

Name:

Class Period:

Date:

## What is Pascal's Law?

Needed Supplies: Pressure Gauge

Instructions: Read the following about hydraulic force multiplication and how it relates to the PFPD you previously worked on. This particular lesson will build upon your knowledge of forces and area by relating them to the definition of pressure.

### Theoretical Background

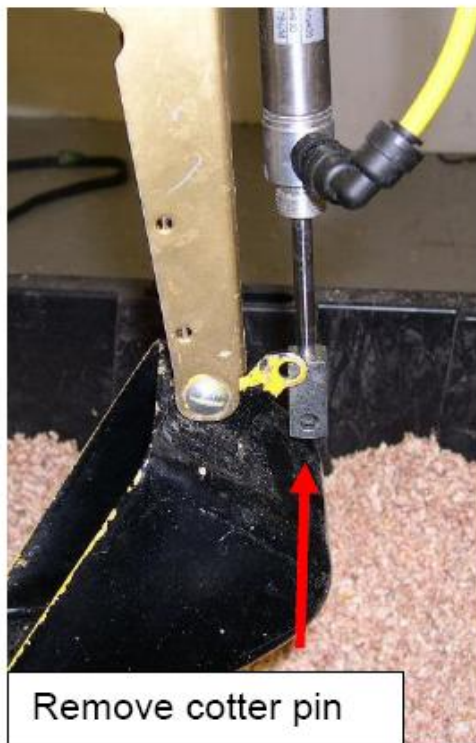
- Pascal's Law
  - For a particular position within a fluid at rest, the pressure is the same in all directions.
  - $P = F / A$  (Equation 1.4)
    - P is pressure (in psi)
    - F is force (lbf)
    - A is area (in<sup>2</sup>)
- Hydraulic Cylinders
  - As you learned in "What is Fluid Flow?", each side of the piston has its own area.
  - The force that the rod can exert depends upon which side of the piston has pressure acting upon it.
  - When the cylinder extends, the system fluid pushes against an area equal to the area of the cylinder ( $A_c$ ).
    - The force that the cylinder rod exerts is:
      - $F = PA_c$  (Equation 1.5)



- When the cylinder retracts, the system fluid pushes against an area equal to the cylinder area minus the area of the rod ( $A_c - A_r$ ).
- The force that the cylinder rod exerts is:
  - $F = P (A_c - A_r)$  (Equation 1.6)



## Experiment



1. Remove cotter pin on cylinder that is attached to the bucket
2. Force produced during extension
  - a. Attach pressure gauge at appropriate port of cylinder
  - b. Move the valve that extends the top cylinder, and record the pressure at the gauge
  - c.  $P = \underline{\hspace{2cm}}$  psi
  - d.  $A_c = .44 \text{ in}^2$

