Fluid Statics

- What is a fluid
- Density
- Pressure

What is a fluid?

- Fluids yield to shearing forces

Resist….	States of matter		
 Compression			
 Shearing			

Density

$$\rho = \frac{m}{V}$$

ρ	Density
m	Mass
V	Volume

Some densities

Water (l)	1.00 x 10^3 kg/m^3
Mercury (l)	14 x 10^3 kg/m^3
Gasoline (l)	0.7 x 10^3 kg/m^3
Air (g)	1.2 kg/m^3
Helium (g)	0.1 kg/m^3

Example 1:
A liquid has a mass of 12 kg and a volume of 2.5 L. *Calculate the density of the material.*

Example 2:
What is the volume of 5.0 kg of water?

Example 3:
What is the mass of 2.0 L of air?

Pressure

$$P = \frac{F}{A}$$

P	Pressure
F	Force
A	Area

Image: Stefan Bracher

Units

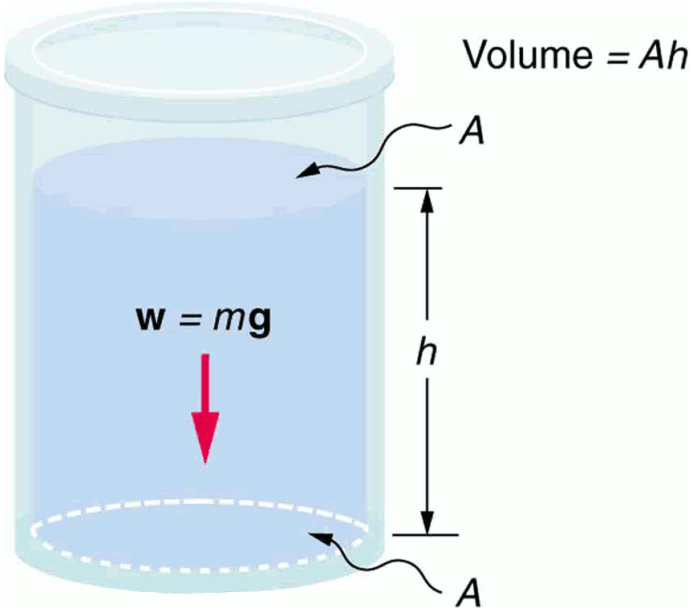
Pascal	1 Pa	= 1 N / m^2	SI-Unit
Bar	1 bar	= 10^5 Pa	Pressure at sea level
Standard Atmosphere	1 atm	= 1.013 x 10^5 Pa	Pressure at sea level
Millimeter Mercury	1 mmHg	= 133.3 Pa	Often used in old pressure gauges.
Pound per square inch	1 psi	= 6.89 x 10^3 Pa	US

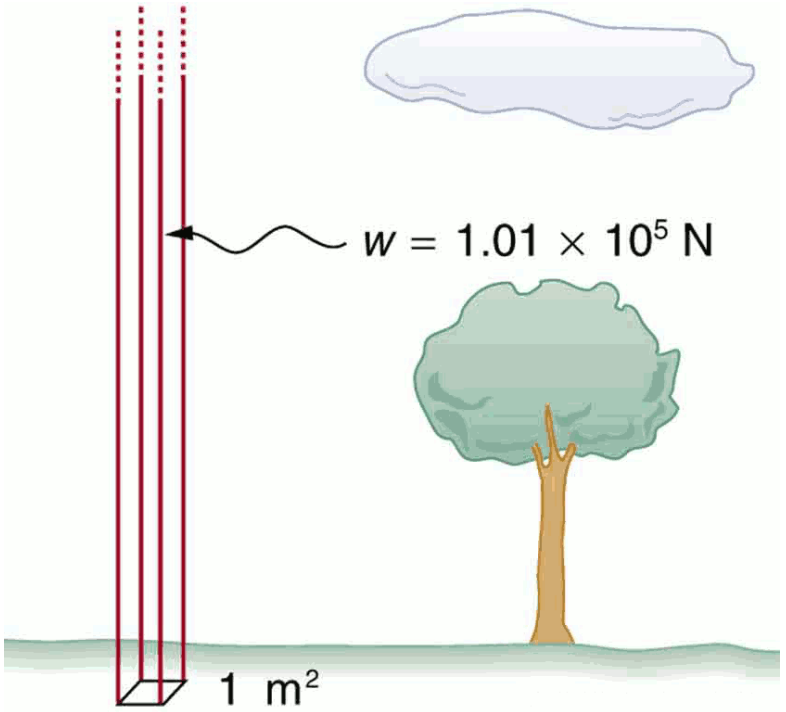
Pressure vs. dept

$$P = \frac{F}{A} = \frac{mg}{A} = h \rho g$$

Liquid only

P	Pressure
ρ	Density
g	Gravity





Images: OpenStax, College Physics. OpenStax CNX. 28. Sep. 2016
http://cnx.org/contents/Ax2o07Ul@9.38:XwsODugl@3/Variation-of-Pressure-with-Dep
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Application Example - To what level is the tank filled?

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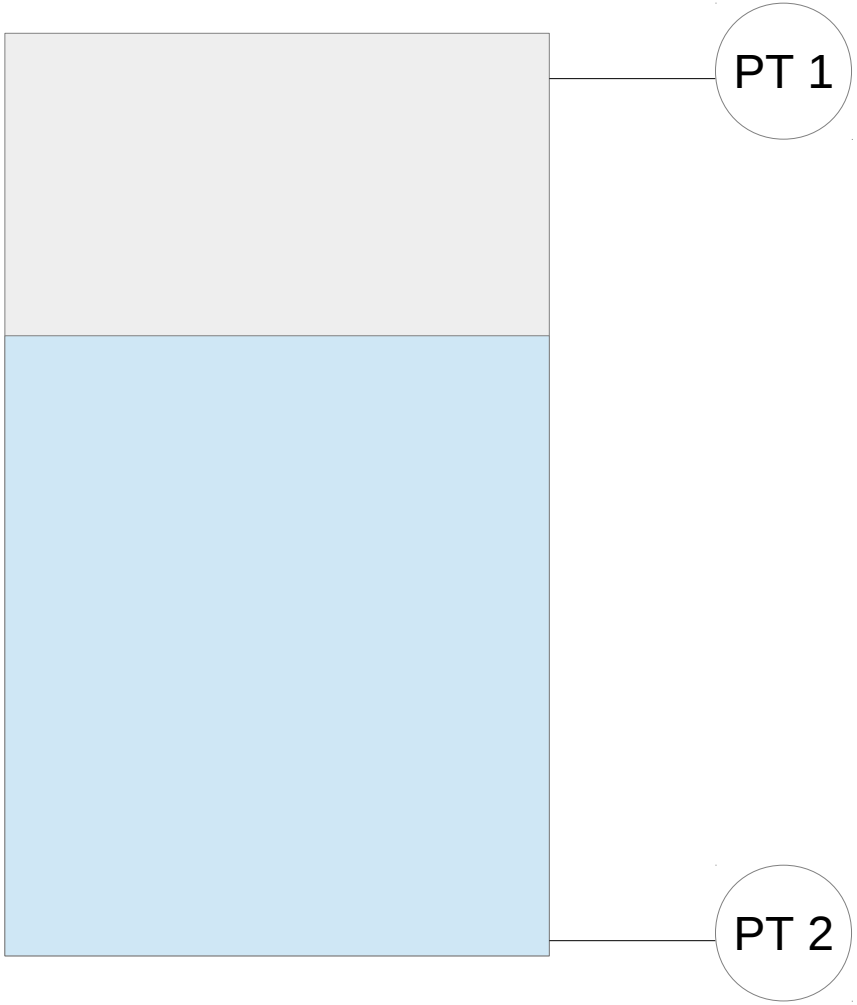

Additional Resources

- Fluid Statics in “College Physics” Chapter 11.1-11.4 http://cnx.org/contents/Ax2o07Ul@9.38:g5mux1l3@3/Introduction-to-Fluid-Statics