

Heat Pump

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Training on
Energy Efficiency and Conservation
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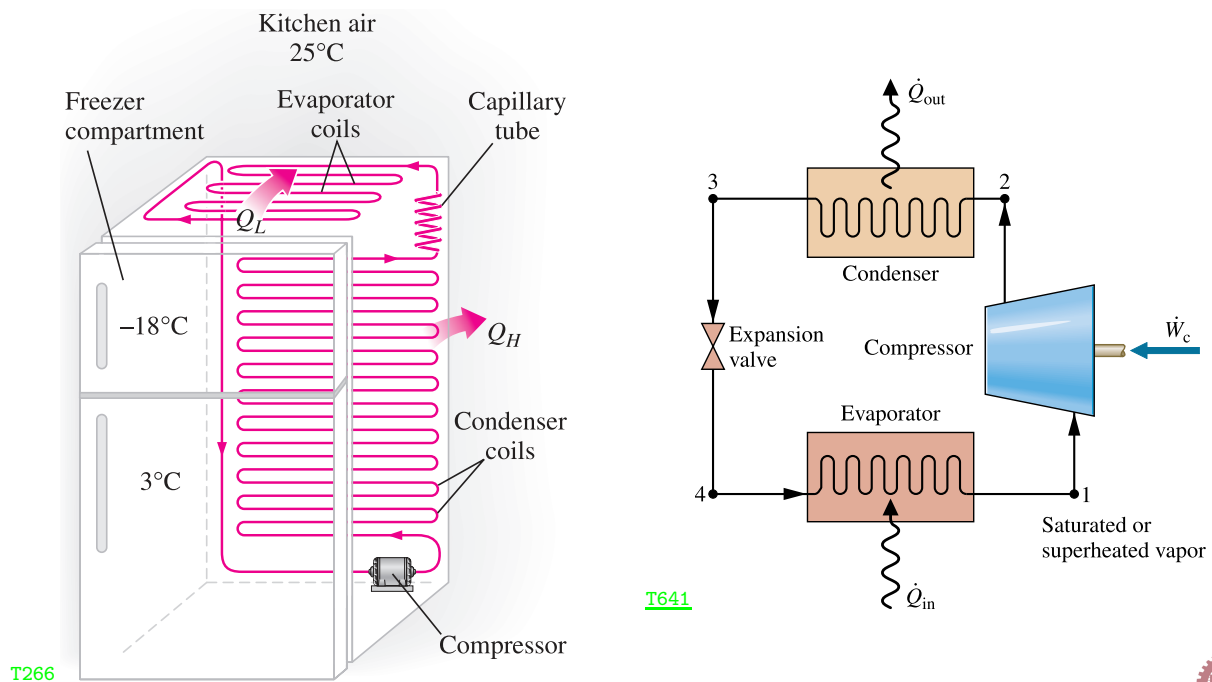


Overview

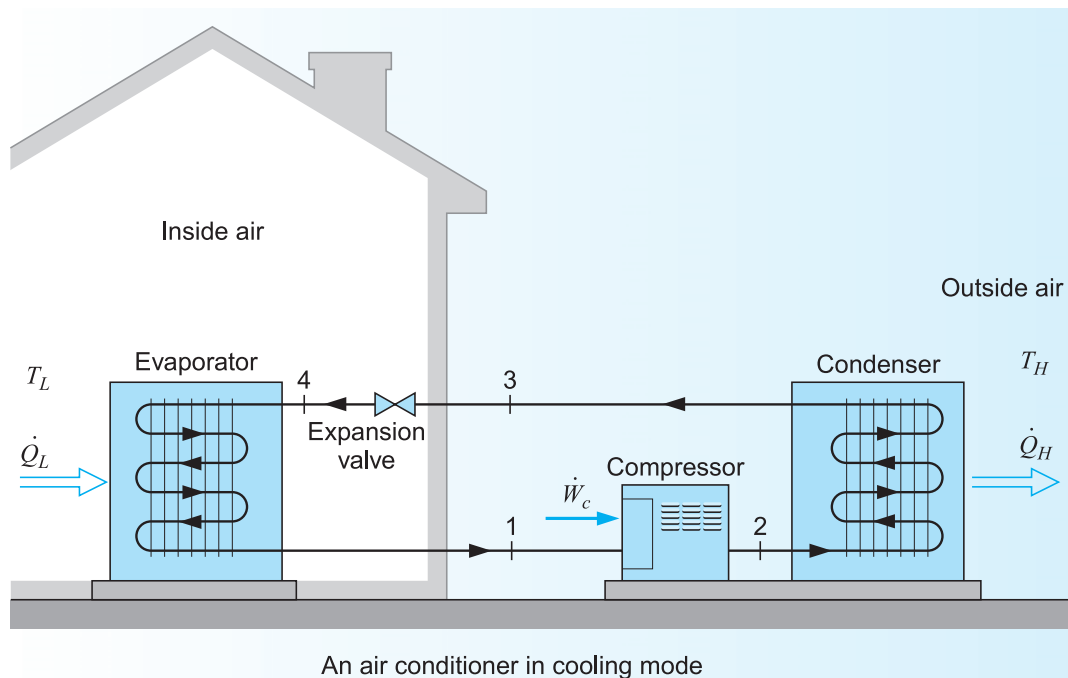
- 1 Basic refrigeration, Air-conditioning & Heat Pump
- 2 Heat Pump



Basic Vapour Compression Refrigeration System

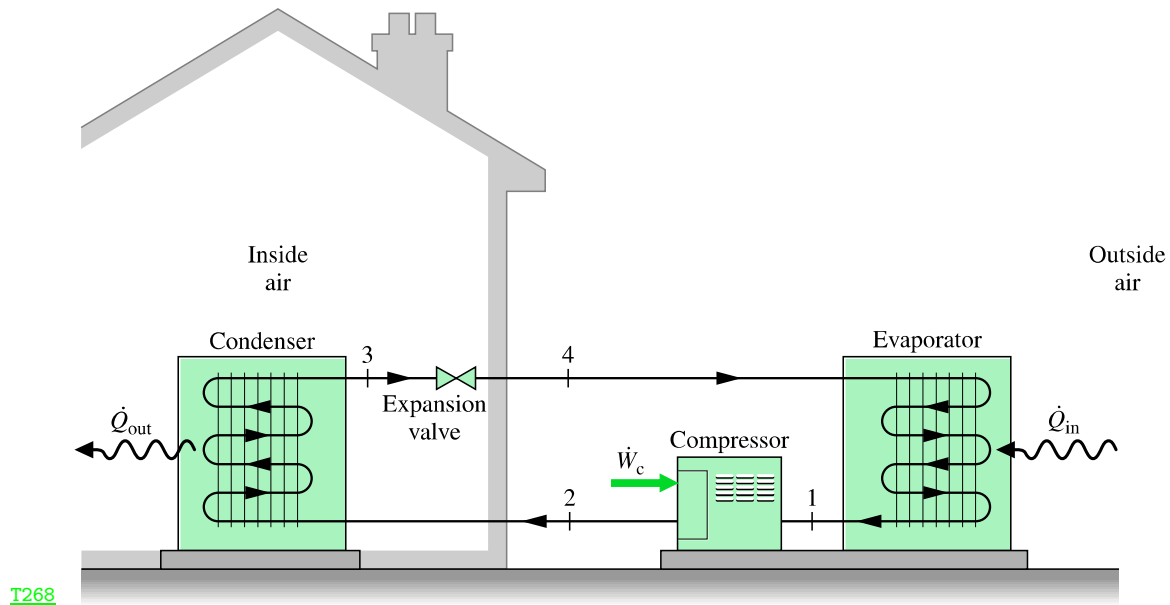


Vapour-Compression Air-Conditioning (AC) System



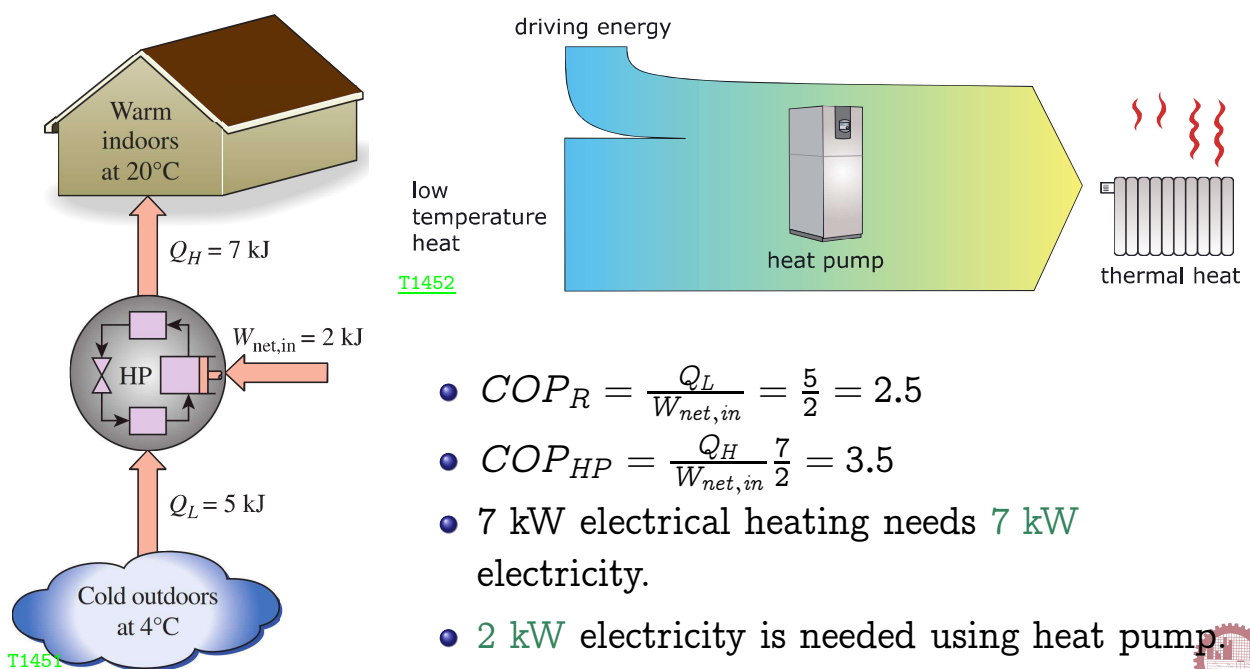
An air conditioner in cooling mode

Vapour-Compression Heat Pump (HP) System



Heat Pump

Heat Pump



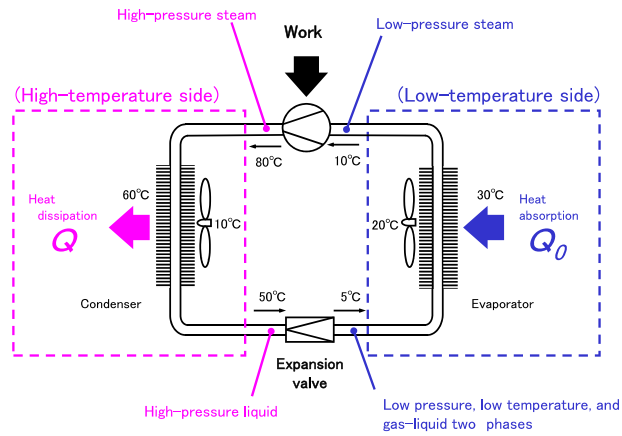
$$\bullet \text{COP}_R = \frac{Q_L}{W_{\text{net},in}} = \frac{5}{2} = 2.5$$

$$\bullet \text{COP}_{HP} = \frac{Q_H}{W_{\text{net},in}} = \frac{7}{2} = 3.5$$

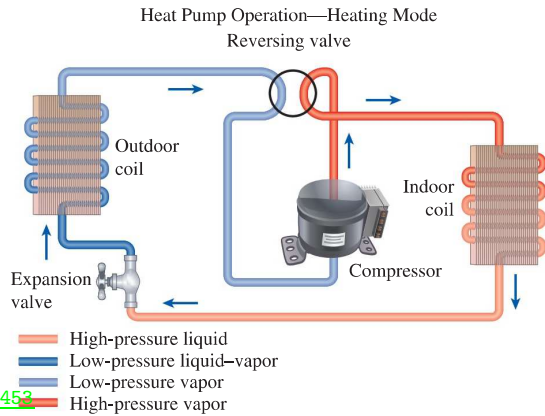
• 7 kW electrical heating needs 7 kW electricity.

• 2 kW electricity is needed using heat pump.



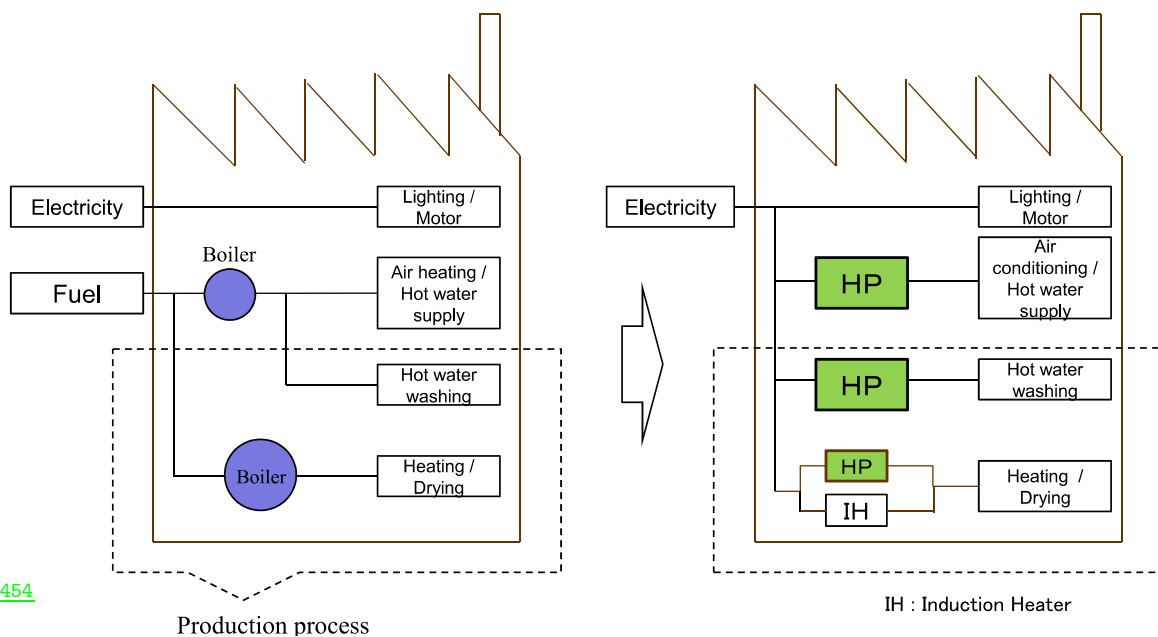
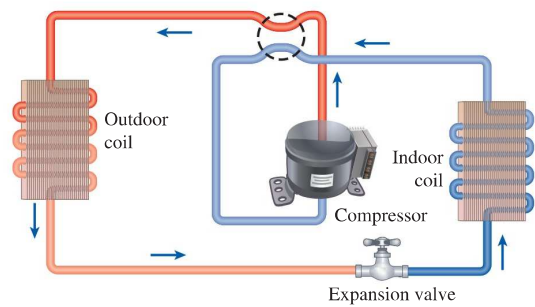


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Heat Pump Operation—Cooling Mode

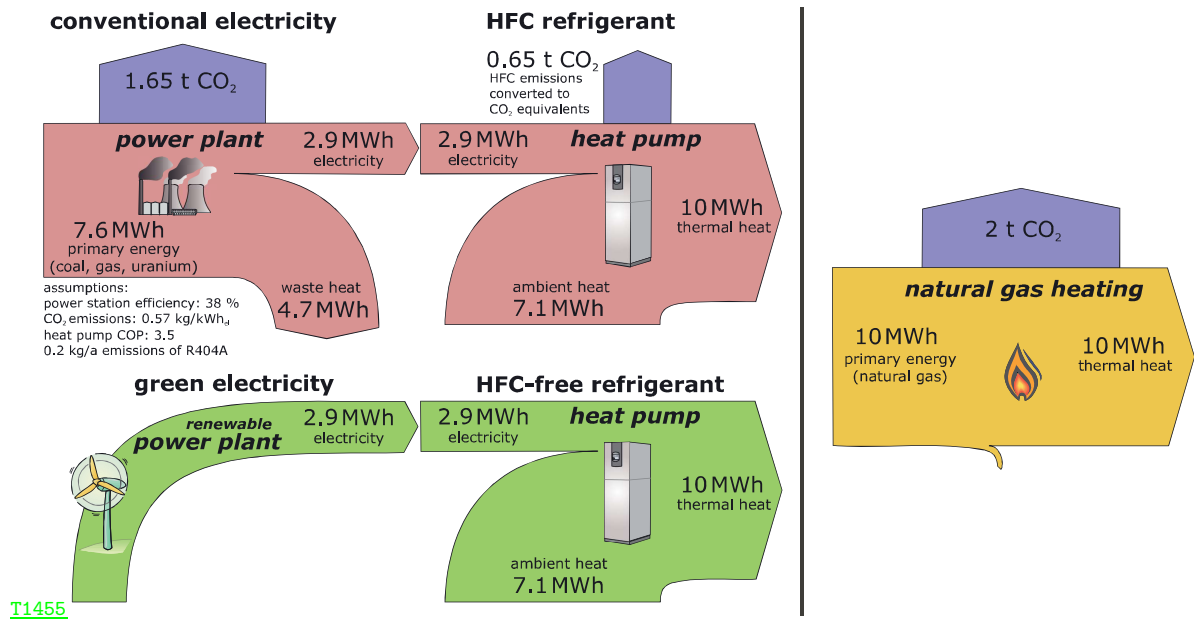


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Production process

Boiler is not the only heat source. Explore alternatives.





Environmental balance sheet



Thanks a Lot

