Design, Fabrication and Analysis of Tie Rods for Steering Mechanism

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***Abstract*— A tie rod joins the knuckle and the center link and the rack to the steering knuckle in suspension system. The tie rod transferred the forces from rack to the steering knuckle to turn the wheels. It is a circular rod with threaded part, Outer end and inner end. The failure of tie rod may cause inconstancy of vehicle and can cause an accident. So it's important to check the strength of tie rod. The tie rod may get fail due to forces and bumping of vehicle during steering. In this project we modified the existing design of tie rod in such a way that its life becomes infinite. The finite element models of the modified tie rod also analyzed to find stiffness and stress distributions in each component.**

Index Terms: **Track Rods, Steering System, Tie Rod**

I.INTRODUCTION

The tie rod is an important member in vehicle suspension system. It performs an important task of transferring the motion from the steering system to the suspension system. In a cars steering wheel is connected to the steering gear steering wheel turns the wheels. The steering gear is connected to the wheels via the tie rod ends. The job of the tie rods end is to ensure the wheels are aligned. It provides adjustment for wheel alignment that keeps the tires from wearing out on the inner and the outer edges. If they wear out the wheels will lose alignment and you may find that the tires and steering wheel are shaking when you are driving the car. To evaluate the structural performance of tie rod, we need to consider the load coming on tie rod. From the various studies and practical observations, it is found that tie rod is primarily under compressive loads and hence fails in buckling. Moreover due to suspension components fluctuating loads are also coming on the tie rod due to the random loads coming on suspension of vehicle.

II. OBJECTIVE

The aim of the project is to perform fatigue analysis of TieRod of TATA INDICA PASSENGER CAR which is very popular model in the automobile industry and to modify the existing design in such a way that its life becomes infinite.

A. Methodology

- Data collection from site
- CAD modelling of existing system
- Finite Element Modelling
- Analysis of the tie rod in FEA
- Optimization of design
- Model fabrication
- Results discussion
- Conclusion

III. CAD MODEL

A. CAD Model of Modified Tie Rod

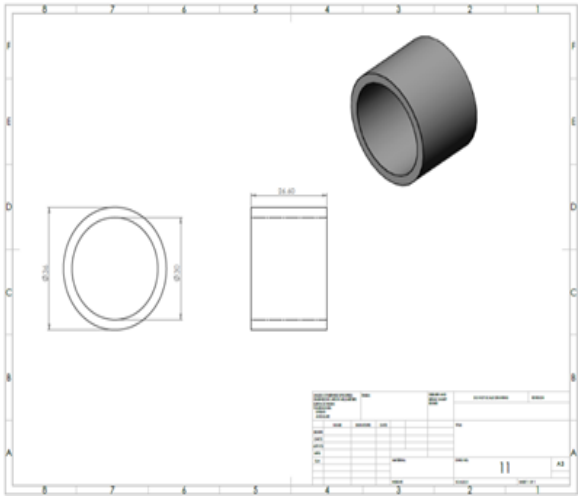

Fig. 1: CAD Model of Modified Tie Rod

B. Modified Tie Rod Finite Element Model and Boundary Conditions

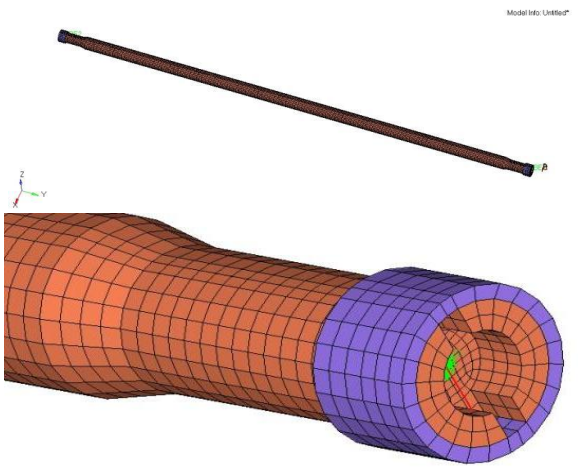

Fig. 2: Modified Tie rod Finite Element Model and Boundary conditions

- 5 Node Penta element- 1552
- 8 Node Hexa element- 45536
- Total- 47088

C. Modified Tie rod Finite Element Analysis and Results

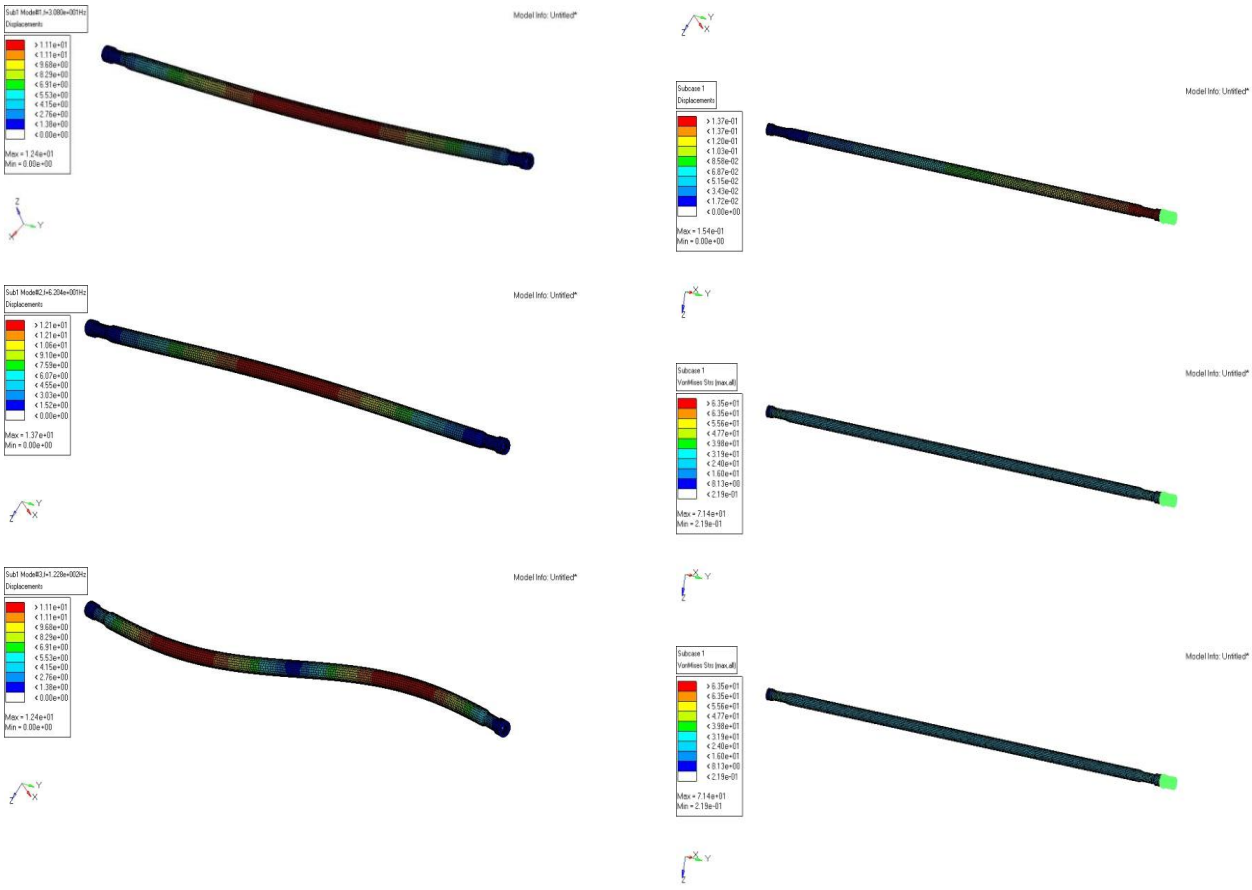

Fig. 3: Modified Tie rod Finite Element Analysis & Results

IV. CONCLUSION

Connecting bushes at both end added to the tie rod to increase the stiffness of the rod against stresses. And finally to validate the modified design again modal, static and transient dynamic analyses were carried out. And result stress 100Mpa obtained which is within the allowable limit.

REFERENCE

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