

Fluid Statics

Mechanical Engineering

Pressure with depth, manometers, and the gauge-versus-absolute trap.

Pressure in a fluid at rest rises with depth and is equal at every point on one horizontal level.

$$p = p_0 + \rho g h \cdot \text{manometer: } \Delta p = \rho g \Delta h$$

Water, 10 m deep

$1000 \times 9.81 \times 10.$

About 98 kPa gauge

Mercury column 760 mm

One atmosphere.

About 101 kPa

Same fluid, same level

Even in a bent tube.

Same pressure

THE COMMON MISTAKE

✗ **Mixing gauge and absolute pressure**

✓ **Say which one, every time**

Gas laws and property tables need absolute pressure. A gauge reads zero at atmosphere, so add about 101 kPa before using a table.

Assumes an incompressible fluid at rest. A tall gas column needs the compressible form.