

# Unit C: Agricultural Power Systems

---

## Lesson 7: Using Hydraulic Systems

---

# Terms

---

- ★ Connectors
- ★ Cycle time
- ★ Directional control valve
- ★ Energy
- ★ Filter
- ★ Flow rate
- ★ Hydraulic actuator
- ★ Hydraulics
- ★ Hydrodynamics
- ★ Hydrostatics
- ★ Law of Conservation of Energy
- ★ Linear actuator

# Terms (continued)

---

- ❖ Micron
- ❖ Multiplication of force
- ❖ Pascal's Law
- ❖ Piping
- ❖ Positive displacement pump
- ❖ Pressure gauge
- ❖ Pressure relief valve
- ❖ Prime mover
- ❖ Pump
- ❖ Reservoir
- ❖ Rotary actuator
- ❖ Strainer

# Hydraulics

---

- ★ A branch of physics dealing with the mechanical properties and practical applications of fluids in motion
- ★ Hydraulic systems do not create power. They transfer power from an outside source
  - ◆ Prime mover – the outside source of power

# Hydrodynamics

---

★ The use of liquids at high flow and low pressure to perform work

# Hydrostatics

---

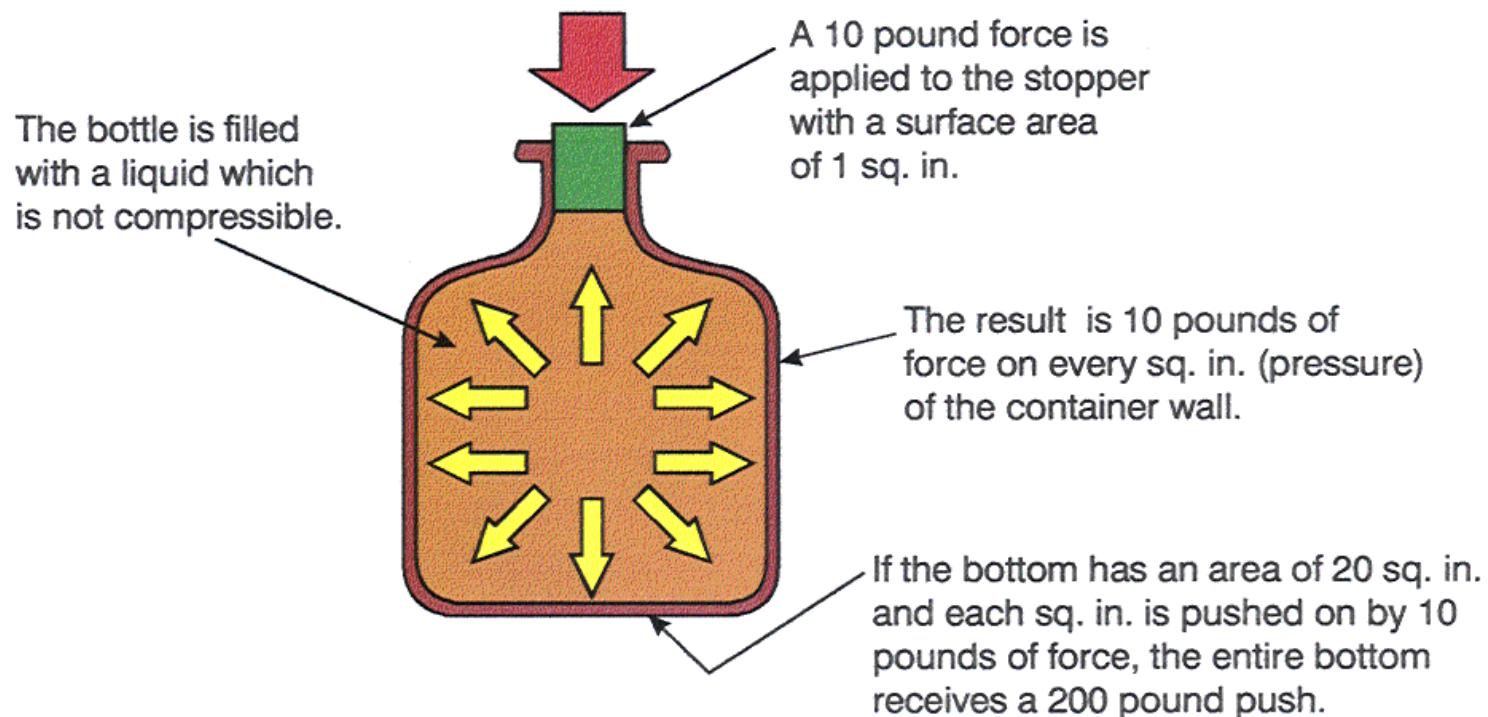
- ❖ Use of liquids at high pressure and low flow to perform work

# Pascal's Law

---

★ Pressure applied to a confined fluid  
is transmitted undiminished in all  
directions

# Application of Pascal's Law



(Courtesy, Interstate Publishers, Inc.)

# Multiplication of force

---

- ★ The hydraulic system takes a small input force and transforms it into a larger output force

# Cycle time

---

- ❖ The amount of time required for one complete set of operations to occur
  - ◆ Flow rate – the measure of how many gallons per minute of hydraulic fluid would run into a container

# Law of Conservation of Energy

---

- ★ Energy may be changed from one form to another, but it cannot either be created or destroyed
  - ◆ Energy – the capacity to do work

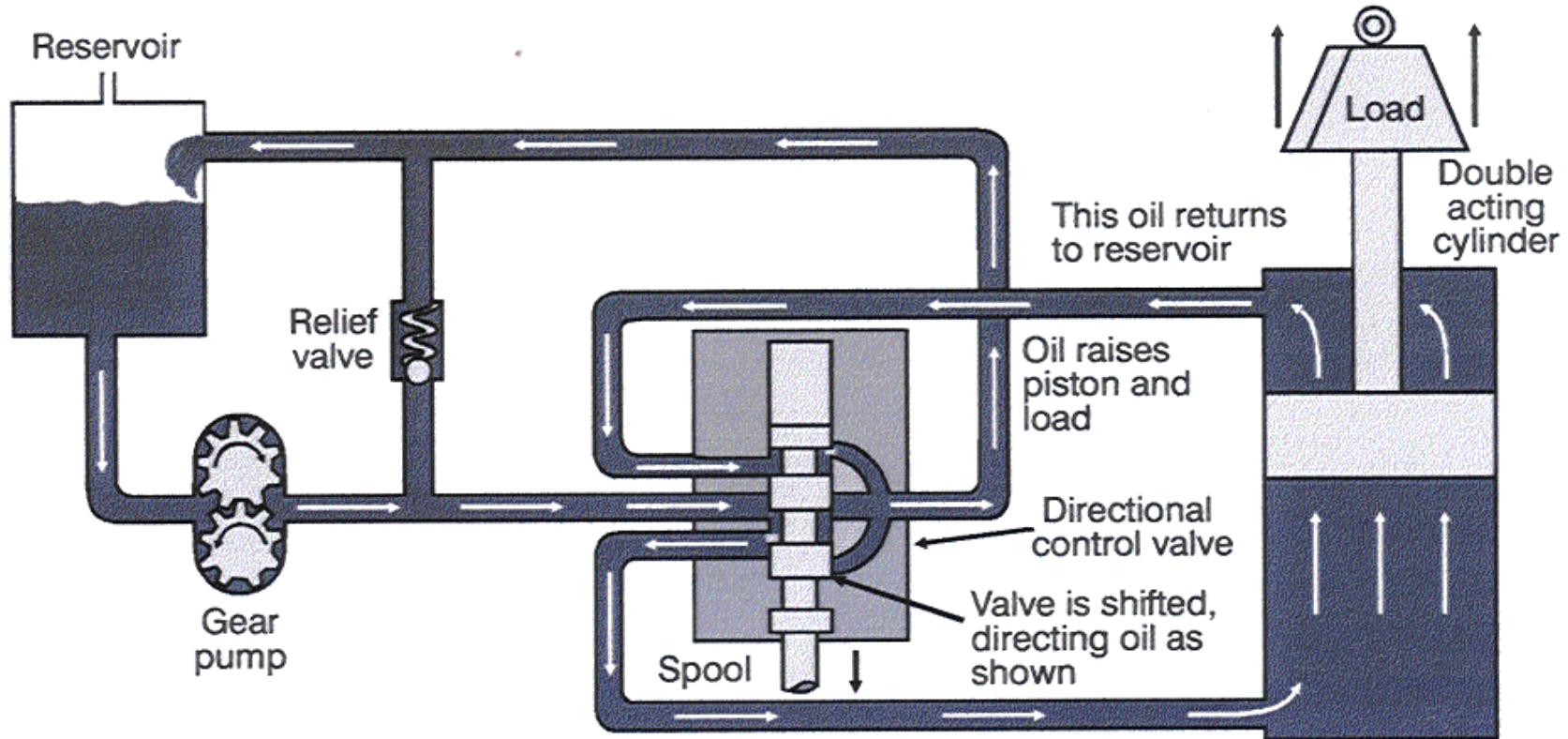
# Components of a hydraulic system

---

- ✿ Reservoir – supplies oil to the hydraulic pump and stores oil that returns after passing through the hydraulic circuit
  - ◆ Strainer – directs the hydraulic oil in a straight line through an element made of metal screens attached to a metal core
  - ◆ Filter – directs hydraulic oil through one or more layers of a porous elements that may trap particles
  - ◆ Micron – equal to 1 millionths of a meter

# Primary components of a hydraulic system

13



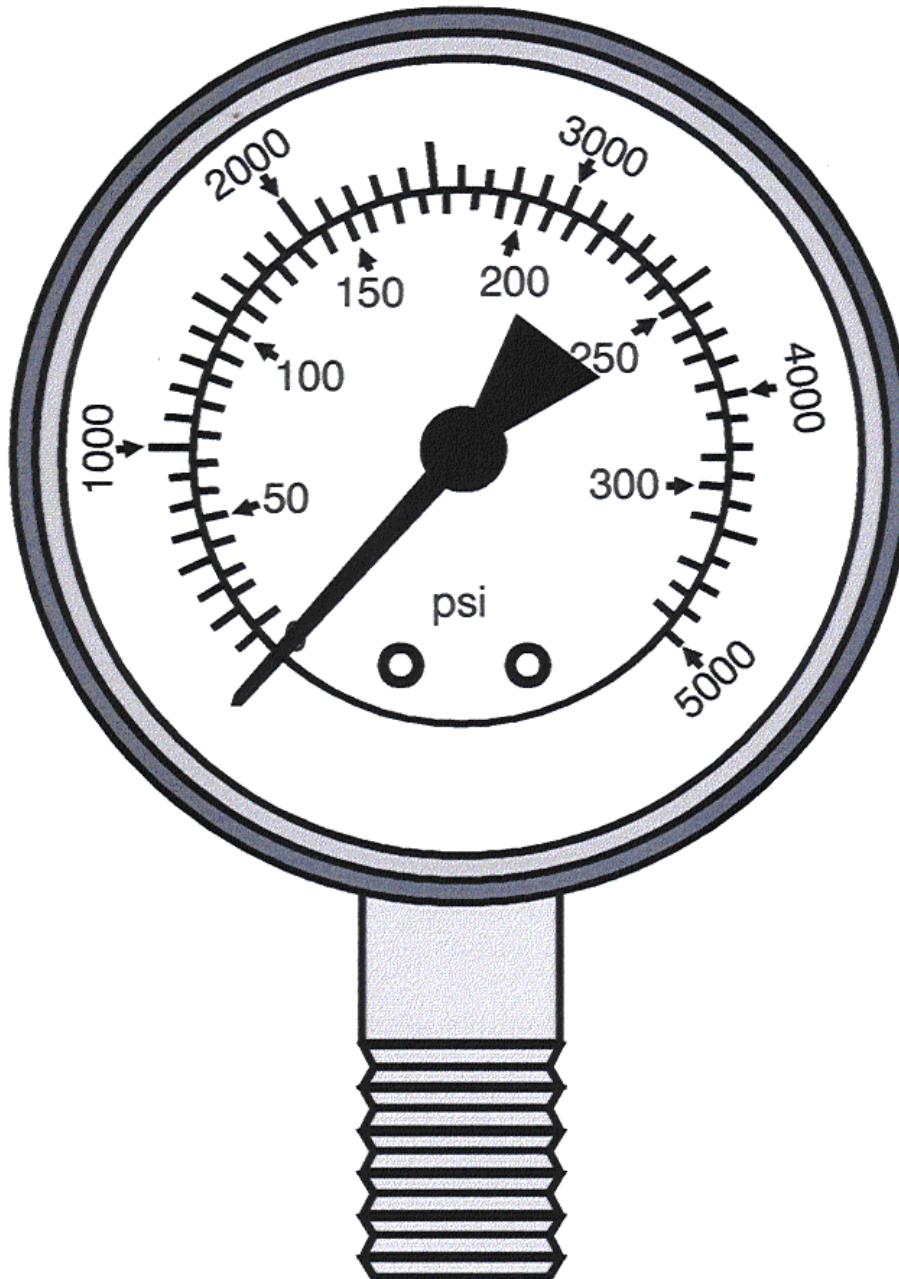
(Courtesy, Interstate Publishers, Inc.)

# Components (continued)

---

- ★ Pump – causes hydraulic oil to flow through the circuit
  - ◆ Positive displacement pump – delivers the same volume of oil per cycle regardless of the pressure at the pump outlet
- ★ Pressure gauge – measure and shows the pressure being produced in a hydraulic system

# A bourdoin tube pressure gauge

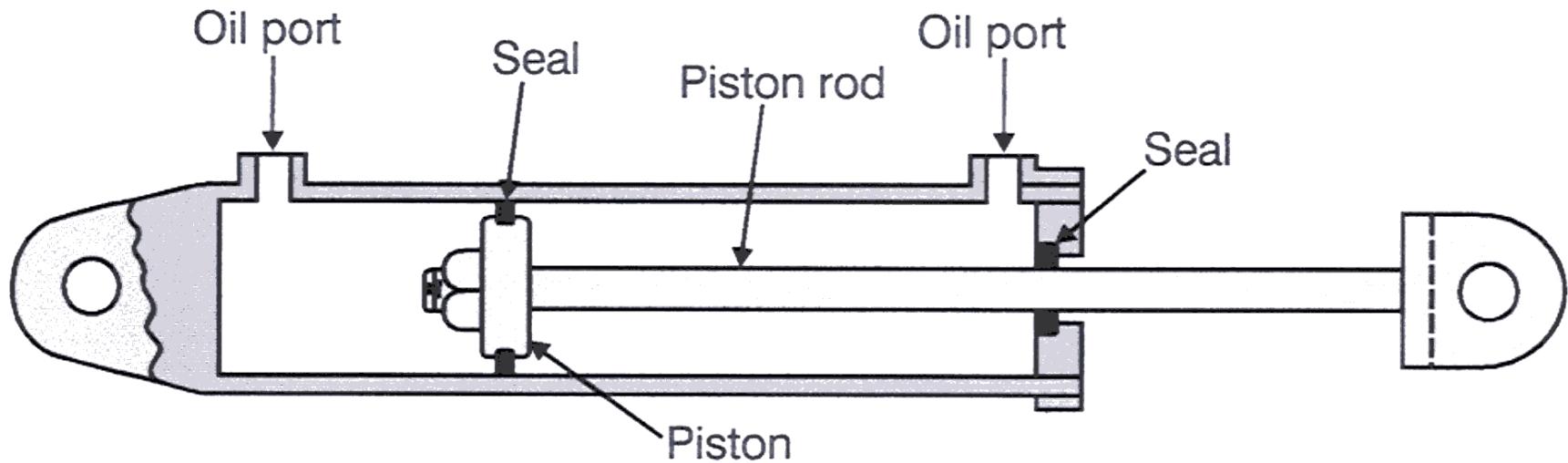


# Components (continued)

---

- ❖ Directional control valve – controls the operation of the system's cylinder sand motors by direction the flow of the fluid in the system

# Primary parts of a typical cylinder



(Courtesy, Interstate Publishers, Inc.)

# Components (continued)

---

- ✿ Hydraulic actuator – converts fluid energy into mechanical energy
  - ◆ Linear actuator – the output of the cylinder occurs in a straight-line manner
  - ◆ Rotary actuator – produces a rotating output force

# Components (continued)

---

- ✿ Piping – fluid conducting lines that connect various components of a hydraulic system
  - ◆ Connectors – used to join one piece of piping to another, or to hydraulic system components

# Advantages of hydraulic systems

---

- ★ Increased flexibility
- ★ Variable speed
- ★ Multiplication of force
- ★ Reduced wear
- ★ Reversibility

# Disadvantages of hydraulic systems

---

- ★ High pressure
- ★ Need for cleanliness
- ★ Safety hazards

# Review/Summary

---

- ❖ What is hydraulics and what are its major operating systems?
- ❖ What principles govern the use of hydraulics?
- ❖ What are the primary components of a hydraulic system?
- ❖ What are the advantages and disadvantages associated with hydraulic systems?