

**LEAKAGE TESTING & AIR FILLING MACHINE**

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**ABSTRACT**

As title suggests it is Leakage Testing & Air Filling Machine. This machine is manufactured as per the customer's requirement and specific testing need. As the component is some form of a casting tube like structure which is leak tested. For this specific purpose and requirement of Leak Testing Machine the industry will train us in terms of design and manufacturing of whole machine. Testing method was the most important consideration. For which Testing method is selected according to the applications of component. According to the first meeting with the customer the specified their component details that the component is an aluminum casting and should be leak tested. As it is a casting component not a machined component, if a crack is detected on a casting component then it is of no use as casted component cannot be welded or machined to fill the crack. For this purpose, dry leak test method is appropriate. As customer just needs to notify that the component has a crack. He is not interested where the crack is. So, dry testing method is appropriate. When company needs to detect the location of the leakage of the component then we used the wet leakage testing method. We just want to inform you whether we have made a project by including both of this & this name is air filling & leakage testing machine. For that we introduce I refrigerator compressor as normal compressor to compress air without having a storage tank and normally using all air filling machine accessories like pressure gauge, air gun for fill air, specific wire connections & a project carrier.

**I. INTRODUCTION**

The testing machines differ considerably in procedure, purpose, nature and even terminology in different branches of machine building. Tests are made in factories and while the machines is in operation. The purpose of the trial determines whether acceptance tests, check tests or research tests a re made. All branches of machine building test models or full-scale machines of new designs and random samples from assembly lines; they also test machines to continue research. Air/ gas filling machine has big role in our day to day waking life. From filling air in cycle tube to use compressed air in industrial application it is used. Initially when air filling machine was introduced, that machines unable to store extra compressed air so that we can use it for future aspects. But slowly technology goes ahead one step air compressor introduces so that we can fill & store air at one time. It saves our waiting time, electricity & human efforts also than using manual air filling machine. A gas compressor is a mechanical device that increases the pressure of a gas by reducing its volume. An air compressor is a specific type of gas compressor.

**II. NEEDS**

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For specific applications, efficiencies of both living and non-living beings depend to a great extent on the physical environment. The nature keeps conditions in the physical environment in the dynamic state ranging from one extreme to the other. Temperature, humidity, pressure and air motion are some of the important environment variables that at any location keep changing throughout the year.

Adaptation to these many a times unpredictable variations are not possible and thus working efficiently is not feasible either for the living beings or the non-living ones. Thus for any specific purpose, control of the environment is essential. Air filling is the subject which deals with the techniques to control the environments of the living and non-living subjects and thus provide them comforts to enable them to perform better and have longer lives..

#### BLOCK DIAGRAM



Compressor working

#### FIG. BLOCK DIAGRAM



As when we complete entire assembly of project then there is no any need of calibration as our all project parts are in good working condition. When electric supply is on then compressor starts its working. Gradually compressor sucks atmospheric air from inlet port into itself & starts immediately delivering it through outlet port, as we early discussed there is no any storage tank for to store compressed air.

#### PRESSURE GAUGE WORKING

When compressor perform its work then pressure gauge also performs its work by indicating amount of pressure flowing through the whole system, when we completely block the pressurized air the pressure gauge's indicating point moving fast towards higher pressure rating, cause we have direct pressurized air transferring system. So in this condition we have release access air so that system doesn't get any damage, especially in this scenario air pipe may get damage by bursting.

#### AIR FILLING GUN

When pressurized air is come out from compressor's outlet port then this air utilize for filling purpose in specific thing like vehicle tube Or also we can also use it for any cleaning purpose or any other industrial application with the help of air gun. Our air gun is only for to fill air in vehicle's tire tube & or for cleaning purpose. In market different types of air guns are available that can we use different purpose application.

Wire connection. There is no more any rocket science technology. It is just only to supply electrical connection to compressor, so that whole set up can easily run.

Another work perform by our project

As considering whole system we also per form leakage testing operation with the help of this system. When a system starts leakage of gas or air then with the help of project we can check whether there is really any leakage or not, cause in pneumatic system we can't immediately det ect problem failure. We can fill air into system & test its air pressure in specific system by pressure gauge.

Also there is one another operation we can per form like transferring of air or gas through different system. Compressor has one another port so that we can perform tra nsferring of gas form one system to another system.

CALCULATION

- SELECTION OF MOTOR

Mathematically:



Where:

- $P$  is the pressure,
- $F$  is the normal force,

PRESSURE UNITS						
	<u>Pascal</u> (Pa)	<u>Bar</u> (bar)	<u>Technical</u> <u>atmosphe</u> <u>re</u> (atm)	<u>Atmosphere</u> (atm)	<u>Torr</u> (Torr )	<u>Pound-force</u> <u>per square</u> <u>inch</u> (psi)
1Pa	1 N/m <sup>2</sup>	10 <sup>-5</sup>	1.0197×10 <sup>-5</sup>	9.8692×10 <sup>-6</sup>	7.5006 ×10 <sup>-3</sup>	145.04×10 <sup>-6</sup>
1 bar	100,000	10 <sup>6</sup> dyn/cm <sup>2</sup>	1.0197	0.98692	750.06	14.5037744
1 at	98,066.5	0.980665	1 kgf/cm <sup>2</sup>	0.96784	735.56	14.223
1 atm	101,325	1.01325	1.0332	1 atm	760	14.696
1 torr	133.322	1.3332 ×10 <sup>-3</sup>	1.3595×10 <sup>-3</sup>	1.3158×10 <sup>-3</sup>	1 Torr; ≈ 1 m mHg	19.337×10 <sup>-3</sup>
1 psi	6.894×10 <sup>3</sup>	68.948 ×10 <sup>-3</sup>	70.307×10 <sup>-3</sup>	68.046×10 <sup>-3</sup>	51.715	1 lbf/in <sup>2</sup>

Example reading: 1 Pa = 1 N/m<sup>2</sup> = 10<sup>-5</sup> bar = 10.197×10<sup>-6</sup>

at = 9.8692×10<sup>-6</sup> atm = 7.5006×10<sup>-3</sup> torr = 145.04×10<sup>-6</sup> psi etc.

- when a specified usage (operating hours) has elapsed
- when an instrument has had a shock or vibration which potentially may have put it out of

calibration

- sudden changes in weather
- whenever observations appear questionable

## BASIC COMPONENTS

The basic components of the dishwasher are:

1. Compressor cooling and assembly
2. Wire Connection,
3. Hose Pipes,
4. Manifold
5. Evaporator

### UV-Light

Compressor cooling and assembly: T

The household (small black) compressors of the series PL, TL, FR, NL and SC are all one cylinder machines with vertically arranged crankshaft. They are usually supplied sufficiently full of oil, so that as a rule you do not have to add any oil (at least for more or less compact systems). In the small sizes, supply through the ambient air is usually enough but in the larger black compressors, either oil cooling or fan-cooling is necessary.

In hermetically sealed compressor, in one side of the enclosed casing the various parts of the compressor like cylinder, piston, connecting rod and the crankshaft are located. If it is a multi-cylinder compressor, there are more than two cylinders inside the casing. On the other side of the casing is the electric winding inside which the shaft of the motor rotates.

This motor can be single speed or multi

-speed motor. In hermetically sealed compressors the crankshaft of the reciprocating compressor and the rotating shaft of the motor are common. The rotating shaft of the motor extends beyond the motor and forms the crankshaft of the hermetically sealed reciprocating compressor.

All these parts of the hermetically sealed compressor are assembled and enclosed in a strong and rigid casing made up of welded steel shell. The steel shell comprises of two half rounded steel bodies that are welded together to form the casing for the hermetically sealed compressor. In some cases the two halves of the shell can be bolted together instead of welding, which permits easy opening of the casing in case of compressor burnout.

The hermetically sealed compressors have built-in lubrication system for the lubrication of the piston and cylinder and crankshaft. The lubricant also acts the coolant for the piston and cylinder. Additionally, the cooling suction refrigerant also offers cooling effect. Externally, the casing has refrigerant suction and discharge connections that are connected to the evaporator and condenser respectively.

There is also socket for the electrical connection. The typical condenser unit with the hermetically sealed compressor is shown in above fig. Such condenser units are called as hermetic condenser units. In the other image various parts of hermetically sealed multi-cylinder reciprocating compressor

In first image we can only see wires which are electrical connector part of our system & in second image we show actual application of it in actual project working. For connecting it has two pin supplies.

## MATERIAL SELECTION

To prepare any machine part, the type of material should be properly Selected by considering design, safety and following points:

The selection of material for engineering application is given by the following

Factors:-

1. Suitability of the material for the required components.
2. Suitability of the material for the desired working conditions.
3. Availability of materials.
4. Cost of the materials.
5. In addition to the above mentioned factors the other mechanical & physical prosperities should be considered while selecting material for fabrication

## FUTURE SCOPE

Scope for future work as suggested in above review is the project is carried out in order to get outside knowledge and involve in practical applications beyond in our day-to-day academic studies under in the module of “Advanced Topics in Mechanical Engineering”. Design and fabrication is high efficient in minimum cost. This machine is very useful to the Air Conditioning & Refrigeration Sector in which licks are very difficult to find manually and this method is more reliable and easy as compared to the Traditional method. The cost of this machine is very less as compared to the market machine. It also can be used as a commercial machine such as in industries & hotels etc. This project is very useful in the smart city project. This project can be further also modified as a mechatronics machine (this will make this machine fully automatic and more user friendly). This machine is very useful to the technicians who use to go on site for their work and this machine is portable and light in weight and it's the whole new technology to check the leakage of any cooling system of vehicle tiers.

## CONCLUSION

The proper guidance of project head and the sincere efforts of our group have lead to the successfully accomplishment of our concerned projects. “LEACKAGE TEST & AIR FILLING MACHINE” was interesting to work on and was also gained in this project work...

This knowledge of project will definitely be helpful in our future. So we must maintain that this final year project was an essential part of our engineering education enhancing our technical knowledge and practical skill.

Manually testing leakage in any air conditioning system is, about twelve place settings, typically requires over more time & hard work than this machine. This work was designed to take less time for the operation compare to that wasted on manually testing. In this project, the design of a special purpose leakage testing machine was successfully carried out. Applying the overall leakage testability index and performance standard index of manual methods from simulations carried out. The designed this machine, when fabricated will be very efficient and easy to operate. This work has established the fact that leakage testing machines of different capacities can be manufactured. The work is rich with mechanical engineering design and so could be used for instructing undergraduate of mechanical, and mechatronic engineering.

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