A Review on Design and Analysis of Body Float Seat Suspension for Two Wheeler

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ABSTRACT : *It is evident that there is a constantly growing interest in providing acceptable system performances of vehicle suspension systems, especially in the past two decades as vehicle suspension systems have many vital functions: for instance, to support the vehicle weight, to provide effective isolation of the chassis from road excitations, to keep tyer. Contact with the ground, and to maintain the wheels in appropriate position on the road surface. In Our Project we will focus on the necessity for developing seat vibration control systems as a part of manufacturers investigation into finding innovative methods to increase the comfort and safety of the two wheeler rider. Operators of either on-road or off-road are regularly subjected to an extended variety of various vibration levels, especially at low frequencies. Considering that exposure to such vibration in long term has some damaging effects on riders health, many comprehensive investigations have been carried out and researchers have proposed several measures for estimating discomfort and the suitability of various economic range of two wheeler seats such as those of shine ,splendor in operating condition.*

1. INTRODUCTION

Nowadays, considering the advancement of different technologies, motor vehicle manufacturers have concentrated on the research to find new techniques to promote the safety and comfort of the rough road vehicle operators. One of the challenging tasks for engineers in automotive industries is the design of the suspension system. It is crucial to design reliable, safe and convenient seats to eliminate road excitation, since transmitted vibrations to the rider's body may cause some damaging effects on their health and efficiency.

There are large number of motorcycles present in the market with different seat designs now-a-days. But the main problem is that seat is not comfortable without any suspension system. Normal seat are produced some amount of jerk when bike is traveling on rough road so by providing seat suspension that amount of the jerk will be reduced. The aim is to study the different economic range cost bike seats present and do the subjective analysis to design the new seat with suspension which would be provide a comfortable design.

In India most of the people are belongs to middle class family. They use bikes for their daily routine About 65-70% peoples use splender, cd-delux or pulsar etc bikes. Because prize of this bikes is comparatively low as well as average is also good but main problem is that this bike don't have any seat suspension so it directly affect on the health of the rider. That's why we design such a spring-damper seat suspension system to eliminate this problem and provide comfort to the rider even at economical cost.

First of all select economy range bike. Measure Dimensions of all Part and make a design of that part with proper dimension. By calculations, select suitable position for spring damper system. In inventor doing analysis of our system for different position.

This system is going to work on the vibration isolation system. This system is a two degree of freedom system. Where we can convert that system into single degree of freedom and calculate the suitable transmissibility for that system.

In our system the pivot point is near the fuel tank, seat will be adjusted accordingly to the position of the spring. First displacement will be produce by the jerk when bike travel on a rough surface. This vibration are firstly absorbed by rear suspension (Telescopic suspension). Some amount of vibration is again transmitted to bike chassis. And here our system is absorbed the vibration which is coming from rear suspension. With help of seat suspension system we can't be eliminate total jerk but large amounts of jerk will be reduced and provide comfortness to the rider.

2. LITERATURE REVIEW

The purpose of this literature review is to examine journal articles, research paper, report and web sites to provide an overview of modified suspension, identifying the major challenges in implementing this technique, and examine their use in practical application.

2.1 Bicycle Shock Absorption System and Energy Expended by the Cyclist: (Henri Nielens and Thierry Lejeune**)** Published: 2004:- This review presents and discusses the most relevant results of studies that focused on mechanical simulations as well as on energy expenditure in relation to-off-road bicycle suspension systems. Suspended bicycles are more comfortable. Moreover, the fact that suspension systems may significantly reduce physical stress should not be over-looked, especially in very long events and for recreational cyclists.

2.2 Lakshmana Kishore. Explained that when shock impulses are damped by shock absorber of suspension system it dissipates Kinetic energy. The shock absorbers obligation is to take up or dissipates energy. The effect of traveling over rough ground is reduced in vehicle, leading to improved ride quality, and increase in comfort due to substantially reduced amplitude of disturbances. Spring is compressed quickly when a vehicle is traveling on a level road and the wheels strike a bump. The spring compressed will return to its normal loaded length and will rebound to its normal height, causing lifted body. The weight of the vehicle will then push the spring down below its normal loaded height. This will cause the spring to rebound again. Until the up-and-down movement finally stops the bouncing process repeated over and over little less each time. Handling of the vehicle would be very difficult and will cause uncomfortable ride, if bouncing is allowed to go uncontrolled. In suspension system design of spring is the most important factor.

2.3 Prince Jerome Christophefer J Pavendhan R stated that, Stress and deformation analysis of the helical spring is done. The output of shock absorber differs by varying the diameter of wire of coil spring .Body float seat suspension is studied with respect to two wheeler vehicle. When the wheel is strike by sudden jerk the spring compresses in reaction. The compressed spring is pulled back to its original dimension or normal length which causes the body to be lifted. Original or normal dimensions are the dimension when the spring is free and no load acts on it. The spring goes down below its normal height when the weight of the vehicle acts on the spring. Due to this strain energy induced in the spring causing it to rebound back. The calculations of the spring dimensions are also done. The bike mass, different loads and number of persons on the two wheelers are being the main concern of the design. Modeling/analysis is done by Autodesk Inventor dynamic simulation.

2.4 P.R.Jadhav, N.P Doshi, U. D. Gulhane explained that, Most commonly used element in suspension system is helical spring which is used to maintain a force between contacting surface. The function of helical spring is to distort or deflect of elastic member under the action of applied load. When load is released it retains its original shape. Along the axis of helix, load is being applied and is made of coiled wire into helical form. When load is applied at both the ends, main property of helical spring is to act in tension or in compression reducing the effect of shock and vibrations in vehicle and machine foundation is the important application of helical compression spring. Forces are also measured with the help of spring. Seat suspension at various angle is been analysed by using Autodesk inventor and analytical validated with varying speed.

2.5 Niranjan Singh. The objective of this research paper fatigue stress analysis of the spring used in automobile. Spring is an elastic body that can be pulled, stretched or twisted by relatively many force. Elastic object such as spring is used to store the mechanical energy. As the force is released it returns to its original shape. As it is a pliant element it is used to store energy, exert torque and exert force at the same time. All the elements of the suspension system provide the connection between vehicle body and tyre. Like rubber band around roll of drawing, linear push force or pulls force or radial is similarly acted on it. Actions and activities assigned to automobile suspension systems are to set apart the occupants and structure from vibrations and shocks generated by the road surface. Rotational effect can be produced with the help of torque. Analysis of the springs is done with the help of Numerical Experimental and Theoretical methods.

2.6 Krzystof Michalczyk. Explained new method of calculation of change of axial twisting angle of compressed helical springs end-coils. Derivation of formulas using the Castigliano rule is done. These formulas can be applied only for Clapeyron systems. The calculations are experimentally verified. Angle of mutual rotation of spring end-coils is calculated. The stiffness of spring is influenced by the shape of end coils. The susceptibility to buckling is influenced by the way in which the spring ends coils. The calculation of the axial twisting angle and change of statically-compressed helical spring is done.

2.7 P. S. Valsange. In this, author discusses the basic concerns such as fatigue loading, spring stability, spring surge, strain energy, spring relaxation and design procedures of helical coil spring in addition to stress distribution. There is also study on fundamental stress distribution and characteristics of helical spring. Material selection of spring and taking the square cross section of the material from helical spring is studied in much detail. F.E method and ANSYS analysis is done on the spring material. Automobile industry needs reduction of weight which is also a prime concern. Thus high stresses with small dimensions are kept in mind, while designing the springs.

2.9 A.V.Lade, R.V.Paropate, A.M. Choube

Suggested that, different material can be used for design of helical spring. Yield stress and poissons ratio of different material are calculated. Helical spring absorbs and dissipates energy, this has been taken into consideration while designing the seat suspension of two wheeler. The helical spring with other material such as carbon steel and brass are considered for suspension. F.E method is used for the analysis of helical spring. Deflection and shear stress of these different metals are compared using the Analytical and F.E method.

3. CONCLUSION

From above literature survey it has observed that most of the work has been done for improving the main suspension of bike. That is front and rear shock absorber of bike but they do not think about providing extra seat suspension near the seat to give more comfort to the rider. So researchers have done work on coil stiffness, damping constant, position of main

rear suspension and rider position relative to rear wheel. So very less work is done on adding a suspension directly below the rider seat.

Now a days this type of body float suspension is observed in some of the bikes . This bikes are very expensive and not affordable to middle class family. Most of economy range bikes don't provide such suspension. So rider's faces health issues. So, provide more comfort to riders on bikes we can provide such suspension to economy range bikes. So there is scope to find optimum stiffness and position of such suspension.

Concept to be meet the criteria the design held to be fully contained suspension system. System that operate outside the natural frequency of human body and passes standard to vibration transmissibility and size constraints.

Theoratical calculation carried out to find spring and damper coefficient required to adequately reduce the displacement, transmissibility and force transmissibility.

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