

# BASIC SCIENCE

## CRUDE OIL AND PETRO- CHEMICALS.

**Crude oil** is a naturally occurring substances found in certain rock formation in the earth. It is dark, sticky liquid which is classified in science as hydrocarbon. Hydrocarbon is a substance or compound containing hydrogen and carbon. Crude oil is highly flammable and can be burned to create energy. Natural gas is also derived from crude oil and can serve as an excellent fuel because it can be stored in cylinders and used for cooking.

### PETRO-CHEMICALS

Petrochemicals are organic compounds derived from crude oil or natural gas. It may also be obtained from other carbonaceous materials such as coal, peat, tar, etc. Therefore, petrochemicals are substances derived from Petroleum.

#### *Examples of petrochemicals:*

- a. Plastics such as polythene
- b. Synthetic fibres like nylon
- c. Detergent
- d. Solvents like ethylene, glycol
- e. Insecticides
- f. Explosives.

### The Refining Of Crude-Oil

In order to obtain maximum value from crude oil, it needs to be refined into petroleum products.

The crude oil produced from rock is piped straight into oil storage tanks. From the storage tanks, crude oil is transported to the refinery where it is separated into its components. Fractional distillation is used in separating crude oil into its components.

Nigeria's total petroleum refinished capacity is about 445,000 barrels per day (bpd). There are four major oil refineries in Nigeria.

- a. The Warri refinery.
- b. The Port -Harcourt refinery
- c. The old Port-Harcourt refinery and
- d. The Kaduna refinery

Nigeria has a total of about 159 oil fields and 1481 oil wells. Refining of petroleum is carried out by multinational companies in collaborations with NNPC. Examples of such companies are: Shell, Elf, Agip, Exxon Mobile, Chevron, Texaco, etc.

## COMPONENTS OF CRUDE OIL AFTER FRACTIONAL DISTILLATION

The different fractions obtained after the fractional distillation of crude oil include:

- a. Petroleum gas or refinery gas- this is obtained at the uppermost part of the tower. It is the product with the least boiling point.

- b. Petrol or Gasoline- this is the second products with relative high temperature range and a number of carbon constituent than the Petroleum gas or refinery gas.
- c. Naphtha- This has a higher number of carbon atoms per molecule than petrol and it's usually further refined to give petrol. Helps to dilute oil to make it pass a pipeline.
- d. Kerosine or Paraffin gas- it is a liquid with higher viscosity than both gasoline and Naphtha. It also contains higher amount of carbon than gasoline and Naphtha.
- e. Light Gas (Diesel oil or Gas oil) - It is a very viscous product.
- f. Lubricating oil and bitumen- They are usually referred to as residues, they are thick and non-volatile products.

## **USES OF CRUDE OIL AND PETROCHEMICALS**

### ***Uses of Crude-oil***

- a. Petrol refinery gas is used as fuel for lightning, heating and cooking purposes in home.
- b. Production of liquefied Petroleum gas (LPG)
- c. Diesel gas oil is used as fuel for diesel engines like lorries, tractors, generators, etc.
- d. Lubrication oil is used to produce Petroleum jelly, paraffin wax for candle and polish. It can also be used as a lubricant.
- e. Residue (bitumen) is used for road construction and binding agents for roofing materials.

### ***Uses of Petrochemicals***

- a. Ethane is used as solvent and for making synthetic rubber.
- b. Plastic and synthetic rubber are used in the production of many household and education materials such as plates, chairs, shoes, toys and rulers.
- c. Pesticides are used in killing insects like mosquitoes.
- d. Detergent are used as a cleaning agent.
- e. Chemical fertilizers help in improving the soil fertility and getting good yield from our crops.
- f. Used in paint production which is used to beautify homes.

## **IMPORTANCE OF CRUDE OIL AND PETROCHEMICALS**

- a. It creates employment for Nigerians.
- b. It brings about industrialisation in the areas where oil is discovered or refined.
- c. It provides raw materials for small scale industries.
- d. Provides revenue for the country, this revenue is used by the government in developing the nation.
- e. It brings about international recognition by other countries of the world.
- f. Provides opportunity for technology transfer.

# HEAT TRANSFER

## (Radiation, Conduction and Convection and Their Applications)

### RADIATION

Radiation is a method of heat transfer which does not involve any material (or medium) between the surface of heat and the part heated. Heat energy from the sun reaches us by radiation.

#### Applications of Radiation

- a. In green house, heat radiates from the sun and keeps the plant and air outside warm.
- b. Lower part of industrial buildings are painted with aluminium paint (silvery) to reflect sun rays during the day and reduce heat radiation at night, thus maintaining suitable temperature of the room.

### CONDUCTION

Conduction is the movement of heat through solid materials Applications of Conduction.

- a. Heat is applied in cooking with metal pots e.g. aluminum pots.
- b. The metal pots conducts heat from the fire used for cooking to material that is being cooked in the pot.

### CONVECTION

It is the internal movement of currents within liquids and gases.

#### *Applications of Conduction.*

- a. Working of a chimney depends on conventional air current. Hot air from the chimney rises up and cool air comes down in turn to replace the hot air, the process continues.
2. Domestic hot water supply system makes use of convection for its working.