



**Ministry of Higher Education and Scientific
Research Al-Mustaqbal University College**

**Department of Chemical Engineering and
petroleum Industrials**

Properties of crude oil

2nd Stage

Lecturer: Dr. Duaa Alwarid

2020-2021

Pre-Treatment of Oil at Oil Field before Refining

Oil and gas when they come out of oil field are separated. The natural gas is compressed to liquefy it which is used for heating of domestic and industrial ovens. Petroleum oil is made free of:

- Water,
- Sediments and
- Salts present in it.

It is then made free of some dissolved gases into it by the process called '**stabilization**'. It is then sent to oil refinery for separation into various petroleum products mainly by distillation and auxiliary operations.

Crude oil as it comes out of well may contain up to (25%) water, salts ($MgCl_2$, $-CaCl_2$, $NaCl$ etc.) up to 2000-5000 (mg/lit) and sediments up to (1-

1.5%). For refining crude oil, the salt content in it should be < 50 mg/lit and Water $< 03\%$. Excessive water in crude requires extra heat for its distillation, increases its cost of transportation, forms emulsion which absorb materials like resin (hence emulsion breakers are to be used).

Salt in crude oil causes

- scaling
- corrosion
- reduces heat transfer co-efficient during its processing.

Sediments present in crude causes:

- erosion
- scaling.

In mechanical method of separation of impurities from crude oil, it is subjected to centrifuging, filtration and settling after heating it to 120-160°C at 6-8 atm. pressure. In physico-chemical method, emulsion breakers are added. But they are costly and cause corrosion & sludge formation.

Stabilization of Crude Oil

Removal of dissolved gases from crude oil by heating it is called its stabilization. Gas accompanied with crude oil must be removed to avoid breathing loss (loss of gasoline, if gas is not removed from oil during pre refining). Breathing loss occurs due to changes of humidity of ambient air and day and night temperature change also during emptying and filling of crude tanker.

Classification of Petroleum

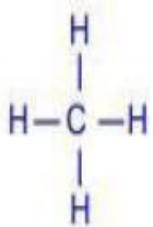
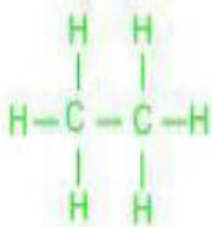
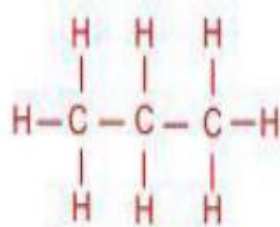
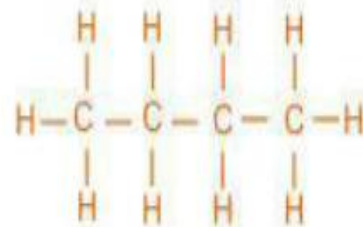
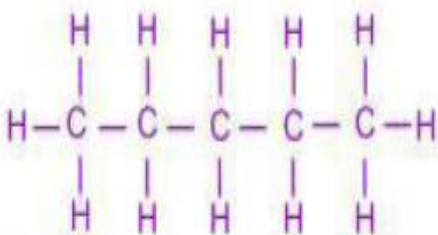
Depending on the nature of hydrocarbons present in it, crude petroleum oil is classified as

- paraffin base,

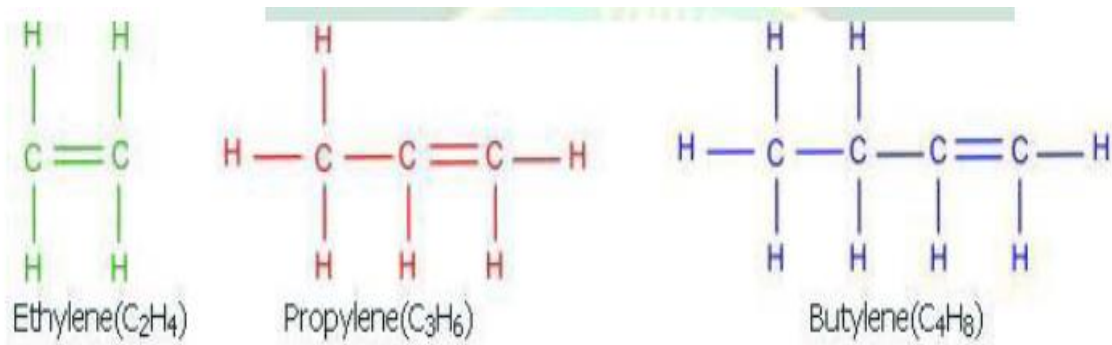
- naphthene base,
- asphalt base,
- mixed base.

Paraffins

Paraffins refer to alkanes such as methane, ethane, propane, n and iso butane, n and iso pentane. These compounds are primarily obtained as a gas fraction from the crude distillation unit.

Methane(CH₄)Ethane(C₂H₆)Propane(C₃H₈)Normal Butane(nC₄H₁₀)Normal Pentane (C₅H₁₂)

Olefins Alkenes such as ethylene, propylene and butylenes are highly chemically reactive

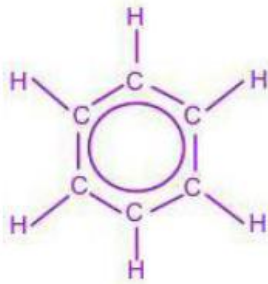
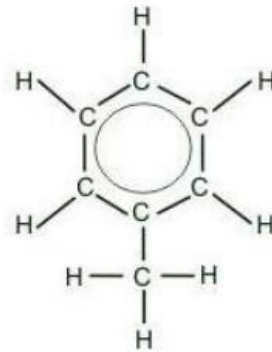
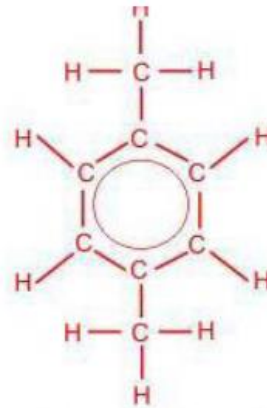


Naphthenes

Naphthenes or cycloalkanes such as cyclopropane, methyl cyclohexane are also present in the crude oil. These compounds are not aromatic and hence do not contribute much to the octane number. Therefore, in the reforming reaction, these compounds are targeted to generate aromatics which have higher octane numbers than the naphthenes.

Aromatics Aromatics such as benzene, toluene o/m/p-xylene are also available in the crude oil. These contribute towards higher octane number

products and the target is to maximize their quantity in a refinery process.

Benzene(C₆H₆)Toluene(C₇H₈)Para-X ylene(C₈H₁₀)

Organic sulphur compounds

Not all compounds in the crude are hydrocarbons consisting of hydrogen and carbon only. Organic sulphur compounds such as thiophene, pyridine also exist in the crude oil.

Oxygen containing compounds

These compounds do not exist 2 % by weight in the crude oil. Typical examples are acetic and benzoic acids. These compounds cause corrosion and therefore needs to be effectively handled.

Resins are polynuclear aromatic structures supported with side chains of paraffins and small ring aromatics. Their molecular weights vary between 500 – 1500. These compounds also contain sulphur, nitrogen, oxygen, vanadium and nickel.

Asphaltenes

Asphaltenes are polynuclear aromatic structures consisting of 20 or more aromatic rings along with paraffinic and naphthenic chains. A crude with high quantities of resins and asphaltenes (heavy crude) is usually targeted for coke production.