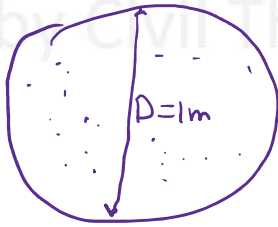


Fluid Mechanics- compression problem solution

A spherical pressure vessel with a diameter $d_1 = 1\text{ m}$ was completely filled with methyl alcohol at a temperature 288 K . Calculate the volume of alcohol with which to fill the tank additionally so that the relative pressure in the tank increases to 10 MPa .

$$\beta = 0.122 \cdot 10^{-8} \frac{\text{m}^2}{\text{N}}$$



$$\Delta V = ?$$

$$m = 10^{-3} \quad 1 \text{ Pa} = 1 \text{ N/m}^2$$

$$M = 10^1$$

$$\Delta p = 10 \text{ MPa} = 10^7 \text{ N/m}^2$$

$$\beta = \frac{-\Delta V/V}{\Delta p}$$

$$\Delta V = -\beta \Delta p V$$

$$V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \times (0.5)^3 = \frac{\pi}{6}$$

$$\Delta p = 10^7 \text{ N/m}^2$$

$$\beta = 0.122 \times 10^{-8} \text{ m}^2/\text{N}$$

$$\Delta V = 6.387 \times 10^{-3} \text{ m}^3 = 6.38 \text{ L}$$

$$\text{compressibility, } \beta = \frac{-\Delta V/V}{\Delta p}$$

$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

This Fluid Mechanics problem was solved by Civil Thinking (<https://civilthinking.com>)

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