



— University of Mosul —
College of Petroleum & Mining Engineering



Properties of Petroleum Products

Lecture 1

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Properties of Petroleum Products

Petroleum :

It Is a mixture of hydrocarbon compounds and relatively small quantities of other materials such as oxygen, nitrogen, sulphur, salt, water, dissolved gases such as hydrogen sulphide (H_2S) and trace amounts of metals such as iron, nickel, copper and vanadium.

1- Boiling point:

The boiling point of a pure compound at a given pressure is the temperature at which vapor and liquid exist together at equilibrium. If the pressure is 1 atm, the boiling point is called the normal boiling point. At this temperature the vapor pressure will equal to atm pressure.

2- Vapor Pressure (P^{vap}) :

In a closed container, the vapor pressure of a pure compound is the force exerted per unit area of walls by the vaporized portion of the liquid. Vapor pressure can also be defined as a pressure at which vapor and liquid phases of a pure substance are in equilibrium with each other. Vapor pressure increases with temperature. The vapor pressure is also called saturation pressure, p^{sat} .

Because of Raoult law, vapor pressure is a hydro carbonic mixture of molecular pressures of all mixture contents. (Raoult law is applicable at low pressure). But at high and medium pressures a deviation happened from Raoult law. There are common ways to measure absolute (infinite) vapour pressure of the mixture, and the most common one is (Reid way).

The importance of measuring vapor pressure for mixtures is in measuring the composition of the liquid and its balanced vapor that they have importance in designing distillation and evaporation , and condensation devices as well as in designing safety and storage warehoused and devices that are exposed to high pressures.

Q/ What is Reid Vapour Pressure (RVP) ?

Reid Vapour Pressure

The reid vapor pressure (RVP) of a product is the vapor pressure: determined in a volume of air four times the liquid volume at 37.8°C (100 °F). This property measures the vapor-lock tendency of a motor gasoline in which excessive vapors are produced in the fuel line causing interruption of the supply of liquid fuel to the engine. It also indicates the explosion and evaporation hazards of the fuel. One of the standard tests is ASTM D323.

3- Flash point (T_F):

Flash point T_F , for a hydrocarbon or a fuel is the minimum temperature at which vapor pressure of the hydrocarbon is sufficient to produce the vapor needed for spontaneous ignition of the hydrocarbon with the air with the presence of an external source, i.e., spark or flame. From this definition, it is clear that hydrocarbons with higher vapor pressures (lighter compounds) have lower flash points. Generally flash point increase with an increase in boiling point. Flash point is an important parameter for safety considerations, especially during storage and transportation of volatile petroleum products (i.e., LPG, light naphtha ,gasoline) in a high-temperature environment.

The flash point can be estimated using the following equation:

$$T_F = 15.48 + 0.70704T_{10}$$

where:

T_{10} is normal boiling point for petroleum fractions at 10 vol% distillation temperature.

Both temperatures (T_{10} and flash point (T_F) in Kelvin).