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AN AUTONOMOUS INSTITUTION



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DEPARTMENT OF AGRICULTURAL ENGINEERING

COURSE CODE & NAME: 19AGT301 & HEAT POWER ENGINEERING

III YEAR / V SEMESTER

UNIT : IV IC ENGINE PERFORMANCE AND AIR COMPRESSORS

TOPIC 7 :Air Compressors



Air Compressors

COMPRESSOR – *A device which takes a definite quantity of fluid (usually gas, and most often air) and deliver it at a required pressure.*

Air Compressor – 1) Takes in atmospheric air,
2) Compresses it, and
3) Delivers it to a storage vessel (i.e. Reservoir).

Compression requires **Work** to be done on the gas,

Compressor must be driven by some sort of **Prime Mover** (i.e. **Engine**)





How they are different from pumps?



- Major difference is that compressors handles the gases and pumps handles the liquids.
- As gases are compressible, the compressor also reduces the volume of gas.
- Liquids are relatively incompressible; while some can be compressed



Applications



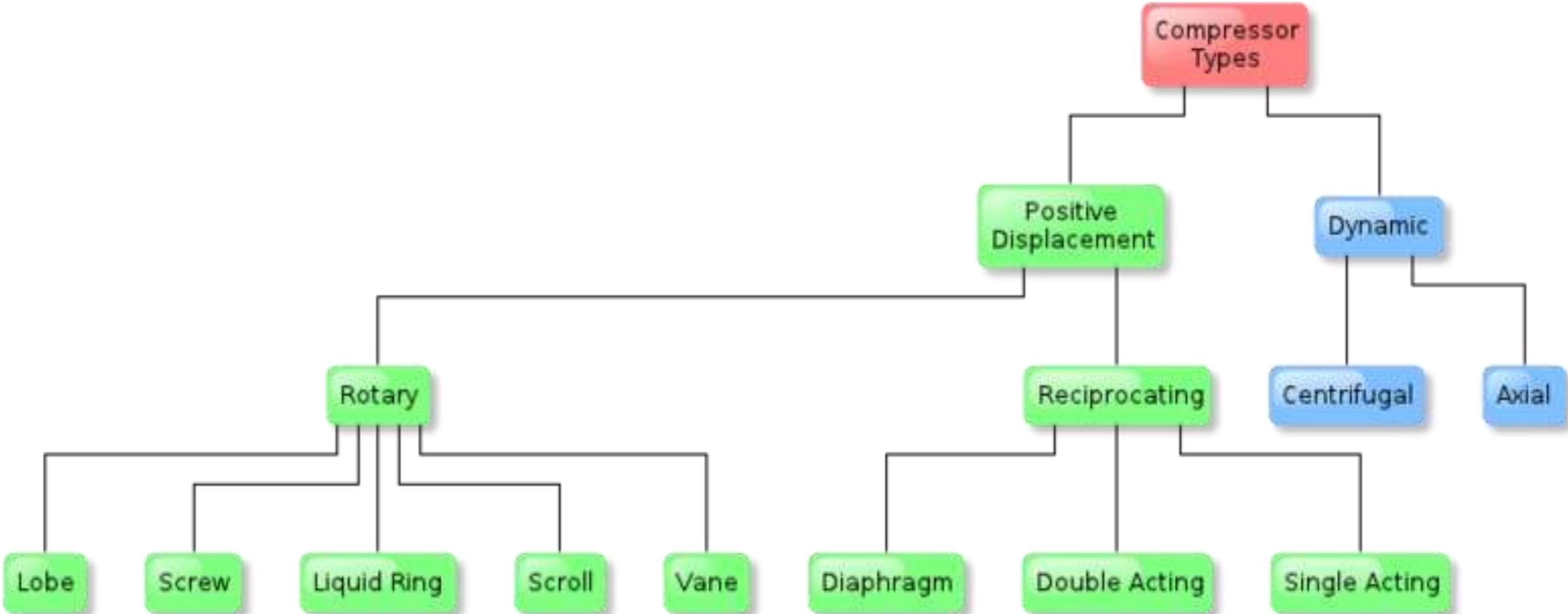
Compressors have many everyday uses, such as in :

- Air conditioners, (car, home)
- Pneumatic devices
- Home and industrial refrigeration
- Hydraulic compressors for industrial machines
- Air compressors for industrial manufacturing



Classification of Compressor

Compressor classification can be described by following flow chart:





Dynamic Compressors



The dynamic compressor is continuous flow compressor is characterized by rotating impeller to add velocity and thus pressure to fluid.

It is widely used in chemical and petroleum refinery industry for specific services.

There are two types of dynamic compressors

- Centrifugal Compressor
- Axial Flow Compressor

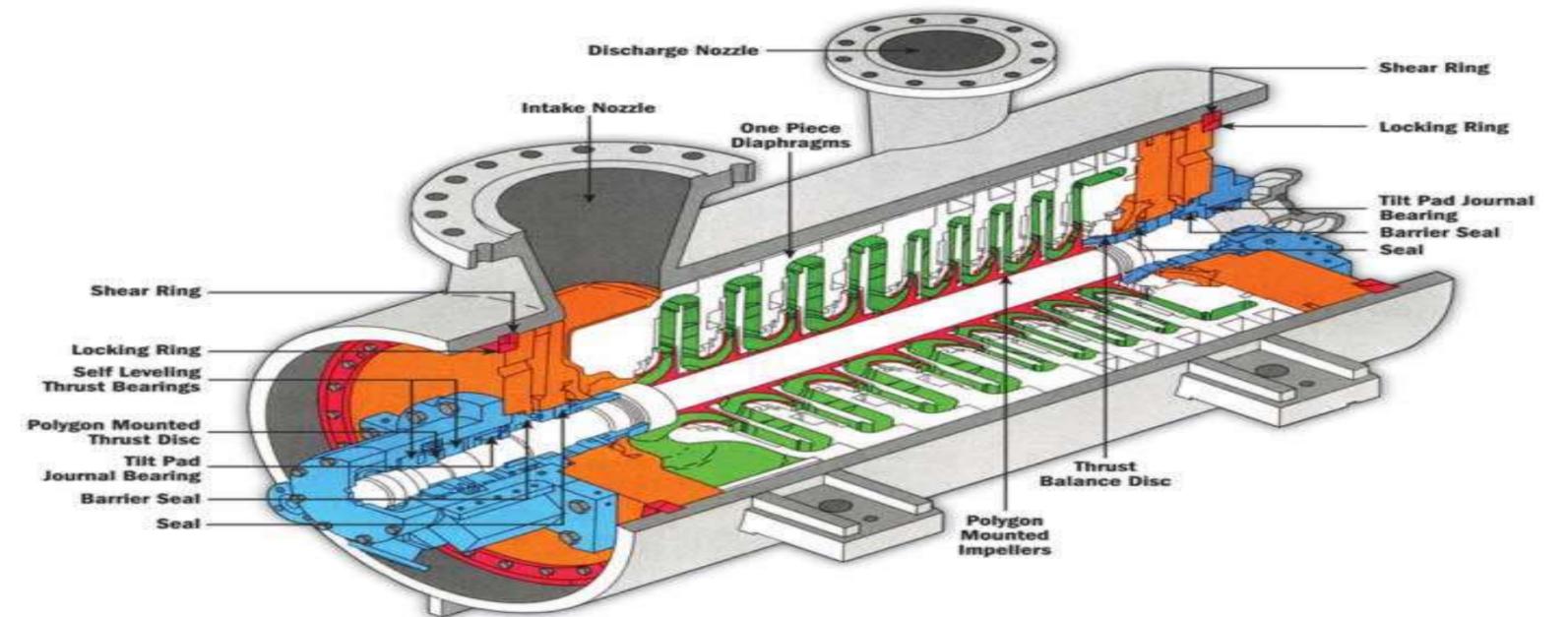


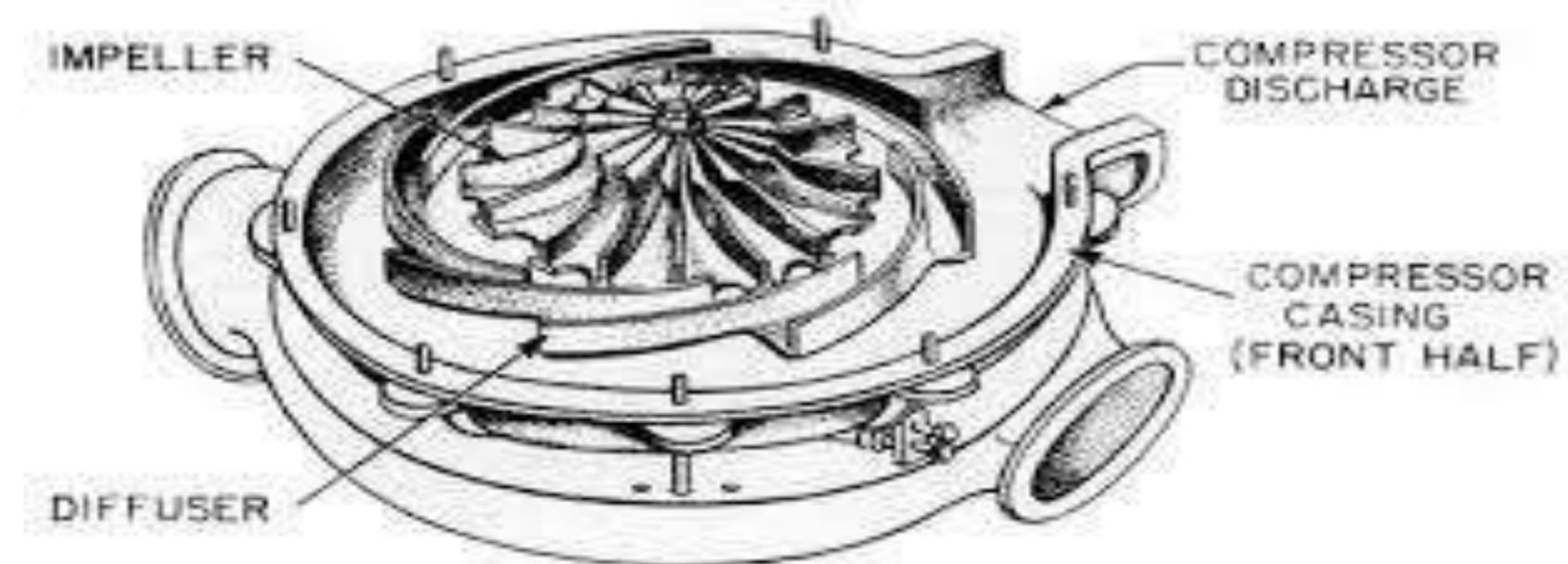
Figure 1. Major Components of Multistage Barrel-type Centrifugal Compressors (Dresser-Rand Co., Olean, NY)



Centrifugal Compressors



- Achieves compression by applying inertial forces to the gas by means of rotating impellers.
- It is multiple stage ; each stage consists of an impeller as the rotating element and the stationary element, i.e. diffuser
- Fluid flow enters the impeller axially and discharged radially
- The gas next flows through a circular velocity and increases pressure.





Axial Flow Compressor

- Working fluid principally flows parallel to the axis of rotation.
- The energy level of air or gas flowing through it is increased by the action of the rotor blades which exert a torque on the fluid
- Have the benefits of high efficiency and large mass flow rate
- Require several rows of airfoils to achieve large pressure ratios, making them complex and expensive



Axial Flow Compressor



Positive displacement Compressor



Positive displacement compressors causes movement by trapping a fixed amount of air then forcing (displacing) that trapped volume into the discharge pipe.

It can be further classified according to the mechanism used to move air.

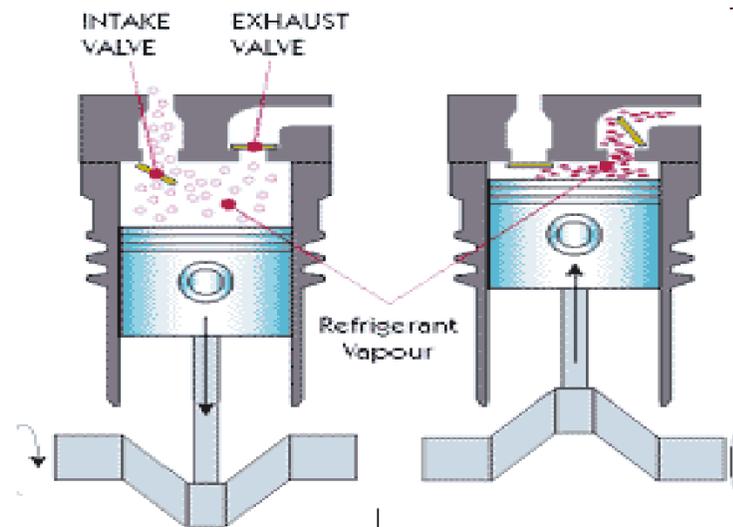
- Rotary Compressor
- Reciprocating compressor



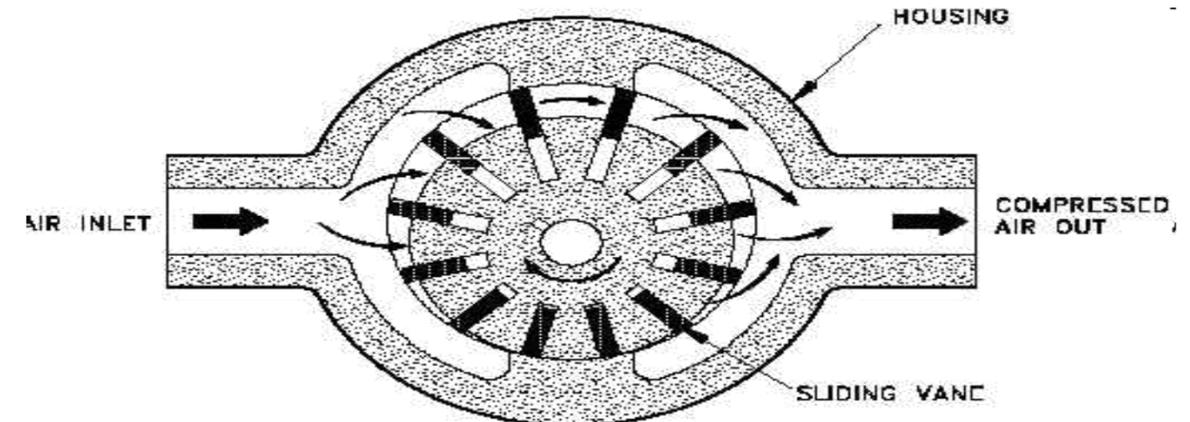
Positive displacement Compressor

Air Compressors

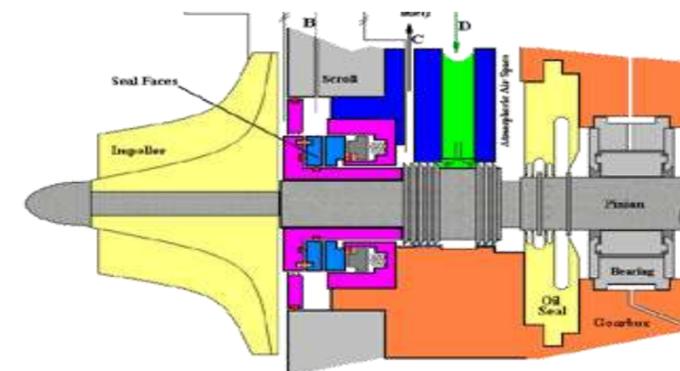
Reciprocating



Rotary



Centrifugal



No. of Stages for Compression

No. of Sides of Piston in operation

Single - stage
Multi - stage

Single - acting
Double - Acting

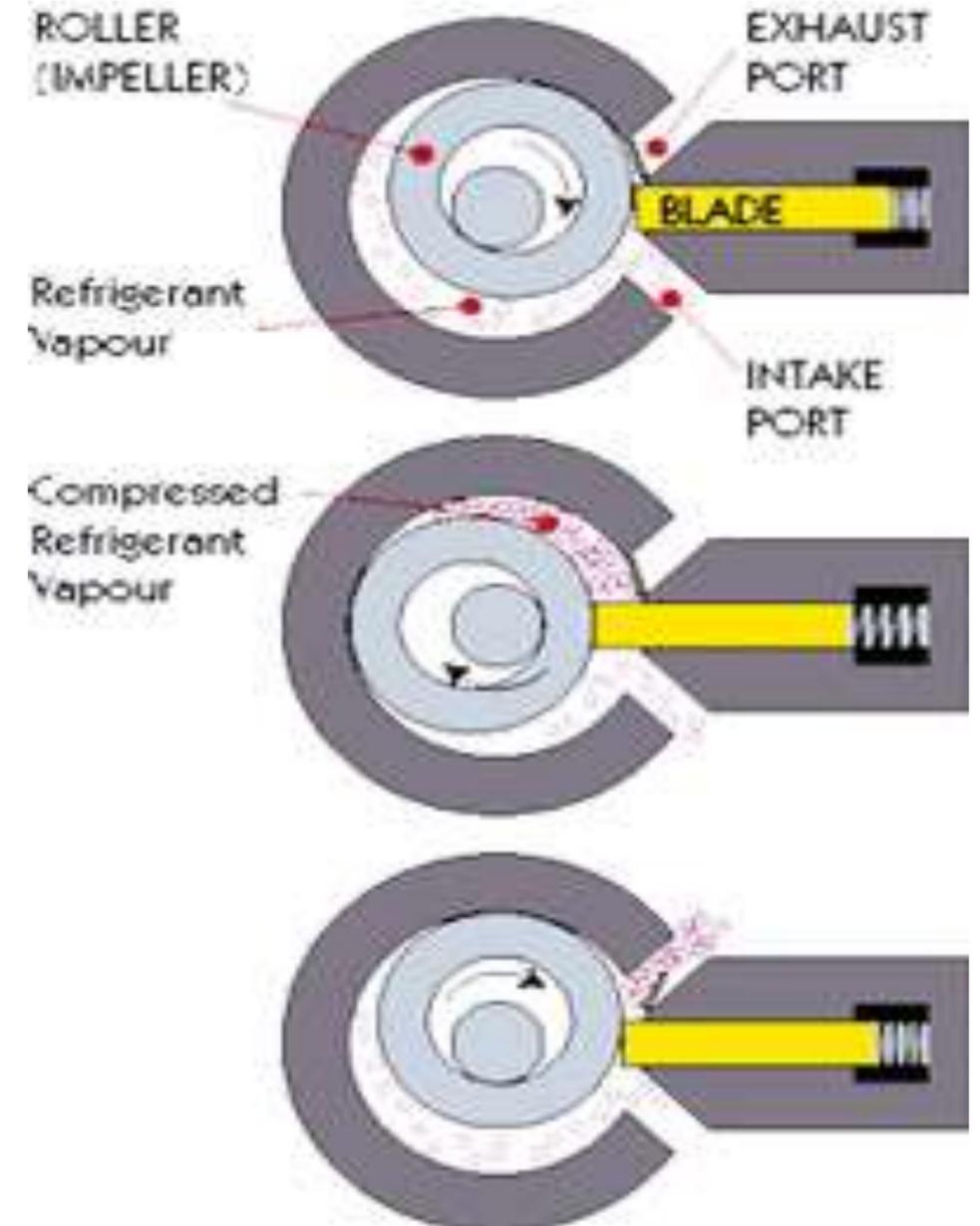




Rotary Compressor



- The gas is compressed by the rotating action of a roller inside a cylinder.
- The roller rotates off-centre around a shaft so that part of the roller is always in contact with the cylinder.
- Volume of the gas occupies is reduced and the refrigerant is compressed.
- High efficient as sucking and compressing refrigerant occur simultaneously.



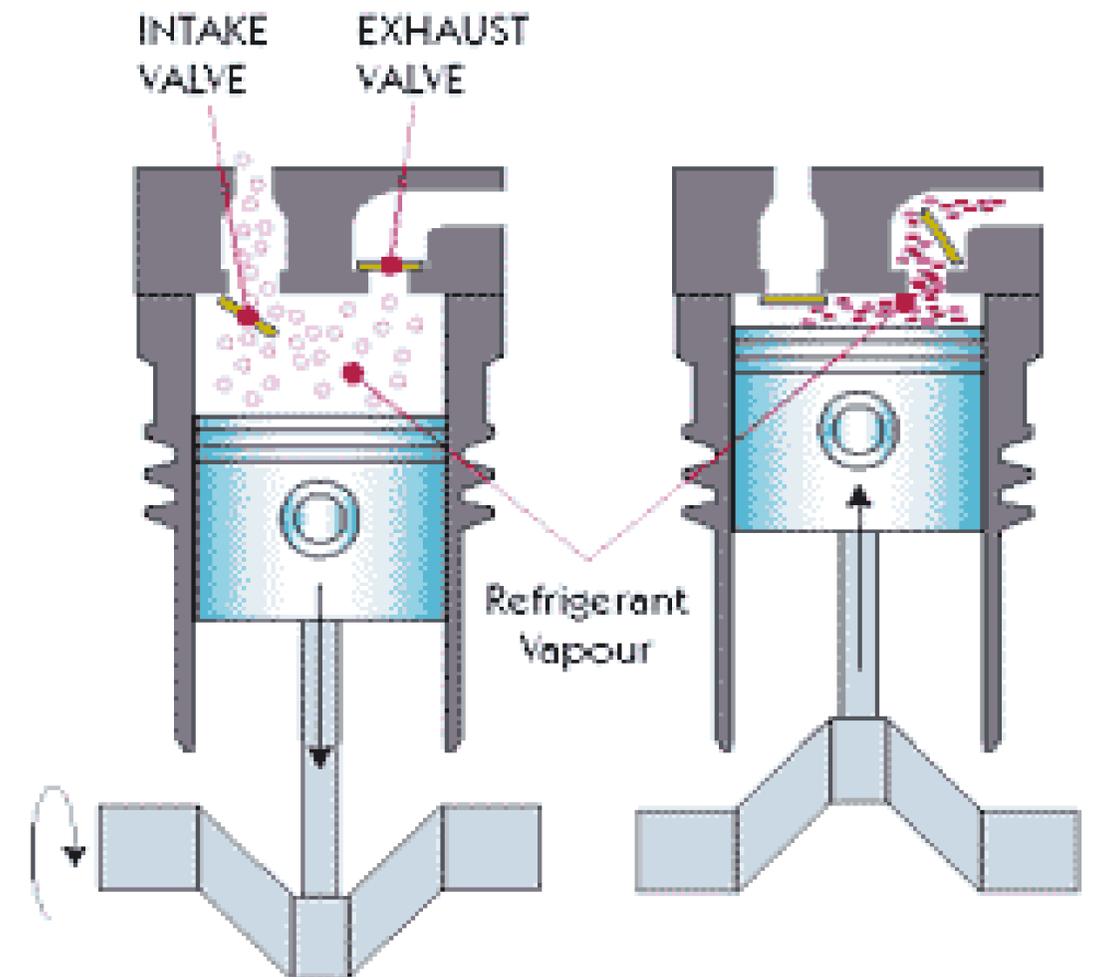


Reciprocating Compressor



It is a positive-displacement compressor that

- Uses pistons driven by a crankshaft to deliver gases at high pressure.
- The intake gas enters the suction manifold, then flows into the compression cylinder
- It gets compressed by a piston driven in a reciprocating motion via a crankshaft,
- Discharged at higher pressure



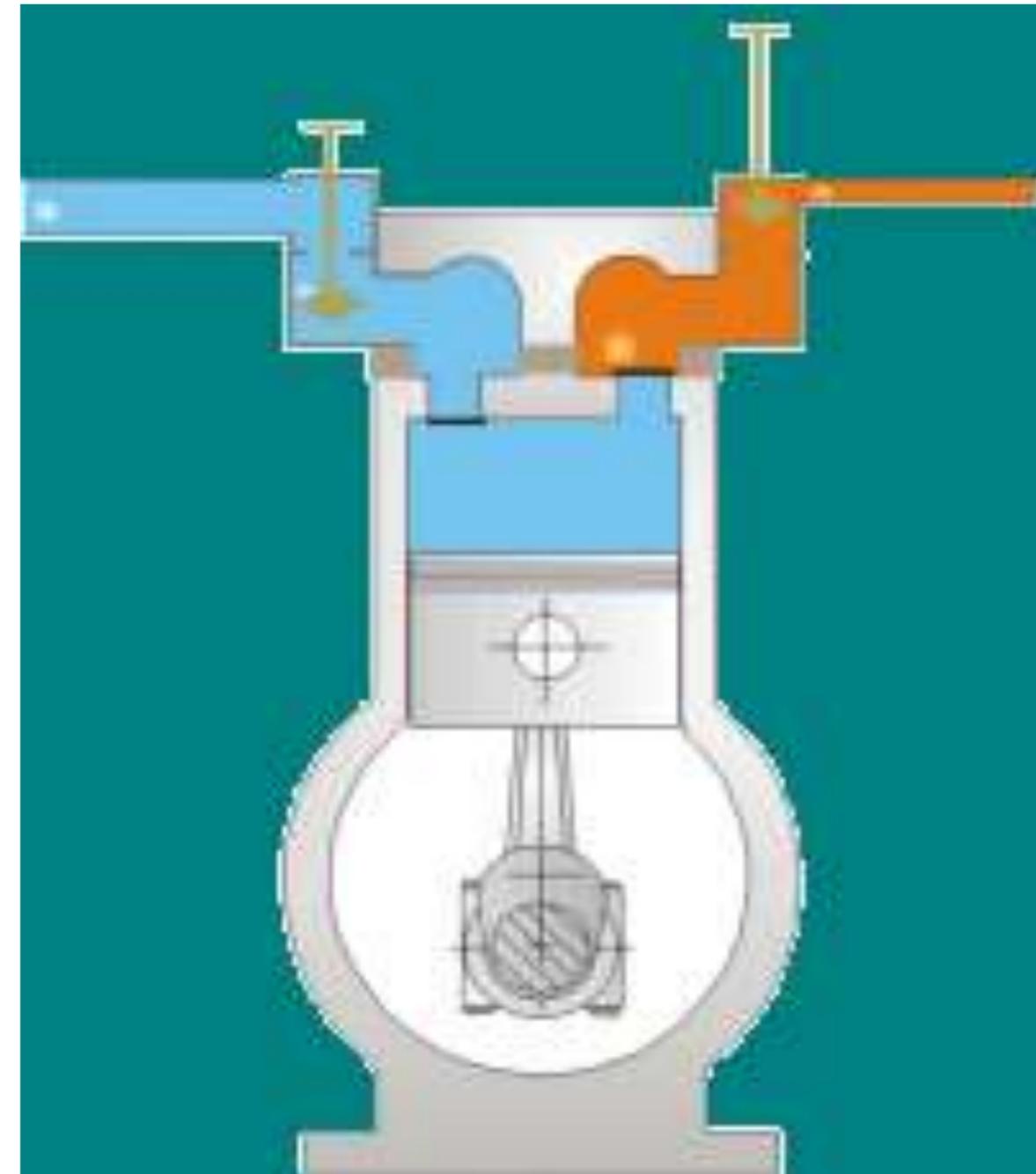


Reciprocating Compressor



Principle of Operation

- ◆ Fig. shows single-acting piston actions in the cylinder of a reciprocating compressor.
- ◆ The piston is driven by a crank shaft via a connecting rod.
- ◆ At the top of the cylinder are a suction valve and a discharge valve.
- ◆ A reciprocating compressor usually has two, three, four, or six cylinders in it.





Thank You