

Design and Fabrication of Car Towing Attachment

Siddhesh Borsutkar¹, Amit Gujar², Zameer Dongarkar³, Vivek Chavan⁴, Prof. Prabodh Horambe⁵

U.G. Students, Department of Mechanical Engineering^{1,2,3,4}

Assistant Professor, Department of Mechanical Engineering⁵

Finolx Academy of Management and Technology, Ratnagiri, India

Abstract: *Vehicles are integral to modern life, and unexpected breakdowns can happen anytime, making car towing attachments essential. These tools are particularly valuable for travelers, enabling the towing of small vehicles with minimal space and effort. The significance of car towing services in today's mobile society cannot be overstated, as they swiftly resolve traffic incidents, reduce congestion, and enhance road safety. By providing timely assistance during engine failures, flat tires, accidents, or extreme weather conditions, towing services offer crucial support to stranded motorists. Their role extends beyond mere vehicle transport, contributing significantly to traffic management, safety, and community well-being.*

Keywords: Vehicles, Road Safety, Engine Failures, Transport

I. INTRODUCTION

Vehicles are now part of many people's life. An unexpected vehicle breakdown happens on any occasion. It is difficult to move vehicle to the garage or home with puncture tire or engine breakdown. For these problems self-towing attachment is useful and easy to use. The wrecker (with lifting jib) was invented in 1916 by Ernest Holmes Sr. of Chattanooga, Tennessee, a garage worker who was inspired after he needed blocks, ropes, and six men to pull a car out of a creek. After improving his design, he began manufacturing them commercially.

A shop-built wheel-dolly used in Europe has a fixed U-shaped frame with four small wheels mounted on spindles at each end of dolly leg. It requires vehicle to be lifted by a jack for placement of wheel onto dolly from above. Its low cost and narrow profile is an advantage over a towing dolly but seems limited by low towing speeds. Saufelle, U.S. Pat. No. 6,106,214, August 2000, provides a dolly that lifts and carries a wheel affixed to a vehicle using lifting paddles as wheel chocks. In trouble situations like vehicle breakdowns, exiting from the ditch, starting the engine, or stuck in the traffic jam, car towing attachment are extremely handy. This product is very useful for many peoples who travel one city to other. This product can handle heavy loads and requires small space. This product suggests a way of towing small vehicles using man power. There are many types of towing attachments for cars. For Example, Flatbed trailer, Lowboy trailer, Step Deck trailer, etc. We are trying to make this product less of cost.

II. PROBLEM DEFINATION

For an emergency vehicle breakdown, to move vehicle effortlessly in garage there is a need of an attachment for vehicles that can provide towing at minimum cost. While going with a big group on a bus or going with a family where you would like to take your car at the back of an RV, we use towing attachment for cars. For towing a car, there are three options, a self-car towing attachment, a 4-down, and a trailer. To rent a trailer or 4-down may cost you more than a tow self-car towing attachment. This is why self-car towing attachment are very popular among many people.

III. OBJECTIVE

The objectives of a self-towing car attachment for vehicles include providing a reliable solution for drivers facing unexpected breakdowns, such as flat tires or engine failures. This attachment aims to enable individuals to tow their own vehicles without the need for professional towing services, enhancing convenience and independence. It is designed to be compact and easy to store, ensuring minimal space consumption. Additionally, the attachment should handle heavy loads efficiently, making it suitable for various vehicle types. By offering a cost-effective and accessible means of towing, the product seeks to reduce roadside wait times and improve overall traffic flow. Ultimately, the

self-towing car attachment aims to enhance road safety, support stranded motorists, and contribute to smoother, more efficient travel.

IV. WORKING PRINCIPLE

Components of Diesel Stripping Systems: Diesel stripping systems consist of several key components:

Frame - The frame is divided into two parts. The long part of the frame is designed to slide into the second part of the frame by aligning with the drill holes.

Arm - Arms or torsional arms contains wheels on each side and lever type hollow pipe attached for the torsional movement. For the arms same material is used as the square hollow section. The cross-sectional area is also given bigger to add strength.

Wheels - These are used types of wheels that are designed to carry heavy loads. It has good rubber tires. It has a roller bearing $t = \text{minimum required thickness (in inches)}$

The working principle of a self-towing car attachment for vehicles revolves around providing an efficient and user friendly mechanism for drivers to tow their own vehicles during breakdowns. The attachment typically consists of a tow bar or tow rope that connects to the disabled vehicle's towing points using a robust hitch system. Once securely attached, safety chains and tire straps or wheel nets are used to ensure the stability and security of the towed vehicle. If the attachment includes a winch system, the driver can use it to pull the disabled vehicle onto a tow platform or out of difficult positions, such as ditches or snow. For enhanced safety, the attachment might feature a brake assist system to help control the towed vehicle's speed and prevent accidents. Integrated lights and reflectors ensure the setup is visible to other road users, particularly in low-light conditions, minimizing the risk of collisions. Control handles or levers are provided for easy operation, allowing drivers to manage the attachment without professional assistance. The entire system is designed to be compact and easy to store, ensuring it takes up minimal space in the vehicle when not in use. By following the instructions provided in the manual, drivers can quickly and safely set up the self-towing attachment, enabling them to tow their vehicle to a repair facility or safe location. This system empowers motorists with greater independence and reduces the dependency on external towing services, facilitating smoother and more efficient resolution of roadside emergencies.

Calculations for Frame:

The total load on the frame is 600kg. Convert 600kg into newtons

$$600 \times 9.81 = 5886 \text{ N}$$

6000N is the load on the frame.

For calculating cross-sectional area of a rectangular hollow section: $\sigma = F/A$ $275 = 6000/A$ $A = 6000/275$

Required Cross-sectional area = 21.8 = 22mm²

Considering 25×21×1 as a cross-section for a square hollow section

Calculations for Arms:

The total load on each arm is 300kg. Convert 300kg into newtons

$$300 \times 9.81 = 2943 \text{ N}$$

3000N is the load on the frame

For calculating the cross-sectional area of a circular hollow section: $\sigma = F/A$ $275 = 3000/A$ $A = 3000/275$

Required Cross-sectional area = 10.9 = 11mm²

Considering the outer diameter of 15mm as a cross-section for a circular solid section

This chapter presents the results obtained from the structural analysis of the 3D model. The analysis results, based on specific parameters, are thoroughly examined and discussed.

V. MATERIAL DATA

Material 1: Structural Steel

Density: 7.85e-6 kg/mm³

Coefficient of Thermal Expansion: 1.2e-5 C⁻¹

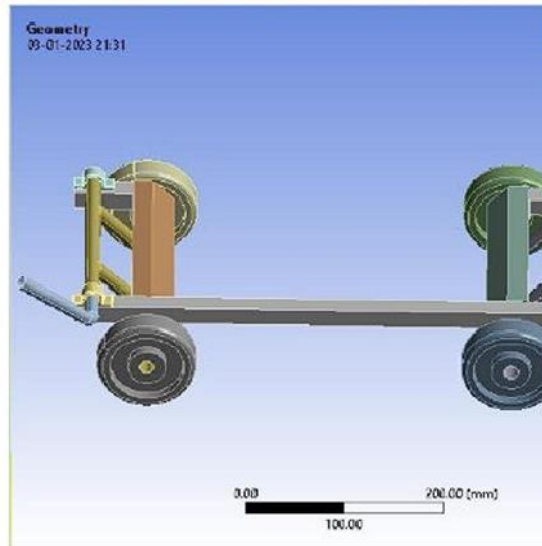
Copyright to IJAR SCT

DOI: 10.48175/IJAR SCT-19137

www.ijarsct.co.in

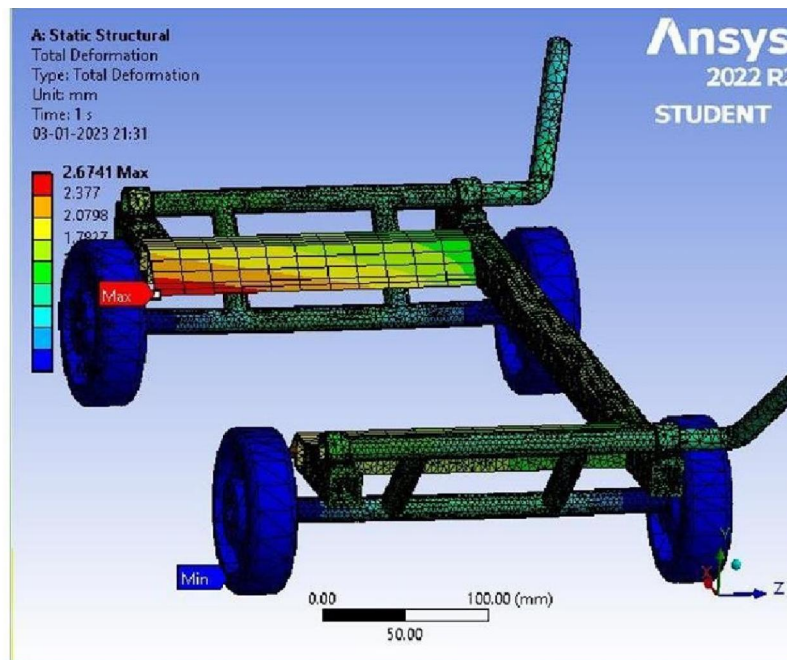


Yield Strength: 275 MPa Geometry image 4.1



Results of the analysis frame

Fig 4.5



In the structural steel analysis, total deformation ranges from 0 mm to 2.6741 mm, averaging 1.0839 mm, with minimum deformation on the wheels and maximum on the trade plate. Equivalent stress ranges from $3.6068e-7$ MPa to 1337.6 MPa, averaging 107.8 MPa, with minimum stress on the rods and maximum on the arms.

VI. CONCLUSION

The research, design, and calculations for this project are complete. The model is safe under the given parameters, with mild steel being the preferred material. Based on the calculations and results, the model is ready for fabrication

ACKNOWLEDGMENT

We have taken a lot of effort into this project. However, completing this project would not have been possible without the support and guidance of a lot of individuals. We would like to extend our sincere thanks to all of them.

We are highly indebted to **Prof. Prabhod Horambe** for their guidance and supervision. We would like to thank them for providing the necessary information and resources for this project.

We would also be thankful to our Principal, **Dr. Kaushal Prasad** and **Dr. Milind Kirkire** (Head of Mechanical Engineering Department) of Finolex Academy of Management and Technology for providing all the required facilities which we wanted in the making of the project.

We would like to express our gratitude towards our parents and our friends for their kind co-operation and encouragement which help us a lot in completing this project.

Thank you to all the people who have willingly helped us out with their abilities.

REFERENCES

- [1]. Ninad Patil*1, Bhushan Gaikwad*2, Siddhesh Kale*3, Ajay Jaybhay*4, Shrikant Pillai*5, EMERGENCY CAR TOWING MACHINE, International Research Journal of Modernization in Engineering Technology and Science
- [2]. Gaurav R. Jawale1 , Anil S. Kadam2 , Roshan S.Kamble3 , Rushikesh D. Kale4 , Prof. Paresh V. Sawai5,” Fabrication of Emergency Car Towing Machine”, Volume 9, Issue 5, May 2020.
- [3]. Chandler, Mark & Bunn, Terry. (2019). Motor vehicle towing: An analysis of injuries in a high-risk yet understudied industry. Journal of Safety Research. 71. 10.1016/j.jsr.2019.10.006