Review On Shock Absorber Test Rig

[1]Prof. Parag P. Akarte, [2]Darshan S. Dhande, [3]Prasad P. Raul, [4]Kundan M. Morey, [5]Jeetesh R. Zatale

[1]Professor, [2,3,4,5]BE Student
Department of Mechanical Engineering
HVPMCOET, Amravati, Maharashtra, India.

***Abstract*- Shock Absorber is a Mechanical Device Designed to absorb the Unwanted Shocks. Also, the Shock Impulses. While in working of the Shock Absorber the Kinetic Energy is dissipated in the form of Heat into the Surrounding. It also shows the relation between the speed and load i.e. It gives the Behavior of Shock Absorber At various speed load. It gives the Performance characteristics of Shock Absorber Under Real Condition, these real conditions are already implemented into the setup. The road disturbances are created by the help of CAM which rotates at its own speed by the help of Motor. Due to these the rotary motion is converted into the linear motion.**

***Keywords*: Mechanical Design, Shock Absorber, CAM, Motor, Kinetic Energy.**

INTRODUCTION

Shock Absorber Is the Necessary Element into the Automobiles. Which differs the suspension system and the car body. It absorbs unwanted shocks developed due to the mass of the rider, different road conditions, varying speed, etc. and Transmit the Motion. Due to these impulses the synodal wave is generated which gives the performance of that shock absorber. By these we can easily determine the Transmissibility of that shock Absorber.

Concept of Shock Absorber Test Rig and Approaching towards Universal Testing Procedure.

The concept of a universal testing procedure and determining, analyzing & rating the performance of shock-absorbers is discussed in this paper. The concept discussed enables the industry to evaluate, compare and choose between various shock-absorber systems and help them improve their damping system and vehicle performance. It is a thorough analysis and a full report generation approach which will help the industry to know more about the shock-absorbers. The concept is in operation and would not be suitable for mass testing or where accuracy and exact values are not major concern. However, this conceptual approach is lengthy, vast and detailed which further makes it complex and time consuming. The concept can be materialized and implemented to obtain experimental results and development of data-base in future. The concept will benefit future researches and complement other projects based on suspension systems greatly.

DESIGN OF SHOCK ABSORBER TEST RIG USING MECHANICAL EXCITER TO DETERMINE TRANSMISSIBILITY AND NATURAL FREQUENCY.

Paper shows the cad models, analysis of the designed parts which constitute for the development of a mechanical exciter. The present set-up is actually a scale down model of the Shock absorber test rig. So, if the dimensions are scaled up, then it can be used for heavy duty applications as well. Also, it can be used to test springs of various stiffness and shock absorbers of varying stroke length. Dimmer is recommended for smooth operation of a shock absorber test rig.

DESIGN AND DEVELOPMENT OF SHOCK ABSORBER TEST RIG.

The paper encompassed the erection of a setup or mechanism which will be able to develop the actual conditions those are faced by a suspension system and ultimately the components of the suspension system. After that the various concepts and available theories, practices adopted in industries by the experts are understood in order to approach towards the implementation. In the design of the various components of the system forces and stresses which are coming on the setup are calculated. By doing this it is ensured that the design is safe against any undesired consequences those may come while in operation. For this use of different sensors and data acquisition system has been studied. Finally, the tests are taken on the shock absorber and results are interpreted. Thus, the performance of the different shock absorbers has been evaluated and compared.

Optimization of Displacement Sensitive Twin Tube Shock Absorber.

1. From the experimental study of shock absorber, as frequency of excitation changes, there is change in the performance behavior of the suspension. The area of hysteresis loop increases with the increase in excitation frequency. The force transmitted increases by 3% for each subsequent rise in frequency. Therefore, Shock absorber is frequency dependent.

2. Shock absorber absorbs energy during compression stroke and releases during expansion stroke. The force transmitted and velocity increases in compression stroke and decreases in expansion stroke. Therefore, shock absorber is stroke dependent.
3. Displacement sensitive shock absorber shows strictly nonlinear behavior.
4. Among four tested suspension spring the optimum spring stiffness is k=44.53 N/mm.

Design of Shock Absorber Test Rig.
The mechanism which is shown in this paper has been converts rotary motion of the circulating disc into the linear motion of the shock absorber. At various loads and speeds combinations the readings on the test rig can take with the help of stylus mounting on test rig and by using the data, characteristics of shock absorber can calculate. Thus, the shock absorber test rig design is very important for characteristics of shock absorber and to find effectiveness. It is done by conceptually.

Study on Dynamic Characteristics of Automotive Shock Absorber System.
The purpose of this project is to study and analysis stiffness and damping of shock absorber system. The stiffness and damping value for shock absorber are strongly related to the capacity of the shock absorber. The results show that good matching with small discrepancy between the experimental and simulation results. As conclusion, the shock absorber test rig capable to identify dynamic characteristics of shock absorber.

Design and Analysis of Suspension System.
The research survey was reflected in different types of suspension systems for the different vehicles but here focused on an independent wheel vehicle suspension system. It was reflected on design and analysis of suspension of such vehicle likes Formula Student Race Car, An All-Terrain Vehicle, BAJA 2016 of All terrain vehicle and Terrain Vehicle with Four Wheel Drive. It was reflected in the design and analysis of suspensions such as analysis methods likes Model Establishment and Parameter Analysis, Vibration Analysis, etc. Some research papers indicated optimization methods like Adaptive fuzzy controller, clipped-optimal control algorithm, Genetic Algorithm, etc. Some research papers indicated real data analysis like a universal suspension test rig. Some research papers indicated an analysis of such a suspension system like Double Wishbone Suspension System, MPV Suspension System, etc. By using Solid work 2020 for CAD modeling as per design consideration of Macpherson Strut Suspension as functional analysis in consideration as static analysis to gives von mises stress, deformation and strain are 26.01MPa, 0.0167297mm and 0.0958758 respectively.

Design and Transmissibility of Shock Absorber Test Rig.
They introduced About the Suspension testing setup; we can test multiple numbers of suspensions at different loads and different speeds. Also, we can use suspensions of different height.
By changing different suspensions and oils we can find out optimum motion transmissibility. With ultimate objective of studying and plotting dynamic characteristics for Hero Splendor suspension and Honda Shine suspension using single wheel model of suspension analysis to produced large number of results. However, it concludes the project work with following points:
1. The suspension system gives best performance when designed to be slightly under-damped.
2. From experimental results and graphs we can conclude that for good ride, transmissibility should be as low as possible and this can be attained by using low damping constant and high spring stiffness and Honda Shine suspension gives the better results as compared to Splendor suspension.

Design of Shock Absorber Test Rig for Measurement and Analysis of Transmissibility.
Load increases at constant speed, the transmissibility of the system goes on decreasing practically. There is increase in transmissibility calculated by theory but it is nearly negligible. when speed increases at constant load, the transmissibility of the system goes on increasing. Practically it shows the increase in distinct manner while theoretically it shows very small increase.

CONCLUSION
The different mechanism used, to determine about the performance characteristics of the shock absorber. While working in real conditions Speed and Load plays an important role because both are varying at their given conditions. The final wave graph is achieved to determine about the Transmissibility of the shock absorber. Which one of the important safety factors consider into the Shock Absorbers.

REFERENCES:

[1] Hunter Engineering Company (2006). A Primer on Suspension Testing.: Technical Paper Hunter Engineering Company.
[2] Knowles, D. (2003). Automotive Suspension & Steering System, Shop manual, 3rd Edition.Cliftorn Park, NY: Delmar Learning.
[3] Gilles, T. (2005). Automotive Chassis: Brake, Steering & Suspension.: Cencage Learning.
[4] Birch, T.W. (1999). Automotive Suspension & Steering System, 3rd Edition: Delmar Cencage Learning
[5] Newbold, D. and Bonnick, A. (2000). Practical Approach to Motor vehicle Engineering. : Edward Arnold
[6] Nakara, B.C. and Chaudhury, K.K. 2004. Instrumentation Measurement and Analysis, 2nd Edition.: Tata Mc Graw Hill.
[7] Pfisterer, U. (2007). The Opel DTM Race Car The technology of the 460HP DTM racing Opel Astra V8 Coupe DTM project manager with Opel Performance Center.
[8] Lalitkumar Maikulal Jugulkar , Shankar Singh , Suresh Maruti Sawant ,Analysis of suspension with variable stiffness & variable damping force for automotive applications Advances in Mechanical Engineering 2016, Vol. 8(5) 1–19.
[9] Mahmoud Omar , M.M. El-kassaby, Walid Abdelghaffar A universal suspension test rig for electrohydraulic active & passive automotive suspension system Alex&ria Engineering Journal (2017) 56, 359–370.
[10] Hitesh K. Tare, C.S. Dharankar Determination of damping coefficient of automotive hydraulic damper using sinusoidal testing VOLUME-3, ISSUE-7, 2016.
[11] P. KARIMI ESK&ARY, A. KHAJEPOUR, A. WONG & M. ANSARI Analysis & optimization of air suspension system with independent height & stiffness tuning International Journal of Automotive Technology, Vol. 17, No. 5, pp. 807−816 (2016).
[12] Łukasz Konieczny, Rafał Burdzik Modern suspension systems for automotive vehicles & their test methods Article in Vibroengineering PROCEDIA • October 2017.
[13] Ankit Kumar Dixit*, Aradhya Saxena, Arpit Gupta, Ch&ransh P&ey, Prashant Chauhan Concept of Shock Absorber Test Rig & Approaching towards a Universal Testing Procedure Volume no.06,special issue no.[02],December 2017.
[14] Alan G. Mayton Joseph P. DuCarme Christopher C. Jobes Timothy J. Matty Laboratory investigation of seat suspension performance throughout vibration testing National Institute for Occupational Safety & Health, Pittsburgh Research Laboratory.