جامعة
بني سويف
التكنولوجية

BST

BANI SWIEF
TECHNOLOGICAL
UNIVERSITY

Basics of hydraulics

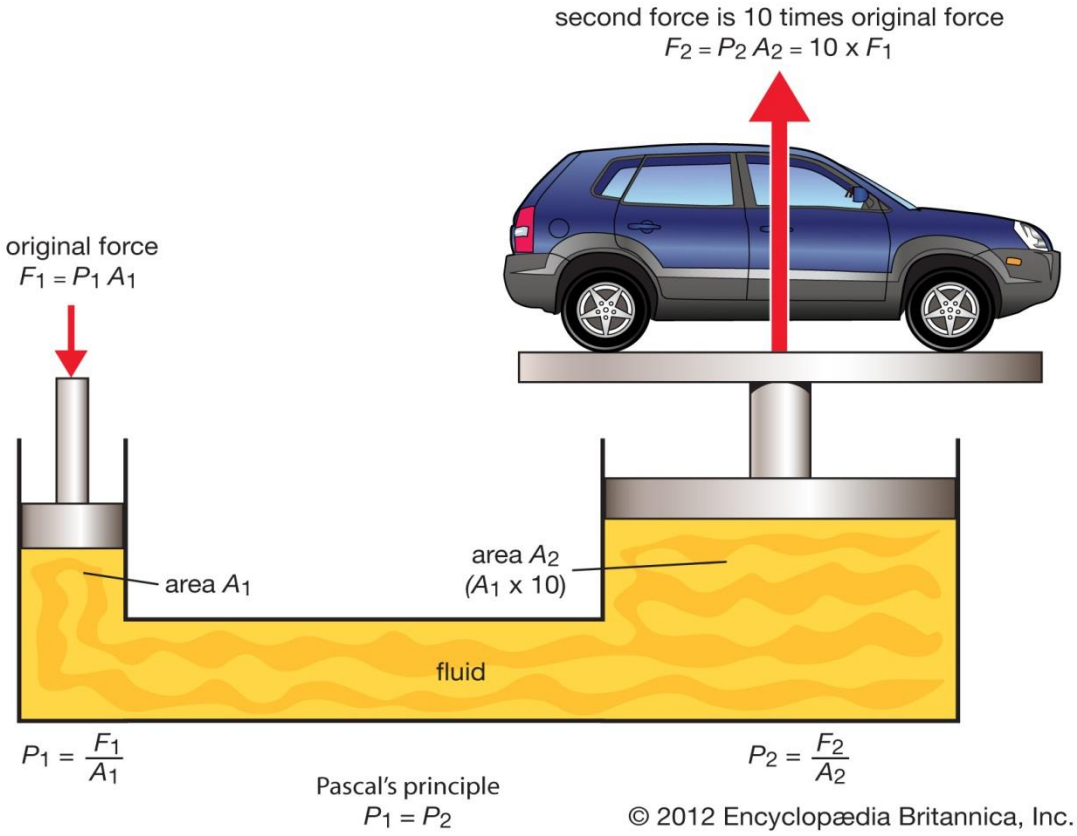
Autotronics Program

Section1

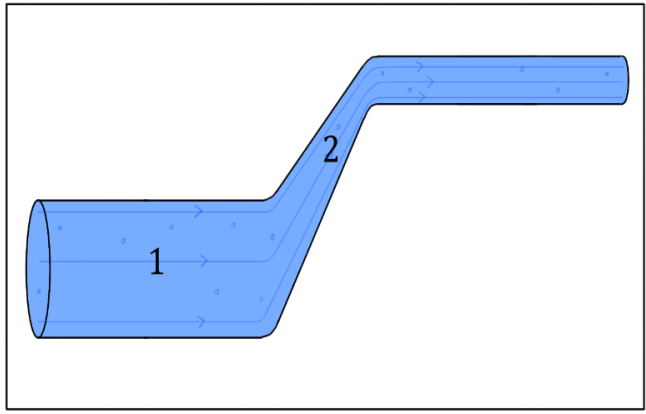
The history of hydraulics

The famers of ancient Egypt developed various water supply system to use water from Nile river in BC 3000.

After a long time, the French mathematician and physicist, Blaise Pascal, announced the Pascal principle stating the power amplification using fluid in 1648.



Bernoulli's principle: At points along a horizontal streamline, higher pressure regions have lower fluid speed and lower pressure regions have higher fluid speed.



Bernoulli's equation:

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

The variables P_1,v_1,h_1 refer to the absolute pressure, speed, and height of the fluid at point 1, whereas the variables P_2,v_2,h_2 refer to the absolute pressure, speed, and height of the fluid at point 2 as seen in the diagram. Bernoulli's equation is a form of the conservation of energy principle. Note that the second and third terms are the kinetic and potential energy with *m* replaced by *ρ*.

Introduction to hydraulics

Hydraulics is the generation of forces and motion using pressurized liquids.

Pneumatics is the generation of forces and motion using compressible gas.

Components of **HYDRAULIC** system:-

-Power sources units:

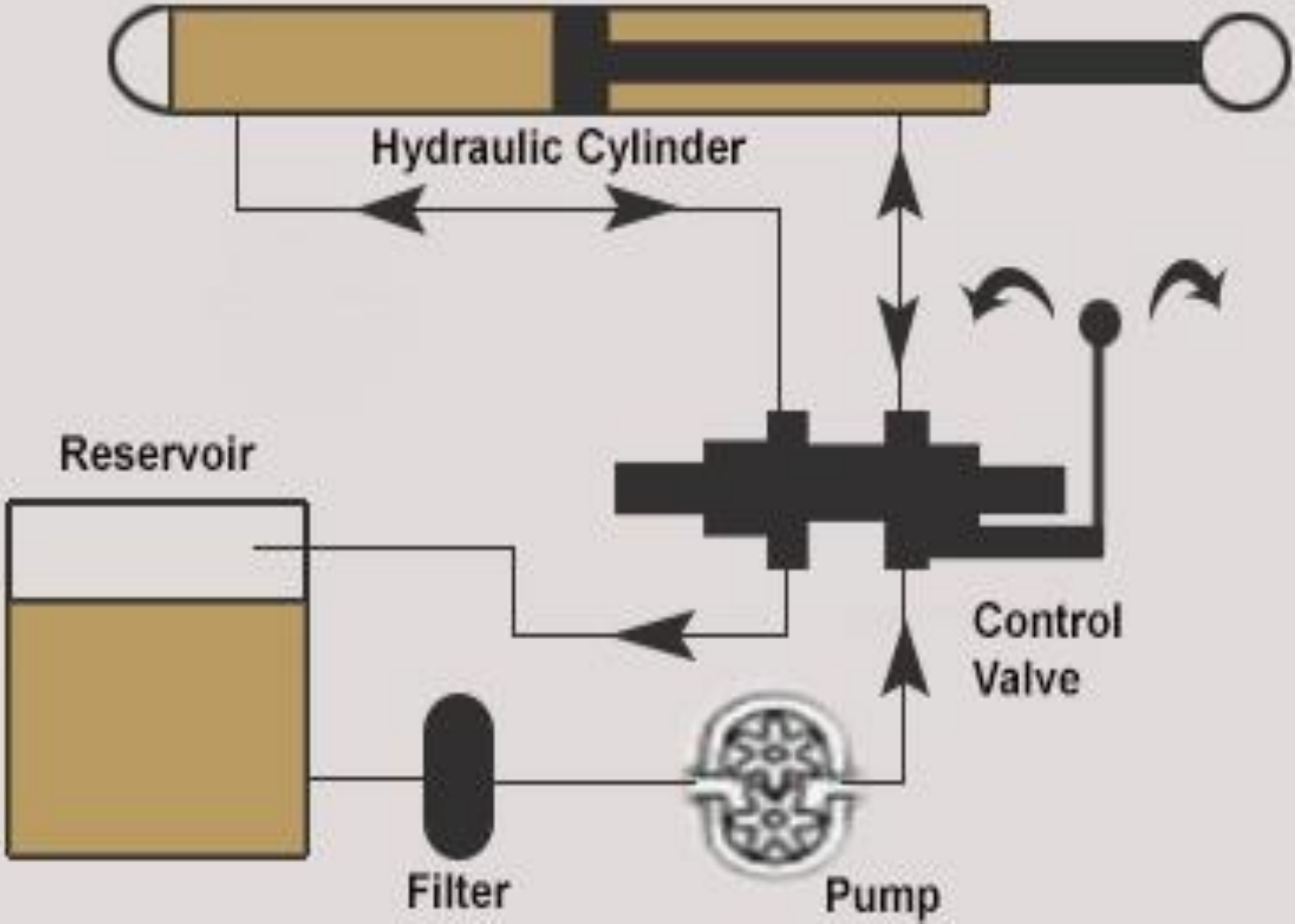
- Tank or reservoir
- Filters
- Hydraulic piping
- Pumps

- Power control units:

- Valves:
  - Directional Control Valves
  - Flow Control Valves
  - Pressure Control Valves

-Drive units:

Actuators


Hydraulic Cylinder
Reservoir
Control
Valve
Filter
Pump

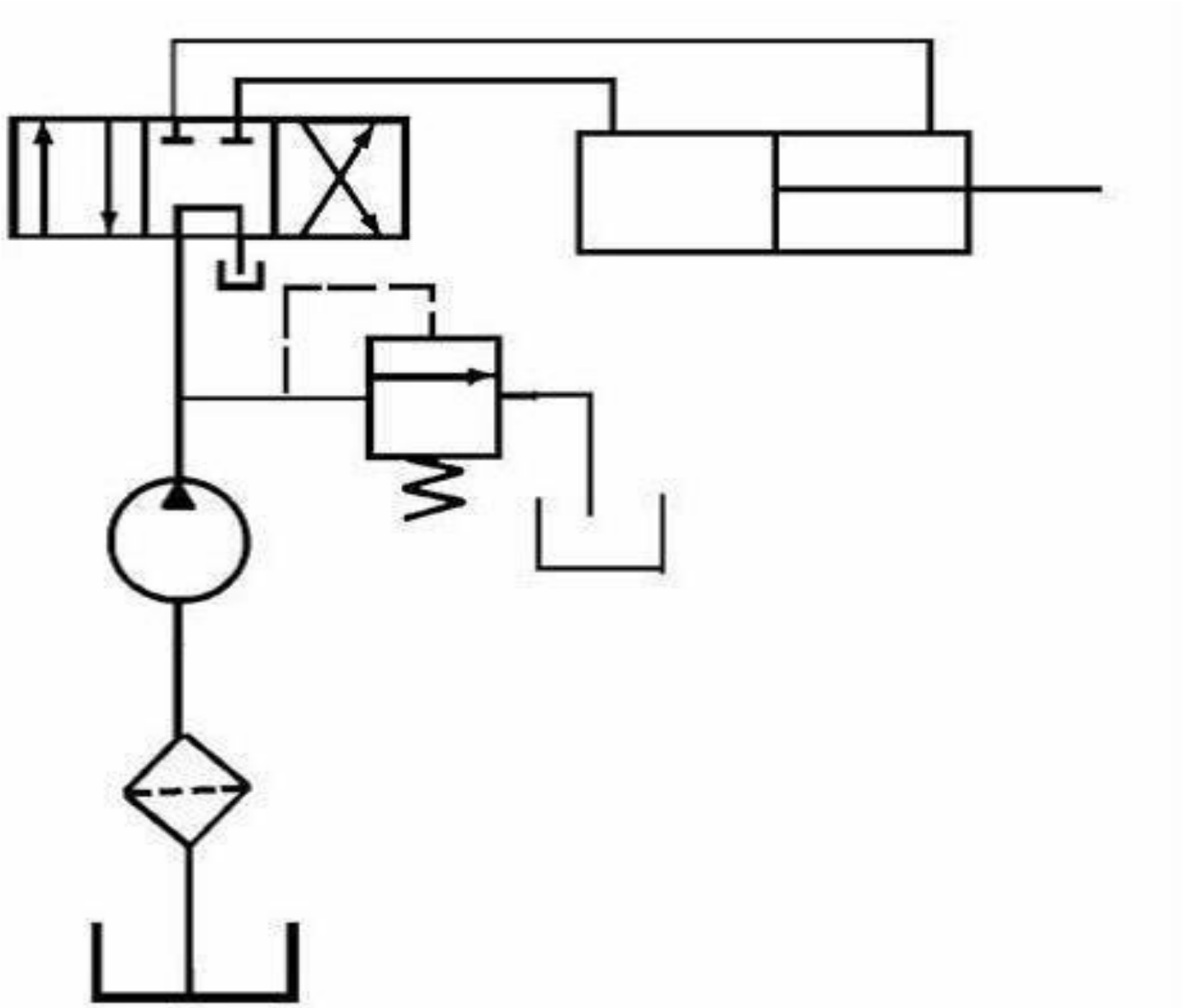


Fig : simple hydraulic circuit

Hydraulics Symbols

1. Pumps and motors

Hydraulic pumps and motors are represented by means of a circle which shows where the drive or output shaft is located. Triangles within the circle give information about the direction of flow.

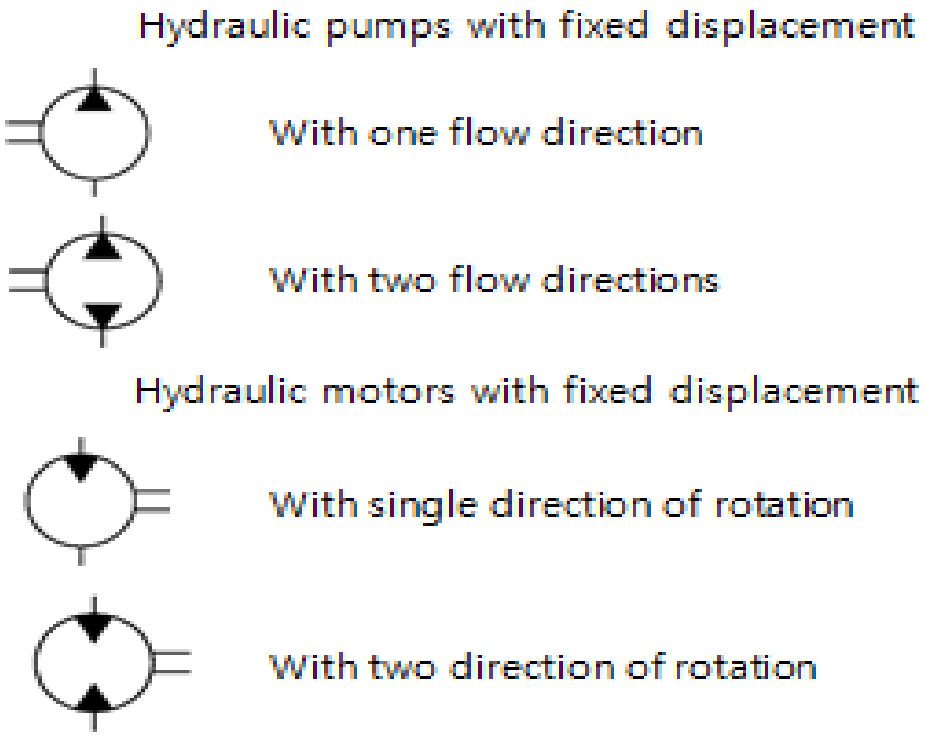


Fig : Fixed displacement hydraulic motors and pumps

Hydraulics Symbols

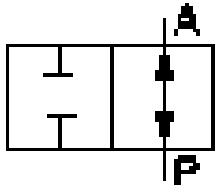
2. Directional control valves

- Directional control valves are shown by means of several connected squares.
- The number of squares indicates the number of switching positions possible for a valve.
- Arrows within the squares indicate the flow direction.
- Lines indicate how the ports are interconnected in the various switching positions.

2/2-way valve

(2 ports and

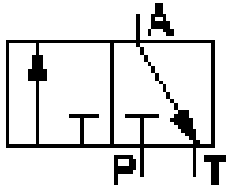
2 switching position)



3/2-way valve

(3 ports and

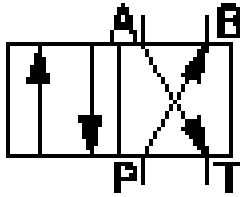
2 switching position)



4/2-way valve

(4 ports and

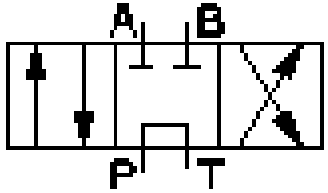
2 switching position)



4/3-way valve

(4 ports and

3 switching position)



Port designations

P: pressure port

T: return port

A, B: power port

Fig : Directional control valves

Thank you for your attention