

Fridge or Heat Pump?

Mechanical Engineering

One machine, two purposes, and why the heat pump always wins on paper.

Refrigerator

- You want the cold space cold
- $\text{COP} = \text{heat removed} \div \text{work in}$
- $\text{Ideal COP} = T_c \div (T_h - T_c)$
- Domestic units run about 2 to 4

Heat pump

- You want the warm space warm
- $\text{COP} = \text{heat delivered} \div \text{work in}$
- $\text{Ideal COP} = T_h \div (T_h - T_c)$
- Always exactly 1 above the fridge

THE DIFFERENCE THAT MATTERS

Same hardware. Which side you call useful is what sets the number.

COP collapses as the temperature lift grows, so a quoted figure means nothing without its test conditions.