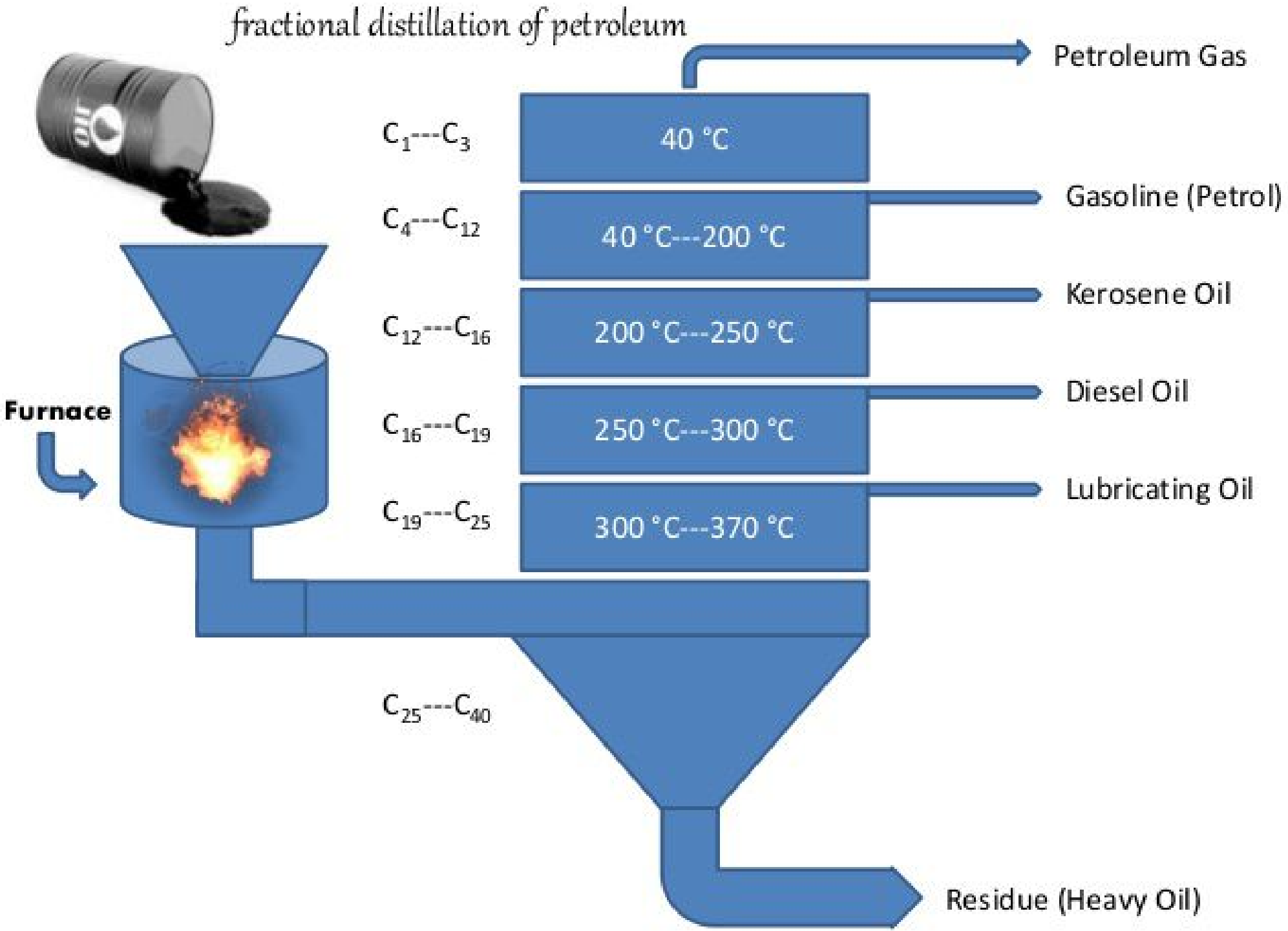
processed fractions are treated to remove impurities.

Fractional distillation:

This process is based on the principle that different substances boil at different temperatures. For example, crude oil contains kerosene and naphtha, which are useful fractions (naphtha is made into petrol for cars, and kerosene is made into jet fuel). When you evaporate the mixture of kerosene and naphtha, and then cool it, the kerosene condenses at a higher temperature than the naphtha. As the mixture cools, the kerosene condenses first, and the naphtha condenses later.


fractional distillation of petroleum
Petroleum Gas
C_1---C_3
40 °C
C_4---C_{12}
40 °C---200 °C
Gasoline (Petrol)
C_{12}---C_{16}
200 °C---250 °C
Kerosene Oil
Furnace
C_{16}---C_{19}
250 °C---300 °C
Diesel Oil
C_{19}---C_{25}
300 °C---370 °C
Lubricating Oil
C_{25}---C_{40}
Residue (Heavy Oil)

The major components of crude oil according to its specific temperature are as follows:

Name of the Component	State of matter	Number of carbons	Boiling range	Uses
Residuals	Solid	Multiple-ringed compounds with 70 or more carbon atoms	Greater than 600 degree Celsius	coke, asphalt, tar, waxes; starting material for making other products
Fuel oil	Liquid	Long chain; 20 to 70 carbon atoms	370 to 600 degree Celsius	used for industrial fuel; starting material for making other products
Lubricating oil	Liquid	Long chain; 20 to 50 carbon atoms	300 to 370 degree Celsius	used for motor oil, grease, other lubricants
Diesel distillate	Liquid	Alkanes containing 12 or more carbons	250 to 350 degree Celsius	used for diesel fuel and heating oil; starting material for making other products
Kerosene	Liquid	Mix of alkanes (10 to 18 carbons) and aromatics	175 to 325 degree Celsius	fuel for jet engines and tractors; starting material for making other products
Gasoline	Liquid	Mix of alkanes and cycloalkanes (5 to 12 carbon atoms)	40 to 205 degree Celsius	Motor fuel
Naphtha	Gas	mix of 5 to 9 carbon atom alkanes	60 to 100 degree Celsius	intermediate that will be further processed to make gasoline
Petroleum gas	Gas	Small alkanes (1 to 4 carbon atoms); commonly known by the names methane, ethane, propane, butane	40 degree Celsius	used for heating, cooking, making plastics

The fractional distillation of crude oil carries out several steps:

1. Heating the mixture of the substances of crude oil (liquids) with different boiling points to a high temperature. Heating is usually done with high pressure steam to temperatures of about 1112 degrees Fahrenheit / 600 degrees Celsius.

2. The mixture boils, forming vapor (gases); most substances go into the vapor phase.

3. The vapor enters the bottom of a long column (fractional distillation column) that is filled with trays or plates. The trays have many holes or bubble caps (like a loosened cap on a soda bottle) in them to allow the vapor to pass through. They increase the contact time between the vapor and the liquids in the column and help to collect liquids that form at various heights in the column. There is a temperature difference across the column (hot at the bottom, cool at the top).

4. The vapor rises in the column.

5. As the vapor rises through the trays in the column, it cools.

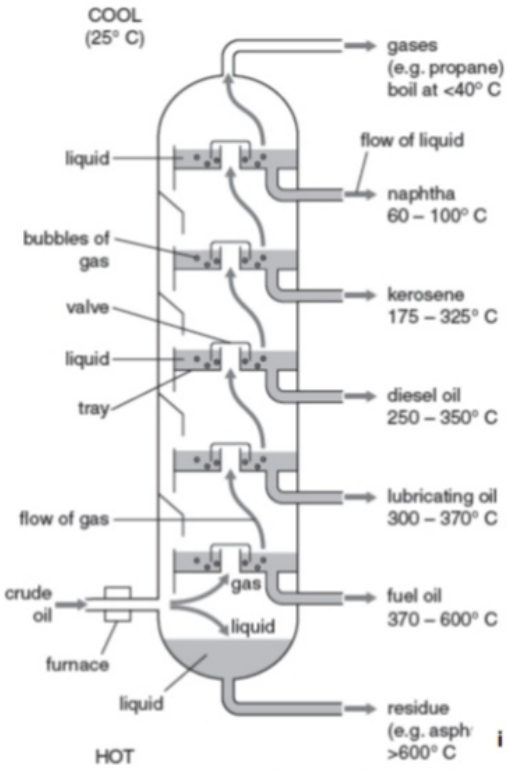


Fig.1: Fractional distillation of Crude oil

6. When a substance in the vapor reaches a height where the temperature of the column is equal to that substance's boiling point, it will condense to form a liquid. (The substance with the lowest boiling point will condense at the highest point in the column; substances with higher boiling points will condense lower in the column)

7. The trays collect the various liquid fractions.

8. The collected liquid fractions may pass to condensers, which cool them further, and then go to storage tanks, or they may go to other areas for further chemical processing

Very few of the components come out of the fractional distillation column ready for market. Many of them must be chemically processed to make other fractions. For example, only 40% of distilled crude oil is gasoline; however, gasoline is one of the major products made by oil companies. Rather than continually distilling large quantities of crude oil, oil companies chemically process some other fractions from the distillation column to make gasoline; this processing increases the yield of gasoline from each barrel of crude oil.