A REVIEW OF TWO WHEELER VEHICLES REAR SHOCK ABSORBER

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ABSTRACT

The need for shock absorber arises because of the roll and pitches associated with vehicle, and from the roughness of roads. The Hydraulic rectifier is Energy Generating device. The rectifier works as Shock absorber by converting bi directional shocks into unidirectional rotation with help of 4 check valve. Passive Damper can be used as active damper with help of electromagnetic Damper (EM). The EM damper generates energy and fulfills the purpose of hybrid shock absorber. The dissipated energy is recovered using Regenerative Electromagnetic shock absorber. Coil assembly moves related to magnetic assembly which produces Energy. Magneto Rehodological (MR) fluid changes braking force by electronic control which operates directly from low voltage power supplies. For the large range of vibration frequency, varying damping coefficient with good performance can be achieved using MR fluids.

KEYWORDS - Electromagnetic shock absorber; Hydraulic Rectifier; Hybrid Damper; Magneto Rehodological Fluid.

INTRODUCTION

Shock Absorber is composing of mainly two parts spring and damper. Spring are helical compression spring made of Spring Steel which absorb the shock and Damper is Damp the vibration of spring. Damping Force produced by converting kinetic energy of shock into heat energy. Currently all shock absorber working in two wheeler automobile are Passive, it absorb the shock very less and directly transmit it to rider. It's very jerky drive on Bad condition road where pot holes and surface finish broken .outcome of it uncomfortable ride. Following Researcher developed certain active and semi active shock absorber concept which capacity of damp the vibration is higher comparatively passive suspension.

HYDRAULIC RECTIFIER

Chaun li et .al Shock absorber absorb the shock and damp the vibration. With the help of fluid friction it is capable of yielding great damping force. It converts kinetic energy of shock in to heat energy and dissipated it into environment .Liner DC Generator, Electromagnetic induction is used for harvesting energy. Rack –pinion amplify the vibration response of damper .Hydraulic rectifier consist of four check valves which convert vibration of shocks into rotation of electromagnetic generator. In Future this prototype will directly used for real

world application. Further research required to reducing cost, size, Weight by compact design and optimization of the Shock absorber. [1]
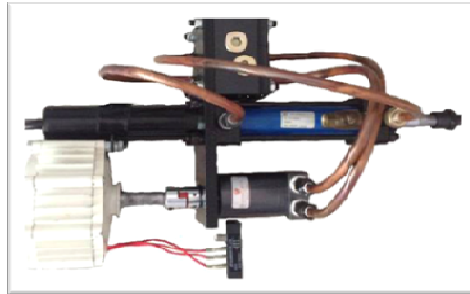

Figure 1. Prototype Device.

ELECTROMAGNETIC SYSTEM

T.V.Hanumantha Rao et .al hybrid damper is a combination of hydraulic damper and Electromagnetic damper .electromagnetic liner actuator have fix stator that windings into metal cylinder and movable slider which utilize permanent magnet that screwed to aluminium rod . Viscous damping force produced by relative motion of stator and slider which induce electro motive force (emf) in coil because opposing force. Passenger comfort ensured by reducing acceleration of mass.
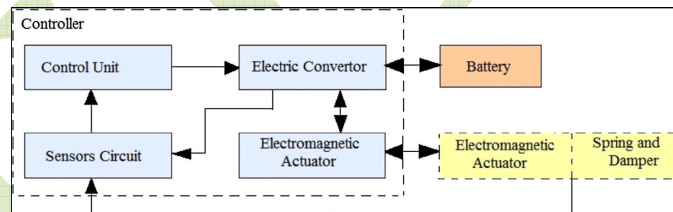

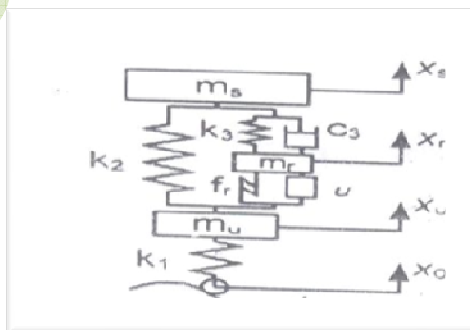**Figure 2. Block Diagram Electromagnetic suspension.**

Figure 3. 3 DOF quarter –car Model.

VOLTAGE GENERATION AND DAMPING FORCE

A Gupta et. Al

Voltage generation

$V = nhvBi$.. …(1)

n= no of turns/mm.

v= velocity

h= height of poll ring

Bi= Magnetic Flux.

Damping force

$F = ILBi$ …(2)

I = Current Amp

L = Length of straight wire.[3]

MAGNETO RHEOLOGICAL FLUID (MR)

Andrzej Milecki et .al MR Damper can operate with low voltage power supplies and it respond within few mille second .MR fluid change their property by changing Electric field .Pressure Difference in piston chamber and piston crossection area are important parameter for shock absorber
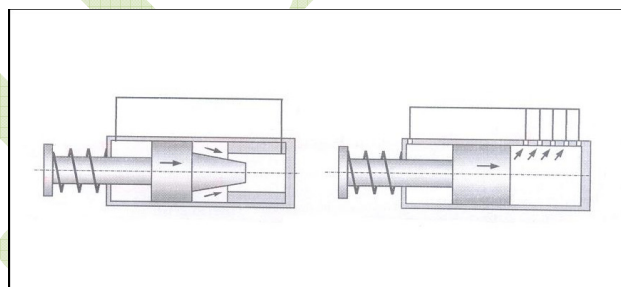

Figure 4. Orifice Cross Section Area Change During Movement.

Braking Force is decrease with proportional to square of piston velocity. By adjusting braking force can change element velocity .throttle orifice cross section area change according to piston position .As piston orifice closed one after another and increase the braking force. MR fluid is suspension of Ferromagnetic particle in carrier synthetic oil. It reduces wear, change viscosity and increase lubricity. In the presence of magnetic field iron practical form liner chain parallel to field, at that point it change viscosity and become viscous elastic solid. its ability to damp up to 12 Hz frequency. MR shock absorber is the sum of three forces. [4]
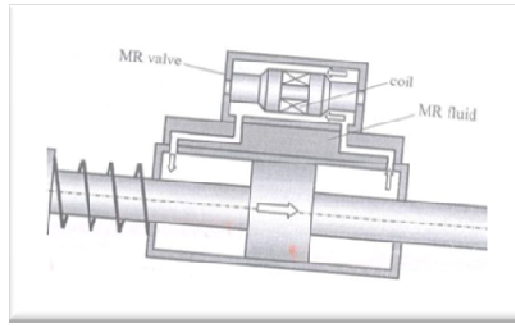
Figure 5. Design of MR Shock Absorber.

DEVELOPMENT OF MR DAMPER

S K Mangal et al . Mathematical design on Mat lab, Virtual analysis on Ansys (FEA) and its experimental analysis on Electro dynamic vibration shaker comparative analysis can predict the damp force of MR Damper. Variable Flux intensity can varies density of alignment. Damping force depends upon induced magnetic field. Its piston and cylinder are made of EN!A Low carbon steel Magnetic flux can found out with help of Reluctance and Permeability Finding for each and every section as shown in Figure.

Magnetic Force $F = R\phi = NI \ldots(3)$

N= no of magnetic coil turn

I = Input current Passed through coil

Φ= Magnetic Flux $=BA \ldots.(4)$

B= Magnetic Flux Density

A= Cross Section Area

Magnetic Reluctance $R = L/\mu A \ldots (5)$

L = length of Component

μ= Magnetic Permeablity

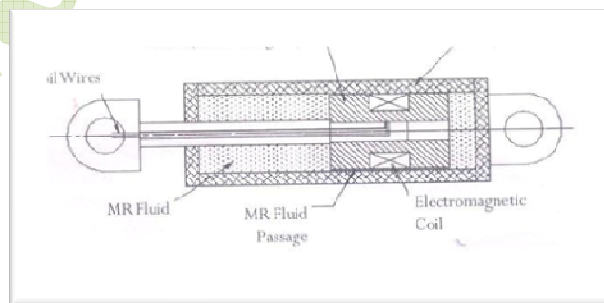Fig 6 Schematic Representation of MR Damper

Figure 6 Schematic Representation of MR Damper

Variable damping is produced by varying current in MR damper .mat lab developed Equation (4 & 8) Yield Stress

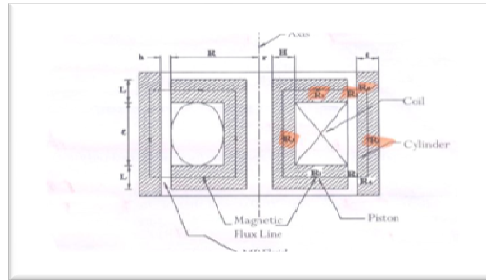$$\Gamma = (6.9*10^2)+(4*10^4)B- (1*10^5)B^2+(9.1*10^4)B^3 \ \dots\dots(6)$$

Figure 7. Typical Magnetic loop of The MR Damper

$$F\Gamma D=F\Gamma+F\acute{\eta}+Ff.. \ \dots \ (7)$$

Where

FΓD=Total damping Force

FΓ = Force Component Due to induced Yield stress

Fή= Viscous Force Of Component

Ff.. =Frictional force Component

By increasing Magnetic field increase damping force. [5]

ADVANTAGES AND DISADVANTAGES

➢ **Advantages**
1. To absorb impact load caused by irregularities of road surface.
2. To provide safety for passenger & driver.
3. To prevent voubling effect.
4. It provides safe guard to component of vehicle etc.

➢ **Disadvantages**
1. Maintenance is required.
2. It increases sprung weight.
3. Cost is high.

CONCLUSION

The Hydraulic rectifier is Energy Generating device and it works as shock absorber. The acceleration of upper sprung mass is minimized by mechanical coupling. The electromagnetic damper generates energy and can be used as hybrid shock absorber. The dissipated energy is recovered using Regenerative Electromagnetic shock absorber. Control force can be obtained by tuning damping coefficient of shock absorber. Coil assembly moves related to magnetic

assembly which produces Energy. It is observed that damping force increase with increasing magnetic field strength. Magneto Rehodological (MR) fluid changes braking force by electronic control which operates directly from low voltage power supplies. For the large range of vibration frequency, varying damping coefficient with good performance can be achieved using MR fluids.

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