

Design & Optimization of Roll Cage

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Abstract: The Primary target of this paper is to optimize the plan of a recent roll cage structure for SAE standard based famous Atv vehicle. In this undertaking work , different factors, for example, Factor of safety ,distortion ,von-misses pressure , work estimate dependency of produced pressure and effect constrained are considered. A small portion vehicle is a small, rough terrain vehicle fuelled by a four stroke motor, along these lines large part of vehicle execution relies upon speeding up which is corresponding to the heaviness of the vehicle and consequently frame. To accomplish more noteworthy execution of the vehicle, a parity must be found among quality and weight of the roll cage to guarantee safety of the driver. So roll cage part of the case is the essential assurance for the driver. The structure improvement of roll cage which depends on position, area and direction of connection. Henceforth a multi-body dynamic examination is completed to think about execution of the roll cage. Demonstrating was done to convey the mass of the vehicle over its casing individuals to recreate this present reality issue for dynamic investigation. The learning intends to configuration, investigate and discover material for a roll cage of an ATV as per the rulebook of SAE BAJA 2018. SAE BAJA is an off-road vehicle rivalry which gives under alumni understudy a viable involvement in building engineering sciences. It manages displaying of roll cage of a car (SAE BAJA) and examining it to give an ideal plan. The roll cage must be built of steel tubing, with least dimensional and quality necessity managed by Society of Automotive Engineers (SAE).

Keywords: Roll cage, BAJA, ATV, solid work, ANSYS CFD

1. Introduction

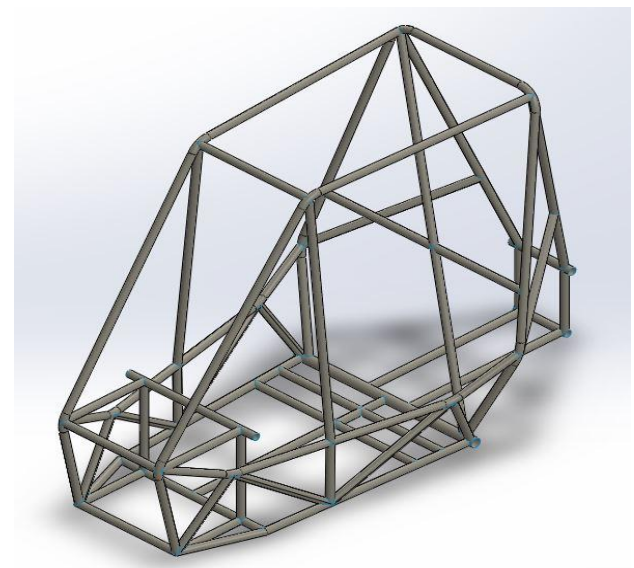
ATV implies All Terrain Vehicle which is extraordinarily intended for goes mud romping driving. ATV is intended for harsh territory, bounces, continuance. The execution procedure of this single-individual vehicle is iterative and dependent on a few building and figuring out procedures.

2. Desirable Design Factor

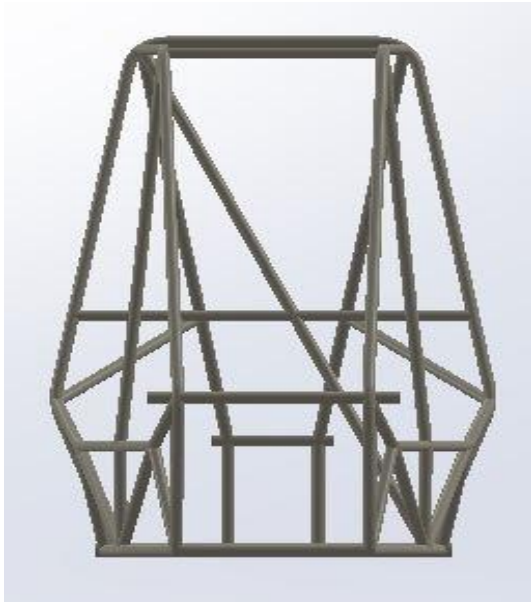
Some desirable design factors while designing of Roll cage are as follow:

- 1) Withstand under high temperature
- 2) Weight of roll cage should be light
- 3) Standardization of roll cage
- 4) Simplified structure of roll cage
- 5) Long service

When structuring the casing, the SAE Rules necessitate that base distance across and thicknesses of pipe are utilized for both the essential and auxiliary individuals from the frame. The two sorts of tubes must be in any event one inch in measurement. Essential individuals are the major auxiliary individuals and must be at any rate 3mm. They are indicated by the red individual.



The auxiliary individuals must be at any rate 0.089mm and are meant. Every one of the tube should likewise be made of steel with in any event 18% carbon. Past MP gatherings have utilized AISI 4130 Steel, otherwise called chromyl steel and also taken AISI 1018 for comparing. It has carbon content somewhere in the range of 28%-33%. It additionally has a high Young's Modulus at 460.0MN/m², so the material would be solid and could take a great deal of power before it starts to twist.



Designed for Primary member

Diameter - 1.00" (25.40 mm)
 Wall Thickness - 0.1181" (3 mm)
 Material - AISI 4130 Steel and AISI 1018
 Modulus of elasticity $E = 205$ Gpa
 Outer diameter $D_o = 25.40$ mm
 Thickness $t = 3$ mm
 Inner diameter $D_i = 19.40$ mm

We are using solid work designing software for designing roll cage for further analysis on it, and by changing material. We can check strength of materials and their durability. Solid Works is published by Dassault System.



Solid Works is a solid modelling computer-aided design (CAD) and computer-aided engineering (CAE) computer program that runs on Microsoft Windows.

Material Specification

Alloy steel is steel that is alloyed with an assortment of various elements in total sum somewhere in the range of 1.0% and half by weight to improve its mechanical properties.

Alloy steels are separated into two gatherings-

Low alloy steels and High composite/alloy steels. The contrast between the two is disputed. Smith and Hashemi characterize the distinction at 4.0%, while Degarmo, et al.,

characterize it at 8.0%. Most generally, the expression "compound steel" alludes to low-alloy steels.

The primary techniques for delivering steel pipe were presented in the mid 1800s, and they have consistently developed into the advanced procedures we use today. Every year, large number amounts of steel pipe are created. Its flexibility makes it the frequently utilized item delivered by the steel industry. Steel channels are found in an assortment of spots. Since they are solid, they are utilized underground for transporting water and gas all through urban communities and towns. They are likewise utilized in development to ensure electrical wires. While steel tubes are solid, they can likewise be lightweight.



3. Conclusion

This analysis shows the benefits of roll cage AISI 4130 over roll cage AISI 1018. This analysis shows that without use of any extra device, with some modification in existing roll cage, the stress developed inside the material of roll cage which is going to bear load of the engine and driver. With this analysis it is possible to increase the strength of existing roll cage with increase change in material or any other modification. The strength can be increased up to higher value with just a modification in design and in changing material. Torque can also be increase, with modification in design which can generate more torque compare to normal engine at particular rpm.

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