Journal of Basic and Applied Engineering Research
p-ISSN: 2350-0077; e-ISSN: 2350-0255; Volume 4, Issue 5; April-June, 2017, pp. 372-374

http://www.krishisanskriti.org/Publication.html

Design, Analysis and Optimisation of Suspension System of Two Wheeler

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Abstract—*In this project a shock absorber is designed and a 3D model is created using CATIA V5. The model is also changed by changing the coil radius of the spring. Structural analysis and optimization done in ANSYS of the shock absorber by varying coil radius and spring radius. The analysis done by considering loads, bike weight, and single person. Structural analysis done to validate the strength and optimization done to determine the better dimension of spring to carry applied load. Optimization done for different dimensions to verify best size for spring in Shock absorber.*

Keywords-ANSYS,CATIA,3-D model

I. INTRODUCTION

Suspension systems have been widely applied to vehicles, from the horse-drawn carriage with flexible leaf springs fixed in the four corners, to the modern automobile with complex control algorithms. The suspension of a road vehicle is usually designed with two objectives; to isolate the vehicle body from road irregularities and to maintain contact of the wheels with the roadway. Isolation is achieved by the use of springs and dampers and by rubber mountings at the connections of the individual suspension components. From a system design point of view, there are two main categories of disturbances on a vehicle, namely road and load disturbances. Road disturbances have the characteristics of large magnitude in low frequency such as hills and small magnitude in high frequency such as road roughness. Load disturbances include the variation of loads induced by accelerating, braking and cornering. Therefore, suspension design is an art of compromise between these two goals (Wang 2001).Today, nearly all passenger cars and light trucks use independent front suspensions, because of the better resistance to vibrations .The main functions of a vehicle's suspension systems are to isolate the structure and the occupants from shocks and vibrations generated by the road surface. The suspension systems basically consist of all the elements that provide the connection between the tiresand the vehicle body.Cost reduction is one of the important parameter in our project.

II. LITERATURE SURVEY

[1]Senthil Kumar, Vijayarangan

In this paper the fatigue life of composite leaf spring is predicted to be higher than that of steel leaf spring. Life data analysis is found to be a tool to predict the fatigue life of composite multi leaf spring. It is found that the life of composite leaf spring is much higher than that of steel leaf spring.

[2]Matthias Decker, Steffen Rödling

This paper covers the influence of mechanical loading taking into account the influences of the kinematics of the suspension system, environmental conditions and steel purity. This leads to a comprehensive experimental validation strategy for suspension springs. Also statistical effects are discussed that have to be taken into account for a safe proof out.

III.METHODOLOGY

- **Problem formulation**
- **Research study**
- **Options of cost reduction**
- **spring design**
- **Tabulation analysis and interpretation**
- **Prototype (Fabrication of modified spring)**
- **Testing of spring,Result, conclusion**

IV. .MATERIALS

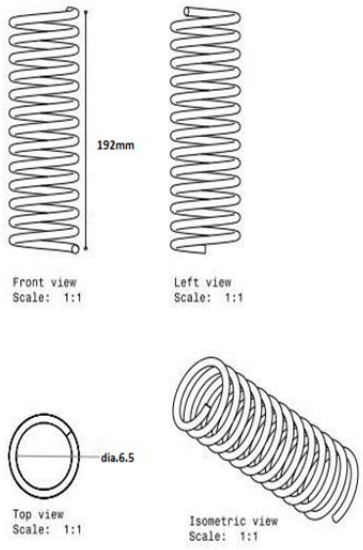
WHY WE CHANGED MATERIAL?

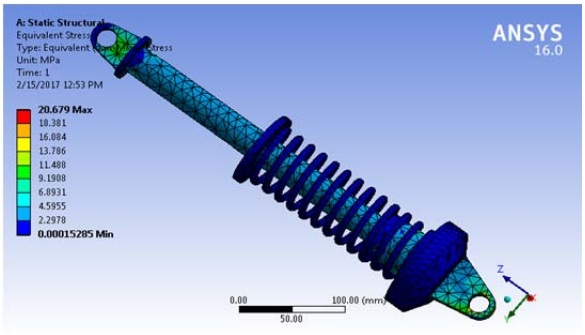
Existing model of hero Honda used structural steel as spring material.But structural steel has some limitation as per following:

1) Maintenance cost of steel is very high. Due to action of rust in steel, expensive paint is required to renew time to time.
2) Steel has very small resistance against fire as compared to magnesium.

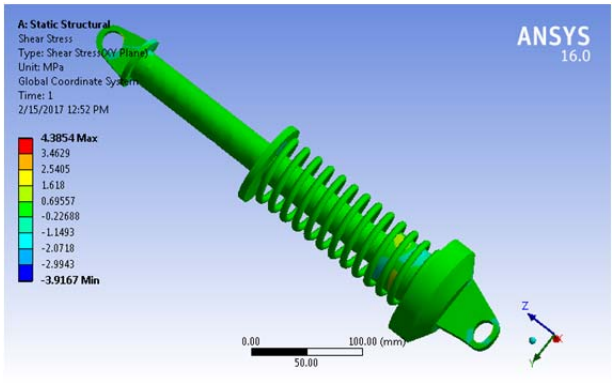
3) Steel cannot be mould in direction if we want. It can only be use in from in which sections originally exist.
4) If steel losses its ductility property then chances of brittle fractures increases.
5) If there are very large variations in tensile strength than this leads steel to more tension. Due to which steel tensile properties graph falls down.

V. Design of Helical spring in Catia

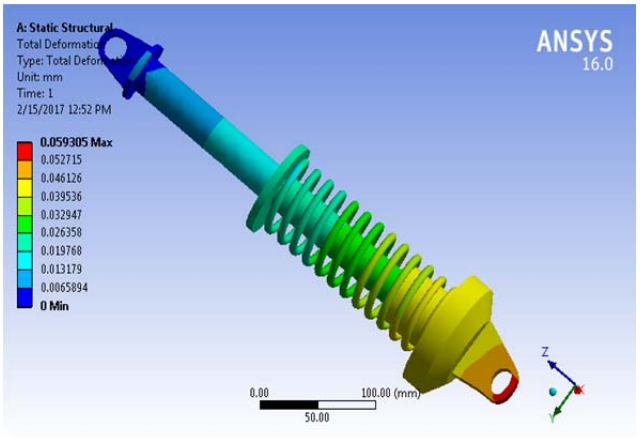




Von misse stress max(20.679)



Shear stress



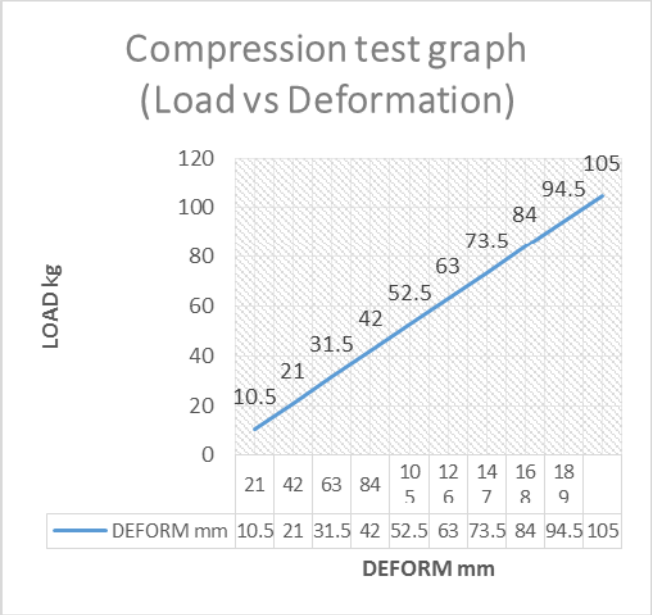
Deformation

VI. Analysis of magnesium alloy in ANSYS
Performance checked on following characteristics:

1.Von mises stresses.

2. Shear stress

3. Deformation.



VII. Graph(load vs deformation)

VII. Testing Result

Load pt.1: Load=30.000kg, Disp=15.800mm

Load pt.2: Load=60.000kg, Disp=30.625mm

Load pt.3:Load=90.000kg,Disp=45.833mm

Load pt.4:Load=120.00kg,Disp=58.550mm

Load pt.5:Load=150.00kg,Disp=74.168mm

Load pt.6:Load=180.00kg,Disp=89.900mm

Load pt.7:Load=200.00kg,Disp=102.00mm

Load pt.8:Load=205.00kg,Disp=105.00mms

VIII. Conclusion

[1]. In this project we have designed a helical compression spring used in a shock absorber of hero Honda splender.We have modelled the helical compression spring by using CATIA V5.

[2]. To validate the strength of our design, we have done structural analysis on the spring. We have done analysis by varying spring material manganese alloy and structural steel.

[3]. By observing the analysis results, the analyzed stress values are less than their respective yield stress values. So our design is safe.

[4]. Also the shock absorber of spring design is modified by reducing the diameter of spring by 0.3mm. By reducing the diameter, the weight of the spring reduces. By comparing the results for both materials, the stress value is less for manganese alloy than structural steel..

[5]. By comparing the results for present design and modified design, the stress and displacement values are less for modified design.

[6]. So we can conclude that as per our analysis using material manganese alloy for spring is best and also our modified design is safe.

REFRENCES

[1] L. Zuo, B. Scully, J. Shestani, Y. Zhou, “Design and characterization of an electromagnetic energy harvester for vehicle suspensions”, *Smart Materials Structure*, 19 (2010).

[2] A.L. Browne, J.A. Hamburg, “On-road measurement of the energy dissipated in automotive shock absorbers”, *Symposium on Simulation and Control of Ground* Vehicles Transport. Syst. 2, 167–186 (1986).

[3] D. Karnopp, “Permanent magnet linear motors used as vehicle mechanical dampers for vehicle suspensions”, *J. Veh. Syst. Dyn.* 18(4) (1989), pp. 187–200.

[4] M.G. Fodor, R. Redfield, “The variable linear transmissions for regenerative damping in vehicle suspension control”, *Vehicle Syst. Dyn.* 22, 1–20 (1993).

[5] K. E. Graves, P. G. Iovenitti, D. Toncich, “Electromagnetic, regenerative damping in vehicle suspension systems”, *International Journal of Vehicle Design*, 24 182–97.

[6] A. Gupta, J. A. Jendrzejczyk, T. M. Mulcahy, J. R. Hull, “Design of electromagnetic shock absorbers”, *International Journal of Mechanics and Materials in Design* (2006) 3:285–291 .

[7] Y. Zhang, K. Huang, F. Yu, Y. Gu, D. Li, “Experimental verification of energy-regenerative feasibility for an automotive electrical suspension system”, 2007 IEEE Int. Conf. on Vehicular Electronics and Safety .

[8] R. B. Goldner, P. Zerigian, “A Preliminary Study of Energy Recovery in Vehicles by Using Regenerative Magnetic Shock Absorbers”, *SAE Technical Paper Series*, 2001-01-2071 .

[9] R.B. Goldner, P. Zerigian, “Electromagnetic linear generator and shock absorber”, *US Patent* No. 6952060 B2, Oct 4-2005.

[10] O.D. Paz, “Design and Performance of Electric Shock Absorber”, *MS Thesis*, December 2004.