

Tutorial - 6

- Q.1. Asbestos insulation ($k = 0.2 \text{ W/mK}$) is put on a Steel pipe ($1.6 \text{ cm ID} + 2 \text{ cm OD}$). Hot water at 90°C flows through the pipe and heat transfer coeff. (h_i) is $500 \text{ W/m}^2\text{K}$. Heat is lost from the outer surface by natural convection to surrounding air at 30°C , and heat trans. coeff. (h_o) is $10 \text{ W/m}^2\text{K}$. Calculate the heat loss rate per metre length of the pipe for insulation thickness of 0, 1 and 4 cm. What's your observation? ~~Neglect thermal resist~~
- a) observation)
- b) what will happen if insulation material is changed to ~~miners~~ glass wool ($k = 0.05 \text{ W/mK}$)
- c) what will happen if, using asbestos, ~~then~~ natural convection is replaced with forced convection ($h_o = 50 \text{ W/m}^2\text{K}$)
- * Neglect thermal resistance of pipe.

- Q.2. Find out the relation of for steady state temperature distribution in an thin infinite slab of width $2b$ in which heat is generated at a uniform rate of \bar{q} ~~units per unit volume~~, the heat transfer coeff. ^{at surface} is h and ambient temp. is T_f .