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Review Paper of Design and Analysis of Two Wheeler Vehicles Rear Shock Absorber

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Abstract: ***The Hydraulic rectifier can works as a Energy Generator and Shock absorber by converting bi directional shocks into unidirectional rotation with help of 4 check valve. Passive Damper can be converted into active damper with help of electromagnetic Damper (EM) which can also generate Energy and fulfill purpose of hybrid shock absorber. Regenerative Electromagnetic shock absorber recover dissipated energy. Coil assembly moves relate to magnetic assembly which produces Energy. Magneto Rehodological fluid (MR) which changes braking force by electronic control.MR fluid can operate directly from low voltage power Supplies. It can vary damping co efficient and give good performance for large range of vibration frequency***
Keywords - Electromagnetic shock absorber, Hydraulic Rectifier, Hybrid Damper, Magneto Rehodological Fluid.

I. 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.

II. HYDRAULIC RECTIFIER

Chaun li et .alShock 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 enviornment .Liner DC Generator, Electro magnetic 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

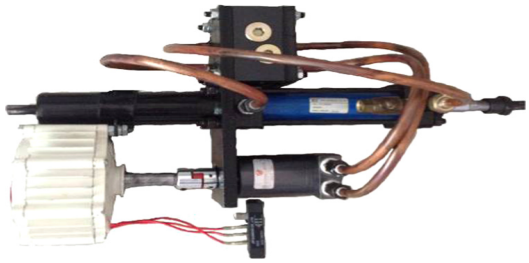

Figure 1. Prototype Device

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]

III. 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 aluminum rod .viscous damping force produced by relative motion of stator and slider which induce electro motive force (emf) in coil cause opposing force

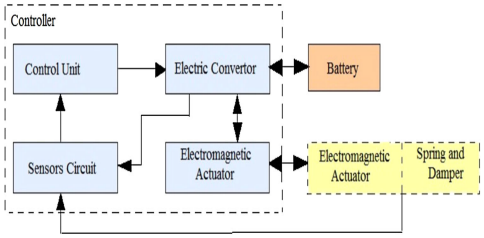

Figure 2 . Block Diagram Electromagnetic suspension

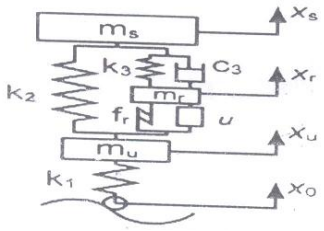

Figure 3. 3 DOF quarter –car Model

Passenger comfort ensured by reducing acceleration of mass

IV. 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]

V. 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

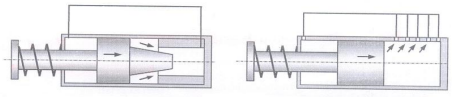

Figure 4. Orifice Cross Section Area Change During Movment

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 reduce 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

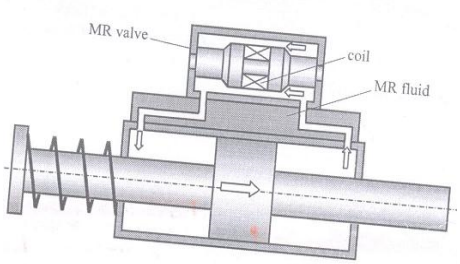

Figure 5. Design of MR Shock Absorber

MR shock absorber is the sum of three forces. [4]

VI. 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 s 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 $F= R\phi=NI$ …(3)

N= no of magnetic coil turn
I = Input current Passed through coil

Φ= Magnetic Flux =BA ….(4)
B= Megnetic Flux Density
A= Cross Section Area

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

L = length of Component
μ= Magnetic Permeablity

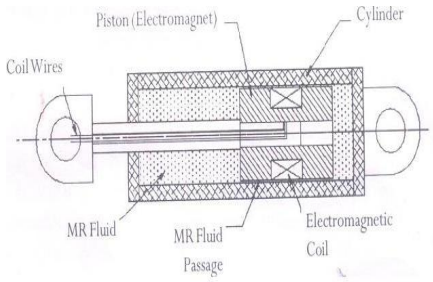

Fig 6 Schematic Representation of MR Damper

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

Yield Stress

$\Gamma = (6.9*10^2)+(4*10^4)B- (1*10^5)B^2+(9.1*10^4)B3$ ……(6)

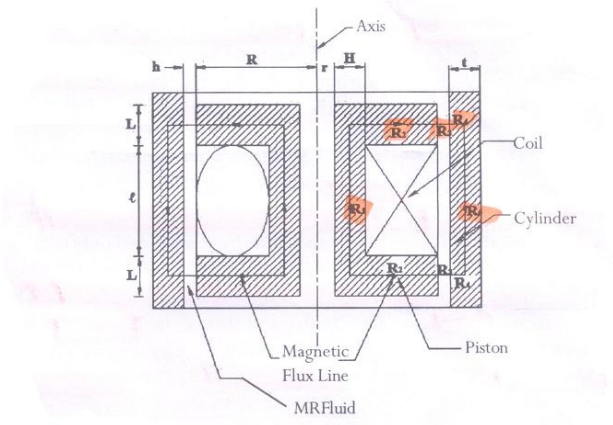

Figure 7. Typical Magnetic loop of The MR Damper

$F_{\Gamma D}=F_{\Gamma}+F_{\eta}+F_{f..}$ … (7)

Where

$F_{\Gamma D}$=Total damping Force

F_{Γ} = Force Component Due to induced Yield stress

F_{η}= Viscous Force Of Component

$F_{f..}$ =Frictional force Component

By increasing Magnetic field increase damping force. [5]

VII. CONCLUSION

Hydraulic rectifier absorbs shocks and energy generated simultaneously. Four check valve Transform Bi directional shocks into unidirectional rotation .Mechanical coupling Minimize the acceleration of upper sprung mass .Hydraulic and electromagnetic Damper is the best combination modeled to hybrid damper. control force obtain by tuning damping co efficient of shock absorber .MR fluid set and control braking parameter at low power and high dynamic range .damping force increase with increasing magnetic field strength .high damping coefficient achieved because in presence of magnetic field MR fluid a line in rigid chain like structure in the direction of magnetic field .

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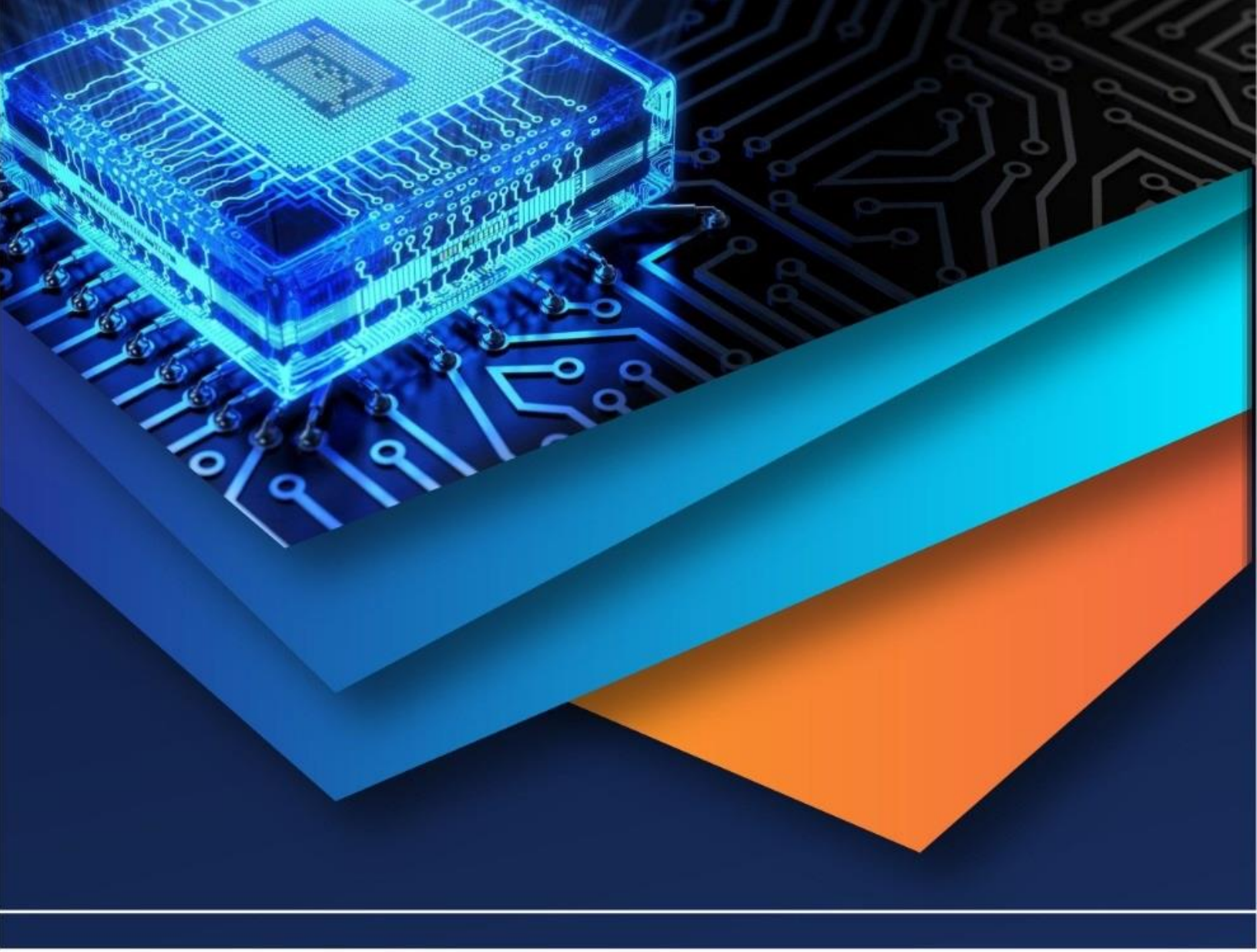

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