Power Generation in battery Using A Shock Absorber.

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INTRODUCTION

- For a smooth and comfortable ride the disturbing forces should be eliminated or reduced considerably by using some devices.
- Shock absorbers are such devices which isolate the vibrations by absorbing some disturbing energy themselves.
- Of the many types telescopic shocks are widely used which has got the draw back that the flow of oil in the cylinder can cause foam of oil and air to form.
- These limit the optimum throughout of the flow in the valves.

- Gas shocks represent an advance over traditional shocks.
- Nitrogen filled gas shock absorbers are the results of years of extensive research and development with top flight shock design engineers.
- They are designed for both lowered and stock vehicles to provide shock absorbers that would out perform anything on the market today.
- Nitro shock absorbers are high quality, nitrogen filled shocks designed and gas charged specifically for each vehicle application.
- The addition of nitrogen under pressure limits the foaming effect and increases efficiency.

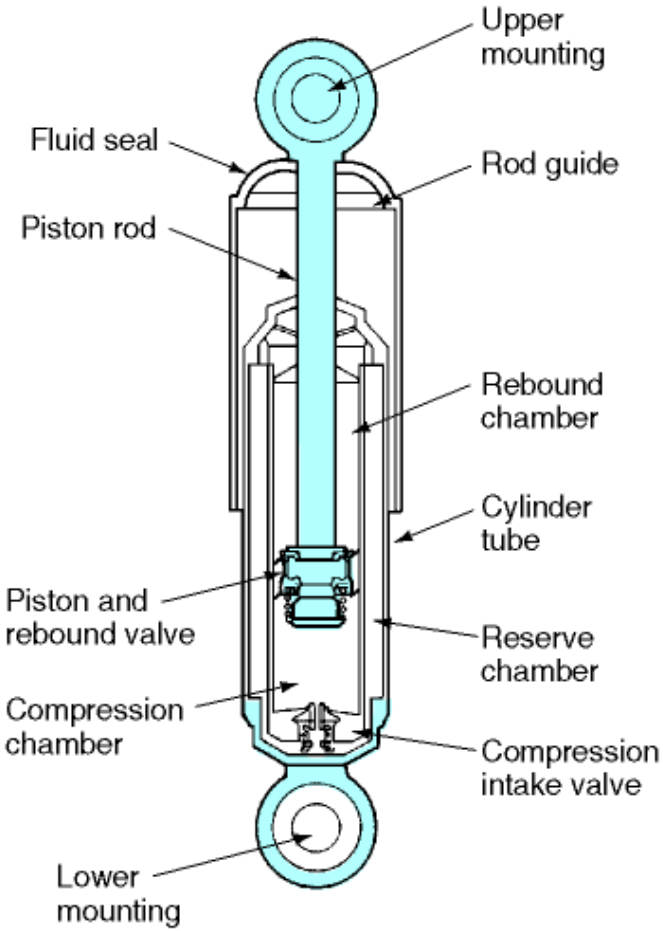
NEED FOR SHOCK ABSORBERS

- Springs alone cannot provide a satisfactorily smooth ride.
- Therefore an additional device called a “shock absorber” is used with each spring.
- Consider the action of a coil spring.
- The spring is under an initial load provided by the weight of the vehicle.
- This gives the spring an original amount of compression.
- When the wheel passes over a bump, the spring becomes further compressed.
- After the bump is passed the spring attempts to return to its original position.
- However it over rides its original position and expands too much

Shock absorber

- A shock absorber is basically a hydraulic damping mechanism for controlling spring vibrations.
- It controls spring movements in both directions: when the spring is compressed and when it is extended, the amount of resistance needed in each direction is determined by the type of vehicle, the type of suspension, the location of the shock absorber in the suspension system and the position in which it is mounted.
- Shock absorbers are a critical product that determines an automobile's character not only by improving ride quality but also by functioning to control the attitude and stability of the automobile body.

SHOCK ABSORBERS



Types of shock absorber

- **Double-wishbone (Multilink)**

(a) Double Tube

(b) Single Tube

- **Strut**

(a)Double Tube

(b)Inverted Type

(c)With a Steering Arm

- **Separately Mounted Spring (Rigid Axle,etc)**

(a)Unit Damper

- Gas Filled Shock Absorber

(a)Twin-Tube with Low Pressure Gas

(b)Single-Tube with High Pressure Gas

Objectives:-

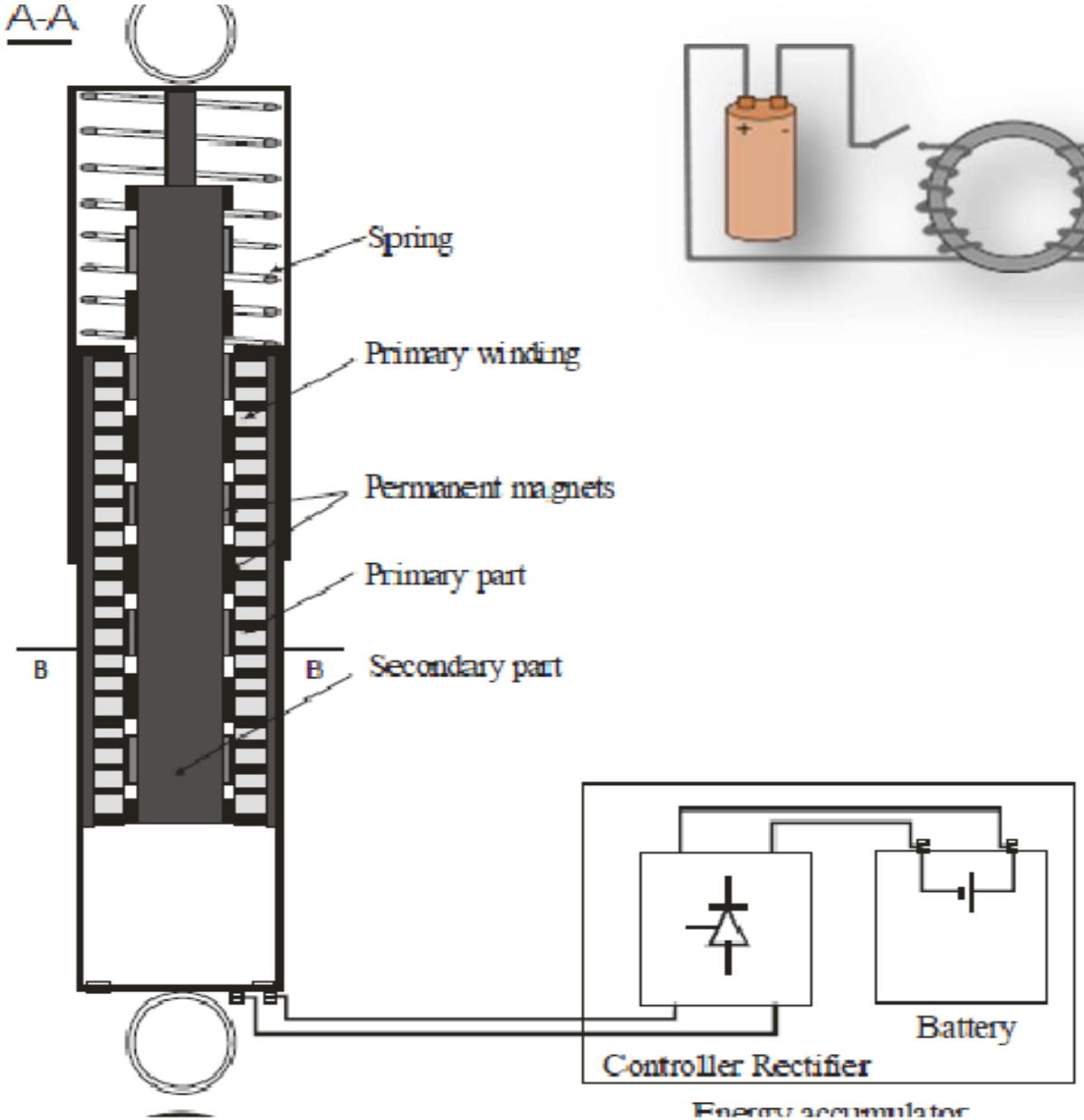
- To offer a maximum efficiency of battery.
- To increase the energy conversion rate for charging the battery.
- To reduce the shock loads (Vibrations) on the bumpy roads.

Working

- Our Project has main part of electrical armature suspensor because these armatures through mechanical motion convert into electrical energy. This electrical armature output voltage 12v – 1amp dc. It supply connect with rechargeable battery 12v-100 ah. This battery fully charging for required 36 pedaling hours or depends on discharging level.
- When vehicle shock absorber pus pull then permanent magnet also follow this mechanical monument between armature coils. Then armature coil and magnet bitewing magnetic repulsion force convert into electrical voltage.
- These armature dynamos connect with flexible dc cable. It battery D.C. voltage supply connect with engine starter by starter ignition switch.
- When this switch on by start key then engine will be start and then time tarter work like heavy dc motor and that starter consumption Battery voltage and battery dies charge.

Faraday’s Law:

- Faraday's law is applicable to a closed circuit made of thin wire and states that:“The induced electromotive force (EMF) in any closed circuit is equal to the time rate of change of the magnetic flux through the circuit.”Or alternatively:
- “The EMF generated is proportional to the rate of change of the magnetic flux.”


A-A
Spring
Primary winding
Permanent magnets
Primary part
B
B
Secondary part
Battery
Controller Rectifier
Energy accumulator

List of Components:

- We started our project for we survey some types of using materials for our project. Before we make project collect as per required listing as under material.
- Suspensor
- Battery 12v 100 ah
- Magnet
- Copper Coil
- Battery cable
- Table
- Led Light
- Battery connector

LITERATURE REVIEW

DESIGN AND STATIC MAGNETIC ANALYSIS OF ELECTROMAGNETIC REGENERATIVE SHOCK ABSORBER

1Rahul Uttamrao Patil, 2Dr. S. S. Gawade[2]

- This paper presents design and finite element analysis of an electromagnetic energy regenerative shock absorber which can efficiently recover the vibration energy wasted in vehicle suspension system.
- In this paper, design process of electromagnetic energy regenerative shock absorber is explained with due consideration to space limitations in commercial vehicle. A static magnetic analysis is used to analyze magnetic field distribution and to obtain optimum design
- The overall conclusion of this research work is that it is possible to harvest energy from vehicle vibrations travelling on a bumpy road.

DESIGN AND ANALYSIS OF ELECTRIC SHOCK ABSORBER BY Oly D. Paz, B.S. Universidad del Zulia, 1990,DEC-2004[3]

- The major goal of the project is to design and analyze the operation of an electric shock absorber.
- The results obtained from the dynamic simulation of the electric shock absorber with the modified output electric circuit show that the oscillations attenuate to zero after disturbance appears. Therefore, the electric shock absorber modified circuit.

REGENERATIVE SHOCK ABSORBER FOR HYBRID CARS BY

C. M. Pramodh, S. R. Shankapal
Department of Automotive & Aeronautical Engineering,
M. S. Ramaiah School of Advanced Studies, Bangalore-58[4]

- The objective of this project is to design a regenerative shock absorber which can harness the energy. In the present work, a regenerative shock absorber is modeled and analysed for emf generated using Ansoft Maxwell and a physical model was built to validate the model.
- From the above simulation and validation study it is evident that recovering energy from the kinetic energy of shock absorber is very well possible.
- The simulation results show that by using NdFeB magnets as core material can yield a voltage of 12 V AC
- But the voltage being generated with the technology demonstrator is very limited to 2 V AC. The reason for this could be using steel as core material.
- voltage is not sufficient to charge the 12V battery which is used in automobiles.

ENERGY REGENERATIVE SUSPENSION SYSTEM FOR VEHICLES

BY Zhang Jin-qiu, Peng Zhi-zhao*, Zhang Lei, Zhang Yu[5]

- The conventional vehicle suspension dissipates the mechanical vibration energy in the form of heat which waste considerable energy.
- In conclusion, only combining vibration reducing performance and energy harvesting efficiency can the regenerative suspensions have a promising prospect.
- Conventionally, the vibration energy of vehicle suspension is dissipated as heat by shock absorber, which wastes a considerable number of resources. Regenerative suspensions bring hope for recycling the wasted energy. All types of regenerative suspension, especially electromagnetic suspension, and their properties are reviewed in this paper.

Energy-Harvesting Shock Absorber with a Mechanical Motion RECTIFIER BY

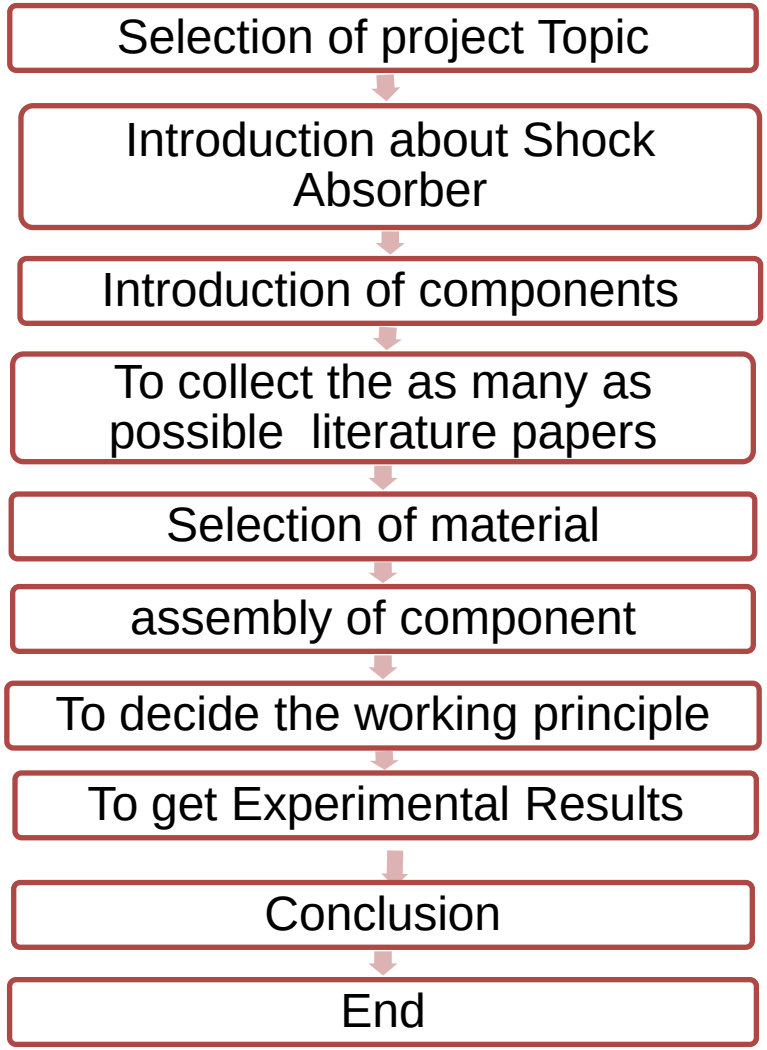
Zhongjie Li, Lei Zuo*, Jian Kuang, and George Luhrs

Department of Mechanical Engineering, State University of New York at Stony Brook

Stony Brook, NY, 11794 [6]

- Energy-harvesting shock absorber is able to recover the energy otherwise dissipated in the suspension vibration while simultaneously suppress the vibration induced by road roughness. It can work as a controllable damper as well as an energy generator.
- An innovative design of regenerative shock absorbers is proposed in this paper, with the advantage of significantly improving the energy harvesting efficiency and reducing the impact forces caused by oscillation.
- In this paper, we proposed a “motion rectifier” based design of electromagnetic energy harvester for enhanced efficiency and reliability for potential application of vibration energy harvesting from vehicle suspensions. “motion rectifier” can transfer the oscillatory motion of vehicle suspension into unidirectional motion of the electrical generator, thus enabling the generator operating in a relatively steady speed with higher efficiency.

Methodology.



WORK TABLE

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April
Define of problem									
Design of model									
Design & Documentation									
Analysis & calculations									
Performance & conclusions									

•Design of Spring:

. There are many different types of springs and spring materials. In the design calculations, the following assumptions are considered:

a) The type and form of the spring will be the compression spring ground.

b) The material must be chosen for the maximum energy and mass, such as music

wire, ASTM A228, Chrome Vanadium or Chrome Silicon steel wire.

c) The ends of the spring are to be closed and ground.

d) The spring is to have maximum energy for the limited space, while the stress level is not to exceed the maximum yield strength of the wire.

e) The spring operates periodically with a long interval of rest.

f) If the spring requires the use of material 0.5” or larger in diameter, wound hot from bar stock will be used

The force Fs produced by a linear elastic spring along its length x with a constant Ks (see Fig. 4.11.)

$$fs=ks.x$$

where: *x - space available when the spring is compressed.*

ks - spring constant or trial rate, which is a measure of a spring's stiffness.It can be calculated as:

$$K_s = \frac{kaDF}{\pi d^3}$$

where: *G - modulus of elasticity (according to the material and wire diameter)*

d - wire diameter

D - mean coil diameter

N - number of active coils determined by the type of ends on a compression

spring. If the ends are to be closed and ground

N=TC-2

TC - total coils that the spring can contain, which is the ratio between the
length of the spring and the diameter of the wire.

$$TC = \frac{x}{d}$$

In the case that the spring works within a tube or cylinder, the spring outside
diameter *o D must be less in diameter to keep the spring from jamming in the bore*
when it is compressed.

The trial mean diameter *D is equal to the outer diameter minus the wire diameter*

$$D = D_o - d$$

➢The spring index,

$$C = \frac{D}{d}$$

C must be kept in the range between 4 and 16. When the spring index is too low,
stress problems occur, and when the index is too high, entanglement and waste of material occur.
The working stress *S is calculated using the appropriate equation with the* working load *F applied to the spring,*

$$S = \frac{8K_a DF}{\pi d^3}$$

➢where the Wahl stress correction factor applied for round wire is,

$$K_a = \frac{4C-1}{4C-4} + \frac{0.615}{C}$$

If the working stress of the spring is below the maximum allowable stress, the spring is properly designed in relation to its stress level duration operation.

The potential energy *E that can be stored in a deflected compression spring is* given by the constant spring and by the distance that the spring is compressed,

$$E = \frac{K_s x^2}{2}$$

Table 4.3. Common Spring Materials and Properties

Material	Tensile Strength min. [psi*1000]	Modulus of Elasticity. [psi*10^6]	Modulus in Torsion. [psi*10^6]	Max. Design Temp. [deg *F]*
Music Wire	229 – 300	30	11.5	250
Chrome Vanadium	190 – 300	30	11.5	425
Stainless Steel 302	125 – 320	28	10	550

Calculation based design procedure

- Material: Steel(modulus of rigidity) G = 41000
- Mean diameter of a coil D=62mm
- Diameter of wire d = 8mm
- Total no of coils n1= 18
- Height h = 220mm
- Outer diameter of spring coil(D),=70mm
- No of active turns n= 14
- Weight of bike = 125kgs
- Let weight of 1 person = 75Kgs
- Weight of 2 persons = 75×2=150Kgs
- Weight of bike + persons = 275Kgs
- Rear suspension = 65% of 275 = 165Kgs
- Considering dynamic loads it will be double W = 330Kgs = 3234N

- For single shock absorber weight = w/2= 1617N = W
- We Know that, compression of spring (δ) =F/K=282.741
- Spring index,C=D/d=7.75.
- Solid length, Ls=n1×d=18×8=144
- Spring index,C=D/d=7.75
- Free length of spring, Lf = solid length+maximum compression + clearance between adjustable coils

$$=144 + 282.698 + 0.15 \times 282.698 = 469.102$$

- Spring rate, K = 5.719
- Pitch of coil, P = 26

Experimental Results:

By all calculations made then after we measure the power generated by the shock absorber through multi-meter device.

The multi-meter readings are given in the table below,

Load on the vehicle(kgs)	Voltage generated (V) in D.C
10	1.11
20	1.55
165	4.21
330	5.84

Advantages:

•High Efficiency, Energy Saving & Low Operating Cost
Wide Operating Range

• Low Noise & Low Vibration

• Automatic Control for charging

• Robust and Simplified Structure, Low failure rate and high reliability.

• Top Level power Efficiency, Energy Efficient Performance and Long Lasting Reliability.

• Maximum Accessibility and Total Connectivity

Disadvantages:

•These projects have main disadvantage like constant shock required.

• Along with the considerable advantages of the power system, It does have two significant disadvantages: the complexity And possible failure of the electrical magnet or electrical winding, the complexity and possible failures associated with battery fail.

Application

- These project main applicants use this project and use with lot of advantage.

1) Two wheeler vehicle such as motorcycle.
2) Automobile industry.
3) Devices were system is used.

Conclusion

- The systems are efficient, low cost systems that meet the environmental requirements of all countries. The attractive economics, reliability and operating flexibility of these systems suggest their consideration for all power generation applications.

Reference

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6. www.wikipedia .org/shock absorber.html//

:Thank You: