RECTIFICATION PROCESS IN PRIMARY OIL REFINING AND IMPROVEMENT OF THE RECTIFICATION COLUMN

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Abstract. Petroleum refining begins with the distillation, or fractionation, of crude oil to separate it into different groups of hydrocarbons. The products obtained depend directly on the characteristics of the crude processed. Most of these distillation products are then converted into more usable products by modifying their physical and molecular structures through cracking, reforming and other conversion processes, and then subjecting the products obtained to various treatment and separation processes such as extraction, hydrocracking and sweetening to produce the finished products. In simpler refineries, atmospheric and vacuum distillation are usually used, while in integrated refineries, fractionation, conversion, treatment and blending are carried out, as well as the production of lubricants, heavy fuel oils and bitumens; these refineries may also include petrochemical processing facilities.

Keywords: Crude oil distillation, atmospheric distillation, vacuum distillation, fractional distillation, rectification column, separation process, boiling point differences, hydrocarbon fractions, light hydrocarbons, heavy hydrocarbons, distillation efficiency, fractionation, reflux ratio, stripping section, rectifying section.

Introduction. With the advent of mass production and the First World War, the number of gasoline-powered vehicles increased dramatically and the demand for gasoline increased accordingly. However, atmospheric and vacuum distillation were limited in the amount of gasoline that could be obtained from crude oil. The first thermal cracking process was developed in 1913. It involves subjecting heavy fuel oils to high pressure and intense heat, which physically breaks the large molecules into smaller ones, thereby producing larger quantities of gasoline and fuel oils. In the late 1930s, visbreaking was developed, an improved form of thermal cracking that produced more valuable and desirable products. The advent of turbocharged gasoline engines created a demand for higher octane gasoline with better anti-knock properties. The introduction of catalytic cracking and polymerization processes in the mid- to late 1930s, which offered higher gasoline yields and higher octane ratings, helped meet this demand. Separation . Crude oil is physically separated by fractionation, in atmospheric and vacuum distillation towers, into groups of hydrocarbons with different boiling ranges, called "fractions" or "cuts." Conversion[1] . Conversion processes used to change the size or structure of hydrocarbon molecules include: decomposition (splitting) by hydrocracking, thermal and catalytic cracking, coking, and visbreaking; unification (combination) by alkylation and polymerization; altering by isomerization and catalytic reforming; processing.

Treatment . Since the early days of refining, various treatment methods have been used to remove nonhydrocarbon compounds, impurities, and other constituents that can adversely affect the performance characteristics of finished products or reduce the efficiency of conversion processes. Processing involves both chemical reactions and physical separation, such as dissolution, absorption, or precipitation, using a variety and combination of processes. Processing methods include the removal or separation of aromatics and naphthenes, and the removal of unwanted impurities and contaminants. Acids and sweetening compounds are used to desulfurize crude oil prior to refining and to treat products during and after processing. Other methods include crude desalting, chemical sweetening, acid treating, contact earthing, hydrodesulfurization, solvent refining, caustic washing, hydrotreating, drying, solvent extraction, and solvent dewaxing.

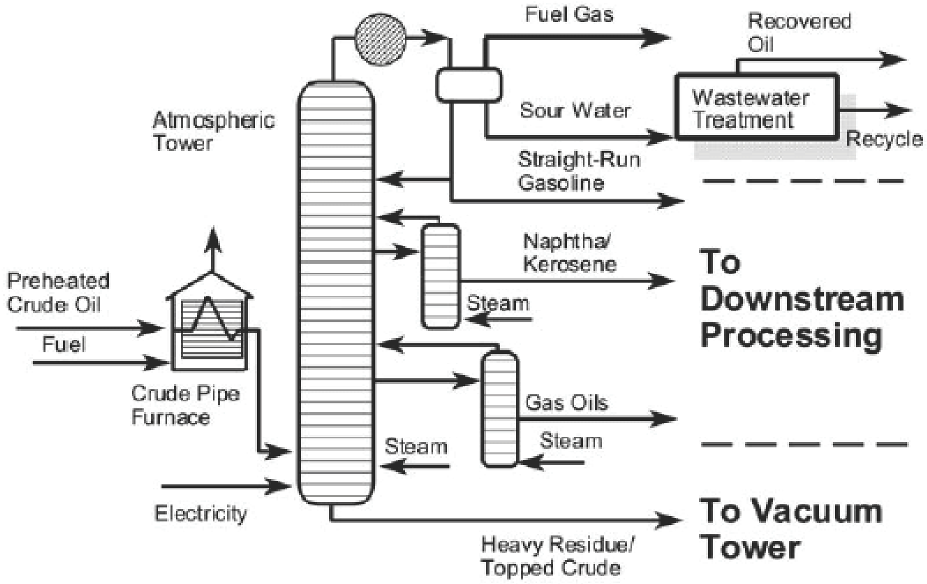

Figure.1

Auxiliary Refining Operations[2] . Other refining operations required in the processing of hydrocarbons include light ends recovery, acid water removal, treatment and cooling of solid wastes, wastewater and process waters, hydrogen production, sulfur recovery, and treatment of acid gases and tail gases. Other facilities provide catalysts, reactants, steam, air, nitrogen, oxygen, hydrogen and fuel gases. In atmospheric distillation towers, desalted crude oil is preheated using recycled heat from the processes. This feedstock is then passed through a direct-fired heater and then down a vertical distillation column at pressures slightly above atmospheric and temperatures ranging from 343°C to 371°C to avoid undesirable thermal cracking that would occur at higher temperatures. The light (low-boiling) ends diffuse into the top of the tower, where they are continuously withdrawn and passed to other units for further processing before being blended and distributed. The lower boiling ends, such as fuel gas and light naphtha, are withdrawn as vapors at the top of the tower. Naphtha, or straight-run gasoline, is taken up as overhead at the top of the tower.

Conclusion

These products are used as feedstocks and reformers, base gasolines, solvents and liquefied petroleum gases. Intermediate boiling range fractions, including gas oil, heavy naphtha and distillates, are sidestreamed in the mid-section of the tower[3]. They are finished for use as kerosene, diesel fuel, fuel oil, jet fuels, catalytic cracking feedstocks and base gasolines. Some of these liquid fractions are stripped of their lighter products which are reinjected into the tower as downflows. Safety and Health Considerations During coking, the temperature should be maintained within a narrow range, as too high a temperature will produce a coke that is too hard to be extracted from the carbonizing drum, while too low a temperature will produce a paste with a high asphaltic content. Improper temperature control could result in an exothermic reaction. In thermal cracking of sour crudes, corrosion may occur if the temperature of metal surfaces is between 232 °C and 482 °C. It is believed that coke forms a protective layer on the metal at temperatures above 482 °C.

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