

Answer on Question #72012-Physics-Molecular Physics-Thermodynamics

The length of Lead piping in the plant is 50 m long at a temperature of 16C. When hot water flows through it the temperature of the pipe rises to 80C. The coefficient of linear expansion of lead is $29 \cdot 10^{-6} \text{ K}^{-1}$

- i) Determine the change in length of the hot pipe.
- ii) Determine the compressive force induced in the pipe if it is rigidly held and expansion is prevented.

Solution

i)

$$dl = \alpha l \Delta T = 29 \cdot 10^{-6} \cdot 50 \cdot (80 - 16) = 0.0928 \text{ m.}$$

ii)

$$F = \sigma A = \alpha T E A = 29 \cdot 10^{-6} \cdot 14 \cdot 10^9 \cdot (80 - 16) \cdot \frac{\pi(0.025)^2}{4} = 12.75 \text{ kN}$$