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## Working Of Air Compressor with Aid of Speed Braker

**V. Dinesh Kumar**

*K.S.R College of  
Engineering, Tiruchengode,  
Tamil Nadu, India*

**A. Gokulnath**

*K.S.R College of  
Engineering, Tiruchengode,  
Tamil Nadu, India*

**P. Naveen Kumar**

*K.S.R College of  
Engineering, Tiruchengode,  
Tamil Nadu, India*

**S. Vinoth Kumar**

*K.S.R College of  
Engineering, Tiruchengode,  
Tamil Nadu, India*

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**Abstract:** *In our project, we are producing the compressed air using with the aid of speed breaker setup in roadways. This is the simple and easy method of producing the compressed air without using the electricity. Nowadays the electric power demand is increased. So we are generating the compressed air without using the electric power. Here instead of electric drive, we are using the mechanical drive to generate the compressed air.*

**Keywords:** *Speed Breaker, Air Compressor, Pressurized Air Generation, Traffic, Return Springs.*

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### I. INTRODUCTION

On road, vehicles waste a tremendous amount of energy on speed barkers, where there is a necessity to provided speed breaker to control the speed of the vehicles. There is tremendous vehicular growth in year by year. The increasing traffic and number speed breakers on roads motivate to manufacture an innovative device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work. In this practical manufacturing processes and steps of speed breaker device for generation of compressed are described which can be used to generate compresses air on highways in remote areas. When vehicles move on the rack it will be pushed down. The piston is reciprocating in the cylinder. The Air pump arrangement converts reciprocating motion into air compression. The second part is specially planned to design and fabricate the conversion unit for utilizing the available unconventional energy source. That is tremendously available energy in low intensity with sample quantity can be utilized. This machine converts reciprocating motion into pressurized motion. Then the pressurized air can be stored compressor

### II. LITERATURE SURVEY

#### 2.1 Compressor

A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. The clean condition of the suction air is one of the factors, which decides the life of a compressor. Warm and moist suction air will result in increased precipitation of condensing from the compressed air.

#### 2.1.1 Reciprocating Compressor

Built for either stationary (or) portable service the reciprocating compressor is by far the most common type. Reciprocating compressors lap be had size from the smallest capacities to deliver more than 500m<sup>3</sup>/min. In single stage compressor, the air pressure may be of 6 bar machines discharge of pressure is up to 15bars. Discharge pressure in the range of 250bars can be obtained with high-pressure reciprocating compressors that of three & four stages. Single stage and 1200 stage models are particularly suitable for the applications, with preference going to the two-stage design as soon as the discharge pressure exceeds 6 bars, because of it incapable of matching the performance of the single stage machine at lower costs per driving powers in the range.

### III. DESCRIPTION

#### 3.1 Pneumatic Cylinder

All the strange names and terms around pneumatics have evolved through about 100 years of their use in manufacturing. Double acting, four way, quick connect are all terms that were invented to describe (as best as could be) the difference between the parts. Pneumatics is easily used in the system. It's all the different names and parts that seem to be overwhelming. But enough about that to the fun stuff.

#### 3.1.1 Air Cylinders

There are only two main kinds of air cylinders: Double acting, and single acting. They come in all variations, shapes, and sizes. Both kinds are useful for haunt work. Double acting cylinders are useful when you need to push in both directions, and single acting cylinders are useful when only a push in one direction is needed. And, sometimes 'in a pinch', you can adapt a double to act as a single, and a single to act as a double.

Table-1: DEFINITIONS

Pressure	This is the maximum pressure the air cylinder can safely handle.
Bore	The interior diameter of the cylinder.
Stroke	The range of movement of the air cylinder's rod.

There are lots of calculations to accurately figure the power of a cylinder, but most haunt pop-up applications can be handled by air cylinders in the range of 3/4" to 1-1/2" bore, and 3" to 8" stroke. Power measurements primarily take into account the air and the bore. The power ratings are usually only quoted at maximum pressure. So if cylinder produces 180 pounds of 'push', it will only deliver that at the maximum pressure (usually 250 psi for commercial cylinders). A good goal is not to exceed 60-70psi for working properties. Going much higher causes more stress on the properties and all parts in the air system, and make your compressor run more often. Even at lower pressures, air cylinders can still move very fast and deliver quite a lot push, so always be very careful around pneumatics.

#### 3.2 Mountings

There are about as many ways to mount an air cylinder as there are different types of air cylinders. Again, this is because of all the uses. My personal favorite is the clevis mount Clevis mounts give the greatest amount of movement, flexibility, and ease of mounting over other mounts.

#### 3.2 Springs

Spring is a device made of an elastic material that undergoes a significant change in shape, or deformation, under an applied load. Springs are used in spring balances for weighing and for the storage of mechanical energy, as in watch and clock springs or door-closing springs. Springs are also used to absorb impact, as in coil or leaf springs used for automobile suspensions, and to reduce vibration by the use of rubber blocks.

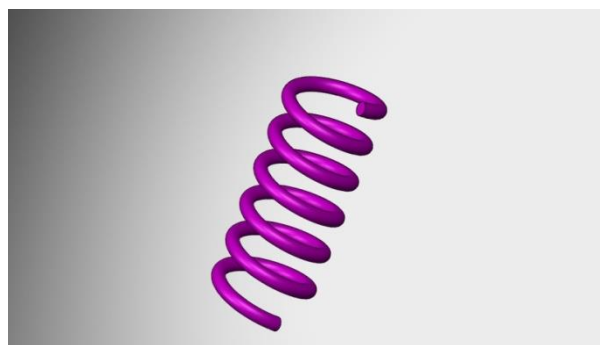


Figure 1: Spring

#### 3.3 Return Springs

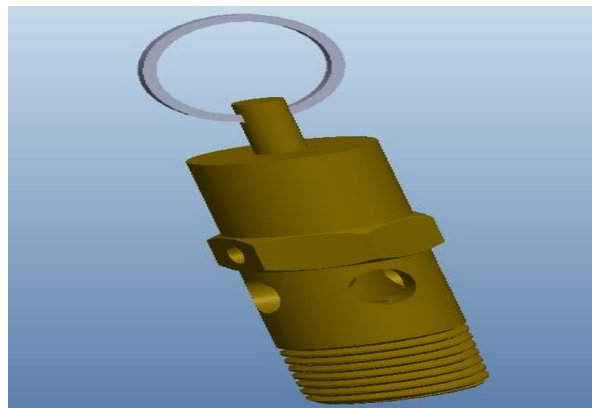
A spring is a flexible elastic object used to store mechanical energy. Springs are usually made out of hardened steel. A spring is a mechanical device, which is typically used to store energy and subsequently release it, to absorb shock, or to maintain a force between contacting surfaces. They are made of an elastic material formed into the shape of a helix which returns to its natural length when unloaded this is called return spring. Springs are placed between the road wheels and the vehicle body. On releasing, due to the elasticity of the spring, material, it rebounds thereby expanding the stored energy. In this way, the spring starts vibrating, with amplitude decreasing gradually on internal friction of the spring material and friction of the suspension joints till vibrations die down.

### 3.4 Safety Valve

A safety valve is a valve mechanism for the automatic release of a substance from a boiler, pressure vessel, or another system when the pressure or temperature exceeds preset limits. It is part of a bigger set named pressure safety valves (PSV) or pressure relief valves (PRV). The other parts of the set are named relief valves, safety relief valves, pilot operated safety relief valves, low-pressure safety valves, vacuum pressure safety valves. Safety valves were first used on steam boilers during the industrial revolution. Early boilers without them were prone to accidental explosion.

### 3.5 Function and design

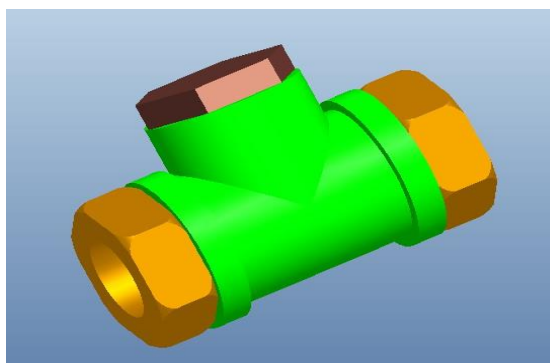
The earliest and simplest safety valve on the steam digester in 1679 used a weight to hold the pressure of the steam, (this design is still commonly used on pressure cookers); however, these were easily tampered with or accidentally released. On the Stockton and Darlington Railway, the safety valve tended to go off when the engine hit a bump in the track. A valveless sensitive to sudden accelerations used a spring to contain the steam pressure, but these could still be screwed down to increase the pressure beyond design limits. This dangerous practice was sometimes used to marginally increase the performance of a steam engine. In 1856 John Rams bottom invented a tamper-proof spring safety valve which became universal on railways.



**Figure 2: Safety valve**

### 3.6 Non-Return Valve

A check valve, clack valve, non-return valve or one-way valve is a mechanical device, a valve, which normally allows fluid (liquid or gas) to flow through it in only one direction. Check valves are two-port valves, meaning they have two openings in the body, one for fluid to enter and the other for fluid to leave. There are various types of check valves used in a wide variety of applications. Check valves are often part of common household items. Although they are available in a wide range of sizes and costs, check valves generally are very small, simple, and/or cheap. Check valves work automatically and most are not controlled by a person or any external control; accordingly, most do not have any valve handle or stem. The bodies (external shells) of most check valves are made of plastic or metal.



**Figure 3: Non-return valve**

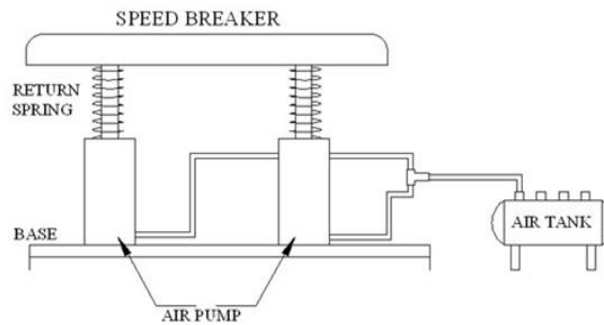
## IV. WORKING PRINCIPLE

The main components in this project are Air pumps, Return spring, Tank (air storage), speed breaker, safety valve and non-return valve. The air pump arrangements are fixed at the bottom of the speed brake arrangement with two return springs. The speed brake arrangement is mounted on the frame. If any vehicle crosses over the setup the air pump start to pump the air it moves upward and downward simultaneously. Due to this motion, compressed air is produced. Then the compressed air is stored in the tank. Non-return valves are used to direct the air to the tank and not return to the air pump. It works on the principle of the reciprocating air compressor in which compressor compresses the air by reducing the volume of air that has been isolated. Here, first, the important

point is how we get reciprocating motion, which is prime input in the system for that we use the weight of moving vehicles that run on roads. These machine unit kept underground of road exactly below speed breaker, the head of piston rod is brought up to the level of the road surface. Now during the dome-shaped part press stroke, the piston is coming towards or away direction pressing the already admitted air to be compressed. Thus the pressure or air increases due to compaction of air in the restricted air i.e. more amount of air packed in the low volume area caused by the sweeping of the piston inside the cylinder. The principle parts of kinetically operated reciprocating air compressor are same as that for the I.C. Engine. Inlet and delivery valves Automatic in their operation being spring loaded. They are operated and closed due to the difference of pressure created on either side and a spring provided to close the valve at its seat

**4.1 Construction Details**

The following elements used for the construction of “Air compressor with aid of speed Braker” model specifications of the equipment as per requirement amount of air can be produced by the air pump. The welding can be used to fabricating the device is shielded by the metal arc welding by using the flux coated electrode, Another part welded on the bottom part of the mild steel and in the middle part of the plate, The weld can be supported by adjusted by the Reciprocating air compressor.



**Figure 4: Air compressor with aid of speed Braker**

**Table-2: COMPONENTS SPECIFICATIONS**

SR.NO	COMPONENTS	RANGE	MATERIAL
1	Cylinder	¾ to 1-1/2	Cast iron
2	Receiver tank	6 bar	EN8
3	Spring	4x20x140 mm in length	Spring steel
4	Pressure gauge	10 mbar down to 10 <sup>-1</sup> 11mbar	Steel
5	Air compressor	6 to 15 bar	Cast iron
6	Flexible pipes	Inner dia 10 mm	Pvc, Rubber

**4.2 Advantages**

In this mechanism, no pollution is created. In power plants there is fossil fuel is used i.e. coal, diesel, gas, etc. but in this mechanism, no fuel is used. Less maintenance is required for this system. The main advantage of this mechanism is there are no any rotational parts like crank shaft mechanism and rack and pinion mechanism also no gear is required. So, it requires less maintenance. The operation is very easy and simple to understand so less operating staff is required. There is also no need for 24-hour observation. Here we can also use adjustable speed bumps so it can easily move and transport to any location, so that site selection problem is not so much important. Running cost is free because there is no fuel is used, and also less installation cost is required, less maintenance cost, so all over cost is less. Energy available all year around.

**4.3 Applications**

Applicable in all speed breakers on the road and traffic rush areas. To provide the electricity in villages near to highway. To provide the electricity to Street lights, Toll booths, and Traffic signals. As a charging station of an electric vehicle.

**CONCLUSION**

The project carried out by us made an impressing task in the field of electricity department. It is used for to produce the current by the air turbines with speed brake arrangements. This project has compensated the power demand in daily uses. The project has been designed to perform the entire requirement task which has also been provided. This paper describes the generation of electricity from speed breakers, the kinetic and potential energy. The power generated is not constant but it is a small step to produce energy from speed breaker it is not just alternative but effective use of wasted energy. From the observations as compression is increased high power can be generated. It is a small level power generation but if it is used in a proper way then we can generate a larger amount of power. Now it’s time to put for these types of innovative ideas and researchers should have been done to upgrade their

implication. The growth of any nation depends on utilization of energy and this paper helps for that. It is successfully produced electricity and compressed air by using speed breaker. This electricity can store in battery in the day time and we can use it in the night time for highway illumination, signal system on the road, tollbooth or any other useful work. And compressed air can use for cleaning purpose in tollbooth and refilling of air in tires. This paper helps for the conservation of natural resources.

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