

Compressed Air Generation Using Vehicle Suspension System

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ABSTRACT

This includes how the compressed air is produced by using vehicle suspension. We know Pneumatic energy is the readily available and low cost energy. Now-a-days Non-conventional energy system is very essential to the world. So here we are focusing on pneumatic type of energy for this project. In this project compressed air can be produced with the help of vehicle suspension system. Then this compressed air is used to operate the vehicle. Compressed air production using suspension system does not require any fuel for its motion. This air operated vehicles are the new innovative concept to run vehicle by using the compressed air. So in this paper we are making one type of device that is used for producing compressed air for different purposes by using vehicle suspension. The compressed air may be used for running the vehicle and for air conditioning purposes. Here we start with an introduction to pneumatic; it's various applications and units and briefly explains a few devices capable of utilizing air effectively and their relative merits. The pneumatic operated vehicle is very useful to save the conventional type of fuel and after few years these things will play a very important role. Pneumatic energy is the readily available and low cost energy. Nonconventional energy system is very essential at this time to our nation. So that the pneumatic type of energy is considered for our project. In this project compressed air can be produced with the help of motion of wheel. Then this compressed air can be used for further applications. Compressed air production using vehicle wheel needs no fuel input power to produce the output of the air.

Keywords : Pneumatic Energy, Comprsed Air, Suspension System, Conventnal

I. INTRODUCTION

Compressed air is a gas, or a combination of gases, that has been put under greater pressure than the air in the general environment. Current applications using compressed air are numerous and diverse, including jackhammers, tire pumps, air rifles, and aerosol cheese. According to proponents, compressed air also has a great deal of potential as a clean, inexpensive, and infinitely renewable energy source. Its use is currently being explored as an alternative to fossil fuels. Pneumatic energy is the readily available and low cost energy. Non-conventional energy system is very essential at this time to the world. So In this project compressed air was produced with the help of

vehicle suspension. Then this compressed air is used to operate the vehicle. Compressed air production using vehicle suspension does not require any input power to produce compressed air.

The suspension systems are used in vehicle to support weight of vehicle body and to isolate the vehicle chassis from road disturbances. The dampers are designed to dissipate vibration energy into heat so as to reduce the vibration transmitted from road excitation. It is feasible to harvest this vibration energy from the vehicle suspension system to improve the efficiency of the vehicle. The suspension system used for the regeneration of vibration energy is called regenerative suspension system. One of the

important losses is the energy dissipation from the vibration of suspension system.

SYNTHESIS OF COMPRESSED AIR

The compressed air is produced by two methods first is with the help of engine and compressor and another method is with help of suspension system. The disadvantage of first method is it decreases the efficiency of engine and disadvantage of second method is required more space for installation.

NEEDS COMPRESSED AIR

- ✓ To operate pneumatic system in vehicle
- ✓ It saves fuel which was burnt for running Air conditioning.
- ✓ To recover the waste energy of suspension system.

APPLICATIONS OF COMPRESSED AIR

Generally, all the four wheelers are equipped with air conditioning system. The air conditioning system uses refrigerant which produces toxic gases such as Nitrogen Oxide which affects the engine performance and also causes ozone depletion. So, we have done further modifications by using water as a coolant and suspension system to produce compressed air. Water is recyclable, easy availability, free of cost and does not produce any harm to the environment. This system is applicable for all the four wheelers as suspension system works while turning, waviness of road, while applying brakes, speed breakers, on terrain roads etc.

- ✓ Applicable in all vehicles.
- ✓ For cleaning & inflation of tubes.
- ✓ Swing machine.
- ✓ Compressed air can be used for pneumatic braking system.

II. LITERATURE SURVEY

“AUTOMATIC WALL SCRUBBING ROBOT”

Sivanantham.K 1, Banuchandar.N2, Hariprakash.K 3, Jeeva.M., Vehicles, derived from the Latin word, *vehiculum*, are non-living means of transport.

Vehicles may be propelled or pulled by animals, for instance, a chariot, a stagecoach. However, animals on their own, though used as a means of transport, are not called vehicles, but rather beasts of burden or draft animals. This distinction includes humans carrying another human, for example a child or a disabled person. A rickshaw is a vehicle that may carry a human and be powered by a human, but it is the mechanical form or cart that is powered by the human that is labelled as the vehicle. For some human-powered vehicles the human providing the power is labelled as a driver. Vehicles that do not travel on land often are called craft, such as watercraft, sail craft, aircraft, hovercraft, and spacecraft. Land vehicles are classified broadly by what is used to apply steering and drive forces against the ground: wheeled, tracked, railed, or skied. While a vehicle running on the road ways, foot pump produces air in vehicle suspension. Generated air is stored in a tank. Here we are fabricating the model for four wheeler vehicles without using any fuel input, and it is known as pneumatic vehicle. The arrangement of the setup is using the pneumatic rotor (or) gun which is coupled with the worm shaft. The spur gear is connected with the rear wheel shaft which is engaged in the worm shaft. The front wheel drive is to make as the mechanism of rack and pinion which is coupled with the steering shaft.

COMPRESSED AIR GENERATION USING VEHICLE SUSPENSION

S.Vigneswari, V.Vinodhini. In this project we are collecting air cylinder and store this energy to the compressor tank as non-conventional method by simply driving the vehicle. Non-conventional energy system is very essential at this time to our nation. Compressed air production using vehicle suspension needs no fuel input power to produce the output of the air. For this project the conversion of the force energy into air. The control mechanism carries the air cylinder (vehicle suspension), quick exhaust valve, Non-return valve and spring arrangement. We have discussed the various applications and further

extension also. The initial cost of this arrangement is high.

Borse S.H., Satpute A.G. Explained about air conditioning system by using vehicle suspension. When vehicle is run on bumpy road or uneven road then suspension spring move Volume 02, No. 4, April 2016 Page122 continuously up and down. The pneumatic cylinder is installed below this spring arrangement. This pushing power is supplied to pneumatic piston and cylinder arrangement which compresses the air. This compressed air is supplied to air tank through non return valve. By the placement of non return valve stops the back flow of pressurized air into cylinder again. That high pressurized compressed air is stored in air tank. When we want to turn on A.C. system the pressurized compressed air is supplied to parallel flow heat exchanger through pipe by using knob.

III. CONSTRUCTION AND WORKING

Figure shows the top view and side view in our project. It consists air tank, pneumatic actuator, braking system, hoses, 1*2 DC valve, pressure gauge, springs, air pump. Full frame is joined with the help of arc welding. The air tank is with the help of gas welding. The pedal is connected top of the frame with the help of return spring. The rod of air pump is joined to the pedal. Another end of air pump is connected to the one end of nylon type hose and the another end of nylon hose is connected to air tank. The capacity of air tank is 2-3kg/cm². The pressure gauge is connected to air tank which is used for the measure the pressure inside of air tank. The another type of hose (Rubber hoses) is connected between 1*2 DC valve and another end air tank. The pneumatic cylinder is connected with the help of rubber hoses. When the pedal is pressed applying external load the pressure is generated with help of air pump. This generated air is pass in air tank with help of Nylon type of hose. This air is stored in air tank upto 30PSI. When valve is ON this pressurised air is pass in pneumatic cylinder which is connected to braking assembly. When wheel is rotate brakes shoes are opposed the motion of

wheel and vehicle is stopped. This braking system is operated with the help of pneumatic cylinder which is control with the help of 1*2DC valve.



Figure 1. front and top view of compressed air generation using suspension of vehicle

IV. DESIGN

Double acting pneumatic cylinder

Given date:

Cylinder: 16*25

Bore diameter= 16mm

Stroke length= 25mm

$$\begin{aligned} \text{Volume of air exhaust} &= \text{stroke} * \text{area of piston} \\ &= 25 * \pi / 4 * 16^2 \\ &= 5026.54 \text{mm}^3 \end{aligned}$$

$$\text{Area of piston} = \pi / 4 * 16^2 = 201.06 \text{mm}^2$$

$$\begin{aligned} \text{Outstroke force (F)} &= \text{pressure} * \text{Area of cylinder} \\ &= 0.6 * 201.06 \\ &= 120.63 \text{ N} \end{aligned}$$

$$\begin{aligned} \text{Piston rod area } A_1 &= \pi / 4 * d^2 \\ &= \pi / 4 * 7^2 \\ &= 38.48 \text{mm}^2 \end{aligned}$$

$$\begin{aligned} \text{Effective area} &= \text{piston area} - \text{piston rod area} \\ &= 120.63 - 38.48 \\ &= 82.177 \text{ mm}^2 \end{aligned}$$

The force applied to actuate the brake in this problem is the in-stroke force.

In-stroke force for various pressures,

1. $P = 0.4 \text{Mpa}$

$$\begin{aligned} \text{In-stroke force} &= P * A \\ &= 0.4 * 82.177 \\ &= 32.87 \text{N} \end{aligned}$$

2. $P = 0.6 \text{MPa}$

$$\begin{aligned} \text{In-stroke force} &= P \cdot A \\ &= 0.6 \cdot 82.177 \\ &= 49.30 \text{ N} \end{aligned}$$

$$3. P = 0.85 \text{ MPa}$$

$$\begin{aligned} \text{In-stroke force} &= P \cdot A \\ &= 0.85 \cdot 82.177 \\ &= 69.85 \text{ N} \end{aligned}$$

Table 1

Sr.no	Pressure, P (M Pa)	In-stroke force (N)
1	0.4	32.87
2	0.6	49.30
3	0.85	69.85

V. ADVANTAGES& DISADVANTAGES

ADVANTAGES

- ✓ Air production is simple for running the vehicle
- ✓ No fuel is required
- ✓ Electrical power input is not required
- ✓ It is a non-conventional system
- ✓ No pollution
- ✓ No moving parts
- ✓ No lubricating oil required

DISADVANTAGES

- ✓ System is bulky
- ✓ High Initial cost
- ✓ More space required
- ✓ Leakage problems are high

VI. CONCLUSIONS

As we know that Pneumatic energy is the readily available and low cost energy. Non-conventional energy system is very essential at this time to the world. So In this project compressed air was produced with the help of vehicle suspension. Then this compressed air is used to operate the vehicle. Compressed air production using vehicle suspension does not require any input power to produce compressed air. This air operated vehicles are the new innovative concept to run vehicle by using the compressed air system. The above project is made

with pre planning, so that it provides compressed air for various operations like running of vehicle, air-conditioning etc. The project fabrication of a device used for producing compressed air using vehicle suspension is designed and fabricated with the hope that it is very much economical and help full to all vehicles to produce the compressed air.

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