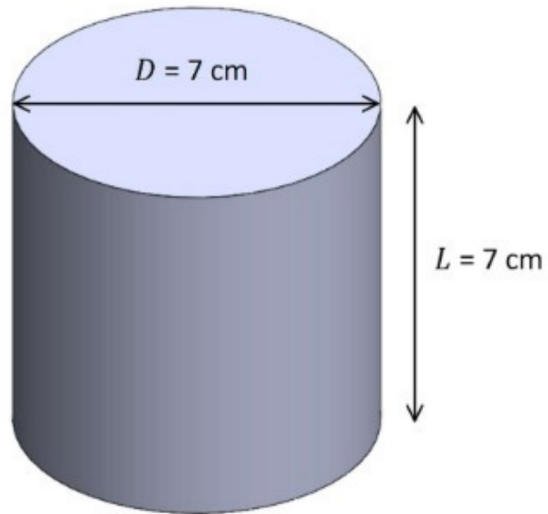


Problem 1

File: C:\Users\jackg\Documents\skew\mcen-3022\hw\1\hw1.EES

28-Aug-24 2:01:04 PM Page 1

EES Ver. 11.589: #0317: For use only by students and faculty, College of Engineering, University of Colorado - Boulder



EES Results:

File:C:\Users\jackg\Documents\skewl\mcen-3022\hw1\hw1.EES

28-Aug-24 2:01:04 PM Page 2

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$$T_0 = \text{ConvertTemp} \left(\text{C}, \text{K} \mid T \left(\text{Water}, P = 80 \text{ [kPa]}, x = 0 \right) \right)$$

$$T_{\text{inf}} = \text{ConvertTemp} \left(\text{C}, \text{K} \mid 20 \text{ [C]} \right) \quad \text{Ambient Temp}$$

$$h = 10 \text{ [W/m}^2\text{-K]} \quad \text{heat transfer coeff}$$

$$D = 7 \text{ [cm]} \cdot \left| 0.01 \cdot \frac{\text{m}}{\text{cm}} \right|$$

$$L = 7 \text{ [cm]} \cdot \left| 0.01 \cdot \frac{\text{m}}{\text{cm}} \right|$$

$$A = \pi \cdot D \cdot L \quad \text{area}$$

$$\rho = \rho \left(\text{Water}, P = 80 \text{ [kPa]}, x = 0 \right)$$

$$m = \rho \cdot \frac{\pi}{4} \cdot D^2 \cdot L$$

$$C_v = \text{Cv} \left(\text{Water}, P = 80 \text{ [kPa]}, x = 0 \right) \cdot \left| 1000 \cdot \frac{\text{J}}{\text{kJ}} \right| \quad \text{Heat Cap}$$

$$dTdt = \frac{h \cdot A}{m \cdot C_v} \cdot (T_0 - T_{\text{inf}}) \quad \text{solving eq}$$

SOLUTION

Unit Settings: SI C kPa kJ mass deg

$$A = 0.01539 \text{ [m}^2\text{]}$$

$$dTdt = 0.01147 \text{ [K/s]} \{0.01147 \text{ [C/s]}\}$$

$$m = 0.2594 \text{ [kg]}$$

$$T_{inf} = 293.2 \text{ [K]}$$

$$C_v = 3802 \text{ [J/kg-K]}$$

$$h = 10 \text{ [W/m}^2\text{-K]}$$

$$\rho = 962.9 \text{ [kg/m}^3\text{]}$$

$$D = 0.07 \text{ [m]}$$

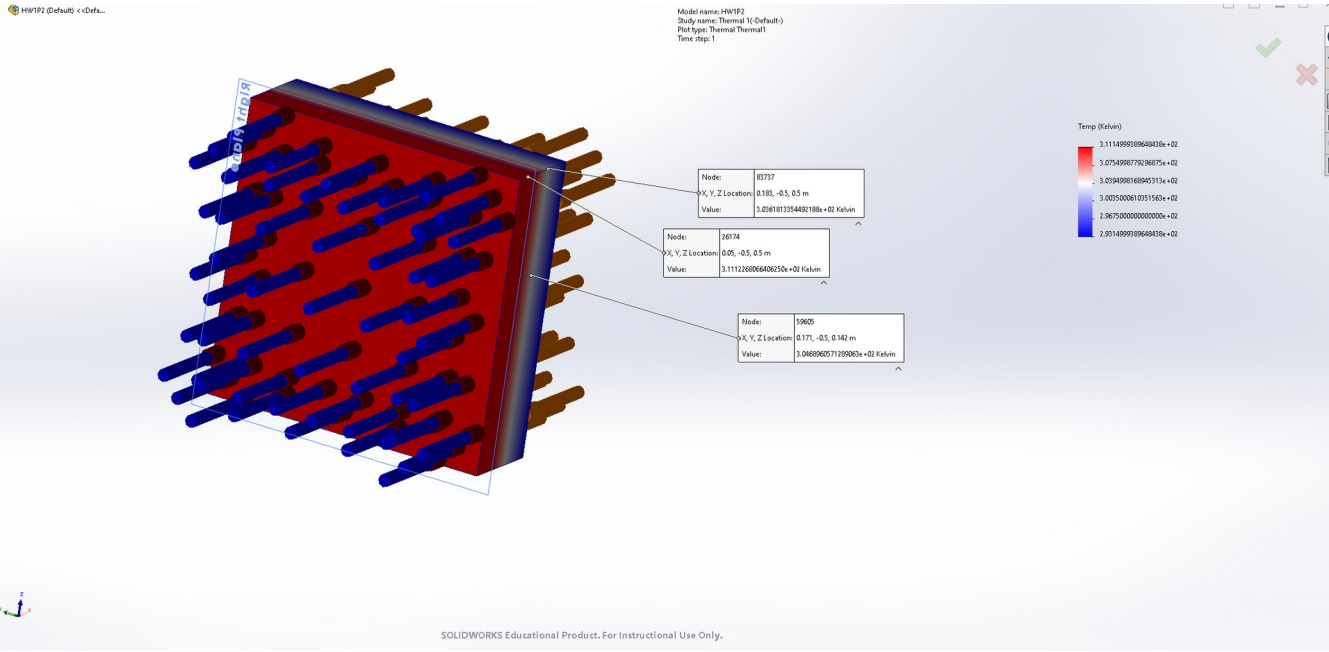
$$L = 0.07 \text{ [m]}$$

$$T_0 = 366.6 \text{ [K]}$$

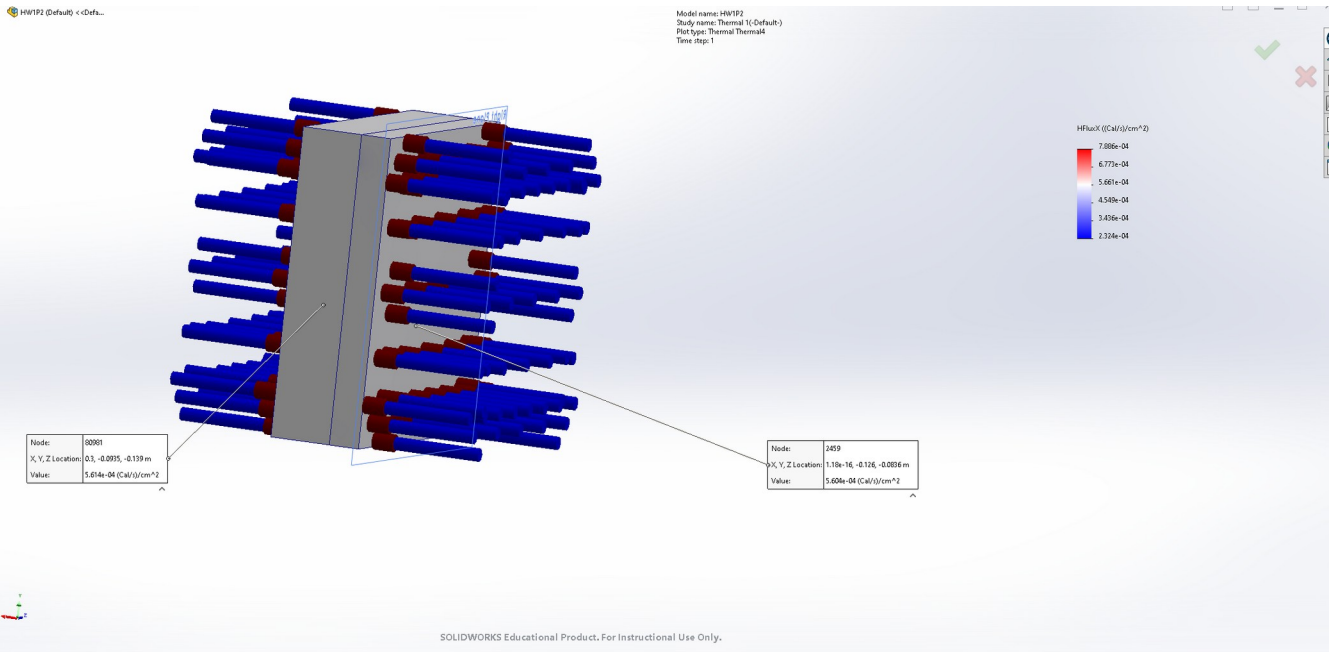
No unit problems were detected.

PROBLEM 2

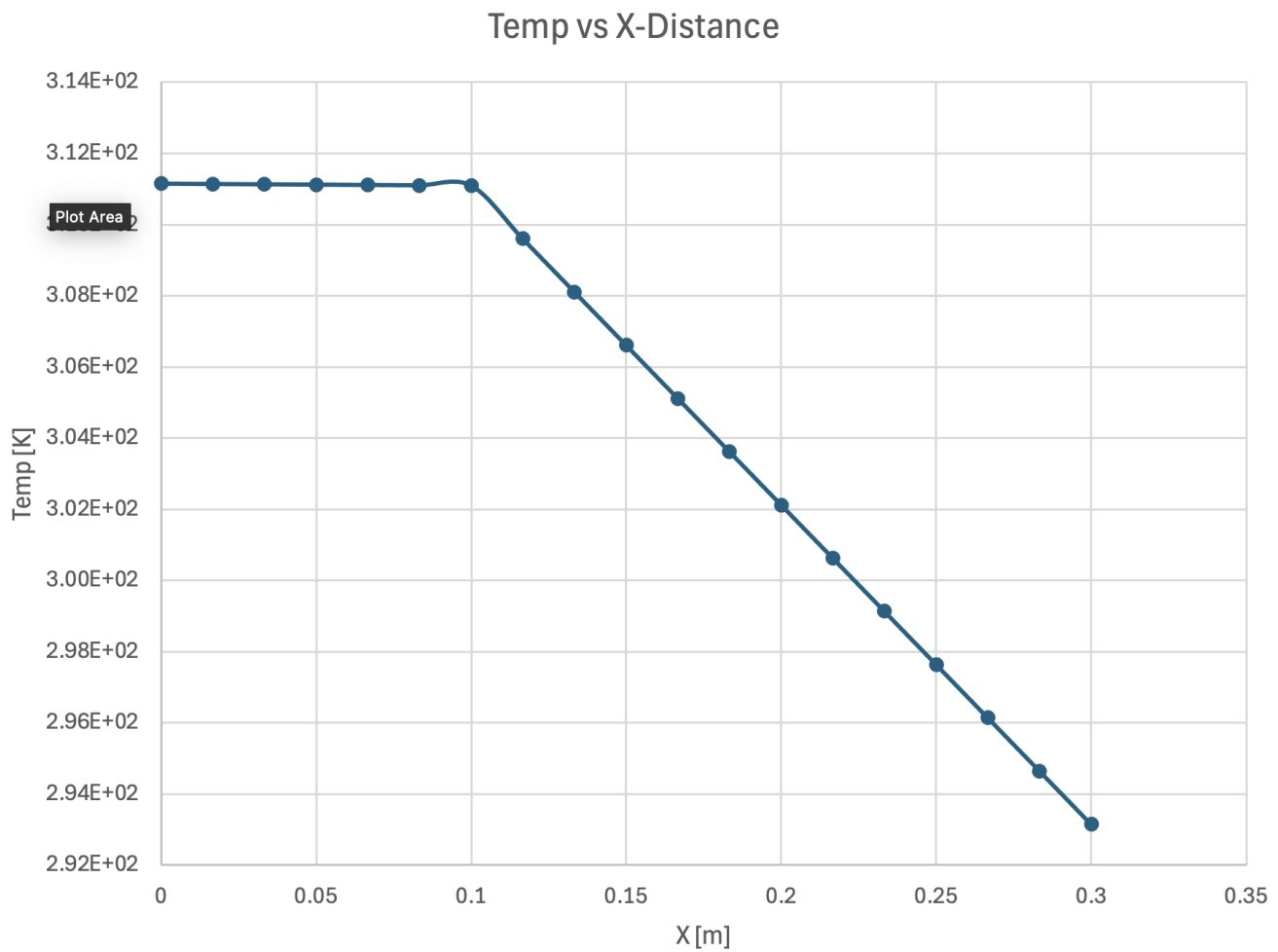
simulation:



Flux:



Graph:



Explanation:

Different materials have different heat-capacities/specific-heat values that affect the rate at which temperature changes. The slope is near flat for the steel because of its high C_v value.