"Design and Development of ATV"

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ABSTRACT: During the industrialization era, the objectives of the design and performance analysis of this ATV (ALL TERRAIN VEHICLE) were fun to drive, versatile, durable, safe, and high performance. However, We have to ensure that the vehicle spastics comply with established rules as well as a vehicle like this needs to be able to maneuver through even the most difficult terrain with confidences. Therefore, We met those targets with the aid of using dividing the automobile into its main aspect subsystems and we have focused on every single system to improve the performance of each component.

KEYWORD: Rear Roll Hoop, Roll Hoop Overhead, Lower Frame Side Members, Side Impact members and Rear Bearing.

INTRODUCTION

The objective of this work is to Design and Analys of Rollcage, Transmission, Suspension and Brake system of Baja ATV to improve driver's safety during various dynamic conditions. In addition, we will be using **SOLIDWORKS** software for designing and analys Workbench 2019 for load analysis and strength tests during collisions. Therefore, we have designed the roll cage keeping in view the safety and aesthetics. These are the two major factors. Which matter to us the most, therefore they are given utmost consideration. This paper deals with the design of a chassis frame for an **All-Terrain Vehicle** and Various loading tests like Front Impact, Rear Impact & Side Impact test have been conducted on the roll cage. In addition, for final product designing we made 3D model in **SOLIDWORKS** Software, in which we made different individual components and finally we made assembly of different components.

LITERATURE REVIEW

S. Simhachalam, P. Saiteja, in their thema work carried out **ATV** stands for **All Terrain Vehicle** which is specially designed for off-road driving. As these are used for very rough terrain, jump, small scale forestry, border patrol, deserts and these are fun to drive so chassis has to be designed to withstand static and dynamic loads. Earlier **ATV**'s are built with ladder frame and back bone chassis which were heavier and lack protection. To overcome from this problem, we are redesigning the chassis of the **ATV** in **Solid Works**, Meshing and Simulation of the chessis is done in ANSYS software.

LESSONS LEARNED

We began the task by conducting extensive research and hence the type of chassis we used is "Tubular Space Frame" due to its advantages and withstanding capabilities. The results are provided in form of graphs by analyzing in ANSYS software. After the design process is completed, the fabricated of the frame is conducted by students of the engineering faculty. The fabricated frame will be used as the main part for a project of which a complete ATV will be developed. Hence, the vehicle is designed in **SOLIDWORKS** software.

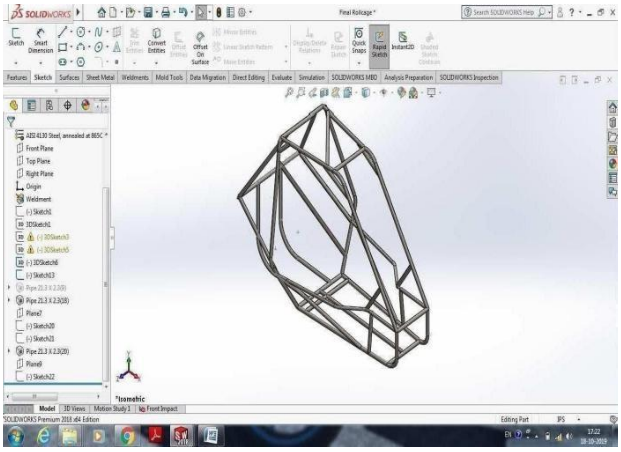
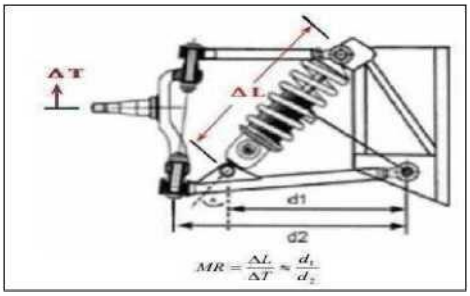


Fig.13D Isometric View

DESIGN CONSIDERATIONS SPRING &

POWERTRAIN



***Spring Data**

Weight (W)= 250kg= 2452.5N

Total length (l) = 56inch = 1422mm

CG Height(h) = 609.6mm(b= 0.924m , c=0.4978m)

Static condition :-

WF = (ω x c)/l= 858.3N

WR = (ω x b)/l=1593..15N

Dynamic Condition :-

WD = W * h (ax)/ (g*l)= 630N

Weight at front single tyre-

WF = (WF1 + WD)/ 2= 743.715 N

Weight at rear single tyre-

Wr = (Wr + WD)/ 2 = 1110.76 N

Diffection :-

D = 50mm, d = 8mm,

G = 78 x 103 N/mm

δF = 8 w D3 n / G d4 = 37.24 mm

δR = 8 w D3 n / G d4 = 69.53 mm

Stiffness :-

KF = W/ δ =19.97 N/mm

KR = W / δ = 15.97 N/mm

***Power train**

1st Gear

$N = \frac{Max\ RPM}{Gear\ Ratio}$

= 4500/10=450rpm

Pully ratio = 1.5

N = 450/1.5 = 300 rpm

$Speed = \frac{\pi D n}{60}$

$= \frac{\pi \times 24 \times 0.0254 \times 300}{60}$

=34.47 Km/h

$Torque = \frac{P\times 60}{2\pi N} = \frac{6000\times 60}{2\times\pi\times 300}$

= 190.98 N.m

Tractive Effect-

$F_{t} = \frac{T}{r} = \frac{190.98}{12\times 0.0254} = 626.61\ N$

Rolling Resistance:-

$Rt = Kr.w = 0.018 \times 255 \times 9.81 = 450279$ N

Acceleration $\alpha = \frac{1}{M}$ (Ft× Fr)

$= \frac{1}{250}$ (626.61 – 45.0279) = 2.280 m/s^2

Gradiability:-

Gr= $\frac{100}{W}$ = (Ft - Rt) = 22.80 %

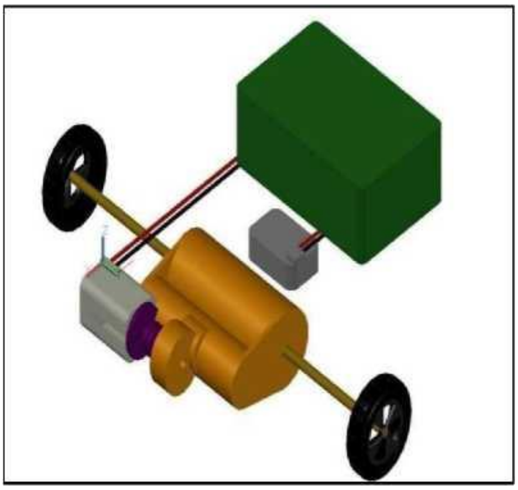


Fig.2 Power Train

CONCLUSION

In essence, This report explores the ways of designing the **ROLL CAGE** of an **all terrain vehicle** and also sheds on possible key points kept in mind for designing. You can also find analysis results in this report along with their respective results and formula used. During the static analysis of the roll cage was changed several times in order to obtain a higher FOS. A higher value of factor of safety insures the durability of the roll cage in the most extreme condition and hence makes the roll cage safe in terms of production. We are also planning to conduct a customer needs survey to improve the vehicle further more. Anything being done for the first time, few difficulties are sure to come. Further improvement and a details of all others system of the vehicle will lead to competitive vehicle. We hope to come with the best possible final product.

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