The Advantages of Pneumatic System over hydraulic system: Review

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ABSTRACT: ***After surviving several successful firms, they have learned about the key of an efficient production. The response was a mix of a few aspects which may be taken into account, i.e. cheap machining cost, high quality product, material availability, environment-friendly, low cost, economically efficient etc. Therefore, owing to its many advantages, pneumatic system satisfies all the requirements for leads in technological progress. In addition, the world of the future approaches sustainable technology. This document will examine a bibliographic research on why the pneumatic system is used frequently in a variety of applications worldwide. This article will also reveal the mystery why corporations invest significant quantities of money in pneumatics and do not use so much other technologies. This article also discusses some prospective pneumatic system applications that are to be employed and are being investigated.***

KEYWORDS: Artificial Muscle, Double Acting Cylinder, Expansion, Pneumatic System, Single Acting Cylinder.

1. INTRODUCTION

1.1 Pneumatic System:

Pneumatic System transforms inert or compressed air into mechanical energy for any operation (Figure 1). Air compressor delivers the pressure to the system which supplies high-pressure air for storage in the atmospheric reservoir[1]. This stored high-pressure air will be supplied through pipes and various valves to the system as required. Pneumatic systems are extensively utilised for a broad variety of industries, such as automation for air brakes, drilling machinery building sites, clamping machine workshops, and other applications[2].

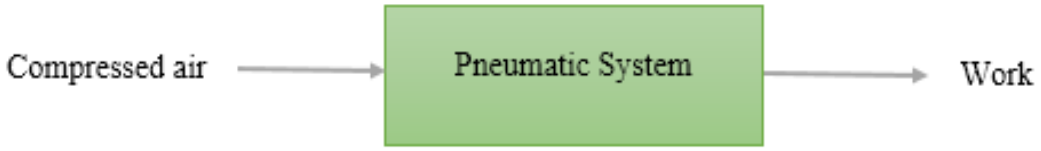

Figure 1: Schematic diagram of Pneumatic system

1.2 Base components in the pneumatic system:

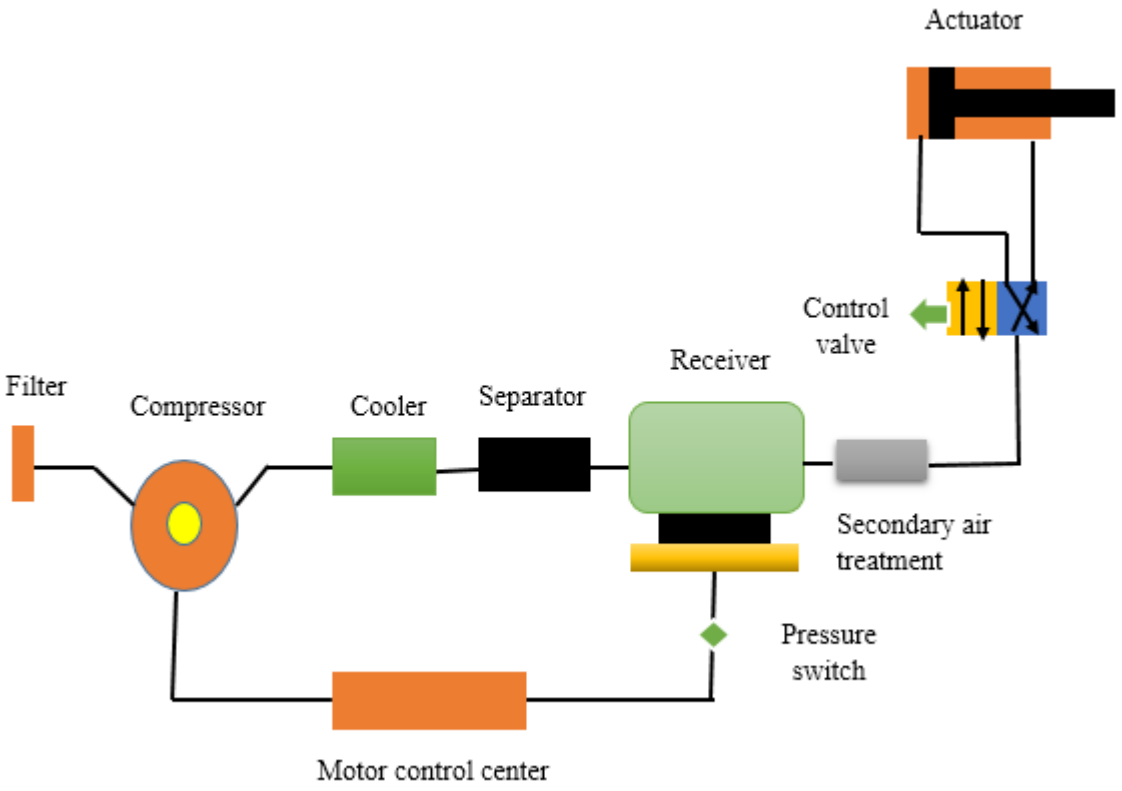

Figure 2: Basic components of Pneumatic system

1.2.1 Compressor: It supports the delivery to the outside surrounding tank of high pressure air. It comprises of an air suction pump, a pump and tank drive motor to store air suction (Figure 2)[3].

1.2.2 Actuating: Comprises, when the pressure is different from the cylinder, of piston rod and cylinder which creates outside force. There are various types of pneumatic actuators including diaphragm cylinders, cylinders less rods, telescopic cylinders and rod cylinders[4].

1.2.3 Filter: Before entering the compressor it helps to filter all the dust and undesirable particles in the ambient air[5].

1.2.4 Colds and separators: The heat from the compressed air is removed and transferred from the compressing air to a separator to remove the water impurities present in the air and send them to the receivers[6]. Colds and separators*:*

1.2.5 Receiver: All air in a different mechanism is stored in it. The pressurize air at the appropriate pressure to control the valve through a pipe is held by a pressure gauge linked to the receiver[7].

1.2.6 Valve control: It helps regulate and maintain air direction and pressure. 1.2.6 Valve control.

1.3 Types of Pneumatic system:

Single acting and double acting cylinder are the most popular actuators:

1.3.1 *Single acting cylinder:* The thrust force is provided solely in one direction with this sort of cylinder[8]. The piston is equipped with a spring to return or the external piston to reverse (Figure 3). They are generally employed when an object is clamped, marked, or assembled[9].

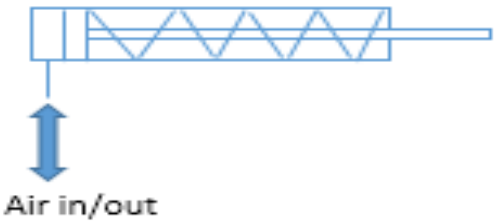

Figure 3: Symbol used for single acting cylinder

1.3.1.1 Advantages of Single acting cylinder:

a. Their design is simpler.
b. The compactness in size is greater.
c. The valves and pipelines must be utilized with less no.
d. Cheaper
e. Less air intake.
f. It's made up of only one port.
g. Small housing is also available

1.3. 1.2 Single acting cylinder disadvantages:

a. The spring utilized to return the rod of the piston, may allow the entry into a system of undesirable particles that diminish cylinder life.
b. Boron and stroke is restricted in size.
c. At the moment of the outstroke there will be a decrease in thrust.
d. (d) The spring employed there shall take up a big area and leave for the piston in a cylinder a modest working surface[10].

1.3.1.3 Application of single acting cylinder:

It is widely used in various applications such as: -

a) Clamping
b) Hydraulic rams
c) Pumps in reciprocating engines
d) Punching applications
e) Positioning applications
f)

1.3.2 Double acting cylinder: It is different from single acting cylinder as it does not have spring for returning the piston rod rather it needs 2-air supplies for outstroke and in stroke to form thrust force (Figure 4).

Figure 4: Symbol used for double acting cylinder

1.3.2.1 Advantages of Double acting cylinder:

a) They are generally designed on ISO standards.
b) It can be widely used for different sizes of bores and strokes.

c) They are widely used in various applications.
d) They are more fast and strong than single acting cylinder.

1.3.2.2 Double acting cylinder disadvantages:

a. Cannot retain the cylinder in the intermediate position.
b. More expensive than a single acting cylinder.
c. More housing is needed.
d. The piston rod is a long stroke cylinder that requires guiding.

1.3.2.3 Application of the Double acting cylinder

It is widely used in various applications such as: -

a) Wide ranges engine
b) Industrial furnace
c) Digging machine
d) Lift shaft.

LITERATURE REVIEW

H. sick et al carried out study and produced a research article enabling us to investigate the technology utilized in the field of pneumatic system, automation and robots. The research paper "a review pneumatic bumper for wheeler two cylinder[11].

S. G. T. Studies mentioned arguments and purposes for selecting pneumatic systems in several sectors in his study "Pneumatic Systems.The authors in their web article titled "5 application of pneumatic system," discusses various application of pneumatic system widely in industries.The authors describe the rod-related information about a smaller cylinder which has no piston but nevertheless works mechanically on their webpage "The Basic Components Of A Pneumatic System[12].

Papoutsidakis et al. carried out a study on the pneumatics System, which has a long history of proving the use of pneumatic systems, in which they investigated pneumatics systems that are continuously expanding with creative ideas necessary[13]. In the online paper entitled 'Pneumatic Basics and Pneumatic Systems, 'Satyendra' speaks about the usage of pneumatically applied compressed air, which may readily be delivered over long-distance pipes In their Web page entitled "Benefits and Benefits of pneumatic systems," the authors reveal that pneumatic systems are simple in design, however sensitive to rapid and severe changesIn its webpage "Know your pneumatics: single or dual action," the authors? While you choose the right cylinder" spring said it might let undesired particles into the system that reduce cylinder life when returning the piston rod in a single action cylinder C. Mano discusses about the pneumatic system applications that will be utilized in artificial muscles and fluvial logic in his web-article 'Principles of Pneumatic Systems.In its thesis entitled '99 Pneumatic Application Examples,' S. Hesse. The key of an efficient production was led by a number of successful companies the authors discuss about several applications of the single-playing cylinder and the dual-playing cylinder in their online paper "What are the differences?"

3. DISCUSSION

When several successful firms performed a surf, they knew the key of effective manufacturing. The solution to the question was to combine the few aspects examined, such as cheap processing costs, good quality products, material availability, eco-friendly products, low cost of labour, cost efficient products etc. All of this may be done by means of automated equipment and processes. Industrial pneumatics play an important role in expanding production efficiency. Due to the many advantages stated above, Pneumatic system satisfies all requirements for technologically conducive expansion at a highly cheap rate. In our everyday lives, certain instances are employed of the pneumatic system. Take several precautions while pneumatically utilising compressed air and prevent direct skin contact since it will cause injury as the skin is harmful. Although there has to be a few drawbacks, it remains a technology that will never die.

Pneumatic systems have a long history that demonstrates the continual growth of the applications of pneumatic systems with creative concepts. Beginning with the earliest air compressor development in around 3000 B.C.

Then in 1600 the German scientist further contributed to the pneumatic science in inventing the vacuum cleaner by transferring it from generating power in the pneo system. The pneumatic system is widely utilised in several ways, from the production of pneumatic trains to letters. To reduce workforce in industry and to automatically make machines and equipment. The pneumatic system is now entering the level in the production of the control unit.

In the future, the applications of the pulmonary system are artificial muscles and fluid logic. The creation of "artificial muscle" by the physicist McKibben has particularly been created for people with polio. These artificial muscles are far superior than previously utilised artificial legs and robotic legs. Artificial muscles operate in a manner similar to those of humans, contracts when the tube expands and elongates when it flats. The technology is being utilised to power robotic arms and robotic legs. The current issue of the research centre "pneumatic logic" is the replacement of electronic circuits with pneumatic or hydraulic system, since the main benefit of utilising these systems is that sunlight does not impede them. The NASA scientific scientist is currently using this technique to regulate the separation of the rocket - stage.

4. CONCLUSION

According to the comprehensive pneumatic system research, which delivers an affordable high pressure. Various pneumatic system components that work together to create high pressure are mentioned above. In addition, pneumatic technology is increasing, but in the pneumatic power system, heat generation remains a significant challenge. Fluid is used by the pneumatic system to transmit energy without any mechanical or electronic equipment from one point to another. With these brief papers, the secrecy behind it is concluded why corporations invest huge volumes of money in pneumatics and do not utilise other technologies as much as they do is because the atmosphere is infinite in the air and will never be completed like other natural resources. The focus is on employing sustainable technologies in the current or the coming times. Although the pneumatic system has several disadvantages, such as it can be used only on simple control devices, with low torque and low work speeds, the advantages that it provides are far greater in comparison with those that are easy to install and maintain, simple design, cheaper and more expensive. In the future, the applications of the pulmonary system are artificial muscles and fluid logic.

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