

Fractional Distillation and Crude Oil

Crude Oil

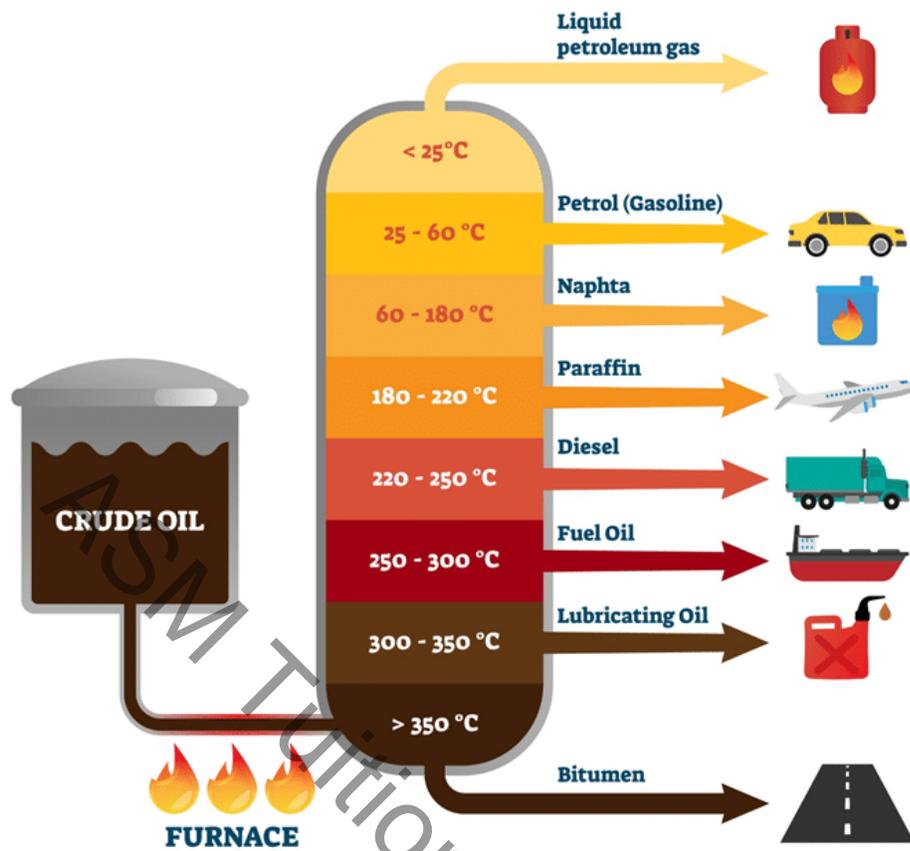
- ▶ **Crude oil** is a complex mixture of hydrocarbons extracted from the ground. In its raw form, crude oil is not very useful because its properties and composition vary widely.
- ▶ To make crude oil useful, it must be broken down into simpler mixtures. These mixtures, called fractions, contain hydrocarbons with similar carbon chain lengths and properties.

Fractional Distillation

- ▶ **Fractional distillation** is a process that separates the components in a mixture based on their different boiling points.
- ▶ We can separate the various hydrocarbons in crude oil as they all have different boiling points. By breaking down crude oil into these different fractions, we can isolate the specific hydrocarbons we need for various purposes or to create useful product

Process of Fractional Distillation with Crude oil

1. Heated crude oil enters the fractionating column at the bottom, and the vapours rise up through the column (The column is hotter at the bottom and becomes cooler towards the top).
 2. As the vapours rise, hydrocarbons with higher boiling points start to condense into liquids at lower temperatures, towards the bottom of the column.
 3. Hydrocarbons with lower boiling points continue to rise further up the column.
 4. As the different hydrocarbons reach different heights in the column, they condense into liquids at different temperatures, forming separate fractions. Once the hydrocarbons condense into a liquid, they are drawn off from the column.
- ▶ The separation of the hydrocarbons in crude oil occurs because different hydrocarbons have different boiling points.



► Long-chain hydrocarbons

I. It have stronger intermolecular forces and therefore higher boiling points. These hydrocarbons require more energy to break the forces of attraction between their molecules.

II. As a result, they evaporate and condense in the fractions near the bottom of the fractionating column.

► Short-chain hydrocarbons:

I. **It** have weaker intermolecular forces and therefore lower boiling points means that they will stay as a gas for much longer and rise further up the column.

II. Less energy is required to break the forces of attraction between their molecules.

III. As a result, they condense in the fractions near the top of the column.

Property	Short-Chain hydrocarbons	Long-Chain hydrocarbons
Boiling point	low	high
Volatility	Evaporates easily	Evaporates less easily
Flammability	Ignites easily	Ignites less easily
Viscosity	Runny (flows easily)	Thick (flows less easily)

Uses of Crude oil in daily life :

- ▶ **Petrochemicals** are substances that we get from crude oil. These substances are used as feedstocks, which means raw materials.
- ▶ The petrochemical industry then transforms these feedstocks into a wide range of products with various uses, including:
 - Solvents
 - Lubricants
 - Detergents
 - Polymers
- ▶ **Crude oil** is also useful as fuel. Different fractions of crude oil have different properties and can be used for various purposes. Here's a table showing the different fractions of crude oil and their uses:

Fraction	Use
Liquified petroleum gases	Domestic cooking and heating
Petrol	Fuel for cars
Kerosene	Fuel for aircrafts
Diesel oil	Fuel for some vehicles
Heavy fuel oil	Fuel for ships and power stations
Bitumen	Surface roads and roofs

