DESIGN & ANALYSIS OF A TWO WHELER SUSPENSION SYSTEM FOR VARIABLE LOAD CONDITIONS

K. Srinivasa Rao[1], Banavath Giridhar[2], N. Sairam[3]& P. Shanigarapu Anvesh[4]
[1] Professor, Department of Mechanical Engineering, CMR College of Engineering & Technology, Hyderabad, India
[2,3,4] Student, Department of Mechanical Engineering, CMR College of Engineering & Technology, Hyderabad, India

Abstract

Pneumatic and hydraulic shock absorbers commonly take the form of a cylinder with a sliding piston inside. The cylinder is filled with a fluid (such as hydraulic fluid) or air. This fluid-filled piston/cylinder combination is dashpot. The shock absorbers duty is to absorb or dissipate energy. One design consideration, when designing or choosing a shock absorber, is where that energy will go. In most dashpots, energy is converted to heat inside the viscous fluid. In hydraulic the hydraulic fluid will heat up, while in air cylinders, the hot air is usually exhausted to the atmosphere. In other types of dashpots, such as electrons, the dissipated energy can be stored and used later. In general terms, shock absorbers help cushion cars on uneven roads. Shock absorbers are an important part of automobile and motor cycles us pensions,aircraft gear, and the supports for many industrial machines Large shock absorbers have also been used in structural to reduce the susceptibility of structures to earthquake damage and resonance. A transverse mounted shock absorber,called away helps keep railcars from swaying excessively from side to side and are important in passenger commuter railandrapid transit systems because they prevent railcars from damaging station platforms. The success of passive damping technologies in suppressing vibration amplitudes could be ascertained with the fact that it has a market size of around $ 4.5 billion.

INTRODUCTION

A shock absorber or damper is a mechanical device designed to smooth out or dampshock impulse, and dissipate kinetic. The basic function of the shock absorber is to absorb and dissipate the impact kinetic energy to the extent that accelerations imposed upon the airframe are reduced to a tolerable level. Existing shock absorbers can be divided into two classes based on the type of the spring being used: those using a solid spring made of steel or rubber and those using a fluid spring with gas or oil, or a mixture of the two that is generally referred to as oleo-pneumatic. The high gear and weight efficiencies associated with the oleo- pneumatic shock absorber make it the preferred design for commercial transports. Based on the analysis procedure as outlined in this chapter, algorithms were developed to determine the required stroke and piston length to meet the given design conditions, as well as the energy absorption capacity of the shock absorber.In a vehicle, it reduces the effect of traveling over rough ground, leading to improve rid quality and increase in comfort due to substantially reduced amplitude of disturbances. Without shock absorbers, the vehicle would have a bouncing ride, as energy is stored in the spring and then released to the vehicle, possibly exceeding the allowed range of suspension movement. Control of excessive suspension movement without shock absorption requires stiffer (higher rate) springs, which would in turn give a harsh ride. Shock absorbers allow the use of soft (lower rate) springs while controlling the rate of suspension movement in response to bumps. They also, along with hysterias are in the tire itself, damp the motion of the UN sprungweight up and down on the springiness of the tire. Since the tire is not as soft as the springs, effective wheel bounce damping may require stiffer shocks than would be ideal for the vehicle motion alone.Spring based shock absorbers commonly use color leaf springs, though bars can be used in torsional shocks as well. Ideal springs alone, however, are not shock absorbers as springs only store and do not dissipate or absorb energy. Vehicles typically employ springs or torsion bars as well as hydraulic shock absorbers. In this combination, "shock absorber" is reserved specifically for the hydraulic piston that absorbs and dissipates vibration.

STRUCTURES

Applied to a structure such as a building or bridge it may be part of seismic or as part of new, earthquake in this application it allows yet restrains motion and absorbs resonant energy, which can cause excessive motion and eventual structural

TYPES OF SHOCK ABSORBERS

There are several commonly-used approaches to shock absorption:

Hysteresis of structural material, for example the compression of rubber disks, stretching of rubber bands and cords ,bending of steels rings, or twisting of bars. Hysteresis is the tendency for otherwise elastic materials to rebound with less force than was required to deform them. Simple vehicles with no separate shock absorbers are damped, to some extent, by the hysteresis of their springs and frames.Dry friction as used in wheel brakes, by using disks (classically made of leather) at the pivot of a lever, with friction forced by springs. Used in early automobiles such as the Ford up through some British cars of the 1940s. Although now considered obsolete, an advantage of this system is its mechanical simplicity; the degree of damping can be easily adjusted by tightening or loosening the screw clamping the disks, and it can easily rebuilt with simple hand tools. A disadvantage is that the damping force tends not to increase with the speed of the vertical motion. Solid state, tapered chain shock

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absorbers, using one or more tapered, axial alignment(s) of granular spheres, typically made of metals such as nitinol, in a casing.Fluid friction, for example the flow of fluid through a narrow orifice (hydraulics), constitute the vast majority of automotive shock absorbers. An advantage of this type is that using special internal valuing the absorber may be made relatively soft to compression (allowing a soft response to a bump) and relatively stiff to extension, controlling "jounce", which is the vehicle response to energy stored in the springs; similarly, a series of valves controlled by springs can change the degree of stiffness according to the velocity of the impact or rebound. Specialized shock absorbers for racing purposes may allow the front endof a dragster to rise with minimal resistance under acceleration, then strongly resist letting it settle, thereby maintaining a desirable rearward weight distribution for enhanced traction. Some shock absorbers allow tuning of the ride via control of the valve by a manual adjustment provided at the shock absorber. In more expensive vehicles the valves may be remotely adjustable, offering the driver control of the ride at will while the vehicle is operated. The ultimate control is provided by dynamic valve control via computer in response to sensors, giving both a smooth ride and a firm suspension when needed. Many shock absorbers contain compressed nitrogen, to reduce the tendency for the oil to foam under heavy use. Foaming temporarily reduces the damping ability of the unit. In very heavyduty units used for racing and/or off-road use, there may even be a secondary cylinder connected to the shock absorber to act as reservoir for the oil and pressurized gas. Another variation is the Magneto damper which changes its fluid characteristics through an electromagnet.Compression of a gas, for example pneumatic shock absorbers, which can act like springs as the air pressure is building to resist the force on it. Once the air pressure reaches the necessary maximum, air dashpots will act like hydraulic dashpots. In aircraft landing gear air dashpots may be combined with hydraulic damping to reduce bounce. Such struts are called oleo struts (combining oil and air). Magnetic effects. Eddy current dampers are dash pots that are constructed out of a large magnet inside of a non-magnetic, electrically conductive tube.MODEL OF SHOCK ABSORBER IN CATIAMAKING SHAFTSKETCH 1:

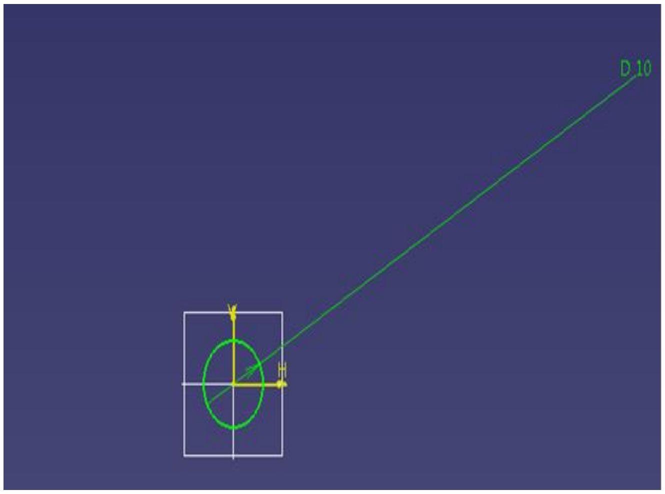

Figure 1- SHAFT SKETCH

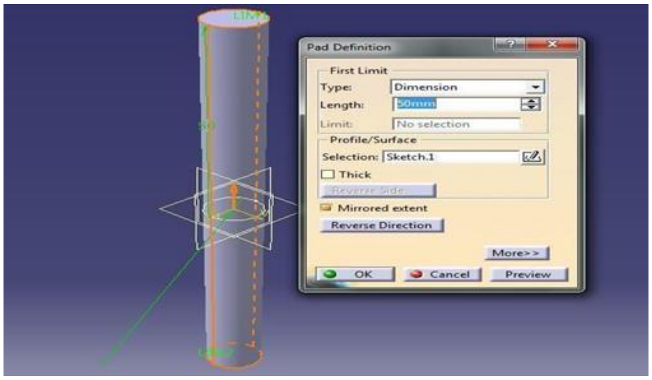

Figure 2 – PAD1

RIB:

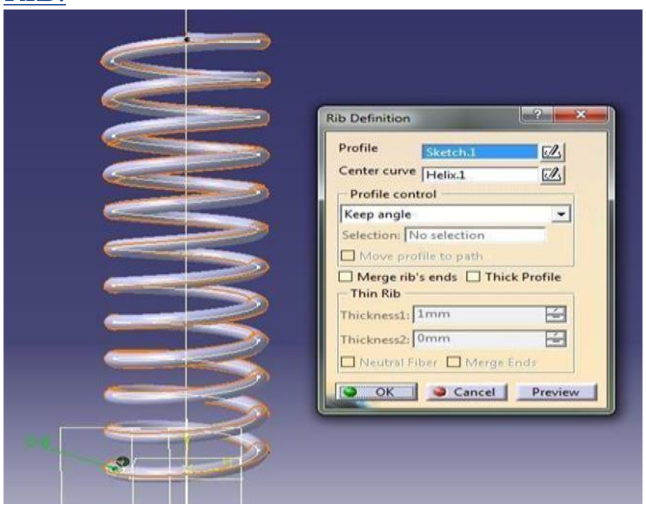

Figure 3 – RIB

FINAL PART OF SHOCK ABSORBER:

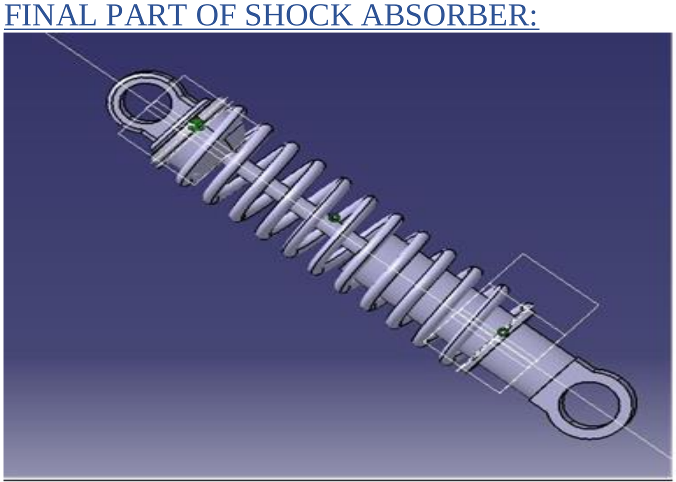

Figure 4 – SHOCK ABSORBER

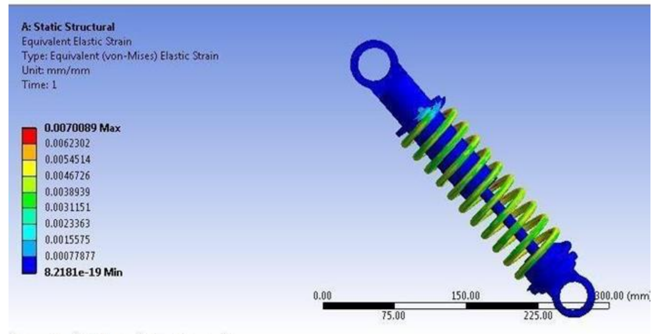

Figure 5 2000 OF LOAD APPLIED (SHOWING DEFORMATION, STRAIN, STRESS)

RESULT

Copper beryllium

s.no	Load	Deformation	Stress	Strain
1	500	24.574	349.88	0.00174
2	1000	52.628	699.76	0.003488
3	1500	73.574	1049.6	0.005248
4	2000	98.296	1399.5	0.0069976

Table-1: Copper Beryllium

Stainless steel

s.no	Load	Deformation	Stress	Strain
1	500	25.611	349.76	0.0018122
2	1000	51.723	699.52	0.0036249
3	1500	76.834	1049.3	0.0054366
4	2000	98.225	1399	0.0072489

Table-2: Stainless steel

CONCLUSION

In the present work shock absorber used in a 150cc bike has been analysed and model has been developed. We have modeled the shock absorber by using 3D parametric software CATIA. While the design and manufacture of a new set of dampers is technically feasible, further Design work must first be undertaken. If a team were to manufacture a set, we would advise the manufacture of a piston and a test rig initially, such that the numerical model can be calibrated to the actual design. From here, alterations can be made prior to manufacturing an entire unit. Also, without dependable data acquisition, numerical modeling of the vehicles behavior serves as an engineering approximation and a starting point for vehicle setup. Consistent driving and lap times will provide the means of car setup from there. Suspension design is so critical to the performance of any racing vehicle, that its parameters drive the design of most others. This requires the component designs to be finalized early in the design phase. As damper performance is critical to the transient balance of the car, the dampers characteristics and quality must be known before it can be included in the design.we would recommend that if this were to be undertaken that provision be made to run other dampers in the case that problems occur, such that the schedule of the project is not delayed. Also the shock absorber design is modified by reducing the diameter of spring by 2mm and structural, modal analysis is done on the shock absorber. By reducing the diameter, the weight of the spring reduces. By comparing the results for both materials, the stress value is less for Spring Steel than Beryllium Copper. By comparing the results for present design and modified design, the stress and displacement values are less for modified design. So we can conclude that as per our analysis using material spring steel for spring is best and also our modified design is safe.

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