DOI: https://doi.org/10.24113/ijoscience.v7i7.415

A Review on the Design and Analysis of Vehicle Suspension System

Rashmi Paliwal
M Tech. Scholar
Oriental Institute of Technology
Bhopal, Madhya Pradesh, India
rashmi152000@yahoo.com

Rahul Shrivastava
Assistant Professor
Oriental Institute of Technology
Bhopal, Madhya Pradesh, India

***Abstract*: In automobiles, a double-wishbone suspension is an independent suspension structure that uses two wishbones to support the wheel and the maximum load is transferred from the upper wishbone to the lower one, which can lead to failure and deflection of the triangle wheel inferior. The developed lower triangle consists of three holes at one end which are attached to the wheel hub, and the other end is connected to the frame, which is placed between the steering arms. This article introduces the vehicle's engine and suspension system, as well as the description of global warming and the effects of global warming.**

Keywords: Global Warming, Suspension System, Automobiles, Vehicle Suspension System.

I. INTRODUCTION

The suspension system in the front and rear are the extremely is important to ensure correct of wheel position, steering control, ride quality and the tire life. The impact of the tires on uneven pavements must be absorbed by the suspension systems. Suspension systems must provide adequate ride of the quality to the maintain customer satisfaction and the reduce operator fatigue and provide the correct position of wheels and tires to provide directional stability while driving. Correct wheel position also ensures normal tread life. The component of suspension system, the frame and chassis are including, are the designed to provide the ride and ride characteristics. The coil springs absorb most of the shocks caused by the impact of the tires on the road surface. When a front wheel hits a bump on the road surface and the moves of upward, the compresses coil spring and absorbs energy as it moves. The coil spring dissipates this energy immediately when spring of returns to it's the original state. There are coil spring seats on the wishbones and the shock absorbers are connected to the frame by the wishbones. [1] One of the reasons a coil compression spring fails is shock loads. These are the main factors that lead to spring failure under dynamic load conditions. Shock load is shock, shock, and rapid charge cause much higher loads than calculated by normal spring formulas. High carbon spring steels do not withstand shock loads as well as alloy steels. The static and dynamic analysis of low-elongation steel leaf springs in light commercial vehicles was performed with the NASTRAN solver and compared with the analytical results [2], methods [3]. In this work fatigue tests, up to 10 9 cycles are carried out on the helical compression of the springs with two dimensions [4][5]. The fatigue and the static analysis of the multiple leaf springs used in light of commercial vehicle suspension systems of automobiles [6]. VSS which uses Finite Element Analysis to analyze fatigue life, missing loads, safety factor and suspension system stability [7].

II. LITERATURE REVIEW

Christianah O. Ijagbem et al. [8] In this paper, a Vehicle Suspension System (VSS) study was conducted using FEA to analyze of the fatigue life, deficiency stresses, safety factor and stability of the suspension system. Suspension, as well as weight and size reduction. Solidworks14® was used to analyze various material are used to design and the development of VSS; A comparison was made between the different materials used to inform that the size and weight of the four suspension systems can be reduced by the use of titanium treated with Ti-13V-11Cr-3Al, which significantly reduces the weight of the car and the better results are the result of strength and longevity that ultimately reduce CO2 emissions and its negative impact on the climate. This innovative design can be presented as a benchmark for the automotive industry.

Olugbenga Moses Anubi et al. [9] This article presents the semi-active case of the variable to the stiffness suspension systems.

The central concept is based on a newly developed variable stiffness mechanism, consisting of a horizontal strut and a vertical strut, both semi-actively controlled by magneto rheological dampers. The results of the analysis and the simulation show that the better performance can be achieved when the attachment point of a suspension system to the frame is exposed to the influence of a horizontal NES system.

T. A. Jadhav et al. [10] This wheel holder is part of kinematics that connects the wheels to the axle. The rear axle cross-member serves as a support for the differential and angle modules. Loads of vehicle parts such as engine, transmission, bodywork, etc. are transferred to the road surface by means of tie rods and suspension rods. Impacts and vibrations from the road surface are also transmitted to passengers via cross members and suspensions. This document is about the design and analysis of the rear axle cross-member by FEA. The FEM results are within the allowable range, so the crosshead design is satisfactory.

Vinod Sheshkar et al. [11] the present work on the design and analysis of hybrid composite crossbows. The design constraints are tension, bending, and stiffness with varying leaf spring thickness. The study of the main objective of this work is the analysis of the equivalent stress, the equivalent elastic deformation, the optimization of the deformation, and the weight of leaf springs using a hybrid composite material.

Samuel O. Afolabi et al. [12] this study examines the fatigue life parameters of machine shafts. Nutcracker tree analysis for plastic deformation was provided. The optimal, safe, and economical design of a machine shaft was proposed. The 3D model of a tree was created with Inventor® with absolute coordinates. The results of the Finite Element Business Analysis and calculations are compared with the results of other methods.

Vi Kie Soo et al. [13] This article presents a dynamic hypothesis that illustrates the effect of time on the life cycle analysis of a car in order to examine the issues related to the efficiency of material recovery. It shows that the effective short-term reduction of environmental pollution through multi-material structures subsequently led to a long-term increase in the amount of waste. Therefore, the current development of the automotive industry follows the much studied "Fixes that Fail" system archetype.

III. Suspension System

The suspension system consists of the springs and associated parts between the wheels and the chassis, subframe or side members of a bodywork. The suspension supports the weight of the top of the vehicle on its axles and wheels, allows the vehicle to travel on uneven surfaces with minimal forward and backward motion, and allows the vehicle to flex with minimal bumps or bumps. It is the way. The four types of springs used in vehicle suspensions are coil springs, leaf springs, torsion bars, and air springs. In a typical suspension system for front-wheel drive vehicles, the weight of the vehicle exerts initial compression on the coil springs. As the tires and wheels hit the bumps in the road, the springs 18 compress or stretch further to absorb most of the impact. Suspension on the rear wheels is generally simpler than suspension on the front wheels, which requires various accessories to allow the wheels to move back and forth to steer. A hydraulic telescopic shock absorber, called a shock absorber, is mounted separately or inside the shock absorber on each wheel to prevent spring movement and prolonged spring wobble. The shock absorber includes a piston that moves in a cylinder as the wheel moves up and down relative to the vehicle's bodywork or chassis. As the piston moves, it pushes the liquid through an opening and holds the spring in place. Spring-loaded valves open to allow for faster fluid flow when fluid pressure is high enough, such as when the impeller is moving quickly.

IV. Vehicle Engine and Suspension

In a typical motor vehicle, the main competition is between the manufacturing processes of the powertrain components and the suspension system. Typical forged components used in vehicles are the crankshaft, connecting rods, camshaft and suspension components such as wishbones, steering joints and wheel hubs. For a better understanding of the vehicle components, we will briefly examine the technical properties of the engine and chassis components, especially the steering joint.

V. Global warming

Global warming, an increase in the average air temperature near the earth's surface over the past two centuries. Since the mid-20th century, climatologists have collected detailed observations of various meteorological phenomena (such as temperature, precipitation and storms) and their effects on climate (such as ocean currents and the chemical composition of the atmosphere). . These data show that the Earth's climate has changed almost every conceivable moment since the beginning of geological time and that the effects of human activity have been deeply rooted in the structure of climate change since the beginning of the industrial revolution. .

The above scenarios depend mainly on the future concentrations of certain greenhouse gases known as greenhouse gases, which are released in increasing quantities from the combustion of fossil fuels for industrial, transport and the residential purposes. the global warming of the modern is the result of the increase in the effect of the greenhouse, warming of the earth's surface and

lower atmosphere due to water vapor, carbon dioxide, methane, nitrogen oxides and other greenhouse gases. The IPCC reported that the concentration of carbon dioxide, methane and nitrogen oxides in the atmosphere exceeds 800,000-year-old ice cores.

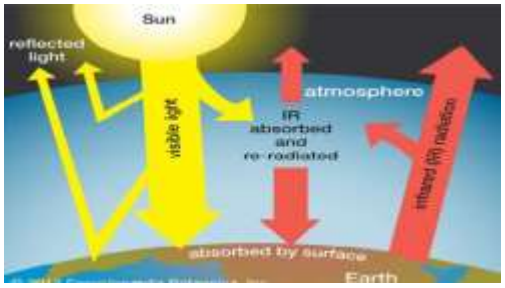

Fig. 1 Global Warming

Of this load of gases, carbon dioxide is the most significant, both for its part in the green effect impact and for its job in the human economy. It is estimated that at the beginning of the industrial era, in the mid-18th century, the concentration of carbon dioxide in the atmosphere was around 280 ppm. They will have hit 406 ppm by mid-2018, and if the fossil fuels continue to burn at there are the current rate, they are the projected to hit 550 ppm by the mid-21st century, which would double the carbon dioxide concentration in 300 years.

There is heated discussion over the degree and seriousness of rising surface temperatures, the effect of past and future warming on human existence, and the requirement for activity to lessen future warming and its outcomes.

VI. CAUSES GLOBAL WARMING

Carbon dioxide (CO2) are the Global warming occurs and other air pollutants and the greenhouse gases accumulate in the atmosphere, absorbing sunlight and the reflection of the solar radiation reflected off the earth's surface. Usually, this radiation escapes into space, but pollutants that can remain in the atmosphere for years or even centuries trap heat and warm the planet. This is called the greenhouse effect.

In the United States the use of fossil fuels to generate electricity is the main source of heat production, causing approximately of the every year two billions tons of CO_2. Coal-fired power plants are with far the biggest polluters. The country's second carbon source is the transport sector, which emits around 1.7 billion tonnes of CO_2 per year.

To tackle dangerous climate change, it is essential to drastically reduce global emissions and use alternatives to fossil fuel. Fortunately we have reversed the situation: CO2 emanations in the United States tumbled from 2005 to 2014, thanks partially to new energy-effective advancements and the utilization of clean energizes. What's more, researchers are continually growing better approaches to modernize power plants, produce cleaner power, and utilize less gas while driving. The test is to guarantee that these arrangements are utilized and generally took on.

VII. THE OTHER EFFECTS OF GLOBAL WARMING

Every each year, the scientists learn more about the effects of the global warming and the many agree that the environmental of the economic and the health effects are the likely if are the current trends of continue. Here is just a brief snippet of what to expect:

• Glaciers are the Melting, early thaws and the severe of droughts create more dramatic water in shortages and the increase of the risk of wildfires in the western United States.

• Rising sea levels are causing flooding on the east coast, particularly in Florida and the other areas in such as the Gulf of Mexico.

• Forests, farms and cities are facing new pests, heat waves, heavy rains and increased floods. All of these factors damage or the destroy agricultures and the fisheries.

• By destroying habitats such as coral reefs and alpine grasslands, many plant and animal species can be threatened with extinction.

• Outbreaks of allergies, and the asthma and infectious diseases will they become more common as there are more pollinating grasses, air pollution increases and conditions are conducive to the spread of pathogens and mosquitoes.

VIII. CONCLUSION

This paper shown is the vehicle's suspension system and suspension system. And what is described global warming and the effect of global warming is present in this article. The literature review presents technologies that involve the use of the arrangement of springs and dampers in series and in parallel. Activating or deactivating one of the shock absorbers can change the stiffness of the system. Thanks to their faster response, MR shock absorbers are also used to vary the stiffness of the suspension system.

REFERENCES

[1] V.K.Aher, R.A.Gujar, Sonawane , “Fatigue Life Prediction of Multi Leaf Spring used in the Suspension System of Light Commercial Vehicle”, IJTARM

international journal on theoretical and applied research in mechanical engineering 2012; vol.1 issue1: pp.71-77

[2] B.Kaiser, and C. Berger, "Behavior of helical compression springs made of different materials", IJF international journal of fatigue 2014;vol.2 issue 1:pp.101-109.

[3] Manoj A. Kumbhalkar, Dr. A.V. Vanalkar, "Material and Stress Analysis of Railroad Vehicle Suspension: A Failure Investigation" Procedia Materials Science 2015,vol.10: pp.331-343.

[4] Tausif M. Mulla, and Vaibhav S. Kengar, "Finite element analysis of helical coil compression spring for three wheeler automotive front suspension", IJMIE International Journal of Mechanical and Industrial Engineering 2012; vol.2,issue 3,pp74-77.

[5] Gaikwad, S.S., P.S., "Static Analysis of Helical Compression Spring Used in Two-Wheeler Horn", IJEAT 2013; vol.2, issue 3:pp.161-165.

[6] VK. Aher and PM. Sonawane, "Static and Fatigue analysis of Multi Leaf Spring used in the Suspension System of LCV",International Journal of Engineering Research and Applications; vol2,vol.4: 1786-1791, 2012.

[7] K Ray, Brita Pyttel, Abhishek Tiwari, "Investigation of probable failure position in helical compression springs used in fuel injection system of diesel engines", JMCE Journal of Mechanical and Civil Engineering 2012; vol.2, issue 3,pp24-29, 2012.

[8] Christianah O.Ijagbem, Bankole I.Oladapo "Design and simulation of fatigue analysis for a vehicle suspension system and its effect on global warming", Humanitarian Technology: Science, Systems and Global Impact, HumTech2016, 7-9 2016, USA.

[9] Olugbenga Moses Anubi and Carl Crane, "A New Semi active Variable Stiffness Suspension System Using Combined Skyhook and Nonlinear Energy Sink-Based Controllers" IEEE transactions on control systems technology, Aug 26, Pp.1-11, 2014.

[10] T.A. Jadhav, A.N.Mudalgikar "Stress Reduction of Cross Member of Rear Axle for Car" Volume. 8 Issue8, Aug.2019

[11] Vinod Sheshkar, Yogesh Yadav "Finiteelement analysis of Mono leaf spring by using Hybrid composite Material" Vol. 05 Issue07 July2018

[12] Samuel O. Afolabi, Oladapo "Design and finite element analysis of a fatigue life prediction for safe and economical machine shaft" Volume8. Issue 1. Pp 105-111(January - March 2019).

[13] Vi.Kie Soo, PaulCompston, PaulCompston "Interaction between New Car Design and Recycling Impact on Life Cycle Assessment" DOI: 10.1016/j.procir.2015.02.055,2015.