

Mini Compressor

Jonny Carmona Reyes¹, Ernesto Mendoza Vázquez², Moises Sánchez Moredia³, Jonatan Montiel Gomes⁴

¹Technological University of Tlaxcala

²Engineering Industrial Maintenance

³Carr. El Carmen Xalpatlahuaya S/N C.P 90513 Huamantla, Tlaxcala

ABSTRACT.- Compressor is a fluid machine that is built to increase pressure and displace different types of fluids called compressibles, such as gases and vapors. This is done through an exchange of energy between the machine and the fluid. The mechanism of the current mini compressors is based on a rod coupled to a series of gears driven by a motor. The size of the compressor was reduced to innovate the technology, improving the mechanism of the compressor to facilitate its transport in the industry. Two stems were placed in the compressor instead of one, also to improve the compression also non-return valves were adapted to it; to retain the pressure it generates. A digital pressure sensor was added to improve compression. The energy consumption generated by the compressor improved with the lengthening of the arm of the stems, a motor of greater speed and smaller size was added to the compressor, to reduce the weight that was had in the compressor. A base was added to the bearings to reduce the wear caused by the arrow attached to the compression rods.

1. INTRODUCTION

The compressors were created during the seventeenth century, by German physical engineer Otto von Guericke who experimented and improved atmospheric compressors. In 1650, Guericke invented the first oxygen pump, which could produce a partial vacuum and he himself used this to study the phenomenon of vacuum and the role of oxygen in combustion and respiration [1] A mini compressor was built at the Technological University of Tlaxcala to facilitate pneumatic work; They add different pneumatic features to it to make it easier to work. The mini compressor has the purpose of carrying out the various investigations carried out on pneumatic systems, resulting in a practical and economical project available to those who have the need to acquire a pneumatic mechanism. This reduces costs compared to other equipment.

1.1 Mini Compressor

¿What is an air compressor?

An air compressor is a machine designed to take the ambient air or gas, depending on the use you want to give it, store it and compress it inside a tank called boiler and

with the air give power to other pneumatic tools, or perform multiple tasks such as inflating tires of cars and bicycles, cleaning or even spraying paint, operation of robotic mini arms and mechanisms with compressed air.[1]

1.2 Components

The compressor that is the fundamental part in the operation of the mini air compressor, because it is the cylinder with piston driven by a 12v electric motor (Figure 1) that allows it to take the ambient air and compress it for a certain use. [2]



Fig-1 Engine

1.2.0 Air tank

The deposit tank, also called a boiler, is a container where compressed air is stored for use, in multiple tasks such as inflating car and bicycle tires, cleaning or even spraying paint. The material of the tank is stainless steel. (Figure 2) [2]



Fig-2 Tank is stainless steel

1.2.1 Engine

The direct current motor, also called, DC motor is a machine that combines electrical energy in mechanics, causing a rotational movement, thanks to the action of a magnetic field. [3]

1.2.2 Steel tank

Stainless steel tanks are containers that are manufactured in this material because of their resistance to corrosion and because they guarantee safety in food, pharmaceutical and other processes that require it. Its main function is the storage of liquids. They are used in the elaboration of alcoholic beverages, dairy products, juices and nectars, medicines and other chemical products.[3]

1.2.3 Piston

A piston is a part that of the operating mechanism of an engine. Also known as a plunger, it is an element that moves alternately inside a cylinder to interact with a fluid.

Bearing is the denomination of a piece that, in some countries, is known as filming, roller, bearing, bolillero or spinman. Bearing: is an element that serves as support for an axis and on which it rotates.[4]

1.2.4 Fitting a fitting

(French raccord) is a metal part with or without internal threads in the reverse direction, which serves to join pipes, hoses, connections.[4]

1.2.5 Ball valve

A ball valve or ball valve is a stopcock mechanism used to regulate the flow of a channeled fluid and is characterized in that the regulating mechanism located inside is in the form of a perforated ball.[5]

1.2.6 Transmission belt

It is known as a transmission belt a type of mechanical transmission based on the union of two or more wheels, subject to a rotation movement, by means of a continuous belt or belt, which hugs the wheels exerting force of friction supplying them with energy from the driving wheel.[5]

1.2.7 Arduino

Arduino is a free hardware platform, based on a board with a microcontroller and a development environment (software), designed to facilitate the use of electronics in multidisciplinary projects.[6]

1.2.8 Pneumatic hose

A pneumatic hose connects the airbrush to the compressor and interposes an air regulator between them. The recommended pressure has to be 3 bars and a filter to remove water, oil residue and particles. They can be used in the cleaning process with a pneumatic gun.[7]

1.2.9 Pressure sensor

A pressure sensor is a device capable of measuring the pressure of gases or liquids. In this context, pressure is an expression of the force needed to prevent the expansion of a fluid. (Figure 3)



Fig-3 Pressure sensor

1.3 3D pieces

1.3.1 3D design

The compressor was designed in the solidwork program making the parts that make up the compressor mechanism, likewise the tank and the base of the engine and the stems. (Figure 4)

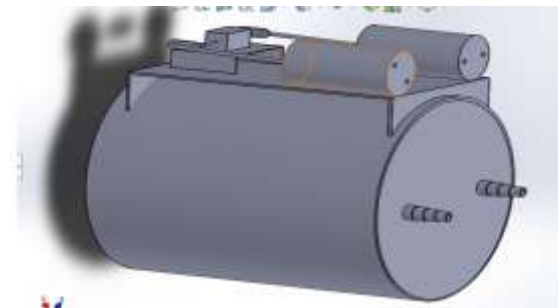


Fig-4 3D design

1.3.2 3D stem design

Two cylinders of one inch diameter were designed, with covers welded to one end of the cylinder with machined holes for a quarter inch outlet, for outlet connections to the non-return valves.

1.3.3 Basic design for the 3D mechanism

A base for the compression mechanism was designed to facilitate its assembly by placing two angles with a hole by placing two bearings and an arrow with a pulley for its stem mechanism. (Figure 5)



Fig-5 3D stem design

1.3.4 3D Compressor tank design

The design was carried out by taking the measurements of the engine pistons, arduino and rods, to give each one an adequate working distance. Two supports were placed to prevent movement when executing their work. (Figure 6)

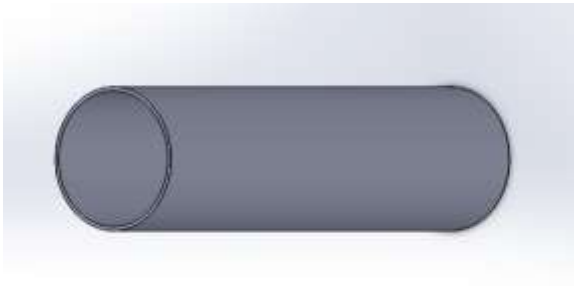


Fig-6 3D Compressor tank design

1.3.5 Design of pulleys in 3D

The pulleys were designed taking into account the height between the engine and the base of the mechanism, giving adequate space for movement with the band of the mechanism, the center of the pulley was made with the measure of the motor arrow for better alignment. (Figure 7)



Fig-7 Design of pulleys in 3D

1.3.6 Arduino

Arduino is the name given to one of the world's most widely used free hardware (with its software) for basic and elementary configuration of an electronic object. Arduino started out as an electronic platform consisting of a board with two ports, one input and one output. (Figure 8)

Source: BricoGeek.com



Fig-8 Partes de la mano

2. RESULTS

Its expansion of the tank was obtained from the mini compressor, improving its mechanism by obtaining a better storage of compressed air, which allows to execute all the practical and theoretical knowledge acquired at the Universidad Tecnológica de Tlaxcala. The mini compressor has great working capacities, its power is effective to be used today, the mini compressor meets the ease of handling, by design it can perform household chores and pneumatic processes in industries.

3. CONCLUSION

The behavior of the compressors at the moment was analyzed, to make a mini compressor, improving its mechanism and reducing its size. To be able to recognize its main functions and components by comparing the different ones.

REFERENCES

1. Abella, M. B. (1998). Mantenimiento Industrial. .
2. Aguerra, J. (. (1996). Mecánica de fluido incompresibles y turbo máquinas hidráulicas.
3. Arnal, D. D. (1898). Purgadores de condensado en sistema de vapor. .
4. Chambadal. (P. (1973)). Los Compresores.
5. Francois, M. ((1990)). Teoría y práctica el mantenimiento industrial.
6. González., A. P. (s.f.). Transmisión por correa. .
7. Kasos, A. (1998.). Gestión del mantenimiento industrial. Madrid: Fundación Repsol.

BIOGRAPHIES

Jonny Carmona graduated from the Technological Institute of Apizaco in 2010 with a bachelor's degree in Electronic Engineering, specialty in automation and instrumentation. He worked as an electronic engineer in MIF company, developing electronic projects for the steel industry



Ernesto Mendoza Vázquez degree in electronics by the benemerita autonoma universidad de puebla, master in engineering and mechanical technology by the research center in engineering and applied sciences (ciicap), with national and international publications, participation in congresses



Moisés Sánchez Moredia earned a Bachelor of Arts in Applied Modern Languages, specialized in English as a second language teaching by Universidad Autónoma de Tlaxcala. He holds a Master's Degree in School Administration and Management by Universidad Internacional de la Rioja (UNIR). From 2016 to 2018,



Jonatan Montiel Gomes, graduated in 2018 as a college higher technical station in the maintenance career of industrial area, at the Technological University of Tlaxcala. The Engineering Career in Industrial Maintenance is currently being studied.