SNS COLLEGE OF TECHNOLOGY, Coimbatore - 641 035
(An Autonomous Institution)
Department of Mechatronics Engineering

UNIT I- FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

Introduction Fluid Power, hydraulics and pneumatics, advantages and limitations,

Fluid Power Definitions

Fluid Power

The use of a fluid to transmit power from one location to another

Hydraulics

The use of a ***liquid*** flowing under pressure to transmit power from one location to another

Pneumatics

The use of a ***gas*** flowing under pressure to transmit power from one location to another

Advantages of Fluid Power

- Multiplication & variation of force
- Easy, accurate control
- One power source controls many operations
- High power / low weight ratio
- Low speed torque
- Constant force and torque
- Safe in hazardous environments

Basic Fluid Power Components

Reservoir / Receiver

- Stores fluid

Fluid Conductors

- Pipe, tube, or hose that allows for flow between components

Pump / Compressor

- Converts mechanical power to fluid power

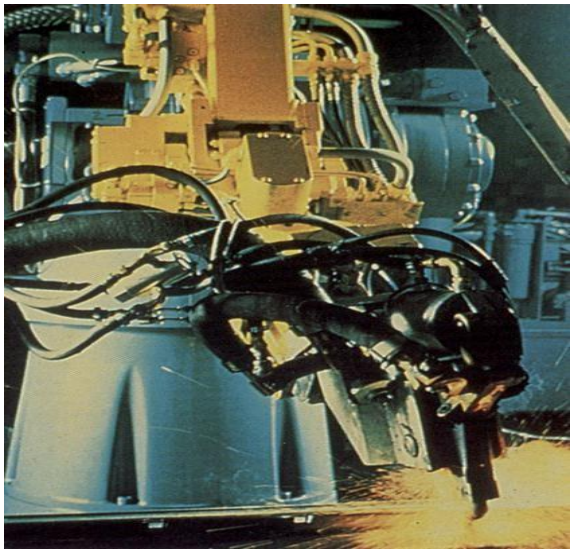
Valve

- Controls direction and amount of flow

Actuators

- Converts fluid power to mechanical power

Fluid Power Examples

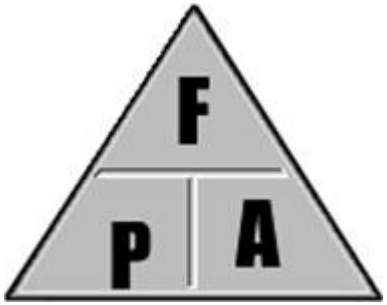


Fluid Power Principles

Definition of pressure

Relationship between force, pressure, and area

$$\text{force} = \text{pressure} \times \text{area}$$



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

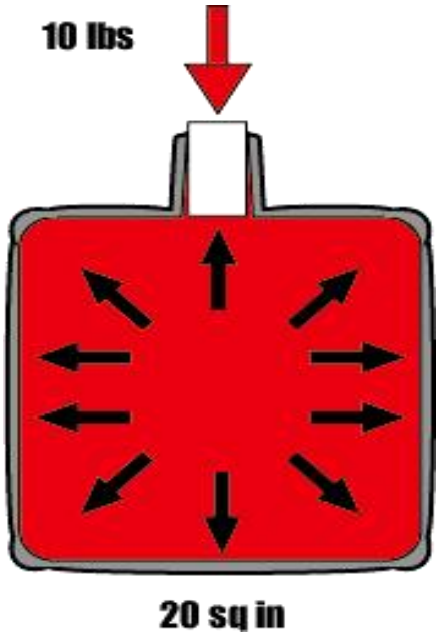
$$\text{area} = \frac{\text{force}}{\text{pressure}}$$

Blaise Pascal developed concepts about pressure in the 1640's.

The SI unit for pressure is the pascal. 1 Pa = 1 N/m^2

Pascal's Law

Pressure applied on a confined fluid at rest is transmitted undiminished in all directions and acts with equal force on equal areas and at right angles to them.



How much force is exerted on every square inch of the container wall illustrated on the right if 10 lb of force is applied to the one square inch stopper?

10 lb

What is the total resulting force acting on the bottom of the container?

200 lb