Oil Refining

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Oil Refining

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ABSTRACT

An oil refinery is an industrial plant that refines crude oil into petroleum products such as diesel, gasoline and heating oils. Oil refineries essentially serve as the second stage in the production process following the actual extraction of crude oil by rigs.

The first step in the refining process is distillation, where crude oil is heated at extreme temperatures to separate the different hydrocarbons. Oil refineries serve an important role in the production of transportation and other fuels. The crude oil components, once separated, can be sold to different industries for a broad range of purposes. Lubricants can be sold to industrial plants immediately after distillation, but other products require more refining before reaching the final user. Major refineries have the capacity to process hundreds of thousand barrels of crude oil daily. In the industry, the refining process is commonly called the downstream sector, while raw crude oil production is known as the upstream sector.

Oil refining or Oil processing is the recovery or generation of usable or salable fractions and products from crude oil, either by distillation or by chemical reaction of the crude oil constituents under the effects of heat and pressure. Petroleum refining also involves treating the raw products by a variety of finishing processes to yield marketable products. A refinery is an integrated group of manufacturing plants that vary in number according to the variety of products produced; it must be flexible and able to change operations as needed.

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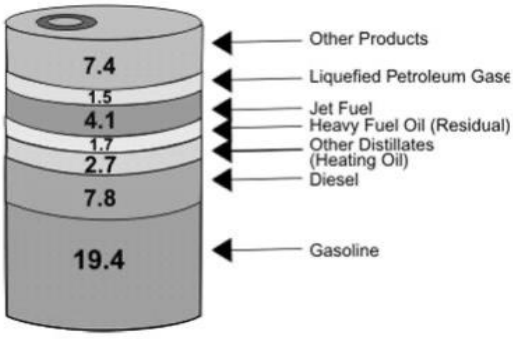
INTRODUCTION

Oil refining plays an important role in our lives. Most transportation vehicles are powered by refined products such as gasoline, diesel, aviation turbine kerosene (ATK) and fuel oil. An oil refinery is an industrial process plant crude oil converted to petroleum products. where crude oil is processed and refined into more useful products. The petroleum products are natural gas, LPG, jet fuel, gasoline, kerosene, diesel fuel, lube oils, petrolatum. That are shown in (Fig.1). 1 barrel is equal to 42 gallons of crude oil

- ❖ 83% becomes fuel.
- ❖ 17% other (solvets, fertilizers, pesticides, and plastics)



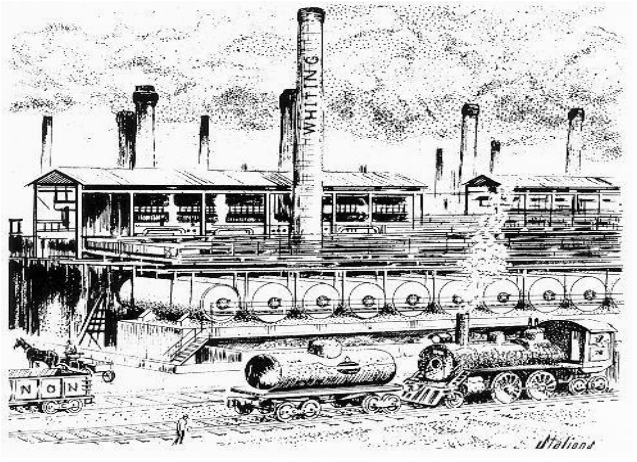
(Fig.1)

Petroleum literally means 'rock oil'. The word comes from the Greek word 'petra' (meaning rock) and the Latin word 'oleum' (meaning oll).The word petrol is a shortened version of petroleum. Petroleum products are all the substances made from petroleum. Petrochemicals feed stock like ethylene and propylene can also be produced directly by cracking crude oil without the need of using refined products of crude oil such as naphtha. oil refineries use much of the technology of, and can be thought of, as types of chemical plants. The crude oil feed stock has typically been processed by an oil production plant. There is usually an oil depot (tank farm) at or near an oil refinery for the storage of incoming crude oil feedstock as well as bulk liquid products. An

oil refinery is considered an essential part of the downstream side of the petroleum industry. Oil refineries are typically large, sprawling industrial complexes with extensive piping running throughout, carrying streams of fluids between large chemical processing units, such as distillation columns.

In many ways, oil refineries use much of the technology, and can be thought of, as types of chemical plants. Petroleum refineries are very large industrial complexes that involve many different processing units and auxiliary facilities such as utility units and storage tanks. Each refinery has its own unique arrangement and combination of refining processes largely determined by the refinery location, desired products and economic considerations. An oil refinery is considered an essential part of the downstream side of the petroleum industry. In the modern refinery, the refining processes are classified as either physical separation or chemical conversion ones. The first step in the refining process is distillation, where crude oil is heated at extreme temperatures to separate the different hydrocarbons.

The world's first systematic petroleum refinery was built in Ploiesti, Romania in 1856 using the abundant oil available in Romania. In North America, the first oil well was drilled in 1858 by James Miller Williams in Oil Springs, Ontario, Canada.



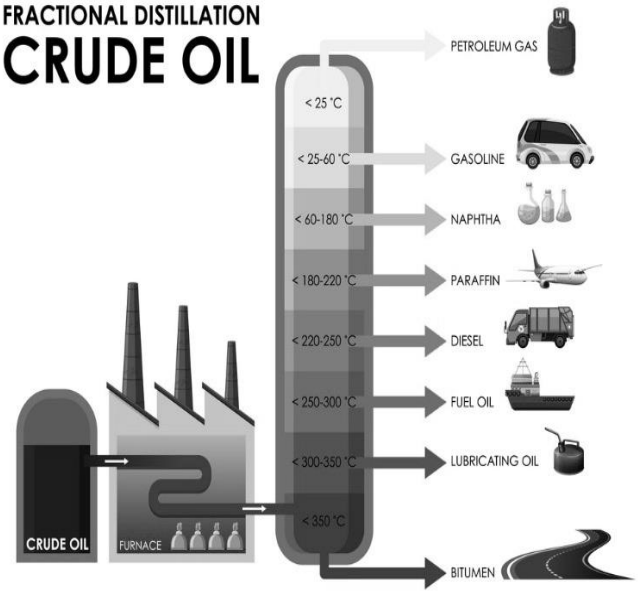
(Fig.2)

BACKGROUND & REVIEW

Fractional distillation splits the crude oil into simpler mixtures called fractions. The different fractions are taken out of the still at different levels. This happens in a distillation tower (which we shorten to still). The crude oil is heated in a furnace to about 370°C and is pumped into the bottom of a distillation tower. Most of the hydrocarbons are gaseous, though the very thick ones are still a liquid even at this temperature.

(Fig.3)

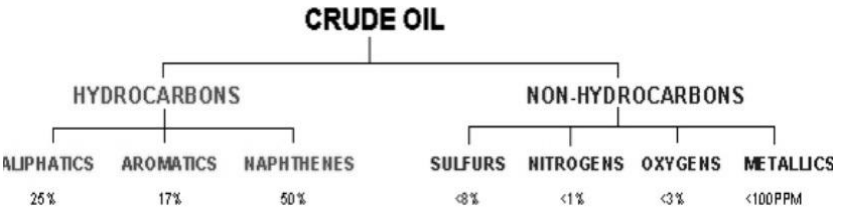
The tower is like a giant heat exchanger it removes heat from the gases as they rise up it. The temperature falls to 20°C by the time the vapors reach the top. The vapors condense as they rise up the tower. The heavier ones (with higher boiling points) condense first. The thinner, runny ones get further up the tower before they condense. And the gases pass out of the top.



fractional distillation is used to separate crude oil into useful substances or fraction having different hydrocarbons of different boiling points. The crude oil fractions with higher boiling points: have more carbon atoms. have higher molecular weights.

METHODS

Crude oil is a liquid mixture of thousands of organic chemicals found underground. It is the result of organic matter decaying over thousands of years, hence the name fossil fuel. Crude oil is found all over the world and varies tremendously in its density, aromatics, sulfur and metals content. The crude oil produced from the atmospheric separator has a composition different from the reservoir fluid from a producing well. Two important things that determine the quality and the price of crude oil are the API gravity and the sulfur content in crude oil.



(Fig.5)

Generally, a crude oil with the API gravity

- less than 20-22 is called heavy crude oil.
- greater than 33-40 is called light crude.
- If sulfur content of a crude is less than 0.5 wt% is called Sweet oil.

Uses of crude oil are shown in (Fig.3). Sulfur is the most important heteroatom in petroleum and it can be found in cyclic as well as noncyclic compounds such as mercaptans (R-S-H) and sulfides (R-S-R). where R and R‘ are alkyl groups. Sulfur in natural gas is usually found in the form of hydrogen sulfide (H_2S). Some natural gas contains H_2S as high as 30% by volume. The amount of sulfur in a crude may vary from 0.05 to 6% by weight.

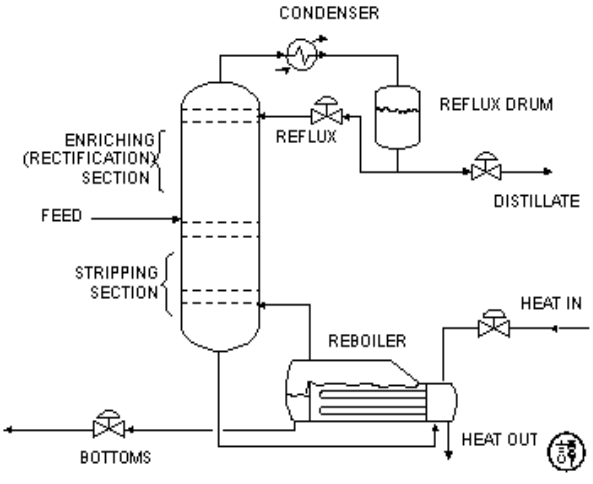
THEORY & DESIGN

Here are some of the chemical processes found and use in oil refinery the units and their works in the oil refinery.

- Desalter unit: washes out salt from the crude oil before it enters the atmospheric distillation unit.
- Crude Oil Distillation: unit distills the incoming crude oil into various fractions for further processing in other units.
- Vacuum distillation: further distills the residue oil from the bottom of the crude oil distillation unit. The vacuum distillation is performed at a pressure well below atmospheric pressure.
- Naphtha hydrotreater unit: uses hydrogen to desulfurize naphtha from atmospheric distillation. Naphtha must be desulfurized before sending it to a catalytic reformer unit.

Main Components of Distillation Columns:

A vertical shell where separation of liquid components is done. Column internals trays/plates and/or packings which are used to enhance component separations. A reboiler to provide the necessary vaporization for the distillation process. A condenser to cool and condense the vapor leaving the top of the column. A reflux drum to hold the condensed vapor from the top of the column so that liquid (reflux) can be recycled back to the column.



(Fig.5)

CONCLUSION

To conclude with, Oil refinery as we know is an industrial plant that refines crude oil into petroleum products such as diesel, gasoline and heating oils. Also, is the recovery of usable or salable fractions and products from crude oil, either by distillation or by chemical reaction of the crude oil constituents under the effects of heat and pressure. Oil refining plays a very important role in our lives. Most transportation vehicles are powered by refined products. In oil refinery crude oil is processed and refined into more useful products, the petroleum products are natural gas, LPG, jet fuel, gasoline, kerosene, diesel fuel, lube oils, petrolatum. And also word petrol is a shortened version of petroleum mean rock oil. The fractional distillation splits the crude oil into simpler mixtures called fractions. The different fractions are taken out of the still at different levels. The tower is like a giant heat exchanger it removes heat from the gases as they rise up it. And the chemical process that we can found in the oil refinery are desalter unit, crude Oil Distillation, vacuum distillation and naphtha hydrotreater unit.

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