Testing, Design and Analysis of Go Kart Steering Mechanism

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Abstract— As you see in today's world, use of automobile is in large scale, it shows that how the automobile is an important for today world. Go kart is also from one of them. Go-kart is a very small four wheeler vehicle and it is use for racing competition and it is very fun vehicle and also only for single seated. A Go-Kart is a vehicle without suspension or differential. There are many motorsports in the world. Bikes, Cars, Formula one are examples of them. The competition is held all over the world. The various racing competitions are BAJA, Formula1, Go-kart, etc. It is most popular because of simplicity of rules and is professional as well as non-professional and the kart is made as per their requirements. It's having very less ground clearance. As the kart dose not consist any kind of suspension system. It is also modified as per the comfort of driver& it is single seated. The all major components of automobile are used while fabricating. In this we design and fabricate and Ackerman steering mechanism due to its compactness. 3-D Modeling and analysis is done by using CREO 3.0 and ANSYS WORKBENCH respectively.

Key words: Automobile, Go-Kart, Steering Mechanism, CREO 3.0, ANSYS Workbench

I. INTRODUCTION

Go kart is a simple 4 wheel, open roof, light weight, rear engine and rear wheel drive compact vehicle. It consist of an off-set type engine placement or some time it may be at centre. This vehicle is only use for off road condition. As this vehicle is compact in shape or small in size, that's why here we don't use rack and pinion type of steering mechanism. So to replace this we use simple Ackerman steering mechanism. Ackerman steering mechanism is a geometric arrangement of linkages in the steering of a car or other vehicle designed to solve the problems of wheels on the inside and outside of a turn needing to trace out circles of different radii. The function of this steering system is to provide a proper turning of vehicle. For achieving this some parameters are important like the vehicle is travelling in slow speed, all the wheels roll properly in same direction that of vehicle is moving without any slippage.

II. ACKERMAN STEERING COMPONENT

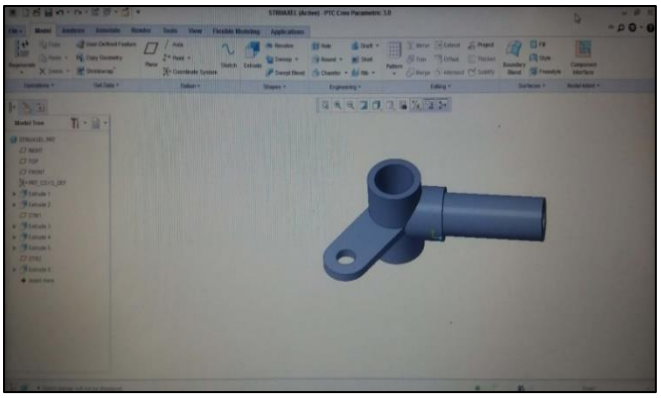

Fig. 1: 3-D model of stur-axle

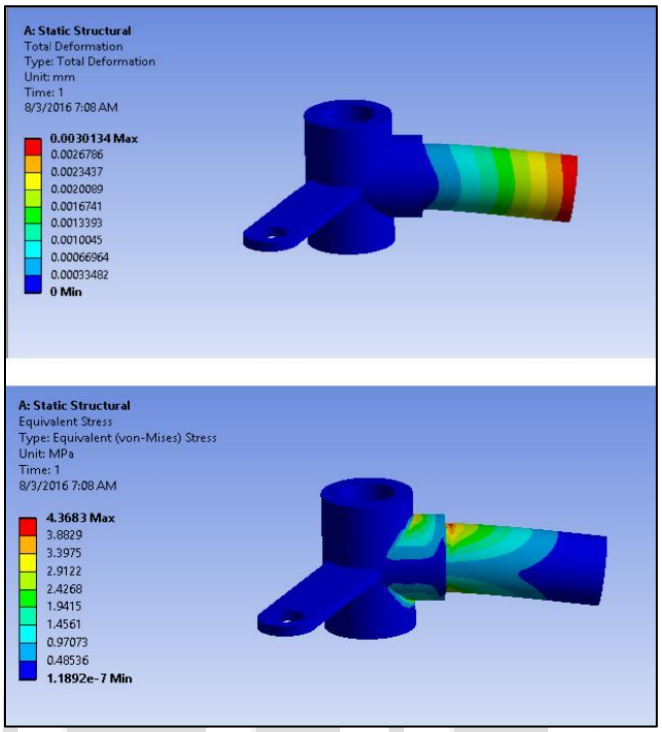

Fig. 2: Deformation of stur-axel

III. CALUTION PARAMETER

- Track width = 37.5inches
- Ackerman angle = 22.89
- Kingpin distance = 24.5 inches
- Turning radius = 1.89 meters
- Length of the rod = 18.6 inches
- Steering rdius = 3 meters
- Caster angle = 12˚
- Camber angle = 3˚
- Kin pin inclination = 3˚

IV. CALCULATIONS

Ackerman angle (α) = $\tan^{-1}$(0.5xtrack width/wheel base)

$\alpha = \tan^{-1}(0.5x\ 38/45)$

$\alpha = 22.89$

Kingpin Center to Center Distance DKC

D_{KC}= tan * 2 * wheelbase

D_{KC} =tan (22.89) *2 * 45

D_{KC} =29.5 inch

1) Ackerman arm radius to be 5.5

$\text{Sin}\ \alpha = y/R$

$Y = 5.5\text{Sin}\ (22.89)$

$Y = 2.12$

2) Steer angle

Steer angle = $K + \gamma + \alpha - 90$

=6.7+77.39+22.89

Steer angle=16.89˚

3) Turning radius(R) =Wheel base/2xsteer angle

=45/2xsin (16.98)

R=77.04 inches

4) Inner steering angle

tanA = W/R-t/2

= 45/77.04-38/2

A =37.78˚

5) Outer steering angle

tanB = W/R + t/2

= 45/77.04+38/2

B=25.1˚

6) Ackerman=tan^{-1} (wheel base/ (wheel base/tan B-track width))

=tan^{-1} (45/45/tan (0.467)-38)

=37.78

7) Ackerman%=37.78/37.78x100

Ackerman % = 97.5%

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Though perseverance and enthusiasm combined with effort in right direction can bring forth the thing called success, but the realization of the reality that the path toward success is full of myriads ,temptations, impediments and pitfalls often proves to be disheartening in such situation. It the able guidance of knowledgeable persons that steers one through difficulties and help them achieve success. We highly obliged to express to deep sense of gratitude and grateful thanks to our project guide Prof. Dinesh yellure sir lecturer in Department of Mechanical engineering and Prof. Bhushan Mahajan the head of Mechanical engineering department for his valuable guidance and support which lead to the successful and timely completion of project work without it was very difficult task . We would also like to give my sincere thanks to Prof. B.R Choudhary Principal of J.D College of engineering and Management Nagpur for his valuable suggestions, constant encouragement and necessary help

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