MCPHERSON SUSPENSION SYSTEM –A REVIEW

Article · August 2014

CITATIONS
0

READS
14,979

3 authors, including:

Dhara Vadodaria
Musandum International
6 PUBLICATIONS **0** CITATIONS

SEE PROFILE

International Journal For Technological Research In Engineering
Volume 1, Issue 12, August-2014 *ISSN (Online): 2347 - 4718*

MCPHERSON SUSPENSION SYSTEM - A REVIEW

Prof. S.C.Jain[1], Dr. Pushpendra kumar Sharma[2], Dhara Vadodaria[3]
Department of Mechanical Engineering
NRI Institute of Science and Technology, Bhopal, India.

Abstract: McPherson suspension system is generally used as the front suspension system in the passenger cars. Where Mcpherson suspension system uses less space and provides more area to engine compartment. Research work on the coil and Mcpherson suspension system to give more comfortable ride and modification on suspension system is done.

I. INTROUCTION

Suspension is the definition given to the system of springs, shock absorbers and linkages that joints a vehicle to its wheels and allows relative motion between the two. Suspension systems allow dual purpose contributing to the vehicle's road holding/handling and braking for good active safety and driving pleasure, and keeping vehicle occupants comfortable and reasonably well isolated from road noise, bumps, and vibrations, etc. If a road surface were perfectly flat and had no irregularities in it, then suspensions would not be required. But roads are far from flat, even freshly paved motorways/highways have subtle imperfections that can interact with the wheels. It's these imperfections that apply forces to the wheels and suspension components and causes handling imbalances in compromised set ups. The MacPherson strut is a type of car Suspension system commonly used in many modern motor vehicles. This includes both front and rear suspensions, but usually located at the front of the car. The McPherson strut normally also has a steering arm built into the lower inner portion. This assembly is extremely simple and can be pre manufactured into a unit at the assembly line. By removing the upper control arm, it allows for more width in the engine bay, aiding in any maintenance work or engine design requirements. McPherson suspension system provides more space in the engine compartments. McPherson suspension system is use as the front suspension in the car and suspension system generally used for better cornering and also for the comfortable passenger ride. Mcpherson suspension system contains upper mounting point, shock absorber, spring, spring leg and lower control arm. It contains only one lower arm so it also known as single wishbone system.

II. LITERATURE REVIEW

Gadhia Utsav D. (2012) [1] presented that Suspension system is a very essential part of the automobile vehicle. Also, Stability and comfort is totally depended on the suspension system of vehicle. Where, suspensions are used to deal with hump in road surface, in other words, enhancing ride comfort from pits and other irregularities. The function of suspension system is to absorb vibration due to irregularities of road conditions. So in every car suspension system must be designed for the capacity of the vehicle. In the paper it is decided that existing car is for 5 people or not. After doing comparison and calculation researcher concluded that car cannot be used for 5 people rather it can be used only by 2 to 4 persons. S. Pathmasharma et al (2013) [2] described that in the past few decades rapid technological growth in the area of automobile engineering have witnessed. One way of improving the market share is to provide a vehicle with maximum comfort which is achieved by modifying the suspension system. Passenger car commonly use coil suspension system in their vehicles to absorb road shocks and provide comfort to passenger. Nonlinear springs are most commonly used in vehicle suspension system. Much research work has been carried out on coil spring with the objective of getting optimized designs to improved passenger comfort. In this paper author has discussed about the existing suspension system and improved design of suspension system. Author has done modeling using UG and dynamic analysis done in the Automatic dynamic of Mechanical System(ADAMS) in which analysis of suspension is carried out by author. In the paper main components like mounting head, track width and other parameters changed by author. Finally, author concluded that modification parameter of the suspension system improves the performance of the suspension system. Gadhia Utsav D. (2012) [3] has described about ADAMS in the paper, where an ADAMS is multi-body dynamic simulation software, for doing analysis in ADAMS first 3-d modelling is done in Pro-e and importing the model to ADAMS. For quarter model analysis of suspension system material and joints have to be applied to the imported parts and then wheel movements are given. The results are obtained in the form of time history plot for force and displacement of the spring. Simulation results are same as obtained by analytical procedure. Here in this paper author represented the procedure for quarter model analysis of wagon-R car's rear suspension system using ADAMS. In ADAMS author have perform force and deformation analysis for quarter model of Wagon-R car's Rear suspension. In the paper author concluded that existing car can be used for the 3.5 persons. If it design of suspension system is improved it can be used for 5 people. D. Colombo (2009) [4] represented in his paper that the investigation of cause of premature failure of the upper strut mount of a McPherson suspension is done. Author reported that the work was prompted by the fact that the failed component has been used for at least four decades by a car manufacturer without reporting any premature failure and therefore an in depth study of the structural behavior of the component was

required. Both experimental tests and numerical analyses had been carried out in order to estimate the service life of the component. The fatigue life of the component has been assessed by a defect tolerant analysis. The result of the investigation is that the upper strut mount failure was due to an impulsive load that cannot be justified by the static and dynamic loads acting on the component caused by road irregularities and vehicle maneuvering during usual working conditions. Author concluded that experimentally and numerically brittle rupture of suspension system caused by impulsive load. From the results obtained in the author work it can be therefore concluded that the failure of the upper strut mount was caused by an impulsive load that cannot be justified by the normal working condition for which both the component and the vehicle were designed. D.V. Dodiya (2014) [5] has presented in research paper that the suspension systems have been an economical choice for the vehicle designers. The suspension system has changed the scenario of the comfort of the vehicle ride and safety and road handling of the vehicle. The horizontal orientation of the shock absorbers helps the designers to accommodate other parts and have a greater stability due to lower centre of gravity of the vehicle. The leading arm has been previously checked for the static characteristics of the vehicle and the analysis of the suspension system, in this we have been considering the dynamic analysis of the suspension system and the consideration of the system in ADAMS and the failure and running conditions and the load and the transfer of forces have been considered to allow the suspension system to simulate and get the results of the working of the leading arm. After analysis author concluded that design of the leading arm is done t reduce the weight and leading arm suspension system works well with the system. Author concluded that modification will give better result in the suspension system and gives effective suspension system.

Yanqing Liu (2001) [6] described that Basically on the multi-body system dynamics; the virtual prototype of the hydraulic shock absorber for the bench test is developed in the ADAMS environment. Dynamic behaviors of the absorber are studied by both computer simulation and real test. Numerical predictions of dynamic responses are produced by the established virtual prototype of the absorber and compared with experimental results. It has been shown from the comparison that the vibration behaviors of the prototype with hysteretic damping characteristics are considered to be more identical with the bench test results than those of the same prototype with piecewise linear damping properties are. The current virtual prototype in author's research shows of the shock absorber is correct and can be a developing terrace for the optimizing design of the absorber and matching capability of the whole car. Author concluded after doing experiment and From the comparison between the simulations and test results, the virtual prototype with hysteretic damping characteristics is more consistent with the bench test and more reasonable than that with piecewise bilinear properties, which can explain test phenomenon of the shock absorber easily, such as jerk and noise and so on. A. Purshotham [7] described that Most of automobiles these days are using two suspension systems namely: double wishbone suspension system and McPherson suspension due to their good dynamic performance and higher passenger comfort. The Macpherson strut setup is still being used on high performance cars such as the Porsche 911, several Mercedes-Benz models and lower BMW models due to its light weight, design simplicity and low manufacturing cost. This paper proposes a systematic and comprehensive development of a two-dimensional mathematical model of a McPherson suspension. The model considers not only the vertical motion of the chassis (sprung mass) but also rotation and translation for unsprung mass (wheel assembly). Furthermore, this model includes wheel mass and its moment of inertia about the longitudinal axis. The paper offers an implementation of the model using Matlab- Simulink, whose dynamics have been validated against a realistic two dimensional model developed with the Ansys software. In this paper author concluded that the McPherson suspension system has been modeled after studying dynamic equations to study vibration characteristics of sprung mass of the automobile system with the inclusion of various design parameters such as stiffness, damping, masses, moment of inertia, etc. The commercial simulation software Simulink is used by author to implement dynamic equations to attain the acceleration and the displacement of the chassis of the automobile during the period in which the vehicle passes through various road conditions. Due to the complexity involved in the mathematical expressions and executing them into the Simulink software, the model has been simplified with a two-dimensional approach. The Ansys software is used to implement a simplified two dimensional practical model of McPherson suspension. The results obtained from Ansys model are compared with the mathematical model implemented on Simulink. It is observed that the displacement and acceleration of the chassis of the automobile obtained in Ansys are nearer to the values of mathematical model. With these developed models, the influence of suspension system parameters can be studied on the performance of passenger comfort.

III. CONCLUSION

From literature review of the research papers it can be found that if modified suspension system is made and analysis of modified suspension system is done than the results produced by the modified suspension system are better than the original suspension system. From better suspension system rider can get comfortable ride too. Comfortable ride can be achieved by doing modification in the existing suspension system.

REFRENCES

[1] Gadhia Utsav D., Prof. Sumant P. Patel, Design and Problem Identification of Wagon-R car's rear suspension, International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, Volume 2, Issue 7, July (2012), Page 111-113

[2] S. Pathmasharma, J. K. Suresh, P. Viswanathan and

R. Subramanian , Analysis of Passenger Car Suspension System Using Adams, International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, Issue 5, May (2013), Page 1186-1193

[3] Gadhia Utsav D., Prof. Sumant P. Patel, Quarter Model Force Analysis of Wagon-R car's Rear Suspension using ADAMS, International Journal of Engineering Research and Technology ISSN 2278 – 0181 Vol. 1 Issue 5, July (2012), Page 1-6

[4] D. Colombo *, M. Gobbi, G. Mastinu, M. Pennati, Analysis of an unusual McPherson suspension failure, Engineering Failure Analysis 16 (2009), Page 1000–1010

[5] D.V. Dodiya, P. H. Patel, M.J. Chauhan**,** Dynamic Analysis Of Leading Arm Suspensions System With Horizontal Spring Damper Assembly, International Journal of Advance Engineering and Research Development (IJAERD), Volume 1 Issue 2, March 2014, e-ISSN: 2348 - 4470 , print-ISSN:2348-6406 (2014), Page 1-6

[6] Yanqing Liu *, Jianwu Zhang, Nonlinear dynamic responses of twin-tube hydraulic shock absorber, Mechanics Research Communications 29 (2002), Page 359–365

[7] A. Purushotham, Comparative Simulation studies on Mcpherson Suspension System, International Journal of Modern Engineering Research (IJMER), Vol.3, Issue.3, May-June.(2013), Page 1377-1381

