Air compressor

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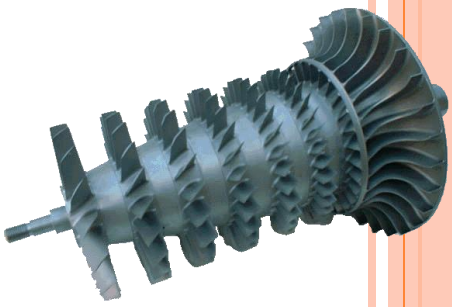
Introduction



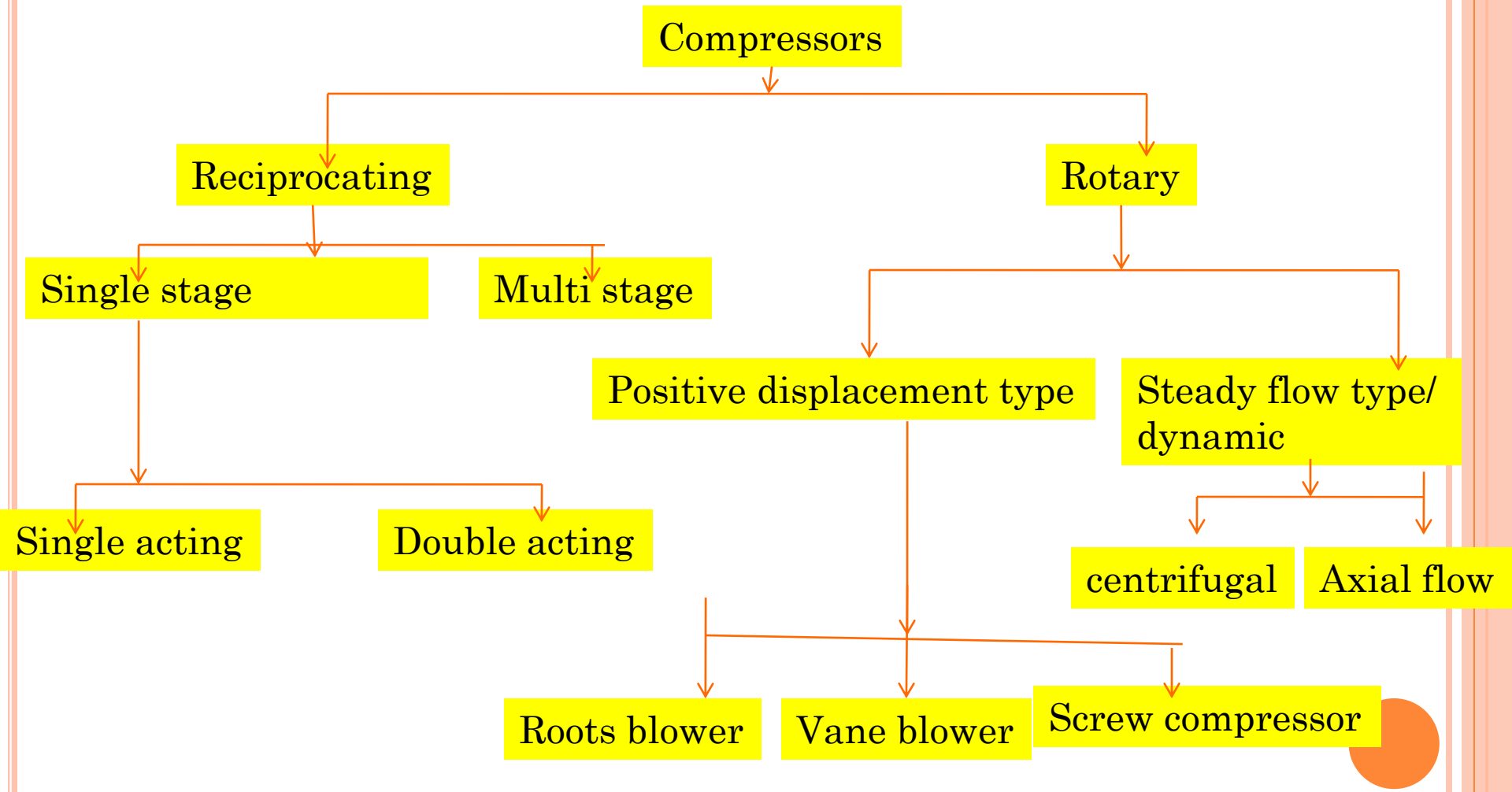
- Compresses the atmospheric air to a higher pressure at the expense of external work supplied by electric motor/IC engine/gas turbine.
- Increases the pressure of a fluid by mechanically decreasing its volume (i.e. by compressing it).

  The fluid here is generally air since liquids are theoretically incompressible
- The compressed air is stored in the air receiver/storage tank and is delivered through pipelines upto the point of end use.
- Air compressor has very few parts hence maintenance is very low

Application of compressed air

- To operate pneumatic tools such as drills, screw drivers, hammers, chisels
- To operate pneumatic cranes
- For pneumatic brakes of automobiles, railways and presses
- For agricultural accessories such as dusters and sprayers
- Spray painting
- Excavation, tunneling, mining
- To drive CNC machine tools
- For pneumatic conveying of materials
- For pneumatic gauging, inspection and low cost automation systems
- Air conditioning systems

Classification of air compressors

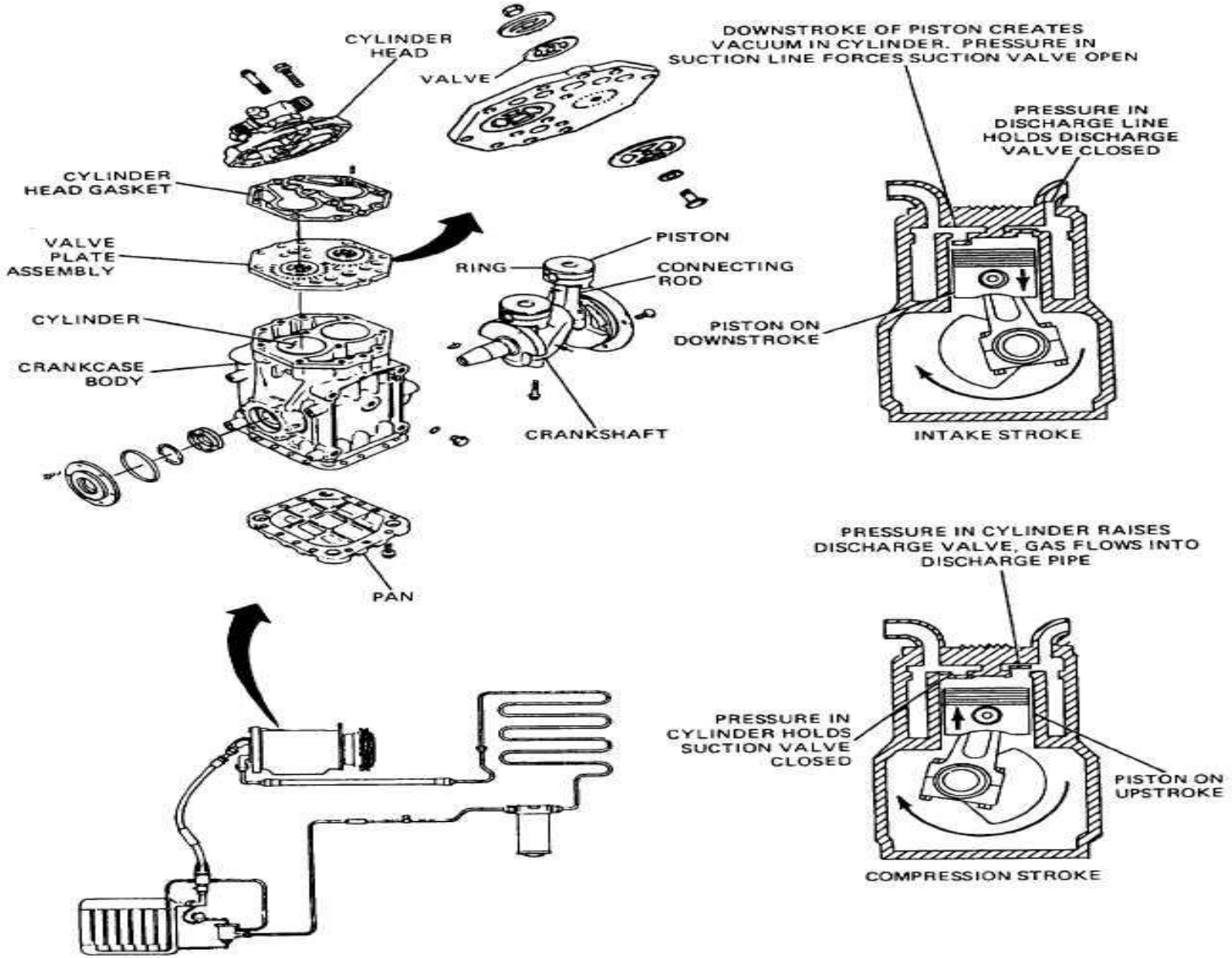


INTRODUCTION

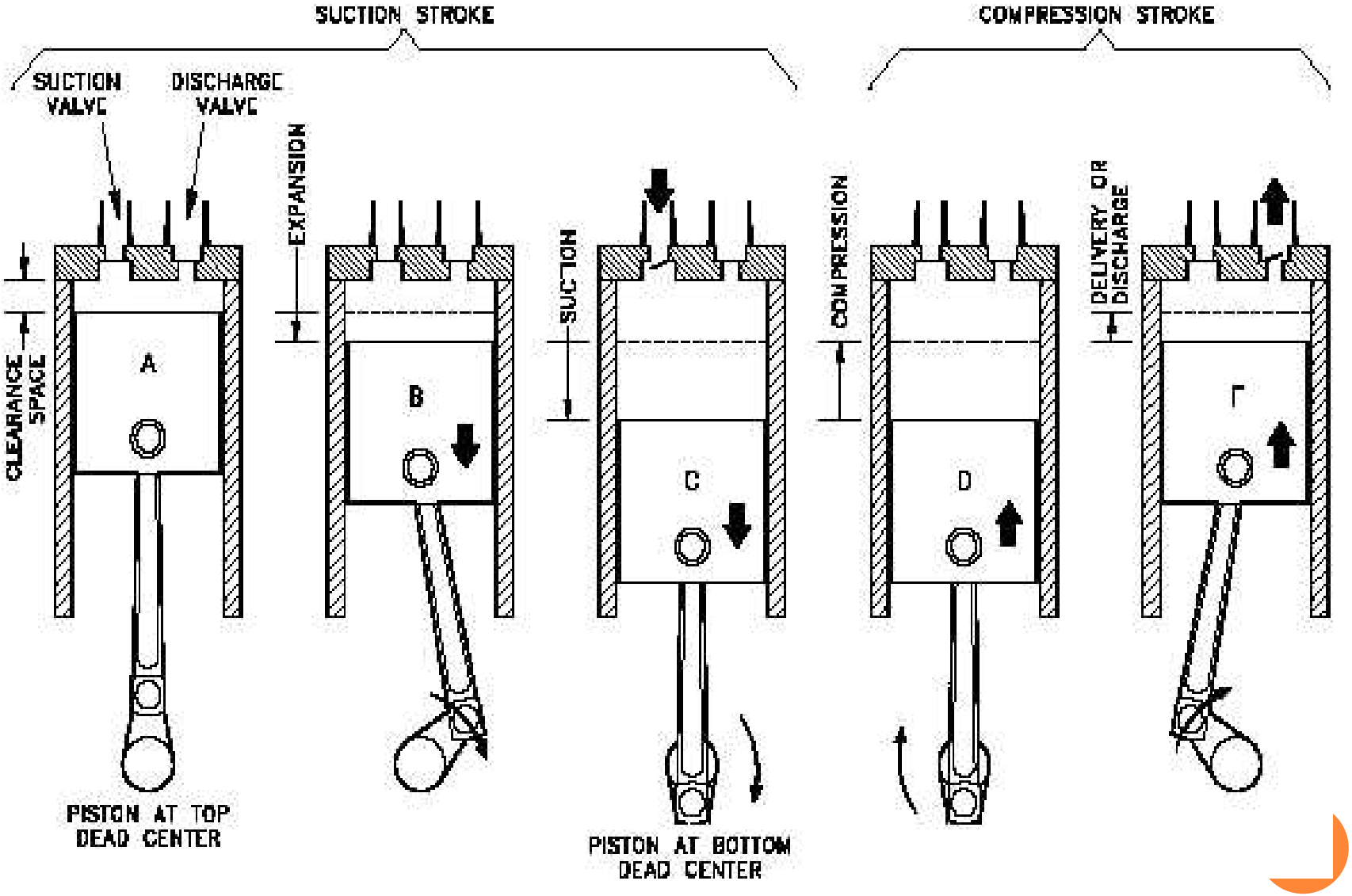
- Positive displacement compressors work on the principle of increasing the pressure of air by reducing the volume of air in an enclosed chamber

- Dynamic compressors impart velocity energy to continuously flowing air or gas by means of impellers rotating at very high speeds. The velocity energy is changed into pressure energy both by the impellers and the discharge volutes or diffusers.

Construction of Reciprocating Air Compressors

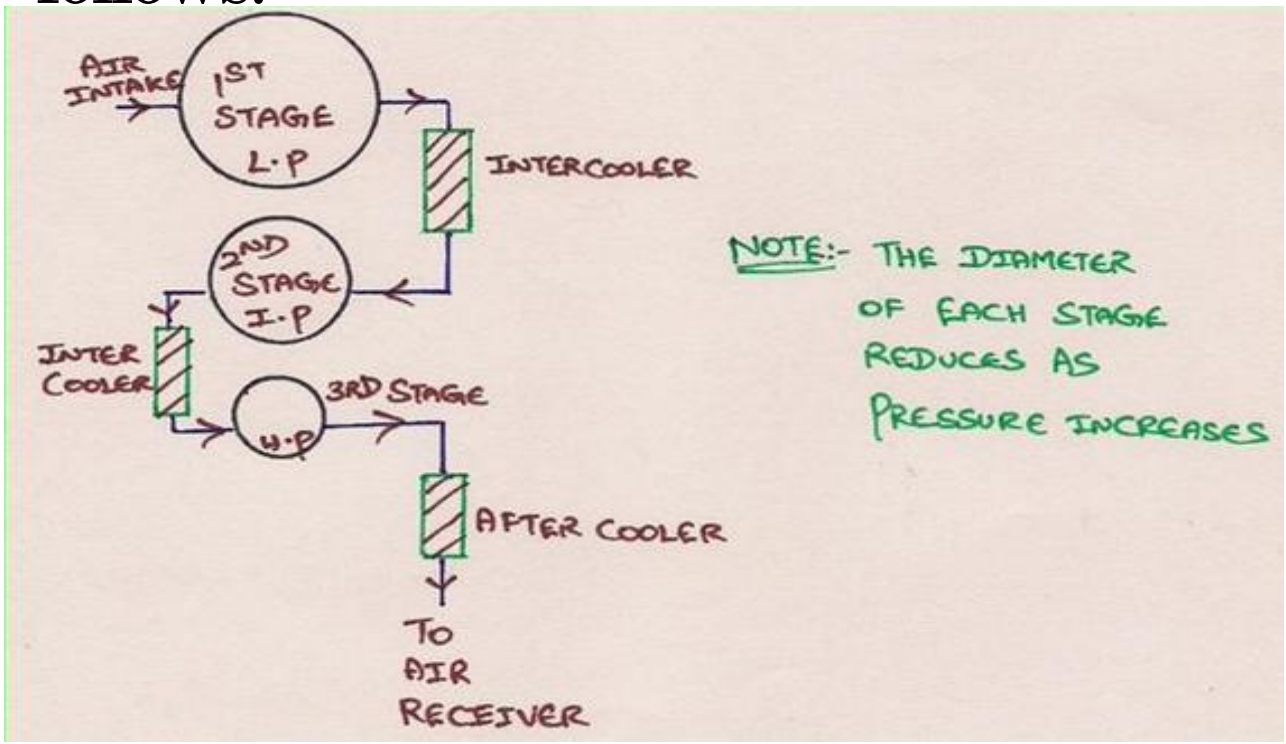


WORKING OF RECIPROCATING AIR COMPRESSOR

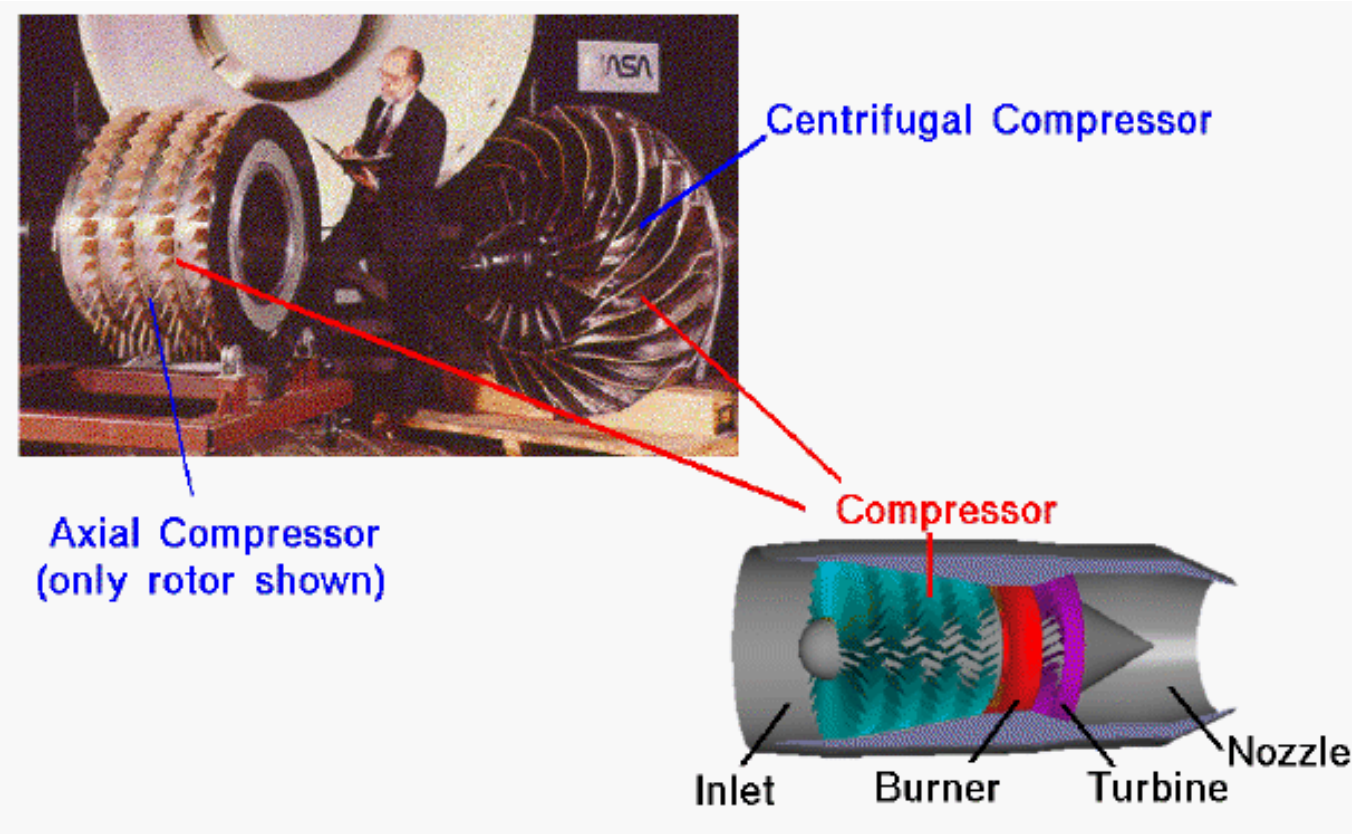


- Suction stroke: When piston starts moving downwards, the pressure inside the cylinder falls below atmospheric pressure that opens suction valve. Delivery valve is closed. The atmospheric air taken in the cylinder upto the end of its suction stroke.
- Compression and delivery stroke: Air compressed gradually as piston moves upwards. When pressure inside cylinder reaches above the pressure on delivery side, the delivery valve opens. Compressed air from cylinder is discharged to the receiver.
- Some amount of compressed air remains in clearance space at he end of delivery stroke.
- The above cycle repeats.

- Single stage air compressor develop pressure upto 7 bar.
- For higher pressures multistage compressors are suitable. It is a series of arrangement of cylinder in which compressed air from the cylinder before, becomes the intake air for the cylinder which follows.

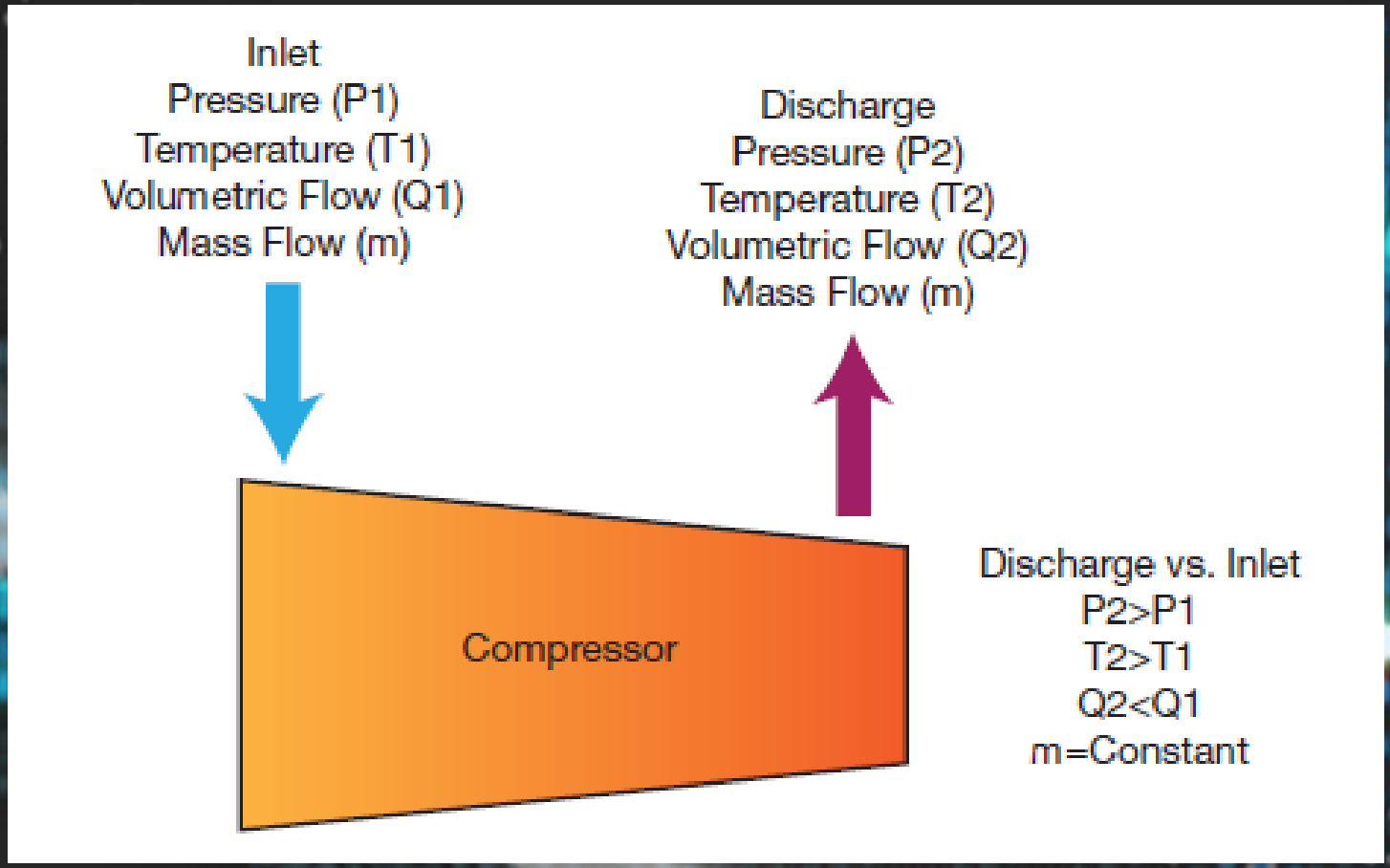


Two primary types of rotary compressors



- Axial Devices
  - High mass flow
  - High efficiency
  - Stackable (multi-staging)
  - More parts
  - More complex
- Radial (Centrifugal) Devices
  - Can not handle as high mass flow
  - Less efficient than axial device
  - Short length
  - Robust
  - Less Parts

Summary of Principles…



Fluid Compression. 2013. Selecting a Centrifugal Compressor. AIChE. Web. 25 Nov. 2013.

Application of compressors

- Reciprocating compressors are typically used where high compression ratios (ratio of discharge to suction pressures) are required per stage without high flow rates, and the process fluid is relatively dry.