

ME-326

Instrumentation & Control Lab (Hydraulic Trainer)

[Students have to perform 4 experiments on Hydraulic trainer]

HYDRALIC TRAINER

Hydraulic power pack gives the necessary power to the system. The Hydraulic Trainer is designed to be a tool for learning hydraulic technology principle and circuitry. It has been engineered for ruggedness, portability and ease of operation. The unit is completely self-contained and operates on standard 415 Volt AC three phase outlet electrical powers. All necessary functions are made with hoses and quick disconnects. No tools are required to arrange circuits. Simply plug in the components needed to arrange a circuit. All the hoses are stored back of the trainer. The Hydraulic Trainer will aid in the study of

1. Basic pascal Law
2. Pressure and Force
3. Flow rate and velocity
4. Flow controls
5. Sequencing circuits
6. Venting a relief valve
7. Maximum flow rate in a system
8. Regeneration
9. Cavitations and aeration
10. Pressure reducing valve

The following figure shows the basic graphical Hydraulic Trainer Principle

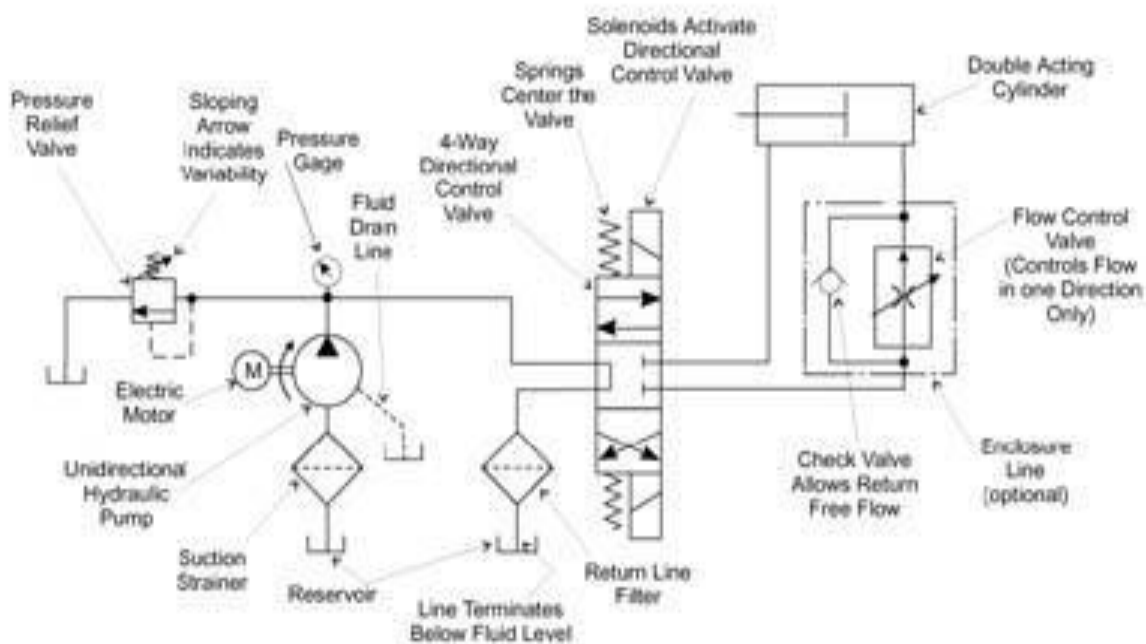
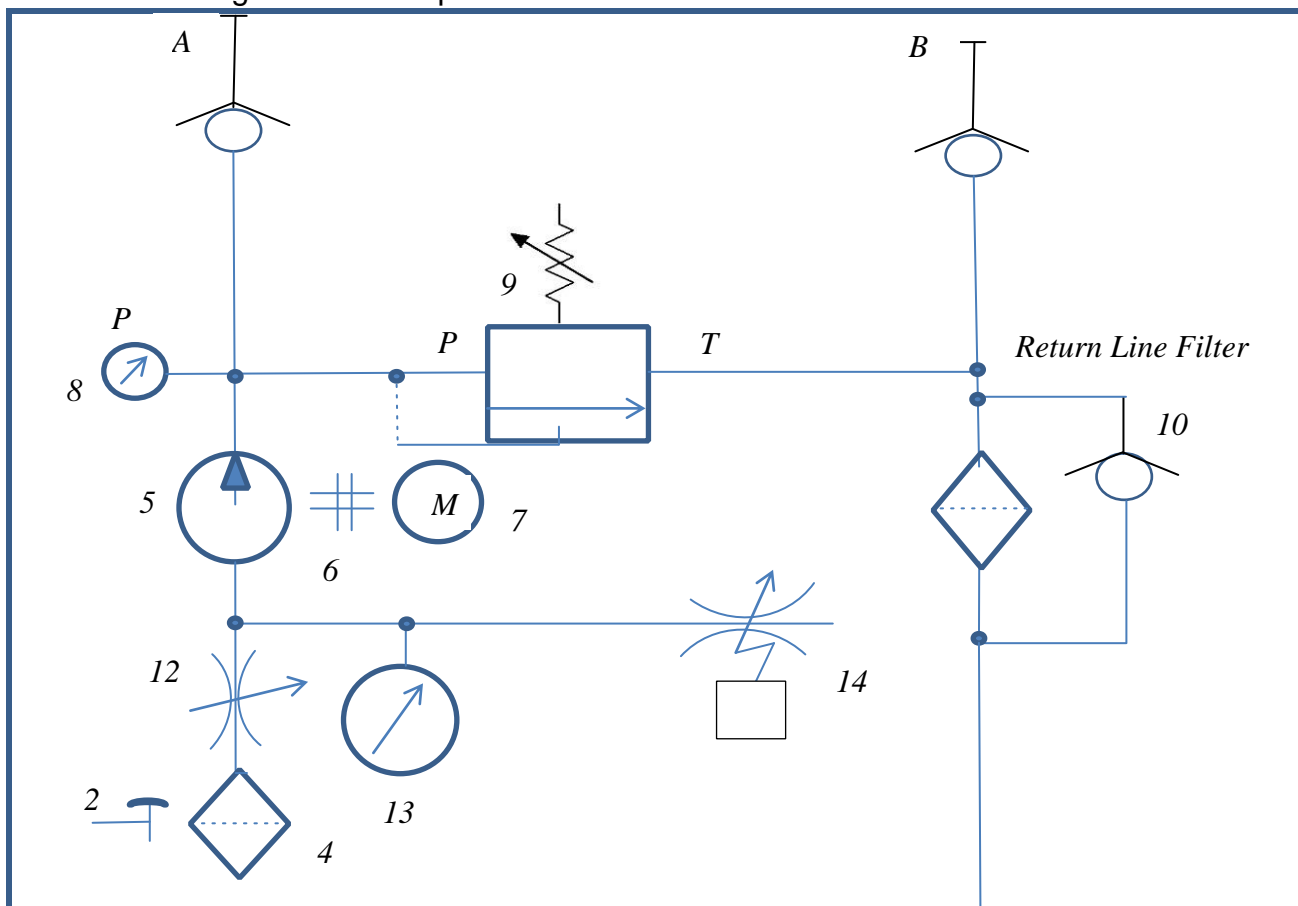


Illustration #37 — Typical Schematic Diagram

The Hydraulic Trainer consists of the following components and its functions are described along with the component name:



1



3



Hydraulic Power pack has following main components:

1. Tank : To hold oil
2. Level gauge: To indicate oil level in the tank
3. Air Breather: To pass the air into tank and allow atmospheric pressure to act on oil column.
4. Suction Strainer: Not to allow impurities in oil to enter in the system.
5. Pump: To create oil flow.
6. Coupling: To connect electric motor and hydraulic pump in order to transmit power.
7. Electric Motor: Prime mover to operate the pump.
8. Pressure Gauge: To indicate system pressure
9. Relief valve: As a safety valve to protect the system from overload. Limits the maximum pressure in the system.
10. Return Line Filter: To trap system generated dirt entering into the oil pump.
11. Drain Plug: To drain the oil
12. Globe Valve: To demonstrate cavitations in hydraulic system
13. Needle Valve: To demonstrate aeration in hydraulic system.

Following are the experiments to be performed in the class.

EXPERIMENT NO. 1 OF C2

Aim of the experiment: To study of cavitation, aeration and its effects.

Objective of the experiment: Study of cavitation, aeration and its effects in a hydraulic drive system.

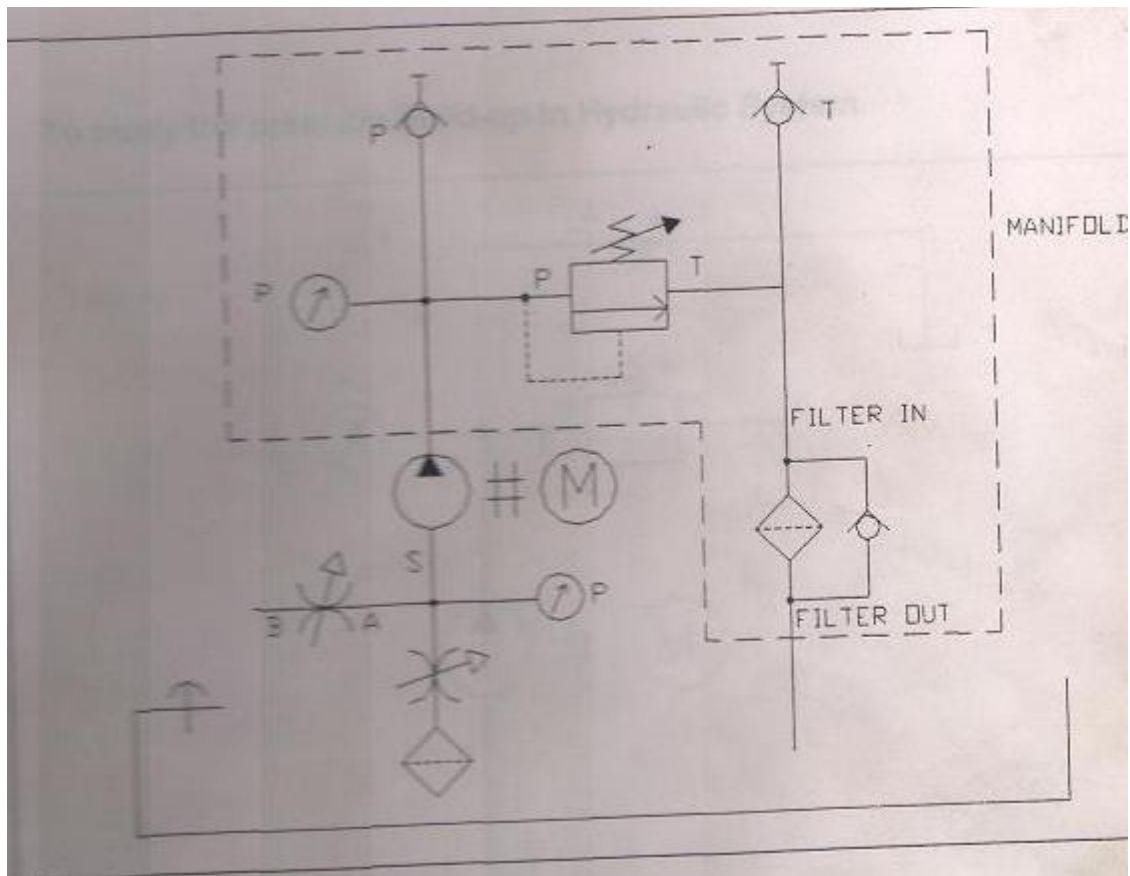
Apparatus used:

1. Relief valve.
2. Globe valve.

Operation procedure:

1. Make connection as shown in the figure.
2. Switch on the hydraulic system.
3. Operate the globe valve.
4. On operating the globe valve the system start generating heavy noise because supply oil to pump is reduced. Pump starves of oil and consequently vacuum is generated. This is known as cavitation. This cavitation phenomenon reduces pump life to great extent.
5. Always keep globe valve of suction line fully open.
- 6 .Open needle valve provided in suction line slightly.
7. You will notice change in pump noise.
8. Now pump is fed with oil as well as air which generate the noise. This is also Detrimental to pump as air in the oil breaks the oil film between two moving Parts.

Circuit diagram:



Brief explanation of the circuit:

General remarks:

EXPERIMENT N0. 2 OF C2

Aim of the experiment: Construction of Hydraulic circuit to control double acting cylinder using 4/3 way DC valve.

Objective of the experiment: To control the Double acting cylinder by 4/3 way dc valve.

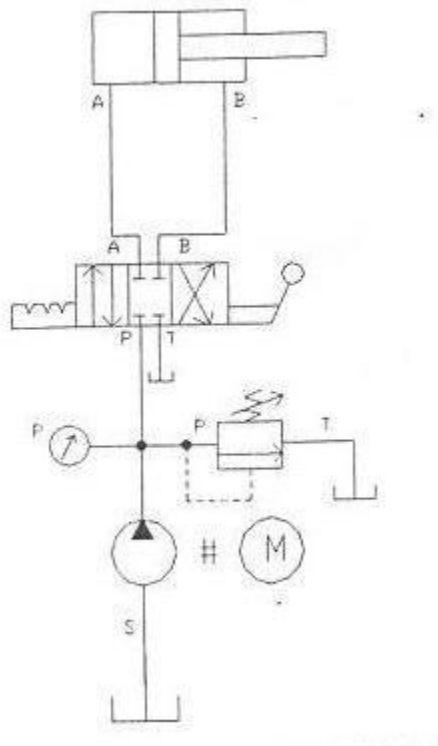
Apparatus used:

1. Double acting cylinder
2. 4/3 way dc valve.
3. A Relief valve.

Operation procedure:

1. Make the connection as shown in the figure.
2. Switch on the hydraulic system.
3. If the lever is in the central position, no movement of cylinder takes place.
4. Operate the lever (push or pull) and see the effect.

Circuit diagram:



Brief explanation of the circuit:

General Remarks:

EXPERIMENT NO. 3 OF C2

Aim of the experiment: Construction of Hydraulic Circuit to be used as Re-generative circuit using 4/3 way dc valve.

Objective of the experiment:

1. To study the operation of a regenerative hydraulic circuit.
2. To study 4/3 way dc valve.
3. To study relief valve.

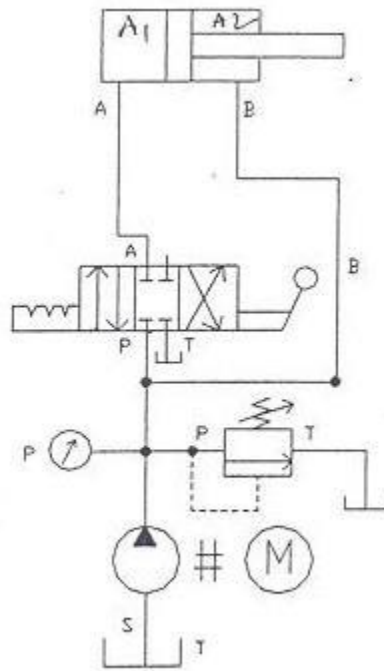
Apparatus used:

1. Double acting cylinder.
2. 4/3 way dc valve
3. Relief valve
3. Hose pipes

Operational procedure:

1. Make connections as shown in the figure.
2. Switch on the system.
3. Operate DCV
4. Connect the cylinder rod end to pressure line.
5. Observe what happens.

Circuit diagram:



Brief explanation of the hydraulic circuit:

General Remarks:

EXPERIMENT NO. 4 OF C2

Name of the experiment: To control double acting cylinder by 4/2 way dc valve.

Objective of the experiment:

1. To study the 4/2 way dc valve
2. To study the Relief valve.
3. To study the Double acting cylinder.

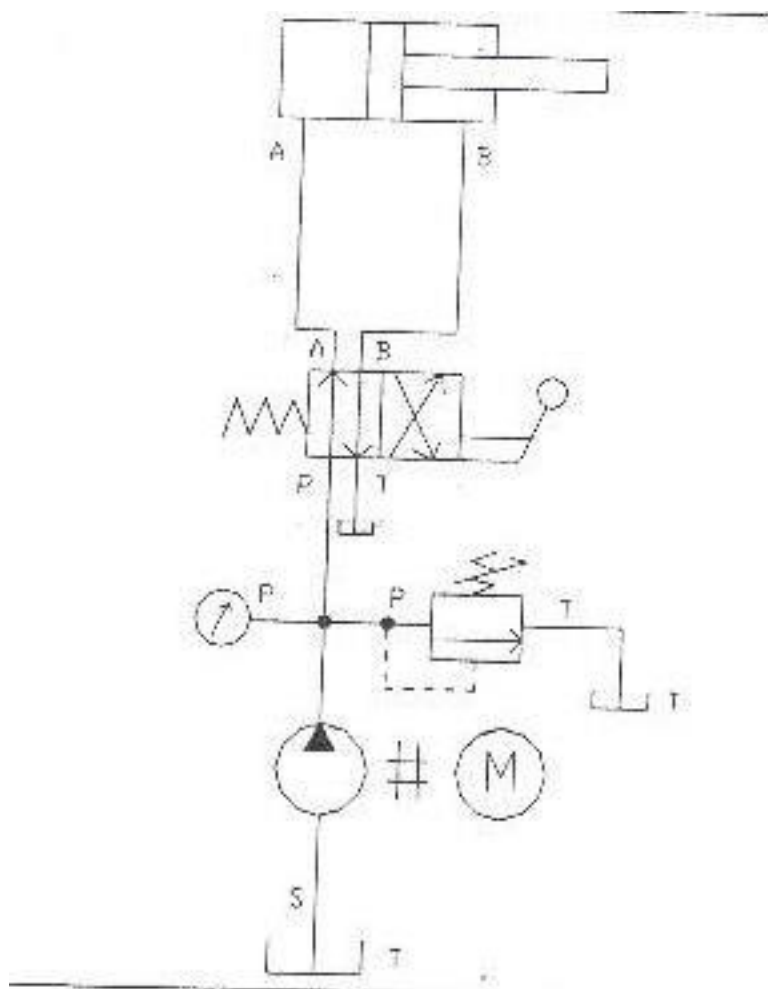
Apparatus used:

1. a double acting cylinder.
2. Relief valve
3. 4/2 way dc valve
4. hose pipes.

Operational procedure:

1. Make the connection as shown in the figure
2. Switch on the power supply.
3. The moment you switch on the system hydraulic cylinder starts extending.
4. Operate the lever cylinder so that it starts moving in reverse direction.
5. Release the lever. It goes to original position due to spring inside the valve.

Circuit diagram:



Brief explanation of the circuit:

General Remarks: