Gas properties

Is the energy required to heat air from 295 to 305 K the same as the energy required to heat it from 345 to 355 K? Assume the pressure remains constant in both cases.

Answer: The heat transfer will be greater for 345 to 355 K because c_p is greater at higher temperatures.

Explanation: The expression for rate of heat transfer is: $\dot{Q} = \dot{m} \cdot (h_2 - h_1) = \dot{m} \cdot c_p \cdot \Delta T$. Here, mass flow is $\dot{m}$, specific heat capacity is c_p and change in temperature is ΔT. If the specific gas constant c_p remains constant as pressure remains constant, then the heat transfer will be the same since ΔT is the same. But c_p is higher (see A-2) at higher temperatures. Therefore, the heat required will be higher for 345 K to 355 K.