CH365 Chemical Engineering Thermodynamics

Lesson 2
Fundamentals 2

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Work

When a force acts over a distance, work is force times displacement:

force is F and displacement is dl

Eq. 1.2 $$dW = F\,dl$$

positive (+) if F and dl are in the same direction
negative (-) if F and dl are in the opposite direction

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Take Notes!

Energy and Work Overview

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Take Notes!

Heat

"Flows" from region of higher T to region of lower T

Take Notes Here!

Temperature difference is the "driving force" for the flow of energy as heat

Take Notes Here!

The driving force analogy comes from physics:

- voltage difference drives current flow in an electrical circuit
- gravitational potential drives free fall of an object
- pressure difference drives fluid flow in a horizontal pipe
- concentration difference drives molecular diffusion

<u>Heat is transferred</u> between the system and its surroundings.

Take Notes Here!

1 calorie raises the temperature of 1 gram of water 1 deg C

1 Btu raises the temperature of 1 lb_m of water 1 deg F

Take Notes Here!

Questions?

Lesson 2 Problems

Problem 1.11

Liquids that boil at relatively low temperatures are often stored as liquids under their vapor pressures, which at ambient temperature can be quite large. Thus, n-butane stored as a liquid/vapor system is at a pressure of 2.581 bar for a temperature of 300 K. Large-scale storage (>50m^3) of this kind is sometimes done in spherical tanks. Suggest two reasons why.