Presentation of Hydrostatic Equilibriums

A Presentation Given to You by Andrew Nassif

Definition

downward force
due to pressure
from fluid above

volume of fluid

weight of fluid
contained in
volume

upward force
due to pressure
from fluid belo

- **Hydrostatic Equilibrium is a condition in which volume of the fluids are staying at rest or reaching a constant velocity. This term is very important in Physics, especially in fluid mechanics.**

Mathematical Analysis

$$F_{top} = -P_{top} \cdot A.$$

Variable 1: Force of top

Variable 2: Pressure

Variable 3: A represents a number

$$F_{bottom} = P_{bottom} \cdot A.$$

Similarly you can find the opposite equation of one pushing upwards rather then downwards.

Application

Astrophysics

- In astrophysics, when you are given a star's layer, you can use hydrostatic equilibrium to find out the thermal pressure from below the weight of a material pushing upward.
- Hydrostatic Equilibrium is also important in measuring the core of clusters in a galaxy.

Planetary Geology

- This process is important in determining what type of planetary objects are out there, as well as the dynamic layers of planets and celestial objects.
- Hydrostatics can also determine the shape of a planet with thermodynamics as a measurement of fluid flow in a terrestrial planet or object.

Fluid Statics

- Fluid statics is the same thing as hydrostatics and it means fluids at rest.
- The use of fluid to do work or in mechanical engineering is called hydraulics.
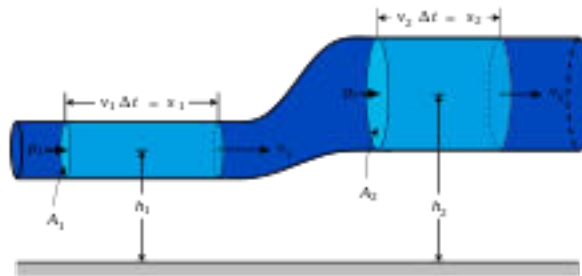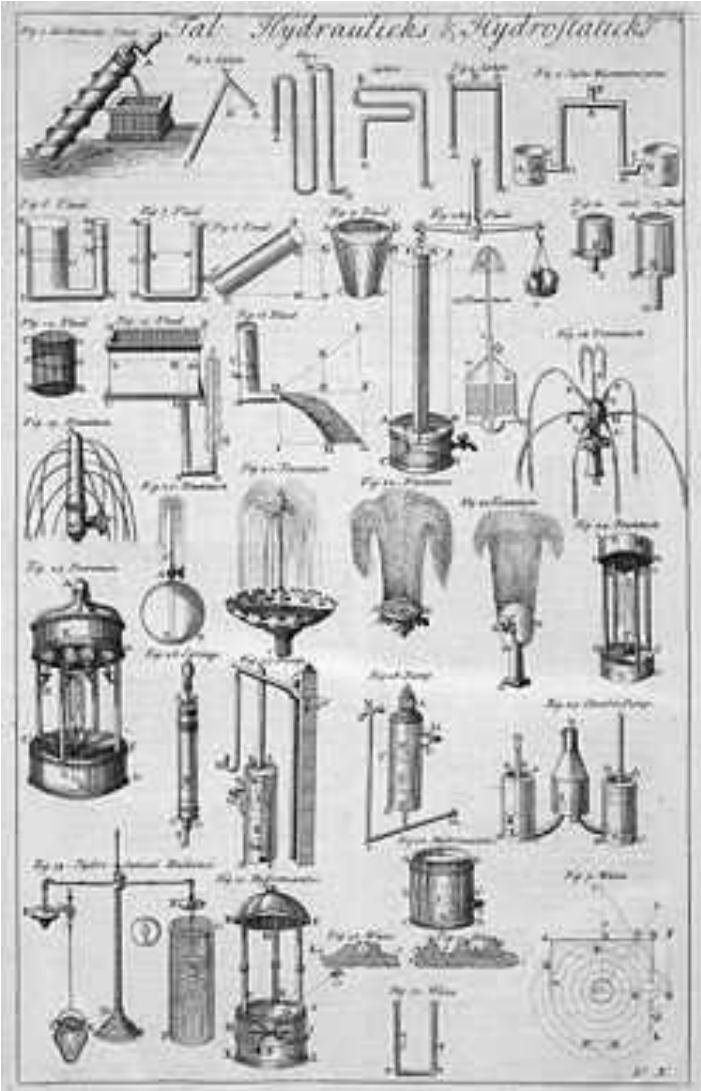- Hydraulics is part of a scientific series known as Continuum Mechanics.

Table of Hydrostatic Machinery from 1728 Cyclopedia

Measure of Hydrostatic Pressure

$$p(z) = \frac{1}{A} \int_{z_0}^{z} dz' \iint_A dx'dy' \, \rho(z')g(z') = \int_{z_0}^{z} dz' \, \rho(z')g(z')$$

1. P is the hydrostatic pressure
2. · is the fluid density (kg/m3),
3. g is gravitational acceleration
4. A is the test area
5. z is the height parallel to the direction
6. z0 is the height of the zero reference point of pressure

Sources

^ Brown, Amy Christian (2007). Understanding Food: Principles and Preparation (3 ed.). Cengage Learning. p. 546. ISBN 978-0-495-10745-3.

^ a b Fox, Robert; McDonald, Alan; Pritchard, Philip (2012). Fluid Mechanics (8 ed.). John Wiley & Sons. pp. 76–83. ISBN 978-1-118-02641-0.