Hydrostatic Pressure in Liquids

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Abstract

In this module, we will study the pressure exerted by the liquid on the material submerged in it, that is the building concept for fluid dynamics and helps in multiple field across different industries. Hydrostatic pressure is due to the weight of the fluid above and increases with depth, fluid density, and gravitational acceleration.
Hydrostatic pressure increases with depth. This is because the deeper the material displaces the fluid, the greater the weight of the fluid above, which increases the pressure. The denser the fluid, the greater the pressure it applies on the material. This pressure is also proportional to the acceleration due to gravity, g.

Factors Affecting Hydrostatic Pressure

1. **Depth (h):** As you go deeper into the fluid, the weight of the fluid above increases, which increases the pressure at that point. Therefore, hydrostatic pressure is **directly proportional** to the depth.
2. **Density (ρ):** The denser the fluid, the more mass it has at a given volume. This means the weight of the fluid is greater, leading to higher pressure. Therefore, pressure is **directly proportional** to the fluid density.
3. **Gravitational acceleration (g):** The pressure is also **proportional** to the gravitational acceleration. The stronger the gravitational force, the higher the pressure.

Hydrostatic Pressure Formula

The formula for hydrostatic pressure is:

$$P = \rho g h$$

Where:

- P is the **hydrostatic pressure**,
- ρ is the **density** of the fluid,
- g is the **acceleration due to gravity**,
- h is the **depth** in the fluid.

Use of Apps on Physics

There are several options for liquids in this setup, such as water, ethanol, benzene, tetrachloromethane, mercury, and an unknown liquid. The simulation allows us to adjust the depth at which an object is placed in the fluid and observe the corresponding hydrostatic pressure.

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