Shankersinh Vaghela Bapu Institute of Technology

Mechanical Engineering Deptt.

Sub. : Elements of Mechanical Engineering (2110006)

Chapter No. 2 :-Energy

Prepared By: Harshvardhan Sinh
Shah Khusal C.
Patel Rajvansh
Solanki Hitendrapalsinh
Chaudhari Nishant

Guided By: Mr. Nishant H. Patel
Assistant Professor
Mechanical Department
SVBIT
Gandhinagar

Source of energy

- Non –Renewable energy

✓Coal

✓Oil

✓Gas etc..

- Renewable energy
  - ✓ Solar power
  - ✓ Wind power
  - ✓ Geothermal energy
  - ✓ Tidal power
  - ✓ Hydraulic energy
  - ✓ Ocean thermal energy
  - ✓ Energy from bio mass
  - ✓ Fuel cells
  - ✓ Hydrogen energy

Various source of energy

1. Fossil fuels
2. Nuclear fuels
3. Stored or flowing of water
4. Sun
5. Wind
6. Rise and fall of tides
7. Geothermal energy
8. Biomass and bio-fuels

Energy from Fossil fuel

- Fuel is substance composed of mainly od carbon and hydrogen which produces a large of heat while burning with oxygen.
- The main elements are carbon, hydrogen, compound of hydro carbon and small amount of other substances , such as sulpher ,oxygen, nitrogen etc...
- When the fuel id burnt in presence of air , it produces heat and flue gases.
- This heat is utilized for heating purpose or produce mechanical work with help of prime mover.

Classification of fuel

- According to nature of their existence
  - ✓ Solid
  - ✓ Liquid
  - ✓ Gaseous

- According to nature of their origin
- Natural fuel
- Artificial fuel

Solid fuels

- Natural solid fuels
  - ✓ Wood
  - ✓ Peat
  - ✓ Coal
  - ✓ Lignite
  - ✓ Bituminous coal
  - ✓ Anthracite coal
- Artificial solid fuels
  - ✓ Wood charcoal
  - ✓ Coke
  - ✓ Briquetted coal
  - ✓ Pulverized coal

Liquid fuels

- Natural fuels
  - ✓ Petroleum (crude oil)
- Artificial prepared fuel
  - ✓ Petrol
  - ✓ Diesel
  - ✓ Kerosene
  - ✓ light diesel oil
  - ✓ Heavy fuel oil
  - ✓ Tar
  - ✓ Alcohols
  - ✓ Shale oil

Gaseous fuels

- Natural gas

- Prepared gases
  - ✓ Coal gas
  - ✓ Coke-oven gas
  - ✓ Producer gas
  - ✓ Water gas
  - ✓ Blast furnace gas
  - ✓ Sewer gas

LPG (liquid petroleum gas)

- LPG is a colorless petroleum gas.
- The main components are propene and butane or combination of these two.
- The calorific value is 45,360 kj/kg.
- LPG is use for cooking, run the engine of cars, buses , and also suited for light vehicles such as cars and small vans which is normally run on petrol.
- The main difference between LPG and petrol and diesel is cost of fuel.
- Pollution produced by LPG is 15% lower than the petrol engine.

CNG(Compressed Natural Gas)

- CNG is made by compressing methane which is extracted from natural gas and is stored at high pressure (about 200 bar).
- It also contains small percentage of ethane, propene, butene,and pentane.
- The calorific value is 40,700-41,200 kj/kg.
- Due to higher octane number, CNG is excellent fuel for petrol engine.
- Pollution produced by CNG vehicles is less than petrol vehicles.
- Use of CNG results into longer service life and lower maintenance costs.

- The big disadvantage of CNG is, storage tank in vehicle has to be robust and heavy because of the high pressure requirement.
- The major problem with CNG are that is expensive because the cost of converting cars to CNG mode.

Nuclear fuel and utilization

- Nuclear energy is the world's largest source of emission free energy.
- Heat energy is produced by the fission or fusion of atoms may be used to produce shaft power by heat engines.
- In fission, the nuclei of uranium or plutonium atoms are split with release of energy.
- In fusion , energy is released when small nuclei combine or fuse.
- The fission process is used in all nuclear power plants , because fusion can not be controlled.
- 1 kg of nuclear fuel is equivalent to about 2.5×10^{6} kg.

- The heat energy so liberated in atomic reactors is extracted by pumping fluid or molten metal like liquid sodium or gas through the pipe.
- The heated metal or gas is then allowed to exchange its heat to the heat exchanger by circulation.
- In the heat exchanger the gas is heated or steam is generated which is utilized to drive gas or steam turbine coupled to alternators thereby generating electrical energy.
- The main disadvantage of nuclear power plants are high investment and the fission byproducts are generally radioactive.

Hydraulic and water energy

- Water stored at high elevation or artificial high level water reservoir contains potential energy.
- When water falls starts flowing, potential energy gets converted to kinetic energy.
- Water at a pressure or flowing with a high velocity or both can be used to run hydraulic turbines or water wheels coupled to generators and therefore generation of electric power.
- This method is ore popular as it is reliable, requires very less maintenance and operating costs , and it is very neat clean plant because no smoke or ash is produced.

Solar energy

- Sun energy results from the nuclear reaction which are taking place within the mass of sun.
- The energy radiated by the sun is form of electromagnetic waves which include the heat , light and lot of ultraviolet radiations.
- Solar energy reaching the earth in tropical zones about 1 kW/m2 per day.
- For ten month of the year, six to eight hours a day, much of India receives high intensity fairly uniform sunshine.
- The radiated heat energy by the sun can be utilized for domestic and commercial purposes such as water heating , water distillation , refrigeration , drying, power generation etc.

Wind energy

- Wind is the motion of air caused by pressure difference of air due to uneven heating of earth surface by sun and rotation of earth.
- Wind energy can be utilized in wind turbines which produces mechanical energy and coupled with electrical generator.
- It is also utilized to run water pump at remote place where electricity is not available.
- The main advantage is inexhaustible, non-polluting and it does not require any operator.
- It also does not require any maintenance and repairs for long intervals.

Bio- fuel

- Bio fuel is gaseous or liquid combustible substance made form biomass.
- It includes plants, animals and their by-products.
- It is renewable energy source based on the carbon cycle, unlike other natural resources such as petroleum , coal and nuclear fuels.
- The bio-mass is converted into useful fuels

✓ The bio-chemical conversion to produce biogas

✓ Thermo-chemical conversion to produce ethanol and ethanol.

- Advantages
  - ✓ Reduced pollution
  - ✓ Reduces the use of fossil fuel
  - ✓ Increases opportunities for rural peoples
  - ✓ Increases national energy security
- Limitations
  - ✓ Production process is very low
  - ✓ It must be redesigned and replace rapidly.

Some of bio-fuels are….

- ✓Bio-diesel
- ✓Bio-ethanol
- ✓Vegetable oil
- ✓Bio-gas
- ✓syngas

Hydrogen (H_2)gas

- Hydrogen is simplest and colorless gas.
- An atom of hydrogen consists of only one proton and one electron.
- Hydrogen does not exist freely in nature; it's always combined with other elements.
- Hydrogen is not energy source , but it is only produced from other sources of energy , so it is referred to as energy carrier that is efficient way to store and transport energy.
- Hydrogen can be produced by.....

✓ Thermo-chemical process

✓ Electrolysis

✓ By water splitting

- Hydrogen can be mixed with natural gas to create an alternative fuel for vehicle that certain types of I.C engine is called ICE vehicle.
- The major problem of using H2 as the fuel is due to its high explosive nature during combustion.
- Also speed of flame development is very high.

Global warming

- Global warming is the rise in the average temperature of earth's atmosphere and oceans since last 19th century and its projected continuation.

- Since the early 20th century. Earth's mean surface temperature has increased by about 0.8°C ,which is greater than that of increasing since 1980.

Cause of global warming

- Increasing concentrations of green house gases produced by human activates such as…
- ✓ Burning of fossil fuels
- ✓ Deforestation

- Earth has warmed at a rate higher than that of previous time over the last hundred year.

Indicators of global warming

- ✓ Sea ice increase
- ✓ Snow cover decrease
- ✓ Glaciers decrease
- ✓ Sea surface temperature increase
- ✓ Temperature over ocean increase
- ✓ Humidity increase
- ✓ Troposphere temperature increase
- ✓ Temperature over land increase
- ✓ Sea surface increase
- ✓ Ocean heat content increase

Impacts of global warming

- ✓ Human societies have to bear the effect of extreme weather events.
- ✓ Pests and disease is increased
- ✓ Agricultural output is reduced
- ✓ Increased area of deserts
- ✓ Ocean acidification is increased

Mitigation of global warming

- To adopt special policies that will limits greenhouse gas emissions
- More drastic measure will required n later year to stabilize a desired atmospheric concentration of green house gases

Thank you