

Practical No. 3: Use of Pumps and compressor mounted on hydraulic and Pneumatic trainer.

Practical Significance:

Pump is a power source of hydraulic system that supplies high pressure oil. Selection of hydraulic pumps depend upon pressure generated fluid or discharge of oil speed and efficiency. Like a pump used for hydraulic system there is an air compressor for pneumatic system. The study of pumps and compressors is necessary for proper selection of actuators, valves, pipes, hoses, etc. and thus making the system compatible.

Minimum Theoretical Background: (write brief information)

1. Hydraulic pumps:

Types – Gear pumps, vane pumps
Construction, working and applications.

2. Air Compressors:

Types – Reciprocating and rotary compressors
Subtypes, construction, working and applications.

3. Selection criteria for pumps:

4. Selection criteria for compressors:

Resources required:

| Sr. No.: | Name of resource required | Specifications | Quantity |
|----------|---------------------------|---|----------|
| 1 | Hydraulic trainer | Transparent / actual working components | 1 |
| 2 | Pneumatic trainer | Transparent / actual working components | 1 |
| 3 | Hydraulic Pumps | Internal and external gear pumps, Balanced and unbalanced vane pumps. | 1 each |
| 4 | Air Compressors | Single and multistage reciprocating compressors, Vane compressor, screw compressor. | 1 each |

Precautions:

1. Avoid improper/loose connections of components.
2. Do not forcefully connect to connectors to avoid the damage.

Procedure:

1. Initially check the level of hydraulic oil to ensure adequate oil in the tank.
2. Make connections of pump discharge to the pressure gauge and flow meter.
3. Allow the trainer in ON position for 5 minutes for initial warm-up.
4. Note down the pressure and Flow rate generated by the pump.
5. Make necessary connections to the actuators like S.A.Cylinder, D.A.Cylinder, Hydraulic motors
6. Tabulate the readings.
7. Calculate forces developed during forward and return strokes of cylinders.
8. Measure speed of hydro motor using tachometer.

Observation: (Refers to manufacturer catalogues to write the information)

1. Pumps:

| Sr. No.: | Type of pump | Specifications | Pressure (bar) (max) | Flow rate (LPM) |
|----------|--------------|------------------|----------------------|-----------------|
| 1 | Gear Pump | Speed - 1450 rpm | 25 | 50 |
| 2 | vane pump | Speed - 1800 rpm | 70 | 50-70 |

2. Comparison of various pump types:

| Types of pumps | Pressure (Bar) | Flow (l/min) | Speed (rpm) | Overall efficiency (%) | Variable or fixed displacement |
|--------------------------|----------------|--------------|-------------|------------------------|--------------------------------|
| Gear pump | 25 | 50 | 1450 | 80% | Fixed |
| Vane pump | 70 | 50-70 | 1800 | 84% | Fixed |
| Axial piston pump | 280 | 146 | 2000 | 85% | variable |
| Radial Axial piston pump | 400 | 250 | 1450 | 81% | Fixed. |

3. Air Compressors:

| Sr. No.: | Type of compressor | Specifications | Pressure (bar) | Flow rate (LPM) |
|----------|--------------------|----------------|----------------|-----------------|
| 1 | screw comp. | oil Fladded | 75 | 1630 |
| 2 | vane comp. | star delta | 7 | 24 |

4. Comparison between various air compressor types:

| Types of compressors | Pressure (bar) | Flow rate (m ³ / min) |
|--|----------------|----------------------------------|
| Vane compressors | 7 | 1.27 |
| Single/double stage reciprocating compressor | 8 | 1.99 |
| Multistage air compressor | 8 | 3.39 |
| Screw compressor | 7.5 | 1.63 |

Conclusions:

Hence, In this way we have studied hydraulic pump & Air compressors, their specificats, comparison of various pumps, types of air compressor, etc.
