Petrol tanker

A petrol tanker loads 40,000 L of fuel in Darwin and drives it to Sydney, where the temperature is 25° lower. How many litres of petrol does he deliver?
$\beta_{\text{petrol}} = 9.5\times10^{-4}\ \text{K}^{-1}$ and $\alpha_{\text{steel}} = 1.2\times10^{-5}\ \text{K}^{-1}$.

Solution

The change in volume of the petrol is

$$\begin{aligned}\Delta V &= (40{,}000\ \text{L})(9.5\times10^{-4}\ \text{K}^{-1})(-25\ \text{K}) \\ &= -950\ L\end{aligned}$$

so the volume delivered is

$$V = V + \Delta V = 39050\ \text{L}$$

Note the expansion of the steel tank doesn't matter!