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Design and Analysis of Bolt Joint

Jatin Gaur[1], Sandeep Jain[2]
[1]*Research Scholar, Dept. of Mechanical Engineering, Samrat Ashok Technological Institute, Vidisha, India*
[2]*Associate Professor, Dept. of Mechanical Engineering, Samrat Ashok Technological Institute, Vidisha, India*

***Abstract*: Rear axle bolt joint is one of the most unsafe combined of the Tractor. It is dangerous from the Design angle since it tolerates the most tough load condition in the Tractor. The objective of this study is to analyse the failure and redesign the axle housing bolt joint of the rear axle for good service. During the redesign the axle housing several design changed has been done New design of the bolt joint of the axle is a major area where the huge failure has found.**

***Keywords*: Bolt Joint**

1. Introduction

Tractor application of the mechanical component is subjected to low frequency on high amplitude loads which cause sudden fatigue failures. In this paper we will design the axle housing bolted joint. The objective of the paper is to analyze the design of the axle housing bolted joint of the front axle for service load conditions.

2. Material

Table 1
Material use for axle housing

MATERIAL	CAST IRON FG260
Young Modulus (GPa)	110 GPa
Density	7.2e-9
Hardness	180-230HB
Yield Strength	260

Material use for bolt

The bolt is used 12.9 grades, with the following mechanical property,

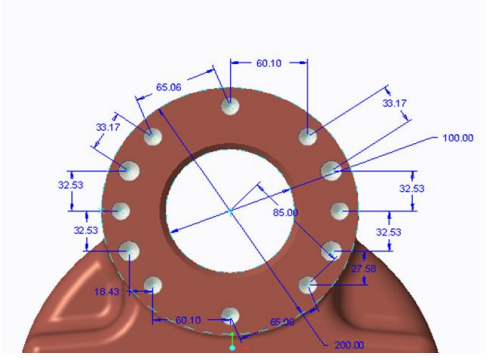
Table 2

Proof load (MPa)	970
Min. Yield Strength (MPa)	1100
Min. Tensile Strength (MPa)	1220

- *Tensile Strength:* The maximum load in tension (pulling apart) which a material can withstand before breaking or fracturing.
- *Yield Strength:* The maximum load at which a material exhibits a specific permanent deformation
- *Proof Load:* An axial tensile load which the product must withstand without evidence of any permanent set. 1MPa = 1N/mm^2 = 145 pounds/inch^2

3. Design, analysis and result

At first we will design the component and then put in the meshing with different load, stress etc. then the further result has been received with the help of analysis.

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CENTER OF GRAVITY with respect to _1514787_1 coordinate frame:
X   Y   Z     2.2494258e-02  5.2626023e+01  7.0492908e+01  MM

INERTIA with respect to _1514787_1 coordinate frame:  (TONNE * MM^2)

INERTIA TENSOR:
Ixx Ixy Ixz  6.5733815e+10  3.4911282e+06 -5.9477231e+06
Iyx Iyy Iyz  3.4911282e+06  4.1644347e+10 -1.2882387e+10
Izx Izy Izz -5.9477231e+06 -1.2882387e+10  7.1009769e+10

INERTIA at CENTER OF GRAVITY with respect to _1514787_1 coordinate frame:  (TONNE * MM^2)

INERTIA TENSOR:
Ixx Ixy Ixz  4.2000980e+10  7.1215002e+06 -1.0848158e+06
Iyx Iyy Iyz  7.1215002e+06  2.6404880e+10 -1.5054628e+09
Izx Izy Izz -1.0848158e+06 -1.5054628e+09  6.2516398e+10

PRINCIPAL MOMENTS OF INERTIA:  (TONNE * MM^2)
I1  I2  I3   2.6342224e+10  4.2000983e+10  6.2579051e+10

ROTATION MATRIX from _1514787_1 orientation to PRINCIPAL AXES:
      -0.00045       -1.00000       -0.00007
       0.99914       -0.00045       -0.04158
       0.04158       -0.00009        0.99914

ROTATION ANGLES from _1514787_1 orientation to PRINCIPAL AXES (degrees):
angles about x  y  z   2.383          0.000         90.026

RADII OF GYRATION with respect to PRINCIPAL AXES:
R1  R2  R3 9.2680158e+01  1.1702813e+02  1.4284829e+02  MM
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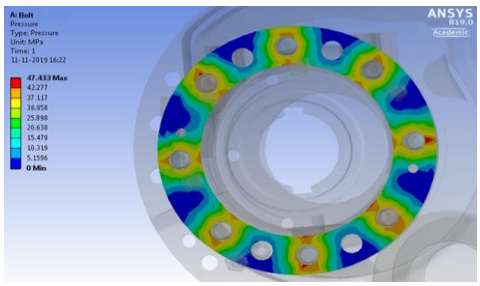

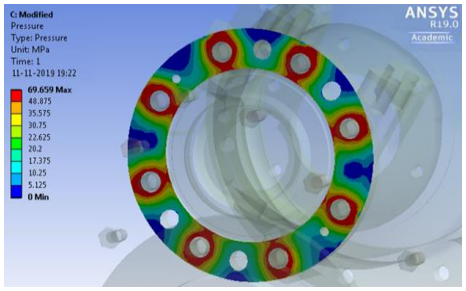

Table 3

Stress	Existing	Modified
Minimum stress MPa	0	0
Maximum stress MPa	47.433	69.659

From this analysis the modified design is safe and the can be used in future work in automobile company.

4. Conclusion

Thus the rear axle bolt casing component was redesigned successfully using creo 2.0 software. The static structural analysis was analyzed successfully and the stress, displacement and frequency values are within the Factor of Safety of the material as the result can be compared with the existing model. this analysis report, it is clear that the redesigned model is under safe mode when compared to existing model.

5. Acknowledgment

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References

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