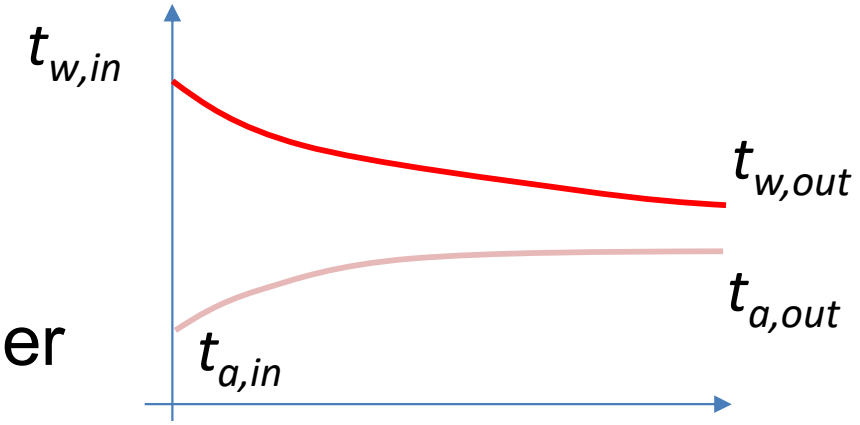
How to evaluate q starting from declared data

ε - NTU method

$$\varepsilon = \frac{q}{q_{\max}}$$

Actual heat flux

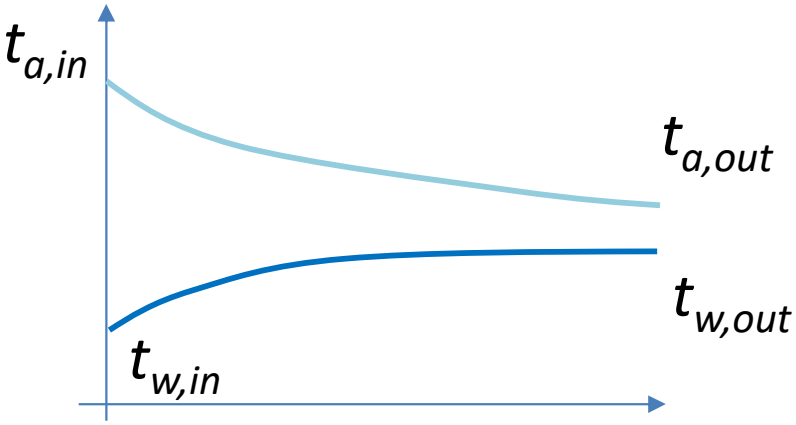
Maximum heat flux in an ideal heat exchanger



$$q_{\max} = \dot{C}_{\min}(t_i^{'} - t_i^{''})$$

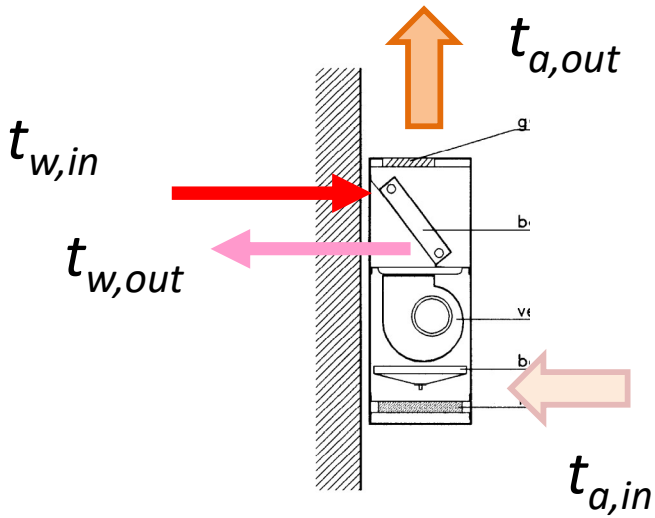
$$q = \dot{C}^{'}(t_i^{'} - t_u^{'}) \qquad q = \dot{C}^{''}(t_u^{''} - t_i^{''})$$

$$\varepsilon = \frac{\dot{C}^{'}(t_i^{'} - t_u^{'})}{\dot{C}_{\min}(t_i^{'} - t_i^{''})} = \frac{\dot{C}^{''}(t_u^{''} - t_i^{''})}{\dot{C}_{\min}(t_i^{'} - t_i^{''})}$$



In a fan-coil usually $\dot{C}_{min}$ is the air

Water temperatures: 50°C-40°C
Ait temperature: 20°C
Flow rate of the air: 1140 m^3/h
Declared power in heating: 6410 W



Declared values

$\dot{m}_{air}$ = 1140 * 1,2 /3600 = 0,38 kg/s

$\dot{C}_{min}$ = 0,38 x 1000 = 380 W/K

Δt_{air} = 6140 / 380 = 16,8 °C

$t_{a,out}$ = 20 + 16,8 = 36,8 °C

Δt_{max} = 50 - 20 = 30 °C

ε = 16,8 / 30 = 56%

$\dot{m}_w$ = 6140/10/4186 = 0,15 kg/s

Water temperatures: 45°C-40°C

Δt_{max} = 45 - 20 = 25 °C

Δt_{air} = 0,56 x 25= 14 °C

$t_{a,out}$ = 20 + 14 = 34 °C

P_a = 14 x 1007 x 0,38 = 5320 W

$\dot{m}_w$ = 5320/5/4186 = 0,25 kg/s