K. D. K. COLLEGE OF ENGINEERING, NAGPUR

DEPARTMENT OF MECHANICAL ENGINEERING

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

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CERTIFICATE

This is certify that, the project entitled "**DESIGN, ANALYSIS AND DEVELOPMENT OF SUSPESION SYSTEM FOR INCREASING STABILITY OF FOUR WHEELER**" is bonafide work done under our guidance and is submitted by **Sachin J. Borkar** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post-graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (M.E.D.)**.

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ABSTRACT

In mechanical field, suspension is an automobile part that separates the frame or main body from wheels, so that there should be some lateral distance between them. This separation avoids the damage caused by road bumps and maintains the contact between road and wheels intact. It also provides the necessary comfort to passengers and goods. The conventional suspension design has been proven of great comfort on straight roads but during corners and U turns, the external forces that coming into the action increase the possibility of car body roll over thereby causing accidents. They only provide support to the car body but do not possess the necessary adaptability to overcome the unbalancing forces. There is a need for design a new kind of suspension system that can adapt these changes quickly and react accordingly for maintaining stability of vehicle.

In this project, the reason behind instability of a four wheeler around corners has been identified and the existing suspension systems have been studied through all available literature about suspension systems and their relevant innovations and examined then modified according to the objectives of the project. The problem is then formulated and the plan of action for creating a solution is decided. The suspension unit shall also be checked for various stresses in actual loading conditions. This could be possible through the Finite Element Analysis method using ANSYS software.

To observe the actual working of the proposed model we need to construct a scale model from the reference of ordinary suspension system. The fabricated model has to be tested for smooth functioning and proposed working. Experimentation performed on the prototype model has proved that the proposed scheme is working correctly.

The proposed model should also be checked for proposed working with help of software simulation. For such, the modeling process in CREO 2.0 will be helpful. The results are discussed at the end along with the future scope of suspension model and the project has reached to its final conclusion.

7.2.6 View of Suspension Assembly:

All the individual components are now assembled together by means of nut bolts. The figure below displays the assembly of whole suspension system. This software model is now ready for simulation. The synchronised working of both the suspension rods can be shown via a video file in presentation.

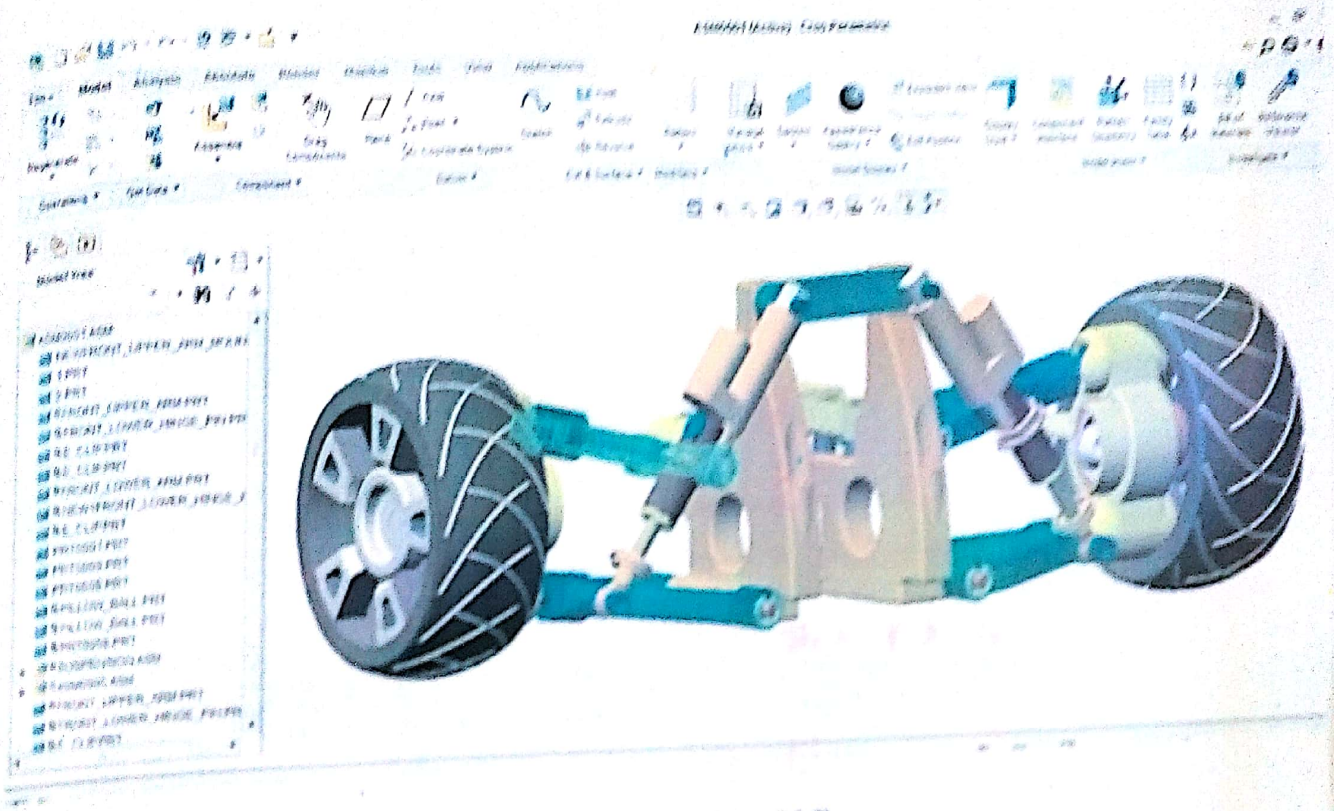

Image 7.2.6 Assembled View

CONCLUSION AND FUTURE SCOPE

9.1 Conclusion:

From all the procedure that we endured in past months to create a working suspension system, we can conclude the following statements:

- The passive suspension system currently in use in most of the four wheelers has not proven to be flexible enough to adapt the changes in road conditions.
- With these little changes we have made in suspension system, the flexibility and maneuverability has been improved. We can now adapt the changing Angles of banking of roads thus improving the overall handling of the vehicle.
- The main goal of maintaining the CG of the four-wheeler closest to its original or prior position is achieved in the simulation of prototype. Also we were able to fabricate the working model of our modified suspension system.
- The stress analysis results were up to the expectations and conclude that our modification can perform well under given load conditions.
- The fabrication of prototype model has also provided us the idea about the cost of manufacture for this new suspension strut assembly. The coatings have proven to be affordable for such huge increase in safety.
- We can now conclude that the driving will be much safer with these new improvements in the suspension causing the less damage to life.

9.2 Future Scope of Work

Although we have achieved our objectives with all the possible hard work, there is always a room for improvements as future scope. The following enlist such possibilities of improvement as well as applications:

9.2.1 Load Capacity:

The load capacity of our suspension strut can be improved by increasing the power of linear actuators. This will be helpful in applying this suspension to bigger vehicles such as Transport Trucks, Volvo Buses, etc.

9.2.2 Maximum Range:

The range of actuation for increasing angle of road banking can be improved further by increasing the range of linear actuator. This could be applied for off-road racing vehicles such as in BAJA and DAKAR rally competitions.

9.2.3 Various Applications:

There is a very broad range of vehicles to which this new suspension can be applicable such as three wheelers (auto-rickshaws, goods-carriers), light motor vehicles such as passenger cars, sport utility vehicles, load carrier vehicles, etc.