

Crude oil pretreatment” Preparation of crude oil for distillation”: (Degassing, Dehydration & Desalting)

In a producing petroleum field, the fluid obtained at the wellhead is submitted to degassing and dehydration operations.

1- Degassing:

At the high pressure existing at the bottom of producing well, crude oil contains great quantities of dissolved gases. When crude oil is brought to the surface, it is at a much lower pressure. Consequently, the gases that were dissolved in it at the higher pressure tend to come out from the liquid.

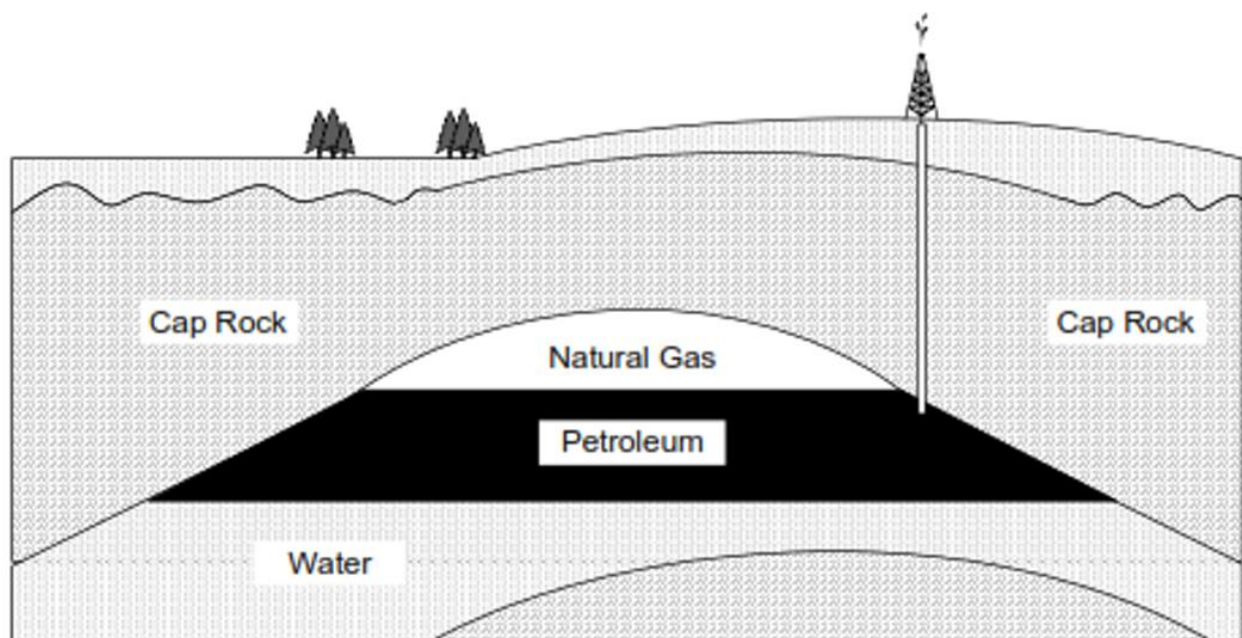


Fig.: Petroleum Reservoir

Two – Phase gas – Oil separation (GOSP):

High pressure crude oils containing large amount of free dissolved gas flow from the wellhead into the flow line, which routes the mixture to the (GOSP).

This is usually done by admitting the well fluid into a gas – oil separator plant (GOSP) through which the pressure of the gas – oil mixture is successively reduced to atmospheric pressure in a few stages.

In the separator, crude oil separates out, settles, and collects in the lower part of the vessel.

Gas goes out the top of the separators to a gas collection system, a vapor recovery unit (VRU), or a gas flow line.

Crude oil, on the other hand, goes out the bottom and is routed to other stages of separation, if necessary, and then to the stock tank.

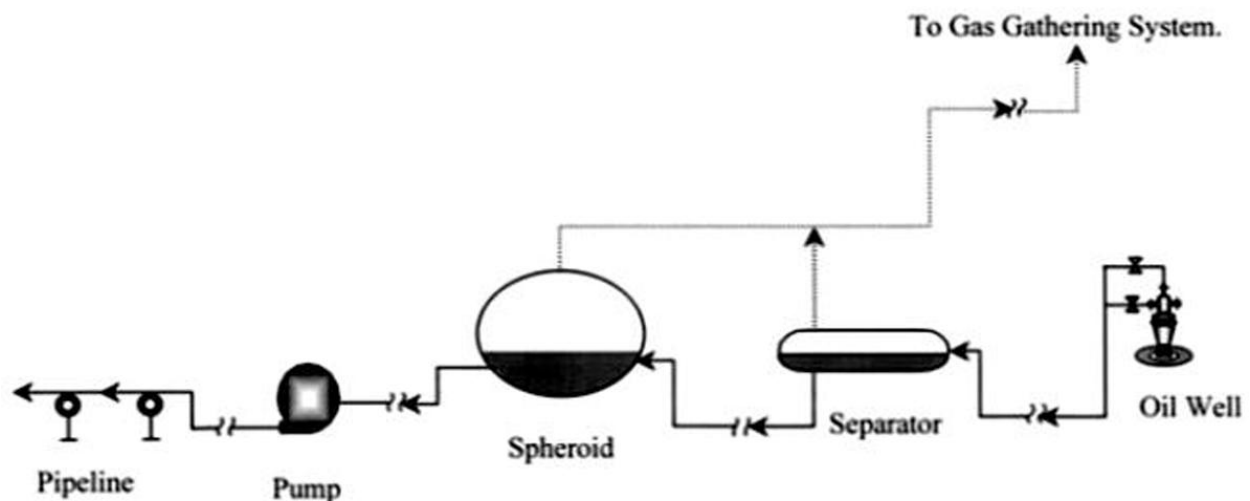


Fig.: Separation of gas from oil.

Dehydration and Desalting:

The fluid produced at the wellhead consists usually of gas, oil, free water, and emulsified water (water–oil emulsion). Before oil treatment begins, we must first remove the gas and free water from the well stream. This is essential in order to reduce the size of the oil–treating equipment.

The operation aim of this to completely eliminate the water that appears in the fluid forming stable emulsions, and the removal of water-soluble inorganic salts associated with the water which, if left in the oil, would give rise to serious corrosion problems in the course of refining operation.

Removal of Free Water:

Free water is simply defined as that water produced with crude oil and will settle out of the oil phase if given little time.

There are several good reasons for separating the free water first:

- 1- Reduction of the size of flow pipes and treating equipment.
- 2- Minimization of corrosion because free water comes into direct contact with the metal surface, whereas emulsified water does not.

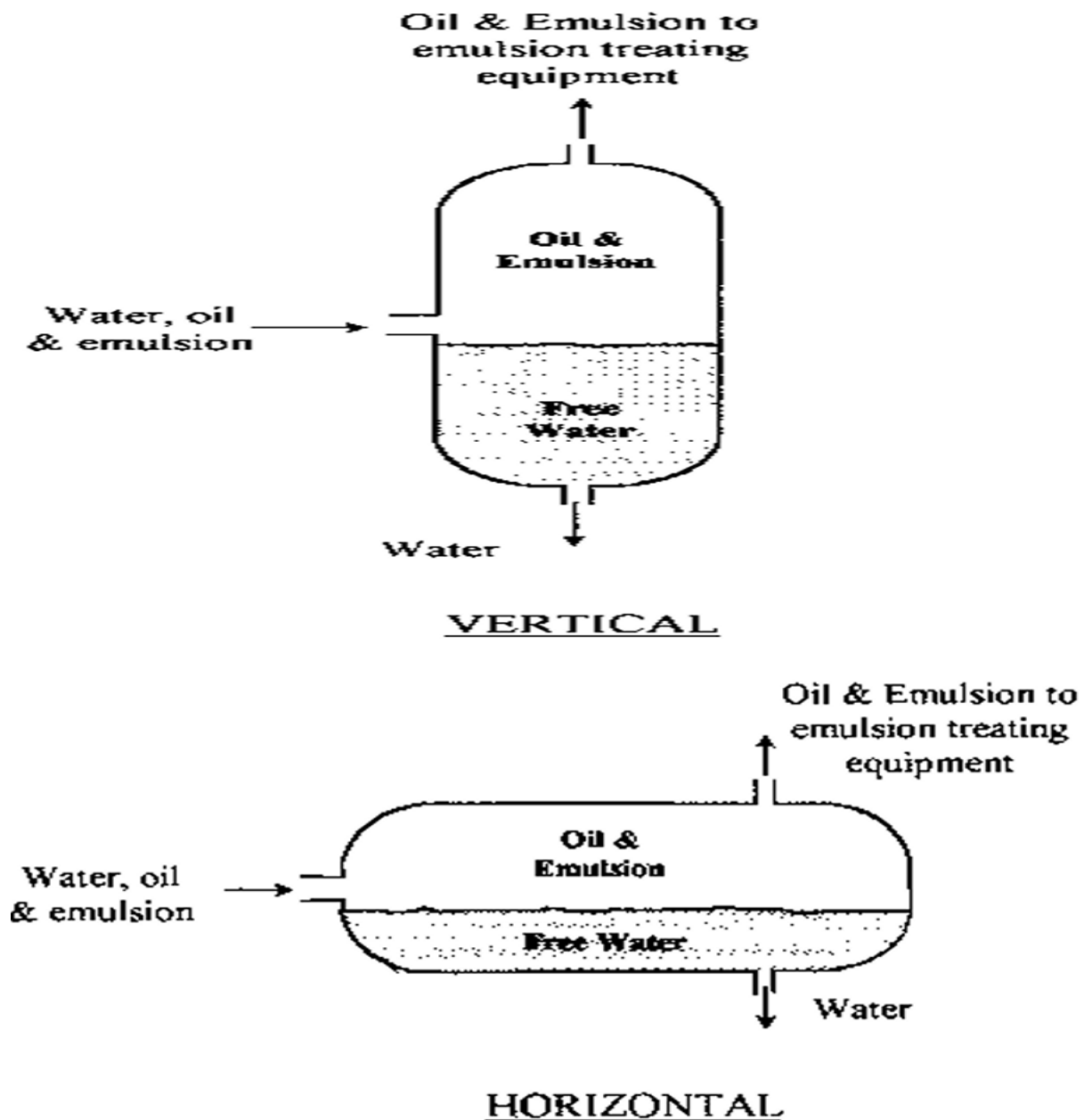


Fig: Two-phase free-water knockouts.

Crude Oil Desalting:

Desalting of crude oil will eliminate or minimize problems resulting from the presence of mineral salts in crude oil. In other words, one would consider the main function of the desalter is to remove salts soluble in water from the crude oil.

However, many other contaminants such as clay, silt, rust, and other debris also need to be removed. It should be stated that the salts contain some metals that can poison catalysts used in the process of refining are dissolved in the water phase.

Desalting processes:

- 1-The addition of heat.
- 2-The addition of chemicals.
- 3-The application of electrostatic field.

Refining of Crude Oil:

There are specifications for over 2000 individual refinery products. Intermediate feed stocks can be routed to various units to produce different blend products depending on market demand. Figure 1 shows typical refinery products with their carbon atom contents and boiling ranges. The specifications of each product are discussed in detail in the coming subsections.

Petroleum refinery processes can be conveniently divided into three different types:

1. **Separation:** division of the feedstock into various streams (or fractions) depending on the nature of the crude material.
2. **Conversion:** that is, the production of saleable materials from the feedstock by skeletal alteration, or even by alteration of the chemical type of the feedstock constituents.
3. **Finishing:** purification of the various product streams by a variety of processes that remove impurities from the product.

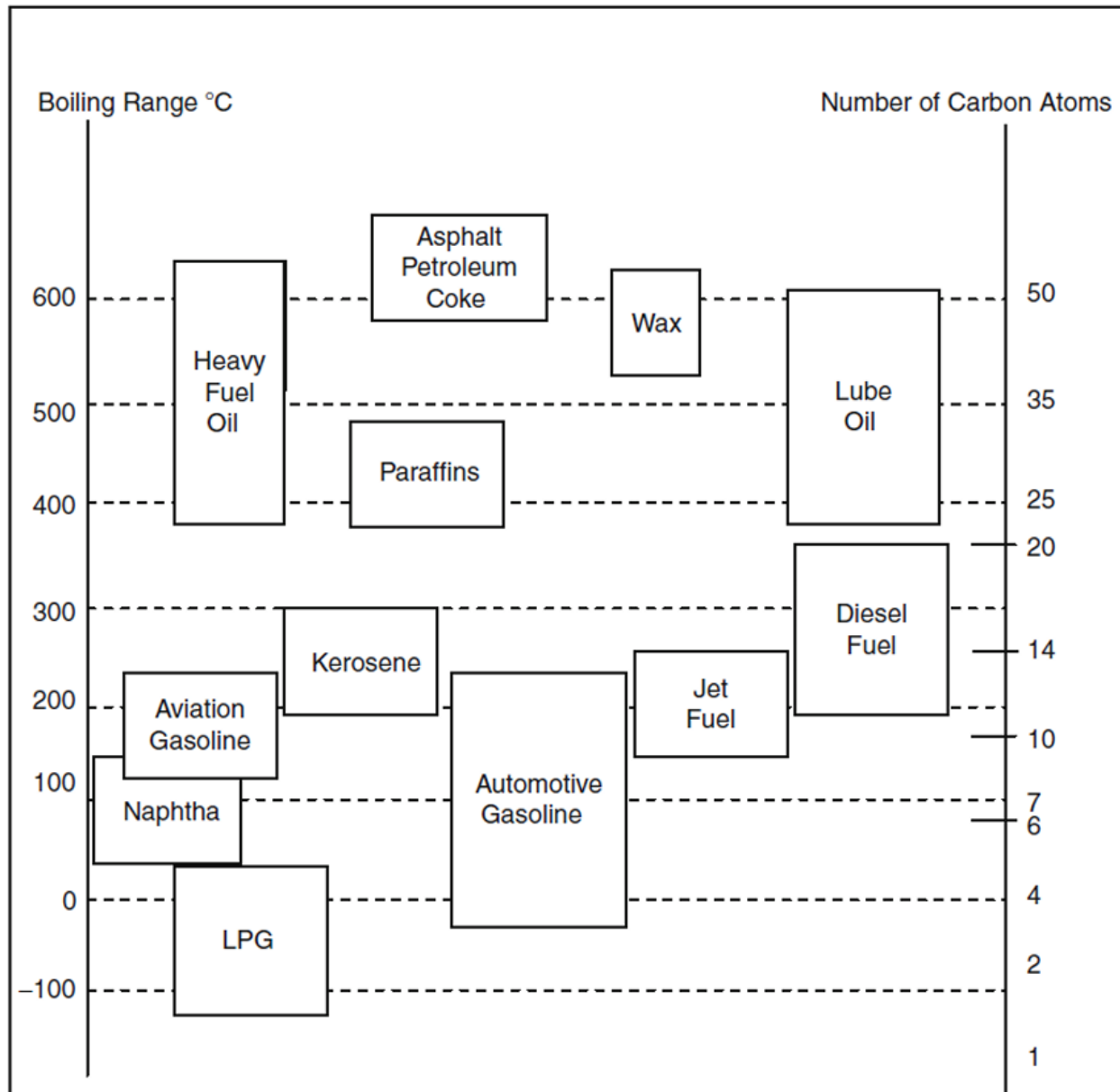


Figure 1 Principal petroleum products with carbon numbers and boiling ranges

Fractional distillation:

The basic refinery uses fractional distillation as the following steps:

- 1- Incoming crude is heated to its boiling point.
- 2- It then enters the distillation column, which separates the different fractions.

Note: Fractional distillation is used in separate columns to avoid heating the raw crude to more than 370 °C. Overheating would cause thermal cracking and excessive coke that may also plug pipes and vessels.

Side cut is another name for the fractions emerging from the side (rather than top and bottom) of the main column, i.e., naphtha, gasoline, kerosene and diesel.

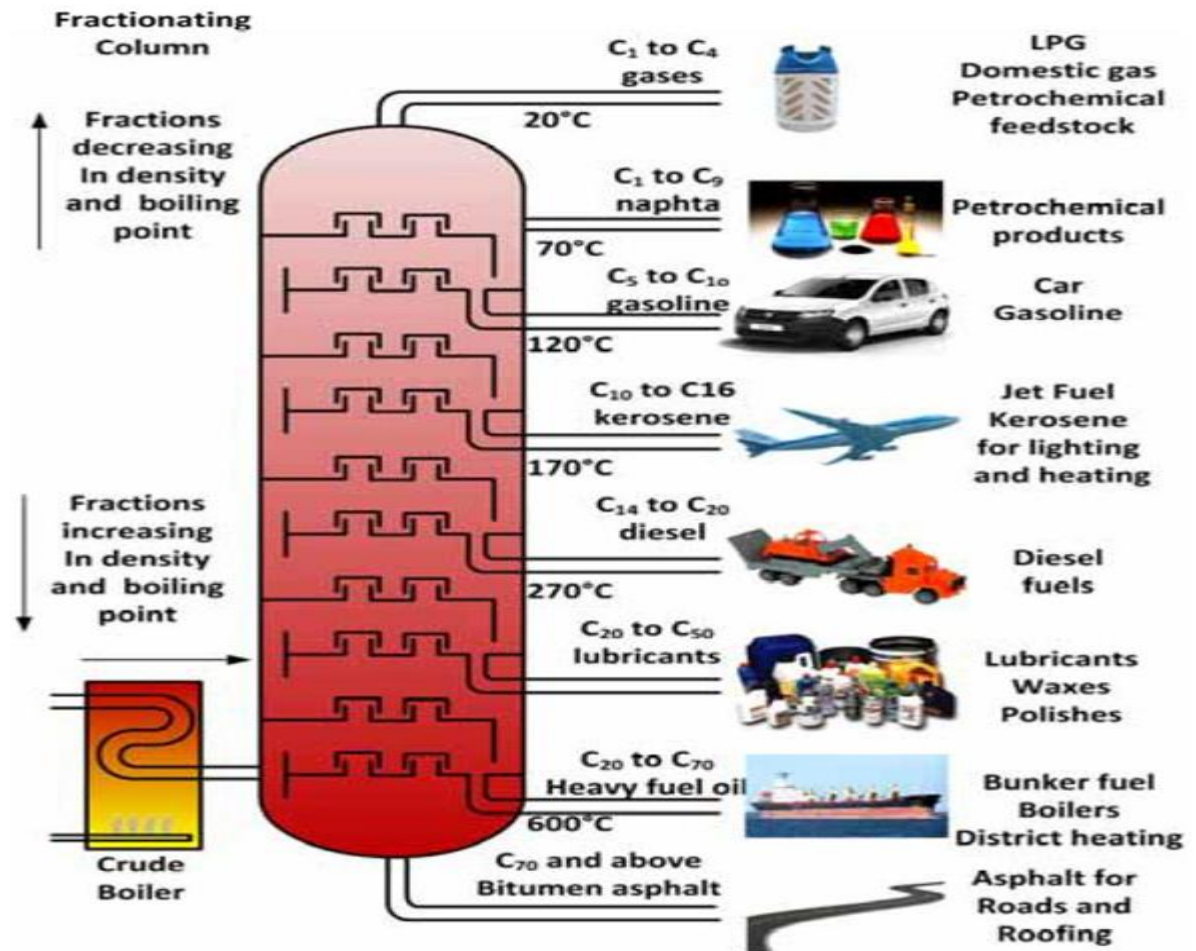


Figure: Fractionating continuous distillation.