

Emergency car Towing Mechanism

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Abstract

Due to mechanical failure automobiles get stuck at the mid path of their journey. So there is a need to design and develop a system which can sideline the failed automobile. The main aim of our project is to design and develop car towing machine which is helpful to move the car from one place to another place. The main components used in the system are Hydraulic jack, Wiper motor. The 3 D model will be drawn on software CATIA V5 R20 software and accordingly calculations are done. After that the components which are required for our project are manufactured and then assembled together. After making the assembly, the testing of model will be carried out. The result and conclusion will be drawn after the testing of the model.

I. INTRODUCTION

Towing is coupling at least two items together with the goal that they might be pulled by a doled out power source or sources. The towing source may be a motorized land vehicle, vessel, animal, or human, the pile whatever can be pulled. These may be joined by a chain, rope, bar, hitch, three-point, fifth wheel, coupling, drawbar, incorporated stage, or different methods for keeping the articles together while in motion. Towing may be as clear as a tractor pulling a tree stump. The most conspicuous structure is the vehicle of debilitated or regardless weakened vehicles by a tow truck or wrecker. Other regular structures are the tractor-trailer blend, and burden or unwinding vehicles coupled by methods for ball or pintle and gudgeon trailer-hitches to more diminutive trucks and vehicles. In the opposite phenomenal are incredibly unshakable tank recovery vehicles, and gigantic weight tractors drew in with overpowering pulling towing loads stretching out into the an enormous number of pounds.

Essentially, government and industry norms have been created for bearers, lighting, and coupling to guarantee security and interoperability of towing equipment. Historically, scows were pulled along streams or trenches utilizing tow ropes drawn by men or draft creatures strolling along towpaths on the banks. Later came chain pontoons. Today, towing boats are utilized to move bigger vessels and freight ships. More than a large number of years the sea business has refined towing to a science. Aircraft tow each other too. Troop and freight conveying lightweight planes are towed behind controlled airplane, which stays a well-known methods for getting current relaxation lightweight planes aloft. There are numerous wellbeing contemplations to appropriately towing a procession or trailer/travel trailer beginning with vehicle towing limit and extending through equalizer hitches to appropriately and legitimately interfacing the security chains.

As indicated by the United States National Highway Traffic Safety Association, in excess of 65,000 accidents including traveler vehicles towing trailers happened in 2004 in the US, hopping about 20 per cent from the past year. IN 2006, Master Lock did their yearly investigation on towing wellbeing to perceive what number of Americans tows their payload effectively. The investigation, Towing Troubles included reactions from trailer proprietors the nation over and found that while most of trailer proprietors accept they recognize what they're doing with regards to towing, most were inadequate with regards to the best possible training. Ace Lock revealed that 70 percent of trailer proprietors didn't completely realize the right method to tow their cargo. An significant factor in towing security is tongue weight, the weight with which the trailer pushes down on the tow vehicle's hitch. Deficient tongue weight can make the trailer influence to and fro when towed. An excessive amount of tongue weight can cause issues with the tow vehicle.

Towing limit is a measure portraying as far as possible to the heaviness of a trailer a vehicle can tow and might be communicated in pounds or kilograms. A few nations necessitate that signs demonstrating the most extreme trailer weight (and sometimes, length) be posted on trucks and transports near the coupling device. For vehicles and light trucks, towing is practiced through a trailer hitch. Notwithstanding as far as possible, the hitch gathering may have its own arrangement of cutoff points, including tongue weight (the measure of weight that presses descending on the hitch) and trailer weight (the full weight of the trailer, including substance). At the point when the hitch is a manufacturing plant choice, the hitch limit is generally expressed in the vehicle documentation as a towing particular, and not in any case set apart on the vehicle.

See moreover

- Gross consolidated weight rating
- Gross trailer weight rating
- Gross vehicle weight rating

Towing limit may either allude to braked or unbraked towing limit.

Braked towing limit

Braked towing limit is the towing limit of a vehicle if the trailer being towed has its own slowing mechanism, regularly associated with the vehicle's stopping mechanism by means of the trailer link. Braked towing limit is normally fundamentally more noteworthy than unbraked towing limit.

Unbraked towing limit

Unbraked towing limit is the towing limit of a vehicle towing a trailer that doesn't have its own stopping mechanism.

Towing of vehicles and trucks is an exceptional structure, with an industry committed to it. Specific "tow truck" vehicle types are frequently utilized. A portion of these are flatbed, with water driven inclining beds and winches and carts to situate the vehicle behind the bed and maneuver it up onto the bed. Others have a particular blast hitch rather than a flatbed, which will lift one finish of the vehicle and permit it to ride on its outstanding tires; they in any case have comparative hardware to the flatbeds and position and perform a lot of like them. In different cases, a particular vehicle cart can be appended to a standard vehicle hitch; for instance, some moving vehicle rental organizations, for

example, U-Haul, will lease these carts for single direction transport of vehicles. Hitch tow trucks are for the most part estimated for vehicles and light obligation trucks. Bigger adaptations, with a since quite a while ago, weighted body and heavier obligation motors, transmissions, and tow snares, might be utilized for towing of debilitated transports, truck tractors, or enormous trucks. The fake estimating and weighting must be intended to withstand the more prominent load of the towed vehicle, which may somehow or another tip the tow truck back.

Of the numerous vehicles fitted with towbars, most are probably going to have fitted towing electrics which are 'covered up' from the vehicle. This electrical establishment is usually called 'By-pass electrics'. This framework is utilized to shield the vehicle's lighting frameworks from potential harm if wiring in a trailer should glitch. It is an attempted and tried framework in exceptionally wide use. Sidestep frameworks are discovered both in "all inclusive" (non-vehicle-explicit) frameworks and in committed and OEM systems. Since the mid 2000s, vehicle innovation has pushed ahead presenting CANbus arrange frameworks which permitted the communication of various frameworks, and furthermore the recognition of a trailer or parade. At times, the makers have not just planned vehicles to detect the nearness of a trailer, yet they have likewise made improved new highlights inside the frameworks associated with the system. This really makes it significant that these specific vehicles can "see" the trailer or train. A couple of these new highlights are for wellbeing and steadiness, yet most are simply accommodation things like naturally turning off the back haze light and stopping sensors. The fundamental new wellbeing highlight, showing up now on certain vehicles, is the Trailer Stability Program which naturally turns on when a trailer identified in the system through the devoted sensors.

A portion of the propelled frameworks being presented in specific vehicles, that may utilize distinguishing the nearness of a trailer are: path change aide, brake hardware, versatile voyage control, suspension framework (ASS), motor gadgets, motor cooling framework, leaving helps, and turning around camera. TSP or Trailer Stability Program is one element which has been added to certain vehicles, to help right the 'winding' activity of a trailer. With such cutting edge innovation, some stopping mechanisms have even advanced further by being worked electronically, without the requirement for power through pressure. Slowing down can turn out to be progressively controlled with quicker slowing down productivity while towing. Some suspension frameworks would now be able to distinguish a trailer and take into account an increasingly level towing change when the heap is applied on the towing hitch. ACC (Adaptive Cruise Control) frameworks are intended to 'distinguish' a trailer so as to make a more prominent slowing down separation between vehicles. It may be viewed as incautious to sidestep such vehicles' trailer recognition frameworks as these vehicles might be intended to act in an alternate manner when a trailer is appended.

At the point when numerous vehicles are to be shipped, as opposed to utilizing a particular vehicle, a specific trailer might be utilized rather, appended to a standard tractor truck or other huge vehicle. These "engine bearers" regularly carry vehicles from manufacturing plants to vendors. They normally have two levels that each hold 3-5 vehicles, slopes for moving the vehicles from ground to either level, and snare/tie ties and mounts to make sure about the vehicles for transport. Their beds, on each level, may have channels or tracks to control stacking and additionally keep up transport soundness.

Vehicle towing might be performed for the accompanying reasons:

- Towing of crippled or harmed vehicle at solicitation of proprietor (the most widely recognized structure)

- Towing of vehicle by government specialists or its operators, due to being incapacitated as well as deserted on an open lane
- Towing a vehicle as a type of significant distance transportation, for example, during the ball is in owner's court to another area, as opposed to driving the vehicle
- Repossession of a vehicle by a loan specialist
- As part of impoundment of vehicles by government offices for infractions including the vehicle being referred to, for example, unpaid leaving or moving infringement ("tickets")

II. SIGNIFICANCE

A portion of the propelled frameworks being presented in specific vehicles, that may utilize identifying the nearness of a trailer are: path change collaborator, brake gadgets, versatile voyage control, suspension framework (ASS), motor hardware, motor cooling framework, leaving helps, and turning around camera. TSP or Trailer Stability Program is one element which has been added to certain vehicles, to help right the 'winding' activity of a trailer. With such cutting edge innovation, some stopping mechanisms have even developed further by being worked electronically, without the requirement for water power. Slowing down can turn out to be progressively controlled with quicker slowing down productivity while towing. Some suspension frameworks would now be able to distinguish a trailer and take into consideration a progressively level towing alteration when the heap is applied on the towing hitch. ACC (Adaptive Cruise Control) frameworks are intended to 'distinguish' a trailer so as to make a more noteworthy slowing down separation between vehicles. It may be viewed as hasty to sidestep such vehicles' trailer identification frameworks as these vehicles might be intended to carry on in an alternate manner when a trailer is attached. It is identified with Agricultural, Mechanical, Electrical, and Electronic Engineering.

III. THOUGHT PROCESS

Towing is coupling at least two articles together with the goal that they might be pulled by an assigned force source or sources. The towing source might be a mechanized land vehicle, vessel, creature, or human, the heap whatever can be pulled. In the contrary outrageous are incredibly hard core tank recuperation vehicles, and tremendous balance tractors associated with substantial pulling towing loads extending into the a large number of pounds. Insufficient tongue weight can make the trailer influence to and fro when towed. A lot of tongue weight can cause issues with the tow vehicle.

Towing capacity is a measure describing the upper limit to the weight of a trailer a vehicle can tow and may be expressed in pounds or kilograms. Some countries require that signs indicating the maximum trailer weight (and in some cases, length) be posted on trucks and buses close to the coupling device. For cars and light trucks, towing is accomplished via a trailer hitch. In addition to the vehicle limits, the hitch assembly may have its own set of limits, including tongue weight (the amount of weight that presses downward on the hitch) and trailer weight (the full weight of the trailer, including contents). When the hitch is a factory option, the hitch capacity is usually stated in the vehicle documentation as a towing specification, and not otherwise marked on the vehicle.

IV. TARGET STATEMENT

To plan and build up a framework which can be utilized to tow the vehicle so it can be sidelined.

To examine the current water powered jack.

To build up a CAD model with the assistance of CATIA V5 R20 programming.

Plan the parts and select the materials as needed.

V. CALCULATION

Let the mass of the total system be,

1. Motor design

1. Mass of C-section (7.14 kg/m)

For 65mm → .65 → 4.65 kg

2. Mass of I-section (8.9kg/m)

For (46*2) + (41*2) 174cm → 1m + 0.74m

→ (8.9) + (6.58)

→ 15.48kg

3. Mass of hydraulic jack & four wheels → 5kg

4. Mass of shaft 2*5 10kg

5. Mass of 3 wiper motors & supporting element 8kg

Total mass of system → 43.13kg → 44kg

Now we are using 100kg mass

Hence total mass to be lifted → 144 kg

Hence the vertical force 1440kg

Now we have to design a system which can lift 100kg force & more. For that purpose, we have to select a motor,

Required torque:

$$T_{\text{req}} = F \cdot R$$

$$= (360) \cdot (7.5)$$

$$= 360 * 0.075$$
$$= 27 \text{ N-mm}$$

For motor, P= 144 watts, & N=210 rpm, 12V & 12Amp

$$P = 2\pi NT/60$$

$$\frac{P * 60}{2\pi N} = T_{\text{sup}}$$

$$T_{\text{sup}} = 68.76 \text{ N-m}$$

Hence selected motor is used to give drive for two wheels at a time,

So, we are selecting two motors P=144 watts to give drive to four wheels at a time.

2. Hydraulic piston/Plunger jack design

Hence, we have lift 1000N, so force F=1000N &

radius of disc 52.5 mm

$$T = F * R$$
$$= (1000) * (0.0525)$$

$$T_{\text{req}} = 52.5 \text{ N-m}$$

For P=144 watts motor, With N=10rpm

$$\frac{P * 60}{2\pi(70)} = T_{\text{sup}}$$

$$T_{\text{sup}} = 68.76 \text{ N-m}$$

3. Hydraulic piston design

$$T_{\text{sup}} = F * R$$
$$68.76 = F * (0.0525)$$

$$1309.71 = F$$

Hence design is safe

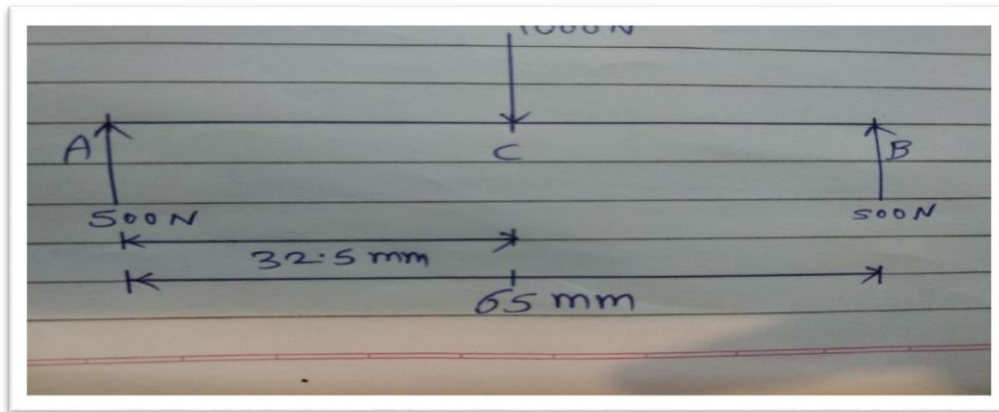
For 22 & of plunger jack,

$$P = \frac{F}{A}$$
$$= \frac{1309.71}{\pi/4(22)^2}$$
$$= 3.44 \text{ N/mm}^2 < S_{yt}$$

Design is safe.

4. Maximum bending stress induced

The bending occurs at the C-section,



- SFD =

$$SF_{AL} = 0$$

$$SF_{AR} = 500$$

$$SF_{CL} = 500$$

$$SF_{BR} = -500$$

$$SF_{BL} = -500$$

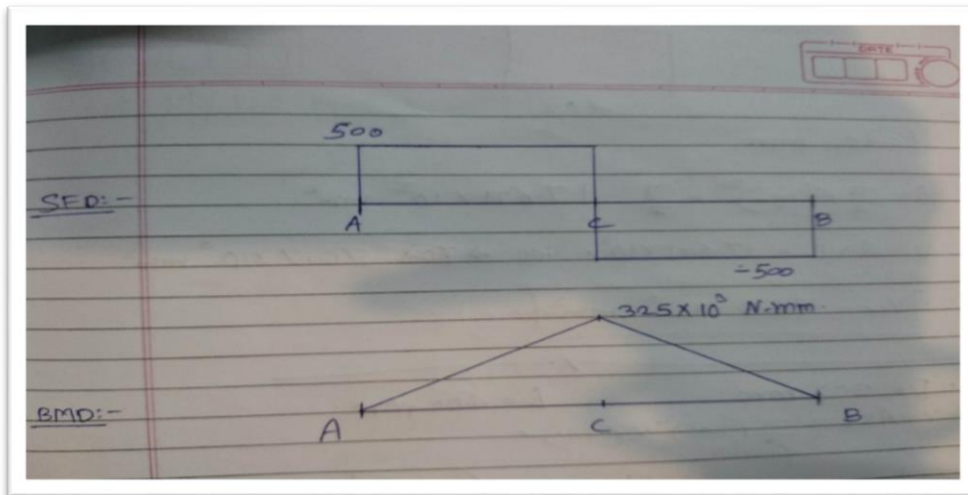
$$SF_{CR} = 0$$

- BMD

$$BM_A = 0$$

$$BM_B = 1000 \times 32.5 = 32.5 \times 10^3 \text{ N-mm} \quad 325 \times 10^3 \text{ N-mm}$$

$$BM_C = (1000 \times 32.5) - (500 \times 65) = 0$$



Maximum bending occurs at pt. C,

$$M = 325 \times 10^3 \text{ N-mm}$$

By considering pure bending moments,

$$\frac{M}{I} = \frac{\sigma}{y}$$

$$\frac{M \cdot y}{I} = \sigma$$

For the C section (MC-75) dimension given as,

$$D=75, B=40, T=7.5, t=4.8,$$

$$I_{yy} = 12.9 \text{ cm}^4$$

$$= 12.9 \times 10^4 \text{ mm}^4$$

$$\sigma = \frac{(32.5 \times 10^3) \cdot (20)}{12.9 \times 10^4}$$

$$\sigma = 5.03 / \text{mm}^2 < S_{yt}$$

5. Maximum shear stress induced in c- Section

$$\tau_{\max} = 3s/2bd$$

$$= 3 \cdot (500) / 2 \cdot 4.8 \cdot 7.5$$

$$= 20.83 \text{ N/m}^2$$

6. Welding length design

Here we are using lap joint,

$$\tau_{\text{all}} = P / (l_2 + l_2) t$$

$$= 1000 / (150) t$$

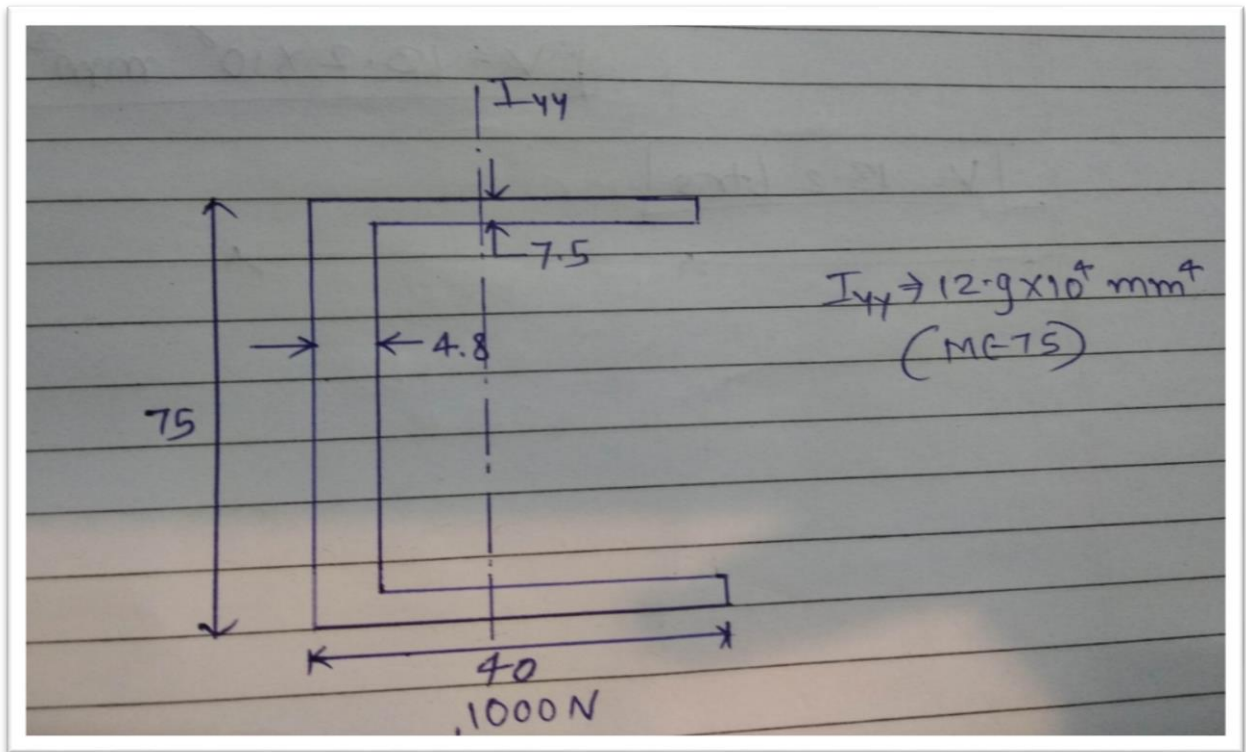
$$= 1000 / 150 * 150$$

$$= 0.044$$

$$\& t = 0.707h$$

$$h = 0.062\text{mm}$$

For both the sides.



SUMMARY

In our plan two electric motors are utilized, one is for moving the harmed car and another is to siphon the oil into the pressure driven jack. Our framework is planned in such a way in this way, that it has low tallness, subsequently it can move beneath any of the vehicle. The upper essence of jack is set in such a way along these lines, that it stalls out into the C-Section of the vehicle. Presently an engine is utilized to siphon the oil into the chamber and that jack will move upward way. It is put at the front side of the vehicle and when state of apparatus is unbiased. So it will lift the vehicle utilizing high torque providing DC Wiper engine. Presently the other engine used to move the vehicle is made to work with the goal that it will move the vehicle. All the controlling is made by Bluetooth controller.

At long last when the vehicle is side lined again oil is driven out from the chamber and vehicle goes to its zero position.

FIGURES

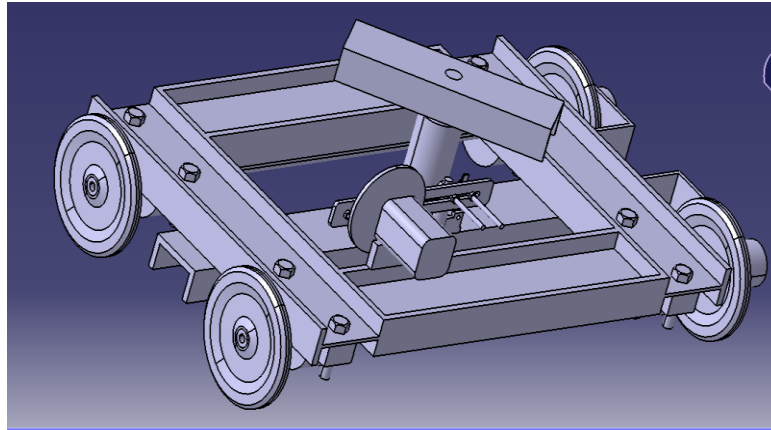


Fig. 1 Car towing mechanism Cad Model

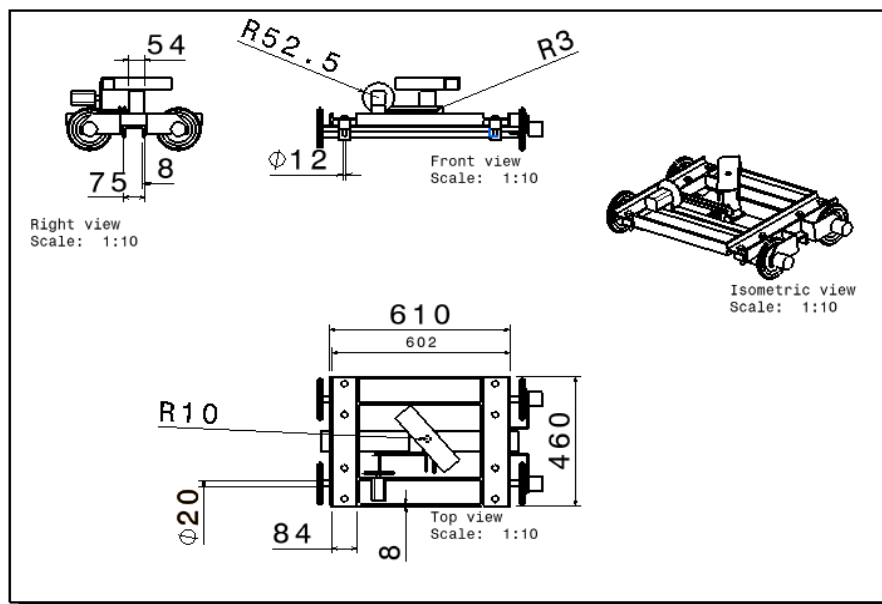


Fig.2 Car towing mechanism Drafting Cad Model

ACKNOWLEDGMENT

We accept this open door with extraordinary delight to communicate our profound feeling of appreciation towards our guide Mr A S Pawar sir for his important direction, support and participation stretched out to us during this task work.

We are so grateful to Dr.K R Jagtap, Head, Department of Mechanical Engineering for giving departmental offices to this work. We might likewise want to say thanks to Dr.R S Prasad, Principal, Sinhgad College of Engineering for their resolute assistance, backing and participation during this undertaking work.

We might likewise want to thank the Sinhgad Technical Educational Society for giving access to the institutional offices.

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