

Answer on Question #42037, Physics, Mechanics | Kinematics | Dynamics

8. A water filled cone of height 50 cm and base area 20 cm^2 is placed on a table with the base on the table. What is the thrust offered by the water on the table?

Solution:

Given:

$$h = 50 \text{ cm} = 0.5 \text{ m},$$

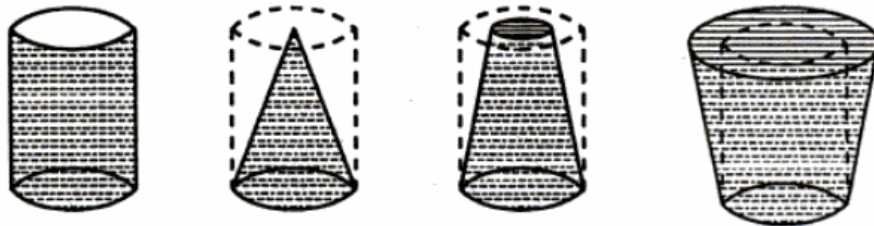
$$S = 20 \text{ cm}^2 = 20 \cdot 10^{-4} \text{ m}^2,$$

$$T = ?$$

Consider a liquid in a container. The liquid is at rest. The force exerted by the liquid is always normal to the surface in contact with the liquid. . The total normal force exerted by a liquid at rest on a surface in contact with it is called fluid thrust. SI unit fluid thrust is newton (N) and is a vector quantity.

Since the pressure at each point in a horizontal plane is the same, the thrust on a horizontal surface will be the product of the pressure at any point of the surface and the area of the surface.

Thus, we conclude that the thrust on the horizontal base of a vessel containing water does not depend on the shape of the vessel nor upon the amount of liquid contained in it; it depends only upon the depth of the liquid and area of the horizontal base.



In the above figure we have four vessels of different shapes but having the same height and equal bases. They contain different amount of liquids. But the thrust on the base of each of the vessels is the same.

If $w = \rho g = 9810 \text{ N/m}^3$ be the weight per unit volume (specific weight) of the water, then the resultant thrust on the base

$$T = wSh = \rho ghS$$

Thus,

$$T = 1000 \cdot 9.81 \cdot 20 \cdot 10^{-4} \cdot 0.5 = 9.81 \text{ N}$$

Answer. $T = 9.81 \text{ N}$.