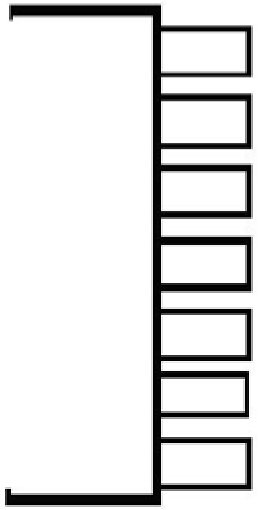
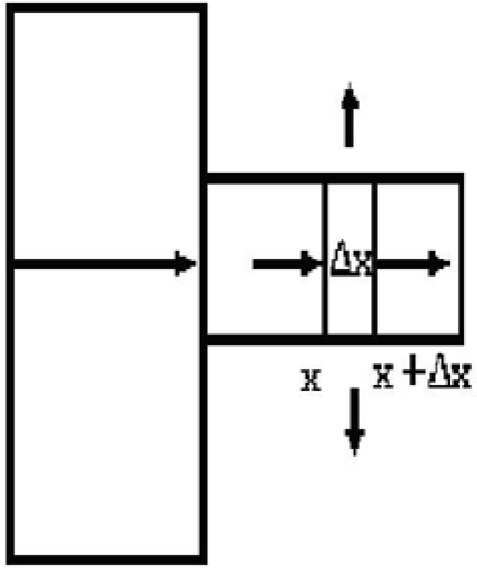
Kanatçıklı Yüzeylerde Isı Transferi:

$$q = hA\left(T_s - T_\infty\right)$$

Isı Transferini arttırmak için A ve h sayısı artırılabilir. Ancak h değeri belli bir artıştan sonra etkilenmez. Yüzey alanını artırmak için duvara aşağıdaki şekilde kanatçıklar konulabilir.





Δx
x
x +Δx

$$q_x - q_{x+\Delta x} - q_{konveksiyon} = 0$$

$$q_x = -k.A_c \frac{\partial T}{\partial x}$$

$$q_{x+\Delta x} = q_x + \frac{\partial q_x}{\partial x} \Delta x$$

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$$q_{x+\Delta x} = -kA_c\frac{\partial T}{\partial x} + \frac{\partial}{\partial x}\left(-kA_c\frac{\partial T}{\partial x}\right)\Delta x$$

$$q_{konveksiyon} = hA(T - T_\infty) \Rightarrow A = P.\Delta x \qquad (P : çevre)$$

$$q_x - q_{x+\Delta x} = q_{kon}$$

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$$\frac{\partial}{\partial x}\left(-kA_c \frac{\partial T}{\partial x}\right)\Delta x = hP\Delta x(T - T_\infty)$$

$$kA_c \frac{\partial^2 T}{\partial x^2} = hP(T - T_\infty)$$

$$\theta_{(x)} = T_x - T_\infty$$

$$\frac{d\theta_x}{dx} = \frac{dT_x}{dx} \Rightarrow \frac{d^2\theta_x}{dx^2} = \frac{d^2T_x}{dx^2}$$

$$kA_c \frac{d^2\theta_x}{dx^2} - hP\theta = 0$$

$$\frac{d^2\theta_x}{dx^2} - \frac{hP}{kA_c}\theta = 0$$

$$\frac{d^2\theta_x}{dx^2} - a^2\theta = 0 \Rightarrow \theta_x = c_1 e^{ax} + c_2 e^{-ax}$$

Sonsuz uzunlukta kanatçık için:

$$\theta(x) = T(x) - T_\infty$$

$$\lim_{L \to \infty} (L) = 0$$

$\theta_{(0)} = T_b - T_\infty \Rightarrow \theta_{(L)} = 0$ Bu koşuldan dolayı $c_1=0$ olmak zorundadır.

$$\theta_x = c_2 e^{-ax}$$

$$\theta_{x=0} = c_2 e^{-a0} = T_b - T_\infty \Rightarrow c_2 = T_b - T_\infty$$

$$\theta_x = (T_b - T_\infty) e^{-\sqrt{\frac{hP}{kA}} \cdot x}$$

$$\frac{T_x - T_\infty}{T_b - T_\infty} = e^{-\sqrt{\frac{hP}{kA}} \cdot x}$$

$$q = -kA_c \frac{\partial T}{\partial x}$$

$$T_{(x)} = T_\infty + (T_b - T_\infty) e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$\frac{\partial T}{\partial x} = -(T_b - T_\infty)\sqrt{\frac{hP}{kAc}}\, e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$q_x = kA_c (T_b - T_\infty)\sqrt{\frac{hP}{kAc}}\, e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$q_0 = q = (T_b - T_\infty)\sqrt{hPkA_c}$$

$$\theta_x = c_2 e^{-ax}$$

$$\theta_{x=0} = c_2 e^{-a0} = T_b - T_\infty \Rightarrow c_2 = T_b - T_\infty$$

$$\theta_x = (T_b - T_\infty) e^{-\sqrt{\frac{hP}{kA}} \cdot x}$$

$$\frac{T_x - T_\infty}{T_b - T_\infty} = e^{-\sqrt{\frac{hP}{kA}} \cdot x}$$

$$q = -kA_c \frac{\partial T}{\partial x}$$

$$T_{(x)} = T_\infty + (T_b - T_\infty) e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$\frac{\partial T}{\partial x} = -(T_b - T_\infty)\sqrt{\frac{hP}{kAc}} e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$q_x = kA_c (T_b - T_\infty)\sqrt{\frac{hP}{kAc}} e^{-x\sqrt{\frac{hP}{kAc}}}$$

$$q_0 = q = (T_b - T_\infty)\sqrt{hPkA_c}$$

$$q = \int_{A_{knt}} h\left[T_{(x)} - T\infty\right] dA_{knt}$$