (c): Von-mises Stress: Al 6061 T6** **Fig 6 (d): Von-mises Stress: Forged Steel**

Figures 6 (a) and (b) show the displacement profiles under centrifugal force condition for Al 6061 T6 and forged steel respectively. The centrifugal force condition is independent of the load i.e. it is same for the two trucks. In Al 6061 T6 rim, it is observed that the maximum displacement is 3.8832e-6 m and it occurs at the rim flange area. In case of forged steel wheel rim, the maximum displacement is slightly less than Al 6061 T6 rim (3.8081e-6 m). The maximum displacement occurs at the rim flange area. Figures 6 (c) and (d) show the stress contours for the two materials. The maximum stress in Al 6061 T6 rim is 9.0072e5 Pa (less than yield strength) while the minimum stress is 2413.1 Pa. The maximum stress in forged steel rim is 2.62e6 Pa (less than yield strength) while the minimum stress is 14418 Pa. As compared to the radial load condition, there is a huge variation in the maximum stress between the two materials. The maximum stress in Al 6061 T6 rim is lower than forged steel rim. In both cases, the maximum stress is noted in the rim flange region while the minimum stress is observed near the bolt holes.

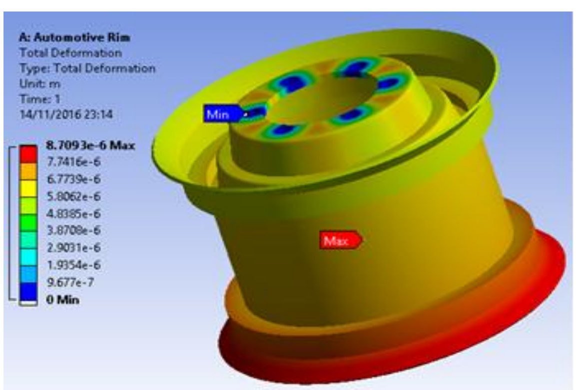
*8.4 Axial load condition for Eicher 10.59 XP*

The following boundary conditions are used for the Eicher10.59 XP analysis:

(i) Axial load of 13.022 KN is used.

(ii) All the bolt holes are fixed i.e. translation and rotation in x, y and z directions is zero.

The displacement and stress contours for Eicher 10.59 XP for Al 6061 T6 and Forged steel are shown below. Figure 7(a) and 7(b) show the displacement contours while Figure 7(c) and 7(d) show the stress contours.



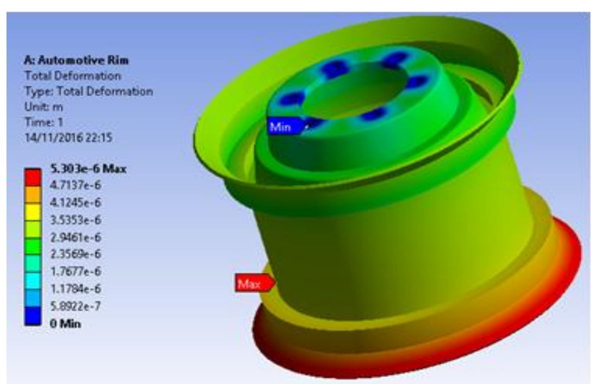
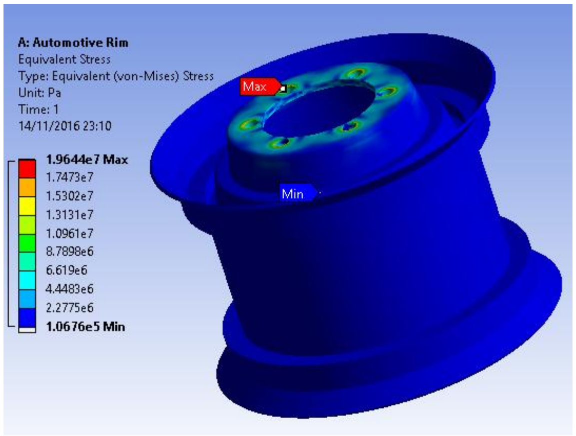
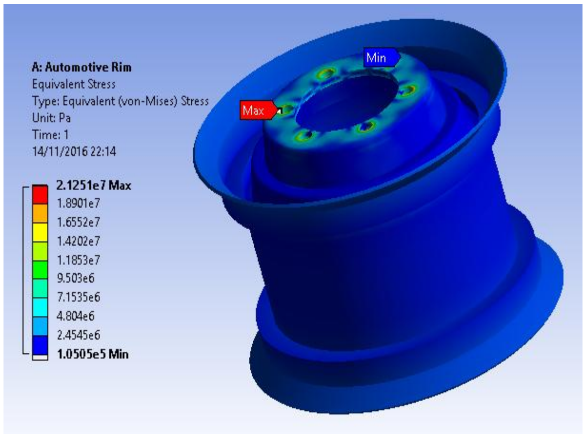



**Fig 7 (a): Displacement for Al 6061 T6**

**Fig 7 (b): Displacement for Forged Steel**




**7 (c): Von-mises stress: Al 6061 T6**

**Fig 7 (d): Von-mises stress: Forged steel**

Figure 7 (a) and (b) show the displacement profiles under axial load conditions for Al 6061 T6 and forged steel respectively. In Al 6061 T6 rim, it is observed that the maximum displacement is 8.7093e-6 m. In case of forged steel wheel rim, the maximum displacement is 5.303e-6 m. The maximum displacement occurs at the rim flange area in both the cases. Figure 7 (c) and (d) show the stress contours for the two materials. The maximum stress in Al 6061 T6 rim is 1.96e7 Pa (less than yield strength) while the minimum stress is 1.06e5 Pa. The maximum stress is observed at the bolt holes. The maximum stress in forged steel rim is 2.125e7 Pa (less than yield strength) while the minimum stress is 1.050e5 Pa. In this case, the maximum stress is observed in the bolt holes while the minimum stress is noted in the hub region. On comparing the two cases, the FE analysis reveals that the maximum stress in forged steel rim is higher.

*8.5 Axial load condition for TATA SFC 909 EX*

In this loading condition, the following boundary conditions are used:

1. Axial load of 13.31 KN is used.
2. All bolt holes are fixed i.e. translation and rotation in x, y and z directions is zero.

The displacement and stress contours for TATA SFC 909EX for Al 6061 T6 and forged steel are shown below. Figure 8(a) and 8(b) show the displacement contours while Figure 8(c) and 8(d) show the stress contours.

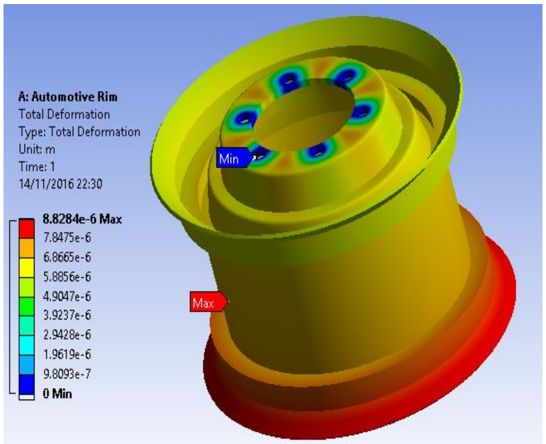



**Fig 8 (a): Displacement: Al 6061 T6**

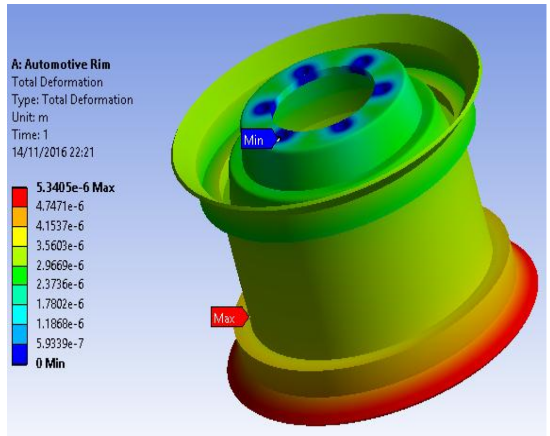



**Fig 8 (b): Displacement: Forged Steel**

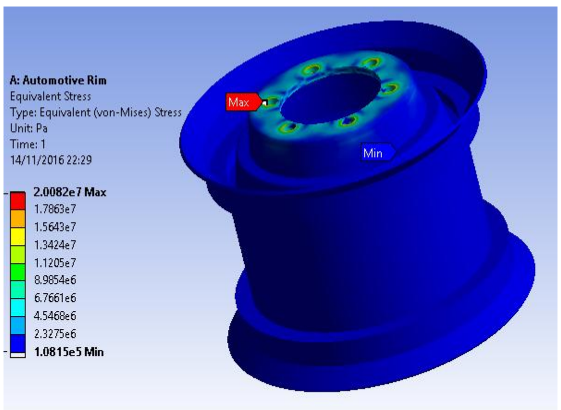



**Fig 8 (c): Von- Mises Stress: Al 6061 T6**

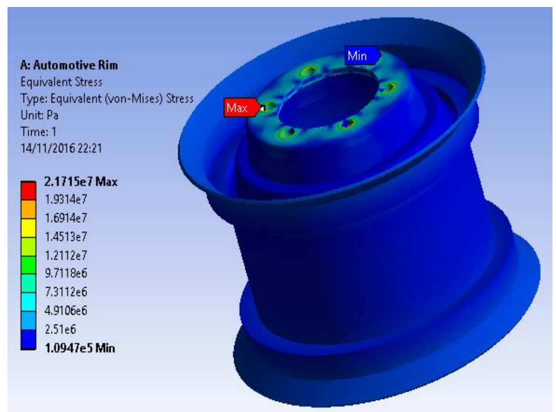



**Fig 8 (d): Von-Mises Stress: Forged Steel**

Figure 8 (a) and (b) show the displacement profiles under axial load conditions for Al 6061 T6 and forged steel respectively. In Al 6061 T6 rim, it is observed that the maximum displacement is 8.8284e-6 m. In case of forged steel wheel rim, the maximum displacement is 5.340e-6 m. The maximum displacement occurs at the rim flange area in both the cases. Figure 8 (c) and (d) show the stress contours for the two materials. The maximum stress in Al 6061 T6 rim is 2.0082e7 Pa (less than yield strength); while the minimum stress is 1.08e5 Pa. The maximum stress is observed at the bolt holes. The maximum stress in forged steel rim is 2.1715e7 Pa (less than yield strength) while the minimum stress is 1.0947e5 Pa. In this case, the maximum stress is observed at the bolt holes while the minimum stress is noted in the hub region. On comparing the two cases, the FE analysis reveals that the maximum stress in forged steel rim is higher.

## 9. Summary of Analysis

Tables 5, 6 and 7 show the summary of results of this study.

**Table 5: Radial load conditions**

| Radial Load Condition | | | | |
|---|---|---|---|---|
| Truck | Max. Displacement (m) | | Max. Stress (Pa) | |
| | Al 6061 T6 | Forged steel | Al 6061 T6 | Forged steel |
| Eicher 10.59 XP | 1.75E-04 | 6.06E-05 | 4.01E+07 | 4.02E+07 |
| Tata SFC 909 EX | 2.01E-04 | 6.96E-05 | 4.60E+07 | 4.61E+07 |

**Table 6: Centrifugal force conditions**

| Centrifugal Force Condition | | |
|---|---|---|
| Truck | Max. Displacement (m) | Max. Stress (Pa) |
| Al 6061 T6 | 3.88E-06 | 9.01E+05 |
| Forged steel | 3.81E-06 | 2.62E+06 |

**Table 7: Axial load conditions**

| Axial Load Condition | | | | |
|---|---|---|---|---|
| Truck | Max. Displacement (m) | | Max. Stress (Pa) | |
| | Al 6061 T6 | Forged steel | Al 6061 T6 | Forged steel |
| Eicher 10.59 XP | 8.71E-06 | 5.30E-06 | 1.96E+07 | 2.13E+07 |
| Tata SFC 909 EX | 8.83E-06 | 5.34E-06 | 2.00E+07 | 2.12E+07 |

## 10. Conclusions

In this paper, we studied the displacement and stress profiles of a wheel rim subjected to different load conditions namely; radial load (with inflation pressure), centrifugal force and axial load. We investigated the behavior of the rims for two materials (Al 6061 T6 and Forged steel) and for two different trucks: Eicher 10.59 XP (4-wheeler) and Tata SFC 909 EX (6- wheeler).

It is found that the maximum stress value on the rims is much below the yield strength of the material for both Al 6061 T6 and Forged steel. This implies that the wheel rims can be used for both the trucks: Eicher 10.59 XP and Tata SFC 909 EX. For all the loading conditions, it is observed that the maximum displacement in forged steel rim is less than Al 6061 T6 rim and that the maximum displacement always occurs in the rim flange region. Furthermore, it is also found that the maximum stress value in forged steel rim is always more than the maximum stress value in Al 6061 T6 rim. On comparing the masses of two rims, the study shows that the mass of the forged steel rim is 30.624 Kg while the mass of Al 6061 T6 rim is 10.533 Kg. On the basis of these observations, it is concluded that Al 6061 T6 is a better material for manufacturing of wheel rims from material utilization perspective while forged steel is a better material when only maximum displacement is considered.

**References:**


- Borase, K.H and Deore, E.R. (2016) 'Studying Effect of Pressure on Rim', International Journal for Innovative Research in Multidisciplinary Field, Vol. 6, pp. 95-99

- Das, S. (2014) 'Design and Weight Optimization of Aluminium Alloy Wheel', International Journal of Scientific and Research Publications, Vol. 4, pp. 1-12

- Deepak, S.V., Naresh, C. and Hussain, S.A. (2012) 'Modeling and analysis of alloy wheel for four wheeler vehicle', International journal of mechanical engineering and Robotics Research, Vol 1, Issue 3, pp. 72-81

- Ganesh, S. and Periyasamy, P. (2014) 'The International Journal of Engineering and Science', Vol. 3, pp. 29-37

- Kale, H.N., Dhamejani, C.L. and Galhe, D.S. (2015) 'A Review on Materials used for Wheel Rims', International Journal of Advance Research and Innovative Ideas in Education, Vol.1, pp. 241-243.

- Kale, H.N., Dhamejani, C.L. and Galhe, D.S. (2015) 'Comparative Study of Wheel Rim Materials', International Journal of Advance Research and Innovative Ideas in Education, Vol.1, pp. 257-260.

- Mangire, S.S., Sayed, L.K. and Sayyad, L.B. (2015) 'Static and Fatigue Analysis of Automotive Wheel Rim', International Research Journal of Engineering and Technology, Vol. 2, pp.753-758

- Prasad, T.S., Krishnaiah, T., Iliyas, J.M. and Reddy, M.J. (2014) 'A Review on Modeling and Analysis of Car Wheel Rim using CATIA & ANSYS', International Journal of Innovative Science and Modern Engineering (IJISME), Vol. 2, pp. 1-5

- Rezal, M.S.N., Mu'az, A., Shahril, K. and Ihsan, J. (2015) 'Deformation Behavior analysis of Car Wheel Rim under Different Loading Using Finite Element Method', International Journal of Engineering and Technology, Vol. 5, pp- 181-184

- Theja, S., Shankar, G. and Krishna, V. (2013) 'Design Analysis of Two Wheeler Lighter Weight Alloy Wheel', Indian Journal of Engineering, Vol. 6, Number 15, pp. 35-45

- Torgal, S. and Mishra, S. (2012) 'Stress analysis of wheel rim', International Journal of Mechanical Engineering and Research, Vol. 1, pp. 34-37

- Yadav, S.N. and Hanamapure, N.S. (2013) 'Analyze the Effect of Slip Angle on Fatigue Life of Wheel Rim of Passenger Car by Using Radial Fatigue Testing', International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2, Issue 9, pp. 4309-4318.

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