

Concept Design of Fluid Reciprocating Air Suspension for Motorcycle

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ABSTRACT

The main objective of this project is to develop the rear suspension of bike using extra piston cylinder. As we all know that when rear suspension of bike does sufficiently work, but still it doesn't working with better performance. So to provide the comfort for better drive to all of us we were designed this system for bike.

Keywords: Suspension, Coil Spring, Bike, Fluid, Air, Piston, Vent Hole.

I. INTRODUCTION

Now in a days there are many research are perusing on automotive engineering to offer smooth ride to customer as well as either in car or motorcycle. There are different types of suspension structures are using in automotive industries like independent suspension which holds wishbone suspension system, dependent suspension system, leaf spring suspension system, coil spring suspension system etc. As we know that the shock absorbers are using to strainer the shock. Generally used in motorcycle, truck, car etc. So that we can say that shock absorbers has capability to reduce the shock and to provide comfort ride.

The unsurfaced road can acting lengthier back pain problem. This problem is produces due to inadequate result of suspension system. Hydro pneumatic shock absorber is design to reduce maximum shock in motorcycle. It can give reliable result for motorcycle. It consists the parts like shock absorbers, extra cylinder chamber, piston and fluid line. Hydro pneumatic shock absorber has many scope in automotive industries.

II. DESIGN OF HYDRO PNEUMATIC SHOCK ABSORBERS

Design is a combination of analysis and imaginative thought. Good designs are based on exceptional concepts and properly designed details. For designing of components CAD software's are required. Here all parts of hydro pneumatic shock absorbers has been designed in Cero.

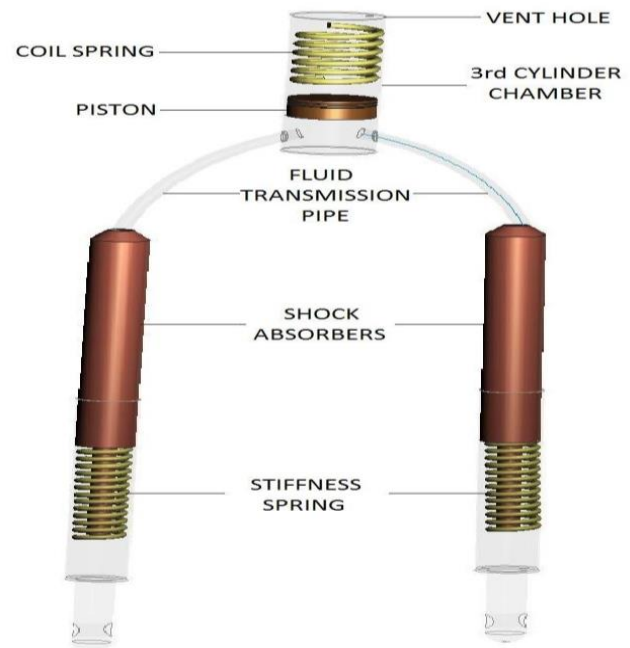


Fig 1.1:- Hydro pneumatic shock absorber

2.1 Design of shock absorbers

For the system it is required to design a shock absorber which is comprising stiffness spring. Because of this spring shock absorbers can withstand the more shock without failure.

The shock absorber is also contain telescopic fluid. When the motorcycle is in jerk motion the plunger of the shock absorber will be compressing and pressurized the telescopic fluid.

ASTM A228 (0.80–0.95% carbon) - It is called as music wire which can use as the material of shock absorber.



Fig 2.1:- Design of shock absorbers

2.2 Design of chamber

Here one extra chamber is using in hydro pneumatic shock absorber system. Which is including the sub parts which are

1. Piston
2. Spring
3. Vent hole
4. Fluid transmission Pipe

2.2.1. Piston

A piston is a module of reciprocating engines, reciprocating pumps, gas compressors and pneumatic cylinders, amongst other similar machines. It is the moving module that is controlled by a cylinder. As well as piston is also using as reciprocating module in hydro pneumatic suspension.



Fig 2.2:- Design of Piston

Piston is containing of materials like cast iron and aluminium alloy. But here we use aluminium alloy for its light weight property. When the Bike is in jerk motion the plunger of the shock absorber will be compressing and pressurized the telescopic fluid. Due to the pressure of fluid the piston of the cylinder will travel upward side and compressing the spring.

2.2.2. Spring

A coil spring, also known as a helical spring, is a mechanical device which is naturally used to store energy and then release it, to absorb shock, or to preserve a force between contacting surfaces. When the force is applied to the spring is go through in compression, but when the shock is release it regain its original shape.



Fig 2.3:- Design of spring

The material for spring steel is a low alloy, medium carbon steel with a very high yield strength. This permits

objects made of spring steel to return to their original shape in spite of significant bending or twisting. Silicon is the important constituent to most spring steel alloys. An example of a spring steel used for cars would be AISI 9255 containing 1.50%-1.80% silicon, 0.70%-1.00% manganese and 0.52%-0.60% carbon. Most spring steels (as used in cars) are hardened and tempered to about 45 Rockwell C.

When the Bike is in jerk motion the plunger of the shock absorber will be compressing and pressurized the telescopic fluid. Due to the pressure of fluid the piston of the cylinder will travel upward side and compressing the spring. But when pressure reduces due to vehicle gets its original position this spring will regain its original shape.

2.2.3. Vent Hole

It is require designing a hole in cylinder for perfect breathing of air. Because when spring regain its original shape the amount of air needs to release.

2.2.4. Fluid transmission Pipe

It is required to transfer fluid when jerk is created by the bike.

III. WORKING

3.1 Shock absorbers

Here, the basic component is shock absorbers. The shock absorber is also consist telescopic fluid. When the vehicle is in jerk motion the plunger of the shock absorber will be squeezing and pressurized the telescopic fluid.

3.2 Fluid transmission line

It is used to transmit the pressurized fluid to 3rd chamber.

3.3 3rd chamber

Here one extra chamber is using in hydro pneumatic shock absorber system. Which is including the sub parts which are piston, spring and vent hole.

3.4 Piston

It is the moving component that is contained by a cylinder. As well as piston is also using as reciprocating component in fluid reciprocating air suspension. Piston is consisting of materials like cast iron and aluminium alloy. But here we can use aluminium alloy for its light weight property. When the vehicle is in jerk motion the plunger of the shock absorber will be squeezing and pressurized the telescopic fluid. Due to the pressure of fluid the piston of the cylinder will travel upward side and compressing the spring.

3.5 Compression spring

It is the device which is used to store an energy and afterward release it to shock absorbers. When the force is applied to the spring is undergoes in compression, but when the shock is release it regain its original shape. When the vehicle is in jerk motion the plunger of the shock absorber will be compressing and pressurized the telescopic fluid. Due to the pressure of fluid the piston of the cylinder will travel upward side and compressing the spring. But when pressure reduces due to vehicle gets its original position this spring will regain its original shape.

3.6 Vent hole

It is require designing a hole in cylinder for perfect breathing of air. Because when spring regain its original shape the amount of air needs to release.

IV. DETAIL OF SUSPENSION OIL

Suspension oil is the key constituents in the suspension. Because of it the sock can absorbs. Suspension oil is also known as telescopic oil or telescopic fork oil. It is available in various grade like 2.5w fork oil, 5w fork oil, 7.5w fork oil, 10w fork oil as per requirement.

4.1 Performance of oil

Comprises an anti-friction additive especially developed by motul, making easier sliding, avoiding drag in the fork. Steady absorbing in an extended range of temperature. For an example the properties of motul fork oil as shown in table.

Table1. Properties of Suspension Oil

	LIGHT	MEDIU M	MEDIU M/ HEAVY	HEAV Y
	5W	10W	15W	20W
Density at 15°C	0.852	0.862	0.869	0.872
Viscosity at 40°C	17.9 mm ² /s	35.9 mm ² /s	57.1 mm ² /s	77.9 mm ² /s
Viscosity at 100°C	3.9 mm ² /s	6.0 mm ² /s	8.3 mm ² /s	10.1 mm ² /s
Viscosity index	112	112	116	111
Flash Point	182°C	230°C	232°C	244°C
Pour Point	-36°C	-30°C	-27°C	-24°C

4.2 Air suspension

Air suspension is a kind of vehicle suspension motorized by an electric or engine-driven air pump or compressor. This compressor pumps the air into a flexible bellows, typically made from textile-reinforced rubber. The air pressure expands the bellows, and raises the chassis from the axle.

4.3 Overview

The purpose of hydro-pneumatic suspension is to provide a smooth, constant ride quality.

Modern electronically controlled systems in automobiles and light trucks nearly always feature self-levelling along with hovering and lowering purposes.

4.4 Air suspension in modern automobile vehicles

Vehicles that usage air suspension today contain models from Maybach, Rolls-Royce, Lexus, jeep, Mercedes-Benzes, Porsche, land rover, SsangYong, and tesla, among others.

The air suspension designs from land rover, SsangYong, Chrysler, Subaru, Audi, Volkswagen, tesla, Porsche, and Lexus models feature height adjustable suspension controlled by the driver, suitable for making it easier to enter the vehicle, clear bumps, or clear rough terrain.

V. CONCLUSIONS

As per discuss above the fluid reciprocating air suspension can excessive reduce the shocks in low jerk motion and In future, this technology is very useful but right now in initial stage somewhat costly and in developing country it is more useful.

5.1 Future Developments

This research focuses mainly on designing of hydro pneumatic suspension for bike. Manufacture as a new suspension.

5.2 Advantages

1. It can serves good suspension effect.
2. It can also provide comfortable ride.
3. It might be reduce the future back pain problem.

5.3 Disadvantages

1. It cannot give sufficient result in low jerk motion.
2. This system needs more maintenance.
3. Leakage of fluid might be possible in heavy jerk motion.

VI. REFERENCES

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