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Design and Fabrication of Pedestal Air Compressor

Mr.S.Sanyasi Rao
Assistant Professor,
Department of Mechanical Engineering,
VITS College of Engineering,
Anandapuram, Sontyam, Visakhapatnam.

Mr.G.S.Appala Naidu
Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Anandapuram, Sontyam, Visakhapatnam.

Mr.Vincent Thomas
Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Anandapuram, Sontyam, Visakhapatnam.

Mr.V.Amaresh
Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Anandapuram, Sontyam, Visakhapatnam.

Abstract:

The objective of this project is to design, fabricate and experimentally investigate the working of Pedestal Air Compressor (PAC) which can be used by connecting the air compressor shaft to the thread mills, health cycles etc. in the health care centres and also in large as well as small scale industries by placing thread mills and cycles for the workers and staff to help them to burn up their calories and so as to develop a health conscious in them and also helps in producing compressed air by establishing this method of production.

In this PAC a two stroke air compressor is being operated by pedaling an ordinary bicycle which is basically used for physical exercises, the bicycle's small sprocket is connected to the compressor shaft in a manner so that the rotary motion is therefore converted into reciprocating motion and which leads to the production of compressed air with a lower pressure and stored in a compressed air cylinder with the help of a NRV without using any electrical source.

Keywords:

Air Compressor; Compressed Air Cylinder; Non Return Valve (NRV); Small Sprocket; Cycle; Thread mill; Health; Calories; Pollution free and Economical.

INTRODUCTION:

Compressors are work absorbing devices which reused for increasing pressure of fluid at the expense or work done on fluid. The compressors used for compressing air are called air compressors. Compressors are in variably used for all applications requiring high pressure air.Some of popular applications of compressor are, for driving pneumatic tools and air operated equipments, spray painting, compressed air engine, supercharging surface cleaning, refrigeration and air conditioning, chemical industry etc. compressors are supplied with low pressure air (or any fluid) at inlet which comes out as high pressure air (or any fluid) at outlet. Work required for increasing pressure of air is available from the prime mover driving the compressor.

Generally, electric motor, internal combustion engine or steam engine, turbine etc. are used as prime movers. Compressors are similar to fans and blower sbut differ in terms of pressure ratios. Fanis said to have pressure ratio up to 1.1 and blowers have pressure ratio between 1.1 to 4 while compressors have pressure ratios more than 4.

The experimental investigation was executed and performance of the PAC was carried out at different rpm. The results indicate that the PAC had given a considerable amount of pressure. The air pressure used in the present study is 5bar which is obtained by the compressor. PAC is pollution free and very economical too. The design and experimental test result presented here can be used for further research and modification of the technique.

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1.PEDALLING BICYCLE:

A cycle or cycle rickshaw is a small-scale local means of transport. Cycle rickshaws are human-powered, a type of tricycle designed to carry passengers in addition to the driver. Tricycles are used primarily for commercial transportation. Various locally made configurations of bicycle or tricycle are available. The present form of cycle has many shortcomings. One of the major problems faced by available bicycle or tricycle is its less efficiency or mechanical advantage. This paper reviews patent (which are now open for public access) and experimental work brought by researchers on drive mechanism of cycle in order to optimize its operating performance. An individual idea or any possible combination of different ideas can be used for optimizing performance of driving mechanism for cycle.

Fig.1: Existing Bicycle

A cycle is widely used local means of transport. One of the forms of cycle is tricycle, also known as cycle rickshaw. Most cycle rickshaws used to carry passengers for hire. These vehicles are widely used in South Asia and Southeast Asia, where rickshaw driving provides essential employment for recent immigrants from rural areas, generally impoverished men. Various locally made configurations of cycle are used across world. In an eco-sensitive zone where motor vehicles are banned, man-pulled cycles are still one of the major forms of transport there.

Fig.2: Designed Stand For PAC

WORKING

2.CHAINDRIVE

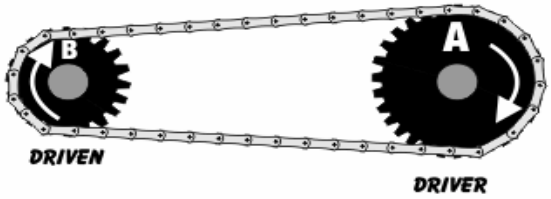

Fig.3:Simple chain drive mechanism

M.A. = V.R.=NB/NA

Where,

M.A. = Mechanical Advantage.

V.R. = Velocity Ratio.

NA, NB = Number of rotation of sprocket wheel A and B respectively.

So, if we able to increase V.R. we will get more M.A.

i.e. more efficient drive.

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3.1 COMPRESSED AIR ENERGY STORAGE:

A way to store energy generated at one time for use at another time using compressed air. At utility scale, energy generated during periods of low energy demand (off-peak) can be released to meet higher demand (peak load) periods.[1] Small scale systems have long been used in such applications as propulsion of mine locomotives. Large scale applications must conserve the heat energy associated with compressing air; dissipating heat lowers the energy efficiency of the storage system. Absolutely essential to any compressed air system, air receiver tanks not only serve as temporary storage, but they also allow your system to perform more efficiently. Because of the immense pressure they contain and because of their importance to an air compressor system, air receiver tanks must be built to be exceptionally durable and strong. To be sure that your air tanks will last you many years to come and will be able to handle the pressures of everyday use, it is absolutely essential to purchase from reputable dealers and brands.

Fig.4: Storage Tank

3.2 AIR RECEIVERS

Compressed Air Systems can help you with air tanks. As an authorized Kaeser and Powerex dealer, we offer some of the highest-quality, epoxy coated tanks on the market today. Choose from both new and used models to get the quality you deserve while still staying within your budget. Ranging in volume from 30 to 8,000 gallons, we have air receiver tanks to suit any need. Plus, if you're not sure which size is right for you, the systems specialists at Compressed Air Systems can advise you and help you figure out which air receiver tanks fit your requirement.

PRIMARY AIR RECEIVERS

Primary Air Receivers The basic purpose of an air receiver is to store a volume of compressed air for use when needed. The most common example is a small, aircooled, piston type compressor, mounted on a tank or air receiver. The compressor operates on a start/stop control system, usually controlled by a pressure switch having a fixed differential. Because of automotive applications, the pressure at which the compressor is stopped normally is 175 psig. The compressor is restarted when the use of the compressed air causes the pressure to fall to about 145 psig (a differential of 30 psi). On larger compressor sizes, the compressor may be loaded and unloaded in a range of 145-160 psig but continues to run.Pneumatic tools normally are designed for operation at 90 psig, so energy is being expended to compress the air well beyond what is needed.

SECONDARY AIR RECEIVERS

In many industrial plants, there will be one or more applications with an intermittent demand of relatively high volume. This can cause severe dynamic pressure fluctuations in the whole system, with some essential points-of-use being starved, impacting the quality of the end product. Usually, this can be relieved by the correct sizing and location of a secondary air receiver close to the point of high intermittent demand. Such demand often is of short duration and the time between the demand events is such that there is ample time to replenish the secondary receiver pressure without adding compressor capacity.

A check valve before the secondary air receiver will prevent back flow to the rest of the system and ensure that the required volume is stored to meet the anticipated event(s). They should meet ASME unfired pressure vessel requirements and have appropriate pressure relief valves. An automatic drain device, with manual bypass for service, also should be included.

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Condensate removed should be decontaminated to meet appropriate Federal, State and Local Codes.

3.3 TYPE OF STORAGE

The storage system of a CAES (Compressed Air Energy Storage) is one of the most interesting characteristics of this technology, and it is strictly related to its economic feasibility, energy density and flexibility. There are a few categories of air storage vessels, based on the thermodynamic conditions of the storage, and on the technology chosen:

1. Constant Volume Storage (Solution mined caverns, aboveground vessels, aquifers, automotive applications, etc.)
2. ,Constant Pressure Storage (Underwater pressure vessels, Hybrid Pumped Hydro - Compressed Air Storage)

NON RETURN VALVE (NRV)

Fig.5: NRV

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, or inexpensive. 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.

PRESSURE GAUGE

Fig.6: PRESSURE GAUGE

Many techniques have been developed for the measurement of pressure and vacuum. Instruments used to measure pressure are called pressure gauges or vacuum gauges. A manometer is an instrument that uses a column of liquid to measure pressure, although the term is currently often used to mean any pressure measuring instrument.

FABRICATION
RECIPROCATING COMPRESSOR

Reciprocating Compressor has piston, cylinder, inletvalve, exitvalve, connecting rod, crank, piston pin, crank pin and crank shaft. Inlet valve and exit valves may be of spring loaded type which get opened and closed due to pressure differential across them. Let us consider piston to be at top dead centre (TDC) and move towards bottom dead centre (BDC).Due to thispistonmovementfromTDCtoBDCsuctionpressureis createdcausingopeningofinlet valve. With this opening of inlet valve and suction pressure the atmospheric air enters the cylinder.

Fig.7: Air Compressor Setup

APPLICATIONS:

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1. For paint spraying.
2. For driving mining tools
3. To operate air brakes in automobiles
4. To operate pneumatic conveyors
5. To super charge I.C Engines
6. To inflate automobile tyres
7. To transmit power for operation of machines
8. To clean machines and automobile vehicles
9. To clean work shop floor
10. To convey materials like concrete and sand along a pipe line
11. To drive compressed air engines used in coal mines
12. To inject fuel into cylinders of the diesel engines
13. To operate pneumatic tools like drills, hammers and rivet sets

SPRAY PAINTING

4.1 SPRAY GUN

Spray painting is a **painting** technique where a device sprays a coating (paint, ink, varnish, etc.through the air onto a surface. The most common types employ compressed gas—usually **air**—to atomize and direct the paint particles. Spray guns evolved from **airbrushes**, and the two are usually distinguished by their size and the size of the spray pattern they produce. Airbrushes are hand-held and used instead of a brush for detailed work such as photo retouching, painting nails or fine art. Air gun spraying uses equipment that is generally larger. It is typically used for covering large surfaces with an even coating of liquid. Spray guns can be either automated or hand-held and have interchangeable heads to allow for different spray.

Fig.8:Spray Gun

4.2 TYPES OF SPRAY GUN

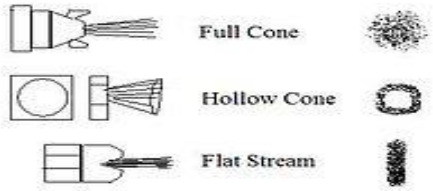

Fig.9:Types of nozzles and sprays

4.2.1 Air gun spraying
4.2.2 HVLP (High Volume Low Pressure)
4.2.3 LVLP (Low Volume Low Pressure)
4 .2.4 Electrostatic spray painting
4.2.5 **Airless spray guns**
4.2.6 Automated linear spray systems
4.2.7 Automated flat line spray systems

ADVANTAGES

1. Easily Transported
2. Easily Stored
3. Clean And Dry
4. Lightweight
5. Safe to use
6. Rational and Economical
7. Temperature is Flexible
8. Fast work Medium

CONCLUSION& FUTURE SCOPE

Fig.10: Designed and fabrication of PAC

1. solar unit is used to run the compressor which is benefit for old persons in tribal areas
2. Air compressor is used to run by man power without any external power source

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3. it is used to create awareness among the public about unusual energy which is being wasting.

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