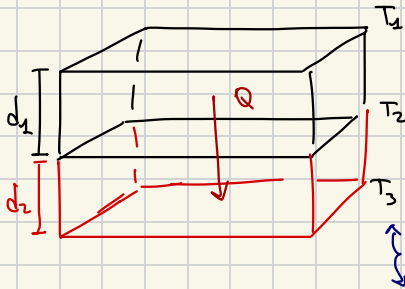


## Esercizio teorico su conduzione di calore



$$\frac{Q}{\Delta t} = \lambda S \frac{\Delta T}{d}$$

Materiale sopra ha coeff  $\lambda_1$   
" sotto ha coeff  $\lambda_2$

Materiale equivalente ha coeff  $\lambda_{eq}$

Oss Cruciali: Nelle due situazioni il flusso di energia che attraversa il materiale è sempre lo stesso

$$(1) \quad \frac{Q}{\Delta t} = \lambda_1 S \cdot \frac{(T_2 - T_1)}{d_1}$$

$$\frac{Q}{\Delta t} = \lambda_2 S \cdot \frac{(T_3 - T_2)}{d_2}$$

$$(2) \quad \frac{Q}{\Delta t} = \lambda_{eq} S \cdot \frac{(T_3 - T_1)}{d_1 + d_2}$$

Manipolando le formule cerco di trovare una formula per  $\lambda_{eq}$  in funzione dei dati che ho.

$$(1) \quad T_2 - T_1 = \frac{Q}{\Delta t} \cdot \frac{d_1}{\lambda_1 S}$$

$$T_3 - T_2 = \frac{Q}{\Delta t} \cdot \frac{d_2}{\lambda_2 S}$$

Faccio la somma

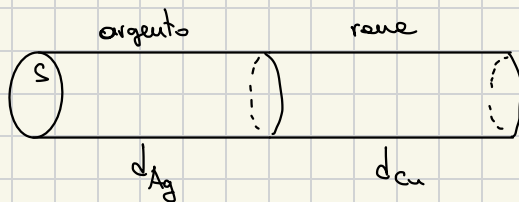
$$T_3 - T_2 + T_2 - T_1 = T_3 - T_1 = \frac{Q}{\Delta t S} \left( \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2} \right)$$

$$\frac{Q}{\Delta t} = \cancel{\lambda_{eq}} \cdot \cancel{S} \cdot \frac{Q}{\Delta t \cdot \cancel{S} (d_1 + d_2)} \cdot \left( \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2} \right)$$

$$\boxed{\frac{d_1 + d_2}{\lambda_{eq}} = \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2}}$$

formula finale.

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$$S = 64,6 \text{ cm}^2$$

$$\boxed{d_{Ag} = d_{cu} = 1,4 \text{ cm}}$$

$\lambda_{eq}$  del sistema?

$$\frac{d_{Ag} + d_{cu}}{\lambda_{eq}} = \frac{d_{Ag}}{\lambda_{Ag}} + \frac{d_{cu}}{\lambda_{cu}}$$

$$\lambda_{Ag} = 430 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$\lambda_{cu} = 400 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$\frac{2 d_{Ag}}{\lambda_{eq}} = \frac{d_{Ag}}{\lambda_{Ag}} + \frac{d_{Ag}}{\lambda_{cu}}$$

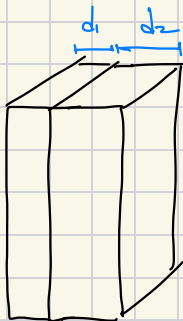
$$\leadsto \frac{2}{\lambda_{eq}} = \frac{1}{\lambda_{Ag}} + \frac{1}{\lambda_{cu}}$$

$$\frac{2}{\lambda_{eq}} = \frac{\lambda_{cu} + \lambda_{Ag}}{\lambda_{Ag} \lambda_{cu}}$$

$\leadsto$

$$\boxed{\lambda_{eq} = \frac{2 \lambda_{Ag} \cdot \lambda_{cu}}{\lambda_{Ag} + \lambda_{cu}}}$$

n62:



$$d_1 = 1,8 \text{ cm}$$

$$\lambda_{eq} = 0,3 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$d_2 = ?$$

$$\lambda_1 = \lambda_{\text{vetro}} = 0,93 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$\lambda_2 = \lambda_{\text{legno}} = 0,2 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$\frac{d_1 + d_2}{\lambda_{eq}} = \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2} \quad \Rightarrow \quad d_2 \left( \frac{1}{\lambda_2} - \frac{1}{\lambda_{eq}} \right) = d_1 \left( \frac{1}{\lambda_{eq}} - \frac{1}{\lambda_1} \right)$$

$$d_2 = \frac{\frac{\lambda_1 - \lambda_{eq}}{\lambda_1 \cancel{\lambda_{eq}}}}{\frac{\lambda_{eq} - \lambda_2}{\lambda_2 \cancel{\lambda_{eq}}}} \cdot d_1 = \frac{\lambda_1 - \lambda_{eq}}{\lambda_{eq} - \lambda_2} \cdot \frac{\lambda_2}{\lambda_1} \cdot d_1$$