

32.6 Cold water initially at $55^\circ F$ is heated to $120^\circ F$ to make potable hot water using a parallel flow shell and tube heat exchanger. Low temperature hot water from a boiler enters the heat exchanger at $160^\circ F$ and leaves at $130^\circ F$. What is the log mean temperature difference?

- A. $40^\circ F$
- B. $45^\circ F$
- C. $56^\circ F$
- D. $58^\circ F$

In a **Parallel Flow** heat exchanger, the temperature of the cold and hot stream will approach but never reach one another. The smallest temperature differential between the two streams will be observed at the outlet and the highest temperature differential will be observed at the inlet.

Call the inlet temperature differential ΔT_A and the outlet temperature differential ΔT_B .

$$\Delta T_A = 160^\circ F - 55^\circ F = 105^\circ F$$

$$\Delta T_B = 130^\circ F - 120^\circ F = 10^\circ F$$

Recall the simplified **LMTD** equation. Substitute and solve for the log mean temperature difference:

$$\Delta T_{lm} = \frac{\Delta T_A - \Delta T_B}{\ln\left(\frac{\Delta T_A}{\Delta T_B}\right)} = \frac{105^\circ F - 10^\circ F}{\ln\left(\frac{105^\circ F}{10^\circ F}\right)} = 40.4^\circ F$$

Answer A