Design and Analysis of Double Wishbone Suspension System For an ATV

H.S.Deore [1], Shivani Aware[2], Chetan Wani[3], Dhiraj Sonawane[4],
Akshay Siddheshwar[5], Kiran Bidgar[6]
[1]Assistant Professor, SNJB's KBJ COE, Chandwad,India
[2,3,4,5,6]Student, BE Mechanical ,SNJB COE,India

Abstract: This paper is mainly focused on design and analysis of double wishbone suspension system for an ATV by considering dynamically balanced conditions and by minimizing unsprung mass. 3-D cad model is prepared by using CATIAV5R20 for analyzing the system for all ride conditions. To provide greater travel, this allows better absorption of shocks during changes in ground conditions. Also this system is less expensive and light weight. During off-road travelling,double wishbone system results into smooth motion and it avoid jerk and bump. Main objective of this project is to improve vehicle stability and comfort.

IndexTerms **– Geometry of Double wishbone, Roll center, Dynamic parameters, Independent suspension.**

I. INTRODUCTION

An ATV is supposed to have best of the suspension system than other categories of vehicles. So, suspension must be engineered in such way that it will provide the ability to complete every event with practical features like ground clearance and suspension travel, which will results in more comfort and control of an ATV for proper navigation. Double wishbone suspension system consist of two lateral control arm usually of unequal length. Upper arm is shorter than lower arm which induced negative camber. Camber change which helps in to keep contact path square on ground.

II. SUSPENSION SYSTEM

Suspension system is the system of mechanical linkages, spring, damper that is used to connect the wheels to chassis. Suspension of the vehicle keep the road wheel in contact with road surface as much as possible, because all the road or ground forces acting on the vehicle do so through the contact patches of the tires.
While designing the suspension system all static and dynamic parameters such as forces, reactions from the ground, wheel alignment, kingpin inclination, scrub radius, ground clearance, roll center, etc. Besides this other factors considered in design are weight, cost, and availability of material.

III. TYPES OF SUSPENSION SYSTEM

3.1 Independent Suspension

An independent suspension permits wheels to rise and fall on their own without disturbing the opposite wheel that is motion of wheel pairs is independent, so that a disturbance at one wheel is not directly transmitted to its partner. Also it has better ride and handling.

Types of Independent Suspension:

1. Macpherson Strut
2. Double Wishbone
3. Trailing arm
4. Multi-link
5. Semi-trailing arm

3.2 Dependent Suspension:

Motion of a wheel on one side of the vehicle is dependent on the motion of its partner on the other side. Rarely used in modern passenger cars because it cannot give good ride and cannot control high braking and accelerating torques. Used in commercial and off-highway vehicles.E.g. Solid axle used in rear suspension of trucks.

3.3 Semi-dependent Suspension:

In this type, the motion of one wheel does disturb the position of the other but they are not firmly attached to each other. E.g. Trailing twist axle suspension.

IV. DOUBLE WISHBONE SYSTEM

 © 2018, IJREAM All Rights Reserved.

The double wishbone suspension also known as A-arm suspension, is another type of independent suspension. It allows for more control over camber angle of wheel, which describes the degree to which the wheels tilt in or out. The main advantages of double wishbone suspension are its kinematic possibilities like camber, toe and other properties

Properties	AISI 4130
Carbon content (%)	0.30
Tensile Strength (MPa)	560
Yield Strength (MPa)	460
Hardness (BHN)	217
Cost (Rs./meter)	725

4.1Stress Calculation

For ductile materials, allowable stress is obtain by following relationship

$$\sigma = \frac{S_{yt}}{fs}$$

Assume factor of safety, f_s = 2.5 (as AISI 4130 is ductile material).

$$\sigma = \frac{460}{2.5}$$

$$\sigma = 184\ MPa$$

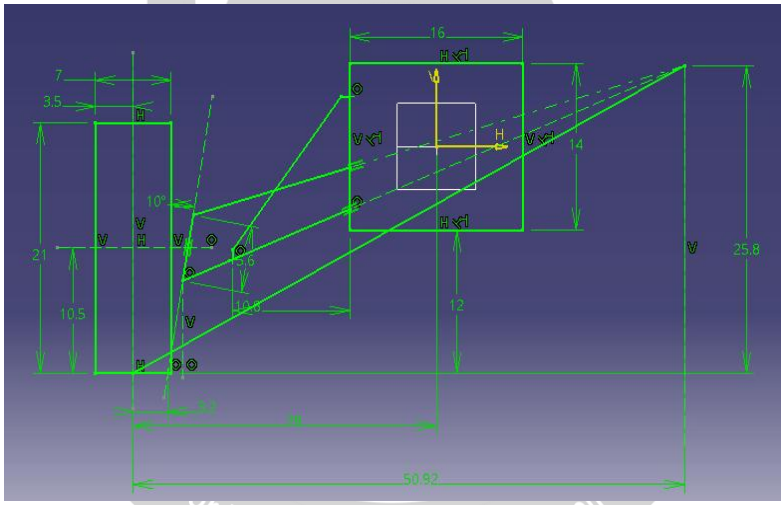

Fig. 1. Geometry of wishbone in CATIA

For the,

Sr..No.	Parameters	Dimensions (in inches)
1	track width	56
2	ground clearance	12
3	center of gravity	28.56
4	tyre dimensions	21*7*10
5	king pin inclination	10
6	Scrub radius	3.2

From geometry,

Length of upper arm = 14.08"

Length of lower arm = 16.02"

Roll center = 14.28"

 © 2018, IJREAM All Rights Reserved.

V. CAD MODEL

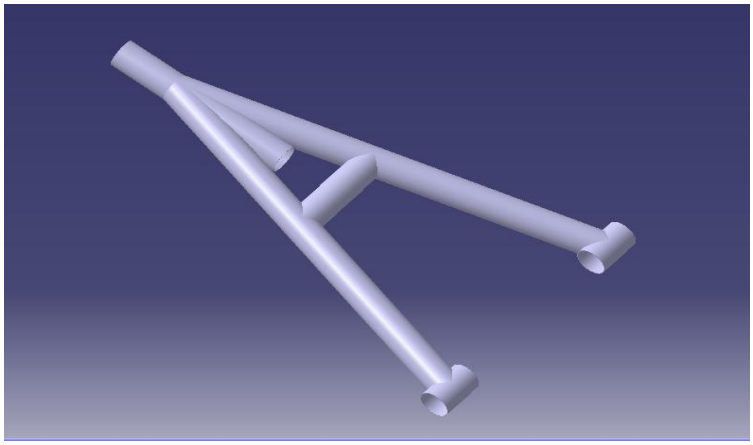

Fig. 2. CAD model of Lower wishbone

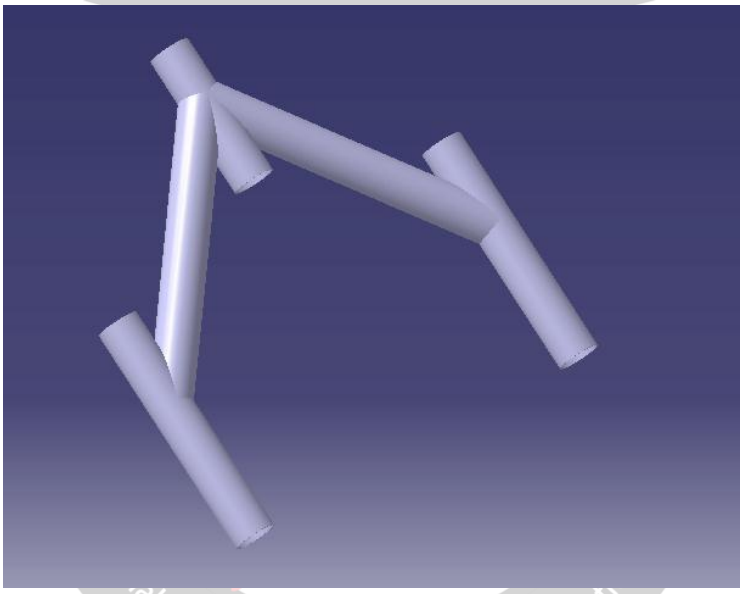

Fig.3. CAD model of Upper wishbone

VI. ANALYSIS OF WISHBONE

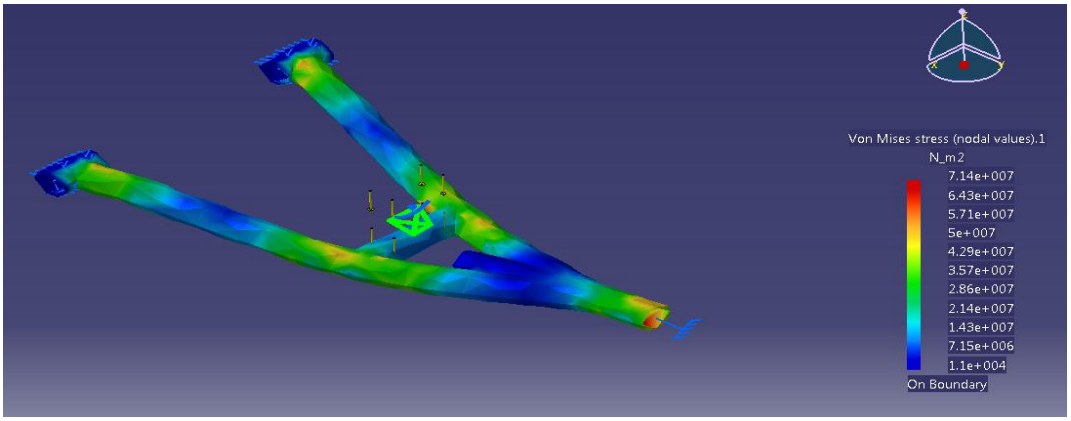

Fig.4. Analysis of Lower wishbone

 © 2018, IJREAM All Rights Reserved.

VII. CONCLUSION

- We have designed the double wishbone suspension and analyzed it on **CATIAV5R20** Software where we found the safe result to desired condition of ride.
- We have calculated dimensions of upper and lower arm also we have calculated roll centre of ATV by geometry of double wishbone suspension system.
- We have predicted result of analysis of lower arm.
- We get maximum suspension travel, better performance and reduce cost and weight of suspension assembly; have been achieved.

REFERENCES

[1] Kirpal Singh, 'Automobile Engineering', Standard Publishers Distributors, 2008.
[2] "Design Data Book", PSG College, Coimbatore, 2011
[3] Nikita Gawai, Design, Modelling and Analysis of Double Wishbone Suspension System (IJMER) ISSN: 2321-5747, Volume-4, Issue-1, 2016.
[4] V.B. Bhandari, "Machine Design."
[5] John C. Dixon "Suspension Geometry and Computation", John C. Dixon, Wiley and Sons Ltd.
[6] Asst. Prof. N.Vivekanandan, Design, Analysis and Simulation Of double Wishbone Suspension System (IIJME) Volume 2, Issue 6, June 2014.

International Journal for Research in Engineering Application & Management
IJREAM

 © 2018, IJREAM All Rights Reserved.