How to build your own pressure manometer

Pressure is defined as a force per unit area - and the most accurate way to measure low air pressure is to balance a column of liquid of known weight against it and measure the height of the liquid column so balanced. The units of measure commonly used are inches of mercury (in. Hg), using mercury as the fluid and inches of water (in. w.c.), using water or oil as the fluid.

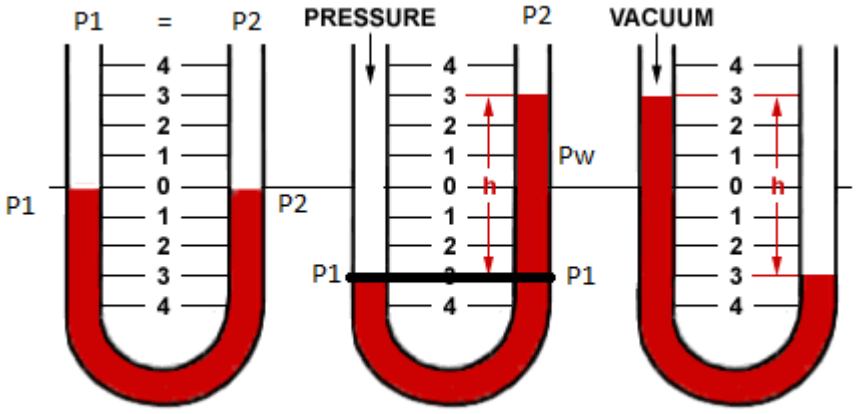

Fig. 2-1 Fig. 2-2 Fig. 2-3

Fig. 2-1. In its simplest form the manometer is a U-tube about half filled with liquid. With both ends of the tube open, the liquid is at the same height in each leg.

Fig. 2-2. When positive pressure is applied to one leg, the liquid is forced down in that leg and up in the other. The difference in height, "h," which is the sum of the readings above and below zero, indicates the pressure.

Fig. 2-3. When a vacuum is applied to one leg, the liquid rises in that leg and falls in the other. The difference in height, "h," which is the sum of the readings above and below zero, indicates the amount of vacuum.

Instruments employing this principle are called manometers. The simplest form is the basic and well-known U-tube manometer. (Fig. 2-1). This device indicates the difference between two pressures (differential pressure), or between a single pressure and atmosphere (gage pressure), when one side is open to atmosphere. If a U-tube is filled to the half way point with water and air pressure is exerted on one of the columns, the fluid will be displaced. Thus one leg of water column will rise and the other falls. The difference in height "h" which is the sum of the readings above and below the half way point, indicates the pressure in inches of water column.

Problem:

Lets say that our manometer pressure has a height of 1 meter. Normal g = 9.80665 m/s^2 and p = 1000 kg/m^3. Solve for P.

Terms:

Pressure is "P"

Force is "F"

Mass is "m"

Gravity acceleration on an object is "g" and g = 9.80665 m/s^2

Area is "A"

Density is "p" and density of water (Pw) = 1000 kg/m^3

Volume is "V"

Height is "h"

Answer:

P = 1m x 1000 kg/m^3 x 9.80665 m/s^2 is 9810 kg/m^s2.

And 1 newton (N) = (kg x m) / s^2

therefore, 9810 kg/m^s2 x N/ (kg x m / s^2) is 9810 N/m^2

and 1 Pascal (Pa) = N / m^2

therefore, 9810 N/m^2 x 1000 kPa is 9.81kPa

Convert kPa to mmhg: http://www.dwyer-inst.com/Products/ManometerIntroduction.cfm

1. 0.1333 kPa = 1 mmHg

2. So, 9.81kPa divided by 1 mmhg equals 73.59mmhg

Final answer is 73.59 mmhg

Conversions:

mmhg to psi

1 mmhg = .01934

therefore, 73.59 x .01934 = 1.4229934835489 psi

meter to inch

1 meter (m) = 39.37 inch (in)