

★ Objective :

To calculate the compression ratio for the reciprocating air-compressor.

★ Theory :

→ In two stages compressor air is partially compressed in a low pressure cylinder. This air is passed through between the first stage and the second stage so that the air at the inlet of the second stage is at a lower temperature than the outlet of the first stage. This is done to reduce work of compressor in the first stage second stage.

First compression is done in the second stage. The compressors are provided with clearance volume, two stage compressors can achieve higher volumetric efficiency than a single stage compressor because of lower compression per stage.

As compressed air is used in a wide range of materials, industrial, domestic, aeronautic fields, etc, compressors are applied in a wide range. They are used wherever air is required at high pressure.

→ About the compressor.

An air compressor is a device which sucks inbow

the air from the atmosphere, compresses it and then delivers it to a receiver tank.

It compresses the air by the means of a reciprocating piston, which reciprocates inside a cylinder. It can be single stage or multi stage. It can be single acting or double acting.

Two stage compressor test rig consists of 2 cylinders and pistons and a receiver tank. An AC Motor runs it.

Thermometers are provided at inlet and outlet. To find inlet volume of air, an orifice is provided. To stream line the intake, a diaphragm box manifold is provided. Pressure gauge is provided at receiver tank. Safety valve and auto power switch is provided for safety factor.

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Specifications of the Compressor:

- (1) Motor — 3 H.P
- (2) Type — AB 7.75
- (3) Compressor — Double stage Single Acting
- (4) Cylinder — 1 — Diameter 93.5 mm, Stroke 78 mm.
- (5) Energy meter — 3200 Pulses / kWh constant (EMC)

(*)

Utilities Required:

→ The ~~four~~^{two} stages is a theoretical requirements.

Vapour compression cycle are:

A. Electric Supply : Single Phase 220V AC,
50 Hz

B. Space Required : $2.5 \times 1.5 \times 3.0$.

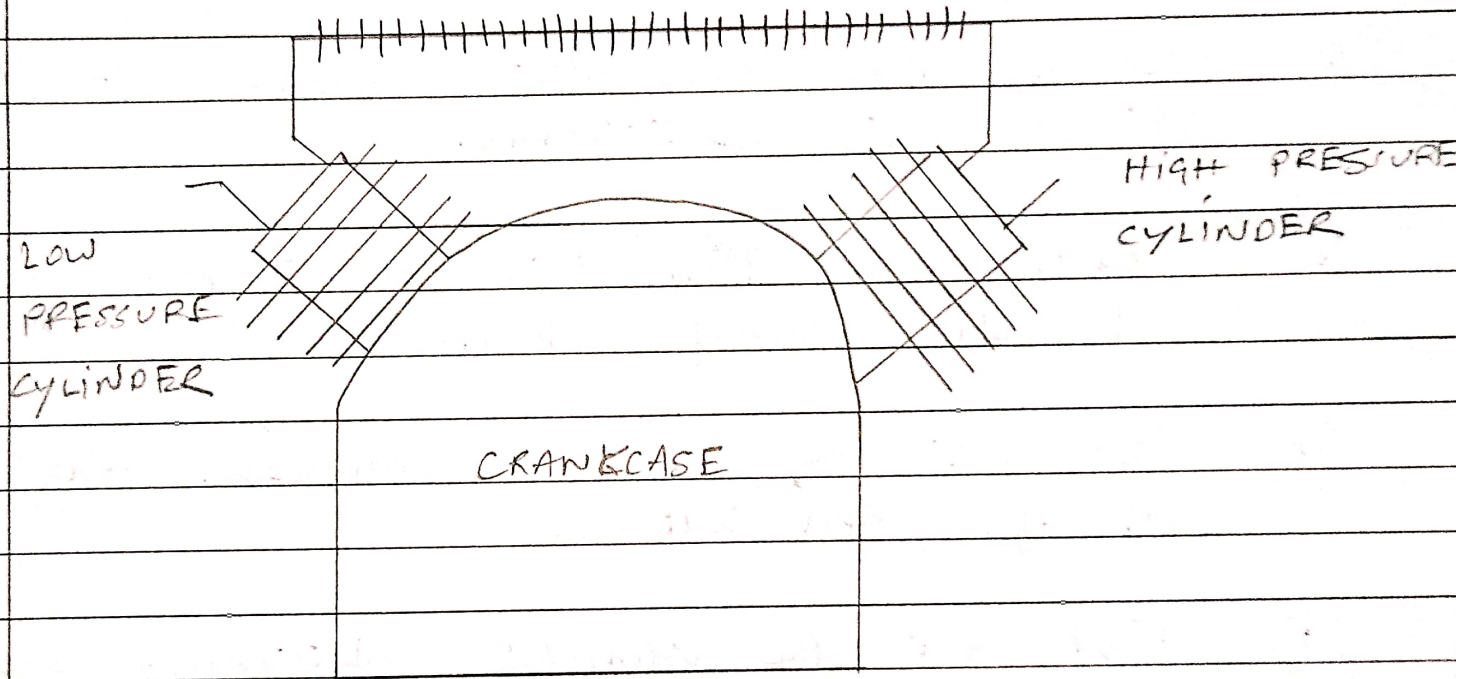


Fig. 1: Basic Parts of a reciprocating compressor.

Procedure:

- ①. Close the outlet valve and of tank and start compressor
- ②. Let the receiver pressure rise up to 2 kg/cm^2 . Now open the delivery valve so that constant delivery pressure is achieved.

- (3) Wait for some time and see that the delivery pressure remains constant, now note down the pressure.
- (4) Record the energy meter pulse / time to find out the input power.
- (5) Record the manometer reading to find out the air input volume.
- (6) Record the temperature of inlet before and after second stage.
- (7) Find out the rpm of compressor with the help of RPM indicator.
- (8) Find out the volumetric efficiency and isothermal power by given formula.
- (9) Repeat the procedure for different delivery pressures.

(*) Conclusion

The compression ratio of compressor is given by:

$$R_c = \frac{\text{Gauge Pressure} + \text{Atmospheric Pressure}}{\text{atmospheric Pressure}}$$