INTRODUCTION

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Industrial organic today can be divided roughly into four major areas. In order of their current economic importance they are polymers, petrochemicals, synthetic materials (other than polymers), and miscellaneous organic materials lumped together under the general heading of *"fine chemicals."* The historic development and present industrial structure of each of these areas are different. Most modern industrial organic materials are derived from petroleum, whose modern production dates from about 1860, or from natural gas. Less important sources include coal tar, wood, and agricultural waste materials. Oil refineries are generally large installations having some flexibility in both input and output, and traditionally switch output between fuel, lubricating oils, and petrochemicals depending on prices and markets.

Petroleum, or oil, is a naturally occurring liquid with widely different composition of very great complexity. While there are a few surface seepages, the vast majority of petroleum is found well below the surface of the earth and can be reached only by drilling. Oil wells tap into pools or oil, or into porous rock containing the oil, called reservoirs or fields. The oil is sometimes found under sufficiently high pressure to flow to the surface without pumping, but for most wells pumping is required. The amount of oil recoverable from a field by pumping may be only 5 %, more frequently 25 – 30 %, of the oil believed to be present.

Addition of liquids to the field down wells, often salt water from brine wells or local fresh surface water with small amounts of surfactants added, is used to provide enhanced recovery of oil. In fields where the oil is very heavy, steam injection may be used. Complete removal of the oil from a field is not possible even with enhanced recovery methods.

Petroleum as obtained from wells, crude oil, is a complex mixture of hydrocarbons. Its elemental composition is primarily carbon-hydrogen, with variable quantities of oxygen and sulfur, and trace amounts of nitrogen, metals and

other elements. Crude oils are classified by the carbon-hydrogen ratio, which is lower for the more desirable crudes containing smaller molecules (light Crude with high API gravity) and higher for the less desirable crudes containing primarily larger molecules (heavy crudes with low API gravity). Crude oil low in sulfur content, is called sweet crude, while the less desirable crude oil with higher sulfur content is called sour crude.

Crude oil is found in many parts of the world. The major producing areas include the southern United States, western Canada, Mexico, Venezuela, the Middle East, the Eastern Soviet Union, Rumania, Nigeria, and Indonesia. Crude oil can be transported economically long distances overland by pipelines and overseas in very large tanker vessels. Refineries are located on seacoasts with tanker docks or are connected to the production areas or tanker ports by pipelines.

1.1. Petroleum Refining:

Crude oil refining usually begins with washing with water to remove salt and other inorganic impurities, followed by fractional distillation. The fractions into which oil is traditionally distilled is shown in Table-1.

The initial distillation or topping of the crude oil separates the fractions shown in Table-1. Each of these fractions is usually subjected to additional processes and portions of them may be combined to give final desired products. Modern refineries produce primarily fuels, especially motor gasoline, kerosene (jet fuel), fuel oil (heating oil), and heavier oils (residual oil), as well as a variety of minor products such as lubricating oils, paraffin, and asphalt.

The fraction indicated as light products (or light hydrocarbons) includes methane through the butanes. The fraction or cut indicated naphtha is also called straight-run gasoline and can be used as motor fuel, although motor gasolines are more sophisticated lends. The kerosene fraction, once in demand for lighting, now finds its primary modern use as jet aircraft fuel. The heavier gas oil fraction is blended into several grades of heating oil and bunker fuel (for ships). Both gas oil

and residual oil are feedstocks for further processes. Residual oil is not the only form of residue; paraffin and asphalt are also left undsistilled.

Natural gas, on compression, will also condense out heavier Alkanes than methane as liquid (Liquefied Petroleum Gases, L. P.G.), and these are a useful source of propanes and butanes for polymers. In a modern refinery, the unused "cuts" or fractions can be cycled to cracking units, which heat the material above 230 ^{0}C at different pressures. Cracking may be done in the presence of catalysts (catalytic cracking) or in the absence of catalysts (thermal cracking) or in the presence of water (steam cracking). The reactions occurring in cracking processes are complex. Most, but not all, convert more complex hydrocarbons to simpler ones of lower boiling point with loss of hydrogen.

Heavier fractions of oil are cracked to gasoline. Propene, CH_3-HC = CH_2, arises as a byproduct of the cracking process which yields ethane or by product of gases liberated elsewhere in the refinery. Ethane, propane, and butane obtained from the natural gas are cracked to Ehene and Propene in the same manner. Butenes and Butadiene, produced in smaller quantities, are used, for example, in the production of rubber.