

Active Learning Exercise



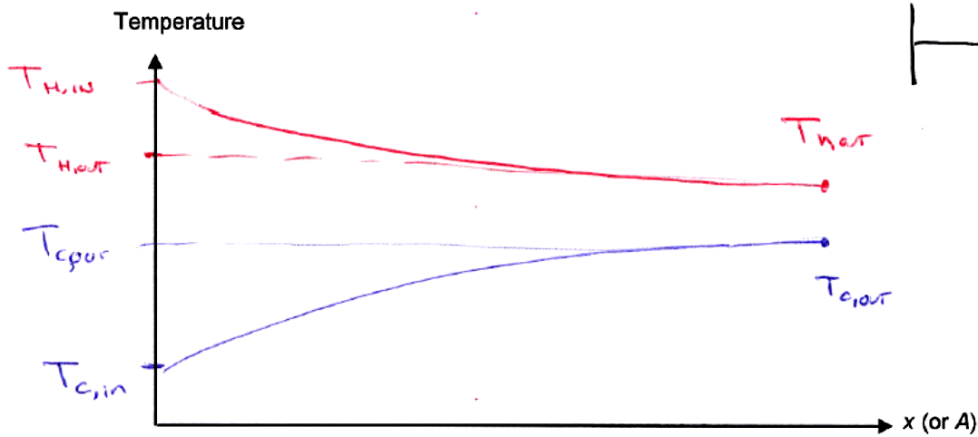
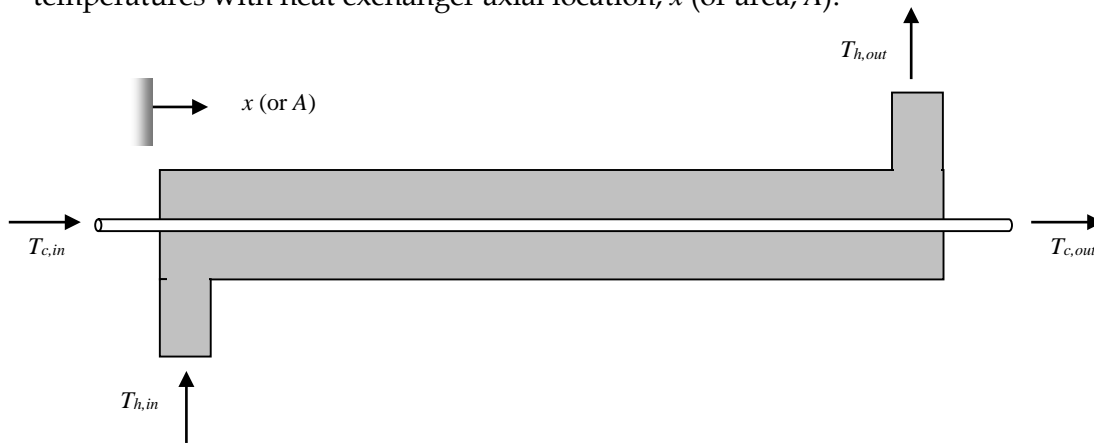
Of the two heat exchangers in the last two examples, which one is better? Why?

The counter-flow is better.

Why is this the case?

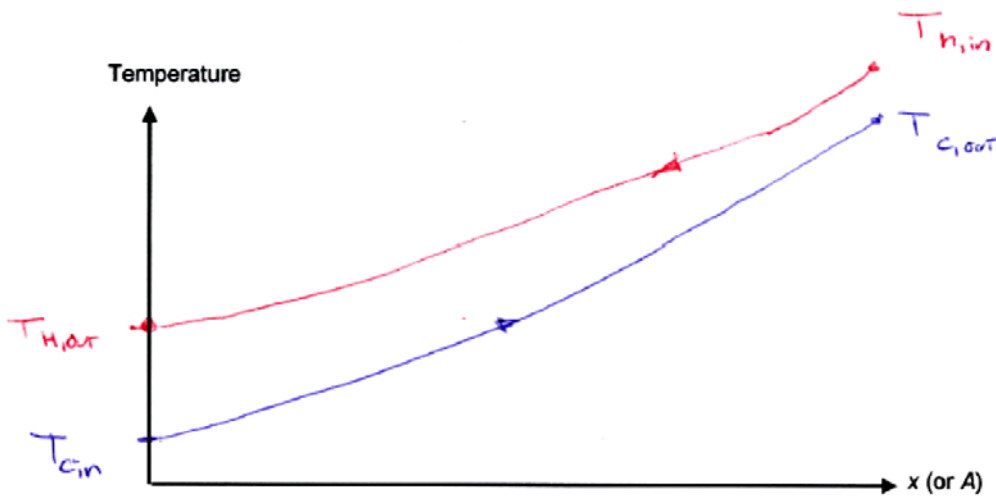
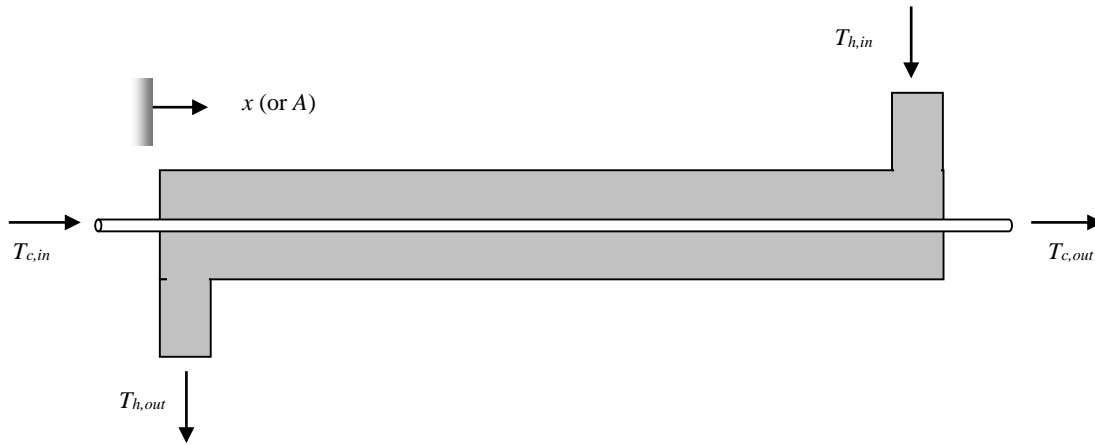
It gives same \dot{Q} but is shorter.

Let's explore this a bit more. Consider a *parallel flow* heat exchanger with a warm fluid inlet temperature $T_{h,in}$ and a cold fluid inlet temperature $T_{c,in}$. Sketch the variation of fluid temperatures with heat exchanger axial location, x (or area, A).



If the HX were infinitely long, the two fluids would approach the same temperature.

Now consider a *counter-flow* arrangement of the same heat exchanger. The warm fluid inlet temperature is still $T_{h,in}$ and the cold fluid inlet temperature is still $T_{c,in}$. Sketch the variation of fluid temperatures with heat exchanger axial location, x (or area, A).



Note that the fluids out do not need to approach the same temperature. In fact,

$$T_{h,out} \text{ CAN BE } T_{c,out} !!$$

$$<$$