The Analysis of Damping Force Characteristics of a Shock Absorber By Damping Force Testing Machine

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Abstract
The main effort is required to predict the damping characteristics of the shock absorber which helps to measure and compare its sensitivity. Accurate sensitivity prediction holds paramount importance for any product. That leads to achieve a smooth working and provides a long life of the shock absorber as well as vehicle system. Hence, there is a need to make use of an adequate model for accurate prediction of the sensitivity of a shock absorber. This result would help to know the sensitivity of a shock absorber in the different vehicles of the automobile industry. The damping characteristics gives the different values but the after the research and analyses of damping values we would make a sensitivity curve based on the different velocities which would help to categories the shock absorber according to their strength and qualities so that more accurate and efficient stability of vehicle can be obtained. This analysis is performed to understand the sensitivity of shock absorber by using damping force testing machine and the measures to improve it by analyzing the related parameters.

Key words: damping force; characteristic curve; shock absorber; shocker sensitivity; damping force testing machine; etc.

1. INTRODUCTION

Accurate estimation of the sensitivity and damping characteristics of the shock absorber is the prime worthiness to the development of an efficient automotive vehicle system. The sensitivity of the system can be defined as the ability of the suspension system to absorb the uneven road roughness and road irregularities. The sensitivity of a shock absorber is the prime concern for the stability and comfort of the vehicle so the main goal is to perform the test to calculate the sensitivity of the shock absorber and if the sensitivity is as per the mass of the vehicle then it would work in an efficient manner. [1] This research work also finds the key reasons of the variation in sensitivity of the shock absorber by calculating the graphs of damping force with respect to displacement at different velocities which would give us an exact range of the damping force behaviour at various velocities. The analysis of these characteristic curves will describe that how much sensitive is the shock absorber. Damping power of a safeguard is specifically relative to the speed and this parameter should be decisively controlled. By doing this analysis we would get the values of tension and compression forces at different velocities by using damping force testing machine. The values of forces should increase as per increment in the velocity. The damping force (tensile and compressive) should be in a range as per the mass of the vehicle and its load to achieve stable vehicle dynamics. The analysis of characteristic curve and test results helps to calculate and to make a sensitivity curve of damping force (tensile and compressive) with respect to velocity to analyze the sensitivity of the shock absorber. [2]

This dissertation work also finds the key reasons of the variation in sensitivity of the shock absorber by calculating the graphs of damping force with respect to displacement at different velocities which would give us an exact range of the damping force behaviour at various velocities. The analysis of these characteristic curves will describe that how much sensitive is the shock absorber. Determining the damping characteristics of shock absorber is a primary concern for controlling and managing the behaviour of the shock absorber. [3] Damping force is measured by testing of shock absorber in the damping force testing machine (DF machine). [4] The value of damping force in the tensile and compressive mode is calculated and analysed and then sensitivity is predicted which brings it to a proper result and conclusion. [5]

2. EXPERIMENTAL SETUP

The experiment is performed on the HK43 R/C-14 model of rear cushion type shock absorber by damping force testing machine. The following steps are carried out during experiment:

2.1 Clamping the shocker: Initially the rear cushion shock absorber is clamped into the damping force testing machine and it is fixed inside the damping force testing machine.

2.2 Loading the shocker: The shock absorber is loaded inside the machine by tightening it inside the machine so that during the testing it should be tight.

2.3 Collecting the information: The information is taken by performing this test on different piston velocities and as per these velocities the value of damping force (tensile and compressive) is obtained.

3. RESULT AND DISCUSSION

The following results are obtained when we performed the damping force testing of HK43 R/C-14 rear cushion

shock absorber used in 2 wheeled vehicles.

Step	Piston velocity	Tensile force	Compressive force
1	Vp= 0.025 m/s	T = 604.7 N	C = -292.7 N
2	vp= 0.05 m/s	T = 1529.2	C = -368.5 N
3	vp= 0.1 m/s	T = 2666.8N	C = -484.3N
4	vp= 0.2 m/s	T = 4039.2	C = -621.5 N
5	vp=0.3 m/s	T = 5083.4	C = -738.7 N

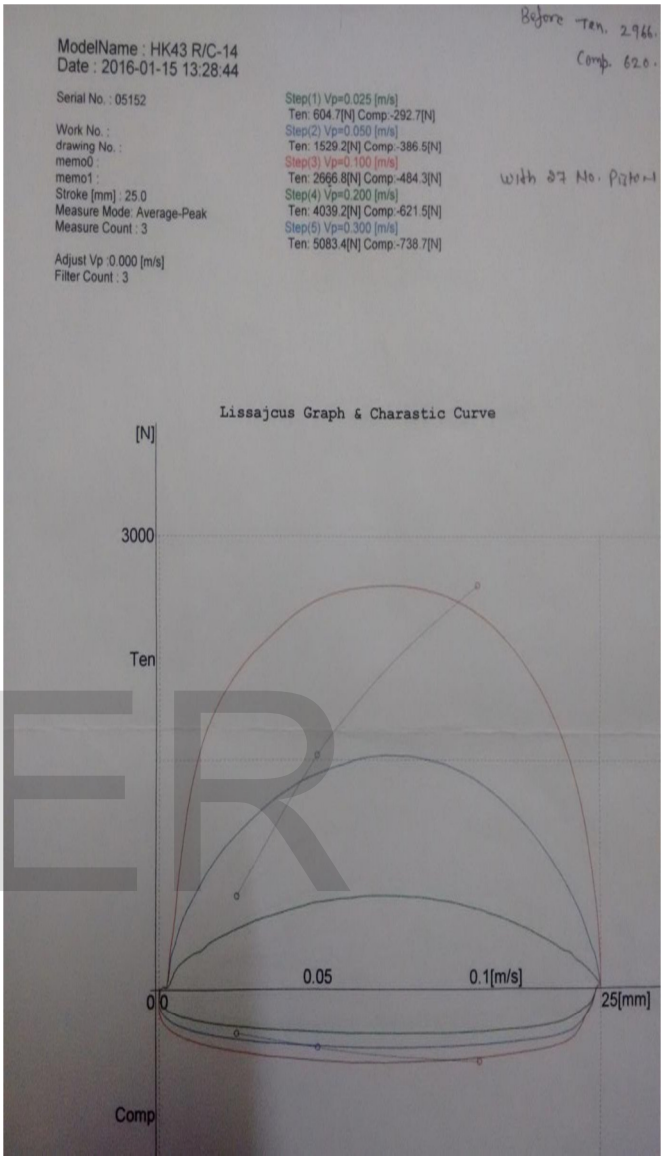

Figure 1: Force verses displacement curve at different velocities.

As per this data analysis the following sensitivity curve is plotted

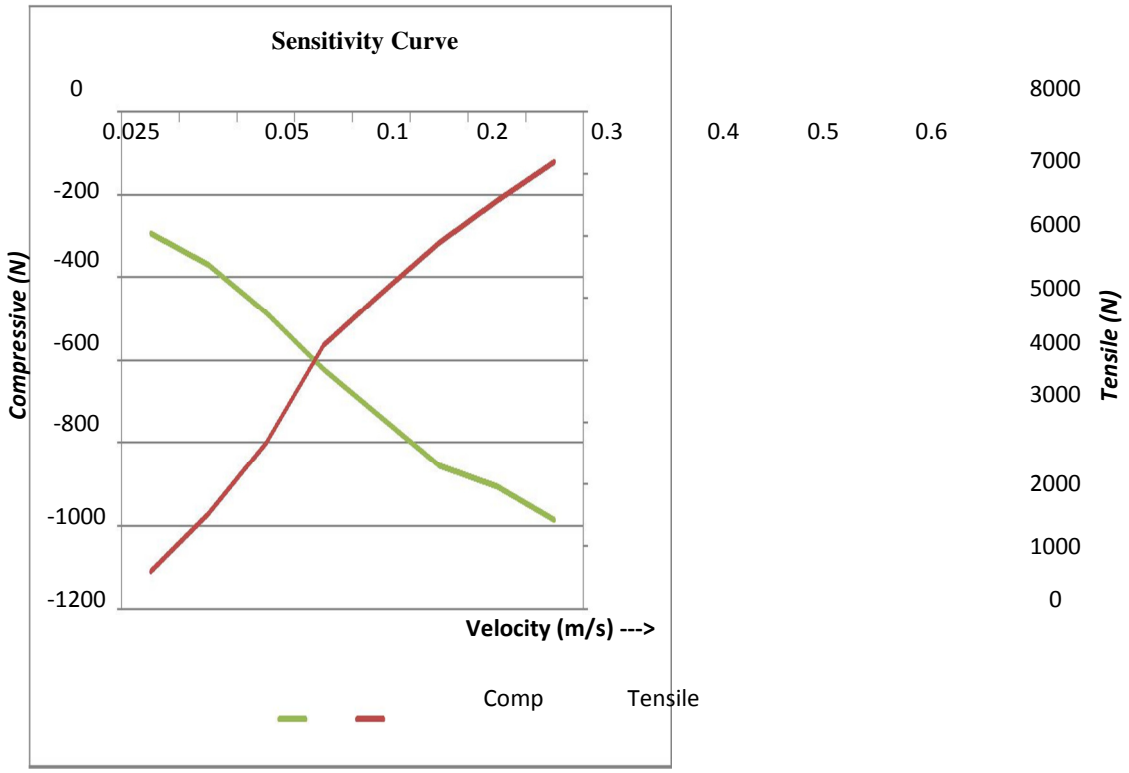

Figure 2: sensitivity curve

[5] Adam G. Bowland, 2011 Comparison and Analysis of the Strength, Stiffness, and Damping Characteristics of Concrete with Rubber, Latex, and Carbonate Additives

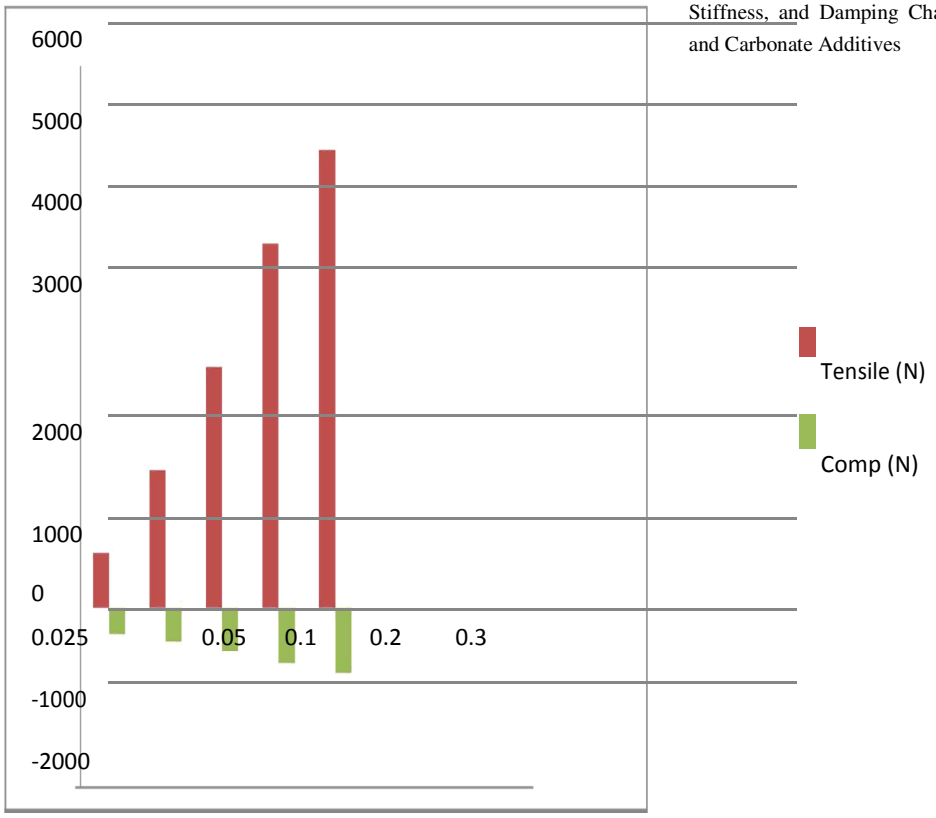

Figure 3: Bar representation of the sensitivity of shock absorber.

4. CONCLUSION

In the work presented, we have focused on two major areas i.e., damping force characteristics and sensitivity curve Estimation. This is done using damping force testing machine on which tests are carried out and results are being analysed. It would help to know the sensitivity of a shock absorber in the different vehicles of the automobile industry. The damping characteristics give the different values but a sensitivity curve help to categorise the shock absorber according to their strength and qualities.

5. REFERENCES

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