

CE 213A

Introduction to Environmental Science

L 5 : Module A

Energy and Review of Thermodynamics

Dr. Anubha Goel

FB 308, anubha@iitk.ac.in, x 7027

Schedule : LEC: Tt. Thu 5:10 - 6:30; T108

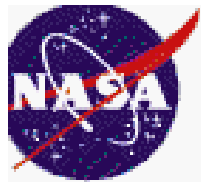
Module A - Energy and review of thermodynamics

Content L5, L6. and L7

- Law of conservation of matter
- Thermodynamics
 - Energy
 - Laws of thermodynamics
 - Heat and Work
 - Forms of heat energy
 - Enthalpy
 - Endothermic vs. Exothermic Processes
 - Enthalpy of formation, Standard States
 - Entropy, Gibb's Free Energy
 - Calculation of Equilibrium Rate constant

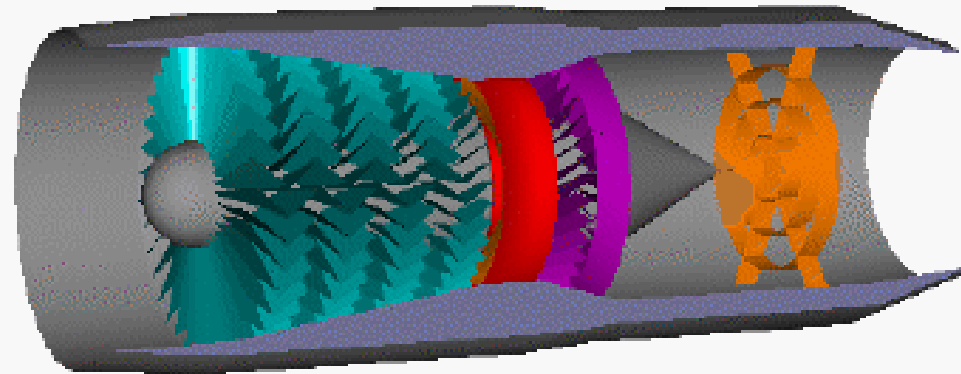
Energy Consumption and Sources - Conventional and Alternate

- Sources of energy
 - Primary, secondary
- Fossil fuels
 - Problems with their use
 - Types of fossil fuels, advantages and disadvantages in their use
- Alternate use of coal
- Gasification, liquefaction
- Impact of impurities in coal



What is Thermodynamics?

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Thermodynamics is the study of the effects of work, heat, and energy on a system. Thermodynamics is only concerned with large scale observations.

Zeroth Law: Thermodynamic Equilibrium and Temperature

First Law: Work, Heat, and Energy

Second Law: Entropy

Energy Sources

- **Primary Energy sources-**

- Fossil fuels (oil, natural gas, coal)
- Nuclear energy
- Falling water, geothermal, solar

- **Secondary Energy sources-**

- Sources derived from a primary source like...
 - Electricity
 - Gasoline
 - Alcohol fuels (gasohol)

Problems with Fossil Fuels



- Non-renewable
 - At projected consumption rates, natural gas & petroleum will be depleted by the end of the 21st century
- Impurities are major source of pollution
 - **SO₂** travels on air currents & falls with precipitation as **acid rain**
 - **Mercury bio-accumulates & biomagnifies** thru ecosystems when it travels on air currents and fall as **particulate dust or with precipitation** elsewhere.
- Burning fossil fuels produces large amounts of CO₂, which contributes to **global warming**
- Makes us rely on other countries for our energy needs. Makes us vulnerable.