	<b>Anjuman College Of Engineering &amp; Technology, Sadar, Nagpur</b>		<b>LABORATORY MANUAL</b>
	<b>DEPARTMENT OF MECHANICAL ENGINEERING</b>		
	<b>Practical Experiment Instruction Sheet</b>		<b>YEAR : 2017-18</b>
Final Year	SEM-VIII	<b>SUBJECT: REFRIGERATION AND AIR CONDITIONING</b>	

### **Experiment No: 03**

**Aim:- To study construction and working of hermetically sealed compressor.**

**Apparatus:** Hermetically sealed compressor, cut section.

#### **Theory:**

**Introduction:** The hermetically sealed compressor is widely used for the refrigeration and air conditioning applications. You can find it in all the household refrigerators, deep freezers, window air conditioners, split air conditioners, most of the packaged air conditioners. In hermetically sealed compressor, the compressor and the motor are enclosed in the welded steel casing and the two are connected by a common shaft. This makes the whole compressor and the motor a single compact and portable unit that can be handled easily. The hermetically sealed compressor is very different from the traditional open type of compressors in which the compressor and the motor are different entities and the compressor is connected to the motor by coupling or belt.

#### **Types of Hermetic compressors:**

One of the most popular types of hermetically compressors are the reciprocating compressors. They were the first to be used as the hermetically sealed compressors and still being widely used. The days the vane type of rotary compressor has become more popular. It is considered that the rotary type of hermetically compressor consumes less electricity, makes lesser noise, requires lesser maintenance, and is cheaper than the reciprocating type of compressor. This is because the rotary compressors have less frictional parts and have only a rotor. The centrifugal types of hermetically sealed compressors are used for the larger units.

#### **Construction of Hermetically sealed reciprocating compressor:**

In hermetically sealed compressor, in one side of the enclosed casing the various parts of the compressor like cylinder, piston, connecting rod, and the crank shaft are located. If it is 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 compressor the crank shaft 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 reciprocating compressor.

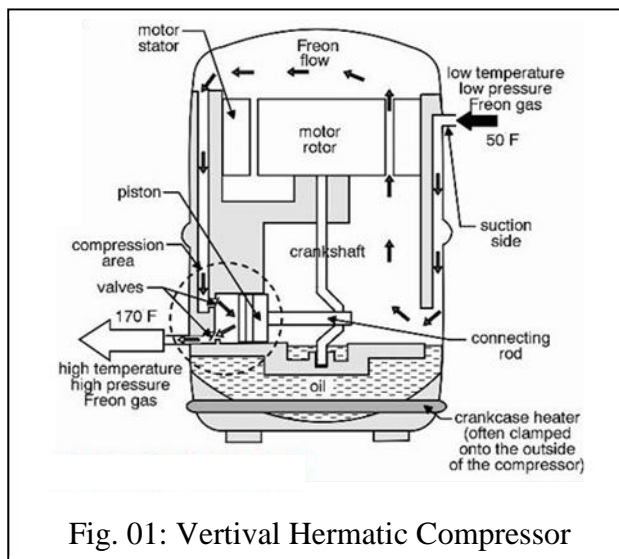


Fig. 01: Vertical Hermetic Compressor

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 inbuilt lubrication system for the lubrication of the piston and cylinder and crank shaft. The lubricant also acts as the coolant for the piston and cylinder. Additionally, the cool 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 fig. Such condenser units are called s hermetic condenser units.

### Working of Hermetically sealed compressor:

In hermetically sealed compressor, the motor and the compressor are enclosed in the same housing to prevent leakage. The housing has welded connections for refrigerant inlet and outlet and for power input socket. As a result of this there is virtually no possibility of refrigerant leakage from compressor. All motors reject a part of the power supplied to it due to

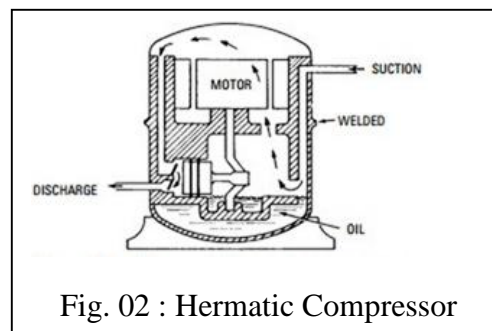



Fig. 02 : Hermetic Compressor

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eddy current and friction. Similarly, compressor also gets heated up due to friction and due to temperature rise of the refrigerant during compression. In open type both the compressor and the motor reject heat to the surrounding air for efficient operation. In hermetic compressor heat cannot be rejected to the surrounding air since both are enclosed in a shell.


Hence, the cold suction gas is made to flow over the motor and compressor before entering the compressor. This keeps the motor cool. The motor winding is in direct contact with the refrigerant, hence only those refrigerants which have dielectric strength, can be used in hermetically sealed compressor. The cooling rate depends upon the flow rate of the refrigerant, its temperature and the thermal properties of the refrigerant. If flow rate is not sufficient or if the temperature is not low enough the insulation on the winding of the motor can burn out and short circuiting may occur. Hence, hermetically sealed compressor give satisfactory and safe performance over a very narrow range of design temperature and should not be used for off-design conditions.

The COP of the hermetically sealed compressor based systems is lower than that of the open compressor based systems since a part of the refrigeration effect is lost in cooling the motor and the compressor. However hermetically sealed compressor are almost universally used in small systems such as domestic refrigerators, water coolers, air conditioners, etc where efficiency is not as important as customer convenience. In addition to this the use of hermetically sealed compressors is ideal in the systems which uses capillary tube as expansion devices. Hermetically sealed compressors are normally not serviceable.

### **Application:**

The hermetically sealed compressor is widely used for the refrigeration and air conditioning applications because of several advantages like:

- 1) The hermetically sealed compressor can be moved easily from one place to the other place, they are highly portable. One does not have to disassemble the compressor from the motor and no coupling, belt and pulley arrangement is involved.

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- 2) The whole condenser unit of the refrigeration and air conditioning unit comprising of the condenser and the compressor can be moved easily from one place to the other.
- 3) Since no coupling, belt or pulley is involved, the maintenance is lesser.
- 4) The lubrication system of the hermetically sealed compressor is inherent and no external lubrication is required, unless the fresh gas charge is done.
- 5) The installation of the hermetically sealed compressor is very easy. The suction and discharge connections and the electrical connections are available externally.
- 6) Hermetically sealed compressor have very long life , the companies offer warranty period upto seven years for these compressors.

**Conclusion:** Thus we have studied the construction and working of hermetically compressor.