



# International Journal of Research Publication and Reviews

Journal homepage: [www.ijrpr.com](http://www.ijrpr.com) ISSN 2582-7421

## Design and Optimization of Semi Chassis of Tractor Trolley

**Ranjit J. Patil<sup>a</sup> Prof. N.V.Hargude<sup>b</sup>**

a. ME Student Mechanical Design Department, PVPIT Budhgaon, Sangli. India

b. Guide Professor Mechanical (Design) Department, PVPIT Budhgaon, Sangli. India

### ABSTRACT

The transportation industry now plays a significant role in the economies of both emerging and developed countries. Tractor Trolleys are a popular and cost-effective mode of transportation for commodities. The chassis frame is a vehicle's backbone, allowing it to securely handle the maximum weight under all operating situations. The tractor trolley was designed for safe working conditions using a design and optimization technique in this research. Need to consider the stress concentration, weight and cost reduction of existing trolley.

Keywords: Design and Optimization, Chassis Of Tractor Trolley, Weight Reduction, Cost Reduction

### Introduction:

Tractor trolleys are widely used in India for transportation in agriculture sector and construction industries. The Tractor trolley is manufactured by a number of small firms. This product may not be designed adequately due to a lack of advanced technologies. The tractor trolley is made according to the customer's specifications Structure or through a trial-and-error process. It's possible that it was developed without taking into account the actual loading situation. The tractor trolley or trailer is subject to certain norms and restrictions. The tractor trolley should meet the Indian Standard IS 8213:2000 criteria. The Indian Standards Specifications Central Motor Vehicles Act, 1988, and the Automotive Research Association of India's safety standard (SS-15) are not followed by many small businesses. Due to the tractor trolley's poor construction, many road accidents, breakdowns, and malfunctions occur. The tractor trolley is being designed for safe working conditions using a design and optimization technique in this project. The amount of tension, the weight, and the cost of the present trolley must all be properly considered.

### Objectives:

1. To Design a semi chassis of tractor trolley.
2. To optimization and manufacturing of semi chassis of tractor trolley.

### Literature Survey:

**Nagaraj S Math et al.** <sup>[1]</sup> investigated transportation tractor trolleys that were subjected to heavy loads of up to 4 tonnes, as well as the trolley chassis cross section that was driven to torsion, axial, and bending loads, with an emphasis on deflection and stress happening in the trolley chassis under these loads. They used the finite element method to analyse the trolley chassis and redesigned it using the same material and dimensions as before, but with the section 'T' instead of the 'C,' making it safer.

**Ramakant Choudhari et al.** <sup>[2]</sup> observed, in both rural and urban regions, tractor trolleys were seen being used for transportation. Calculate the weight of the proposed shape using analytical calculations. Analytical calculations were used to compare the present shape of the axle and its weight to the suggested material. He worked on changing the material and replacing the rectangular cross section with a circular cross section, resulting reduced the axle's deformation and stress, also lowering the cost.

**Pankaj Badhe et al.** <sup>[3]</sup> studied the body and chassis of the automobile were studied separately. They studied about the modelling and analysis of existing

Mini Tractor Trolley chassis with a 'C' section. In the vehicle industry, weight loss is become a major concern. He was redesigned using identical materials and dimensions, and a 'T' cross section area instead of a 'C' cross section area resulted in a 36 percent weight reduction and lower chassis costs.

**Vinayak R. Tayade et al.**<sup>[4]</sup> studied the major needs of trolley production, according to the research, are excellent performance, ease of maintenance, extended service life, and sturdy construction, and tractor trolleys were used for agricultural labour and occasionally for delivering building construction materials. They come in a variety of sizes, including 3 tonne, 5 tonne, 6 tonne, and 8 tonne.

**Arun G V et al.**<sup>[5]</sup> described the design and analysis of vehicle chassis using different materials for different cross sections. The primary goal was to lower the chassis' self-weight. For three different cross sections namely I, C, and conventional box type, two different alloy materials of steel and aluminium were selected. For modelling and analysis, SOLIDWORKS and ANSYS software were utilised. In different cross sections, they compared various materials.

**Suraj B Patil et al.**<sup>[6]</sup> studied researchers work and Finite Element Analysis method for optimum design of truck chassis forms the structural backbone of commercial vehicle. The main function of truck chassis was to support the components and payload placed on it. There are many factors to consider while designing heavy truck chassis, material selection, strength, stiffness and weight.

**Happy Bansalet. al**<sup>[7]</sup> worked on re-designing the axles, The software ANSYS 12.0 was used to create a CAD model. The axle's weight was reduced by 11.5 percent due to the improved cross section. The axle was redesigned to be 40 x 80 mm in size, which was smaller and less expensive than the old axle.

**AshwiniBhoi et al.**<sup>[8]</sup> Working on I-Beams necessitated the creation of a CAD model of the I beam based on existing designs. The Finite element method is then implemented in the static structural analysis workbench of CATIA V5.

**Mr.AshishAzadeet. al.**<sup>[9]</sup> determined the primary properties of a chassis were static and vibration. FEA software was used for analysis static and vibration load. CATIA was used to create a 3D model. To add strength and optimize the weight of the chassis, it was suggested that the advanced FE tractor chassis type be improved.

## Proposed Work:

### I. Theoretical Work:

1. To review existing literature to study current trends in Design and optimization of semi chassis of tractor trolley.
2. Design semi chassis as per required specifications
3. Preparation of 3D model for optimization

**II. Analysis Work:** Analysis of designed blade assembly using appropriate optimization/analysis software.

**III. Manufacturing work:** Suitable manufacturing methods will be employed to fabricate the components and then assemble the test set –up. The fabrication will be carried out as per layout shown below

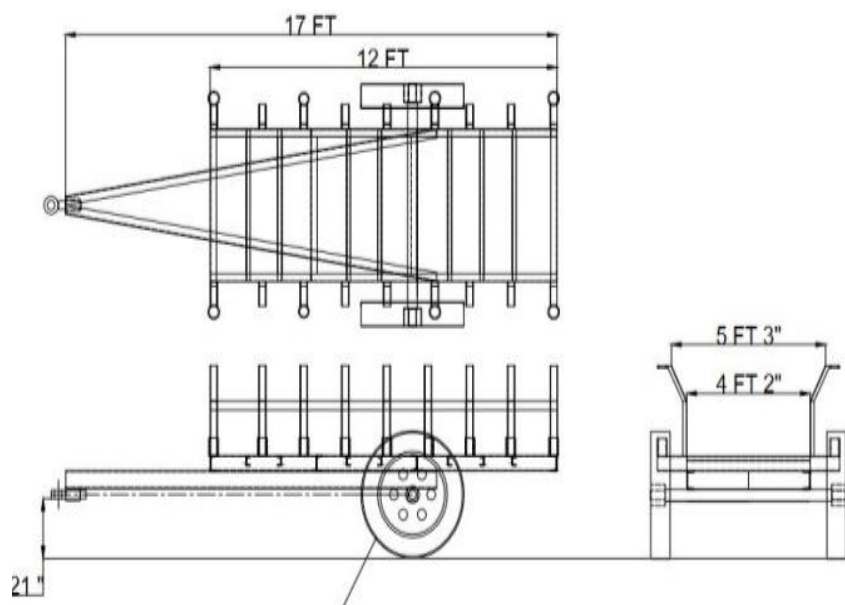


Fig. 1 Orthographic Views of tractor trolley chassis

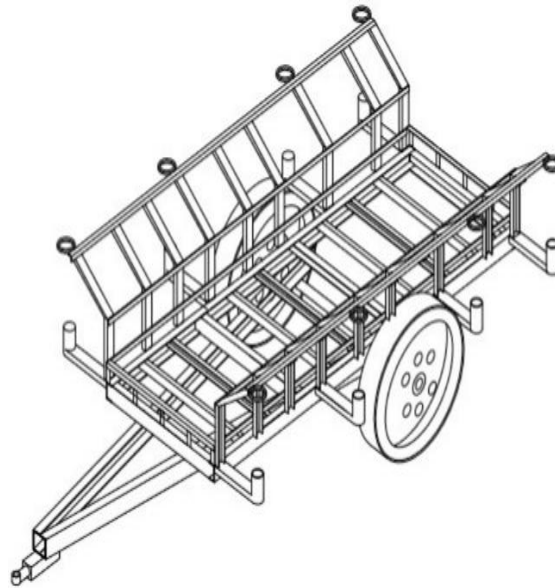


Fig. 1 Optimized 3d Design

### Conclusion:

- According to a literature review, optimization is required to tackle all concerns, including braking, road humps during turning, excessive weight, and high cost.
- The structure is safe even under the most extreme loading situations.

### References:

- 1.Nagaraj S Math, Prashant I Bhandari (2016), Analysis and Optimization of Tractor Trolley Chassis, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 5 Issue 06, June-2016.
- 2.RamakantChoudhari , Yugesh A Kharche (2016), Design and Analysis of Tractor Trolley Axle by Using CAE'' Techniques, IJISSET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 2, February 2016.
- 3.PankajBadhe, V.L.Firake (2016), Design and Development of Mini Tractor Trolley Chassis Using Fea Method, International journal of advanced technology engineering and science, Vol. 4, Issue no. 7, (July 2016).
- 4.Vinayak R. Tayade, Avinash V.patil (2015), Experimental Analysis of Tractor Trolley Chassis, International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655, (October 2015).
- 5.Arun G V, Kishore Kumar K, Structural Analysis of Chassis using AISI 4130 and AA 7068, IOP Conference Series: Materials Science and Engineering, ICMEM (2020).
- 6.Suraj B Patil, Dinesh G Joshi (2015), Structural Analysis Of Chassis: A Review, IJRET: International Journal of Research in Engineering and Technology, Vol. 4, Issue. 4 (Apr-2015).
- 7.Happy Bansal, Sunil Kumar (2012), Weight Reduction and Analysis of Trolley Axle Using Ansys, International Journal of Engineering and Management Research, Vol.-2, Issue-6, pp: 32-36 (December 2012).
- 8.AshwiniBhoi, L P Koushik , NarendraYadav , ManasPatnaik (2013), Optimization of section of a Flat Bed Trailer, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 3, Issue 2, pp.1149-1151, (2013).
9. AshishAzade (2018), Vibrational analysis and optimization of composite tractor trolley chassis using finite element Analysis, IJARIISSN, Vol.4,

---

Issue. 4, (2018)

10. V. B. Bhandari(2014), "Machine Design Data Book", Tata Mcgraw Hill publishing company Ltd. New Delhi,(2014).