



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

**Department of Chemical Engineering and
petroleum Industrials**

Properties of crude oil

2nd Stage

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Petroleum Products:

1. Gases

The terms petroleum gas and refinery gas are often used to identify liquefied petroleum gas (LPG) or even gas that emanates from the top of a refinery distillation column.

Types of Gases in Petroleum Industry:

In this section the three types of gases in petroleum industry will be discussed: **liquefied petroleum gas, natural gas and refinery gas.**

1. Liquefied petroleum gas (LPG)

LPG can be defined as those hydrocarbons that are gaseous at normal atmospheric pressure, but it will condense to the liquid state at normal temperature, by the application of moderate pressures.

It is derived from natural gas and crude oil and it is a mixture of the gaseous hydrocarbons: *propane* (C_3H_8 boiling point: $-42^\circ C$,) and *butane* (C_4H_{10} boiling point: $0^\circ C$,) that are produced during natural gas and petroleum refining.

Although they are normally used as gases, they are stored and transported as liquids under pressure for convenience and ease of handling.

Mixtures of propane and butane can be liquefied under pressure of about 800 kPa to form LPG.

LPG is used for cooking, barbecues, automotive, electricity generation, water boilers, etc

2. Natural Gas

Natural gas is found in petroleum reservoirs as free gas (associated gas), in solution with petroleum in the reservoir (dissolved gas), or in reservoirs that contain only gaseous constituents and no (or little) petroleum (unassociated gas).

The hydrocarbon content varies from mixtures of methane and ethane with very few other constituents (dry gas) to mixtures containing all of the hydrocarbons from methane to pentane and even hexane (C_6H_{14}) and heptane (C_7H_{16}) (wet gas).

Natural gas is a gas consist of multiple hydrocarbons, the most prevalent being methane.

Other constituents of natural gas are evaporated liquids like ethane and butane, pentane, etc. We refer to these collectively as natural gas liquids (NGLs), or "condensates".

Liquefied Natural Gas or LNG is natural gas stored as a super-cooled (cryogenic) liquid.

3. Refinery gas Refinery off-gas (ROG):

Refinery gas is the non-condensable gas that is obtained during distillation or treatment (cracking, thermal decomposition) of petroleum.

It consists mainly of hydrogen (H_2), methane (CH_4), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), and olefins (alkene) ($RCH=CHR_1$, where R and R_1 can be hydrogen or a methyl group).

Refinery off-gas (ROG) comes from a variety of units within the refinery. The quality and quantity of the ROG is dependent on the type of crude and the complexity of the refining.

2. Naphtha

Naphtha is a liquid petroleum product that boils from about 30 C⁰ to 200 C⁰ and contains C5-C17 hydrocarbons (Paraffins, naphthene, aromatics and olefins) in different proportion.

Naphthas constitute a special category of petroleum solvents whose boiling points correspond to the class of white spirits.

White spirit or mineral spirits also known as mineral turpentine, turpentine substitute, petroleum spirits, solvent naphtha (petroleum) or Stoddard solvent, is a petroleum-derived clear, transparent liquid which is a common organic used in painting and decorating. It is a mixture of aliphatic and alicyclic C7 to C12.

Since Naphtha having a wide boiling point range, there are many grades of Naphtha.

Light naphtha is the fraction boiling between 30 °C and 90 °C and consists of molecules with 5–6 carbon atoms.

Heavy naphtha boils between 90 °C and 200 °C and consists of molecules with 6–12 carbons.

Uses:

- Naphtha is used primarily as feedstock for producing high octane gasoline (via the catalytic reforming process)
- Used in the petrochemical industry for producing olefins
- In Chemical industry for solvents (Cleaning application)
- To produce products include fuel for camp stove.