PATNA UNIVERSITY E- LESSON Dr.Ravi kiran Sharma

DEPARTMENT OF GEOGRAPHY, SEM-II, GEO, CORE COURSE-07 Retered Professor

Resource and Economic Geography, UNIT 2. Dept.of Geography.P,U

09.05.2020

Petro-Chemical Complexes with Reference to India

Petroleum or crude oil is in the greatest demand in modern world. It has the widest range of domestic as well as industrial uses. Hence it is often referred to as 'black gold'. However crude oil is of little industrial use without refining it. Thus it is made up of various hydro-carbons which have to be separated in a refinery. Here the hydro-carbons are broken into their respective 'groups' or 'fractions' through a complex process of distillation. Its chief impurity – sulphur is also removed. A refinery may produce as many as 80 oil, gas and chemical products. Refining is a very complex process. A very high technology is required, hence they are mostly located in developed countries, and some in China, India etc. They may be divided into four parts:

1. Lighter fractions- e.g. petrol, kerosene and benzene.
2. Heavier fractions- e.g. diesel, lubricants and fuel oils.
3. Residue includes- coke, asphalt, bitumen or tar and wax.
4. Gases- butane and propane

The following are the chief methods of oil distillation:

Fractional Distillation_ This is the basic method by which crude oil is split into various fractions. In this each of the fractions have a different boiling point and thus a different condensation point. The crude from the storage tanks is pumped into a furnace where it is heated for all fraction to vaporize. This vapour then enters a cylindrical fractionating tower. The interior is divided into comportments or trays. There are holes in the trays to allow vapour to rise and an outlet where condensed liquids of different levels are taken to separate storage tanks. In this way various fraction of oil are obtained.

Thermal cracking_ The previous process yielded very little lighter oil. Thermal cracking process has increased the petrol yield by almost 50%. In this the crude is heated at higher temp, as well as pressure. This combination breaks the larger hydro-carbons to lighter fraction.

Catalytic cracking_ In this a catalyst (fine powder of clay) is added to medium fraction. In the cracking chamber or reactor hot oil and catalyst is combined, oil vapour is broken into lighter fraction and impurities are left with clay. It is thus a chemical process by which sulphur is also removed.

Polymerization_ In this the lightest fraction i.e. gas is made to combine in larger molecule to yield petrol. Also polymerization is used to produce petro-chemical by-products such as plastic detergents, synthetic rubber, fibers etc.

Lately the demand for heavier oil is increasing as the factories change over from coal to oil based power plants. These days the product produced mainly depend on market trends.

Location of Oil Refineries and Petro –complexes

Oil is the largest single commodity in the world trade. Most of it is produced by countries which have little internal demand. So a huge amount is traded the refineries and complexes may be located:

1. Near their raw material
2. Near their markets or
3. At an Intermediate Location

1.a--. Raw material or field based refineries are found especially in USA, Russia and Europe, as they are close to areas of consumption or the market.

b—Some refineries are also found in countries like Venezuela, Middle –east, Algeria, Libya or South-east Asia even though the local market is very small. Here the advantage is the nearness of the crude oil, thus saving transport costs. Some important e.g. of refining towns are Temblador in Venezuela, Duishanzi in west China, Yunnan etc. However there are some disadvantages in such cases:

Firstly1., far off from market,2, sparse population, rugged relief and harsh climate makes the running of refineries difficult, and 3, the refineries will be useless after exhaustion of oil.

c—If the oil field is near the coast, then the above disadvantages are lessened. The transport cost to consuming countries become cheaper. Also, high technology equipments and labour can be brought easily. Thus Middle-east is fortunate as many of their oil fields are near the coast. E.g. are Basra, Abadan, Mina al Ahmadi etc

d,--Lastly oil companies often avoid building refineries in politically unstable countries. However the present trend in the developing countries with vast market is to encourage local refinery complexes so that there is, 1.industrial development, 2.meeting fuel requirements, 3. Generate employment and4. Increase revenue by exporting of finished products. This trend is visible in Venezuela, India mid-east etc.

However field based refineries in non-industrial countries are simple or less complex, than those in developed countries.

2. Intermediate Location

There are many factors when the refinery has to have an intermediate location:

1. If the coastal waters are shallow, and the port is not suitable for large modern tankers. For e.g. in Venezuela, Lake Maracaibo is shallow and the and the mouth narrow. Hence the tankers are unable to reach the lakeside oil fields. Thus the islands of Aruba and Curacao, which are nearby, became major centers of refining as they were more accessible to huge tankers.
2. Pipe lines are also built so that refinery could be set up near the market or a convenient port. Thus in Saudi Arabia, a Trans Arabian pipeline (1600 K.M.) take crude to Mediterranean coast to be refined at Banias and Saida. This avoids the 4800 Km tanker route across Suez.

Singapore is another good e.g. which obtains crude from Indonesia and Brunei.

3. There may be intermediate location nearer to markets than the producing states. Thus the refinery at Bantey Bay in Ireland has many advantages. It has deep sea harbor where the largest tanker can reach, but they cannot enter Rotterdam or even sail through the English Channel. Thus huge amounts of crude are stored and petro-complexes have sprung up. Both crude and petro products are re-exported through small tankers through Rotterdam (entrepot) to the major markets.

3 Market Location

The main oil consuming areas are regions of dense population of developed countries of USA, West Europe and Japan and it is here that that most sophisticated refineries are set up. The chief advantages are:

a. Availability of technicians,
b. Skilled labour,
c. Constructional materials and
d. Raw material needed by the huge industrial regions.

The refinery complexes of market locations are larger and produce wider range of oil products. All refineries of Europe and North America are termed as market oriented because they are well connected by pipe lines to huge petro chemical industries and also to industrial cities where oil is needed for power. Thus, remote sites like Milford Haven in Wales(which has a deep harbor) has a major oil refinery, and it is well linked to industrial centers by pipelines.

Again there is a concentration of oil refinery complexes in coastal areas as oil is easily imported Thos the refineries are clustered at Rotterdam and Antwerp. The coastal refineries in Britain are on the Thames, Mersey and Taco estuaries. In Japan also the complexes are coastal located. Even eastern North America there are coastal refineries using imported oil.

Finally in India there are 18 refineries, out of which 10 have coastal and market location. Others are located near their oil fields or in location where oil can be obtained through pipelines (Mathura, Barauni etc).

Petro- Chemical Complexes in India

The bi-product of oil refineries has resulted in the creation of giant petro-chemical complexes throughout the industrial world. Petroleum is in great demand in modern industries.

The Petro –chemical industry entered the Indian industrial scene in 1970s. it registered a rapid growth in 1980s and 1990s. The initial efforts were made through the naphtha crackers of National Organic Chemical Industry Ltd. (NOCIL) and Union Carbide in Thane and Belapur respectively. They were set up in 1960s. These were in Private sector. The real thrust came with the setting up of the large size unit of IPCL at Baroda in late 1970s in public sector. The discovery of crude and natural gas in the off-shore region in the western coast has provided a new dimension to the expansion of petro-chemicals from the sixth plan onwards.

India's large petro- chemical complexes are at a. Chennai, b. Bongaigaon in Assam, c. PCL at Baroda and Naldhari in Gujrat and d. Hazira in Gujrat. Also they are set up at Koyali, Haldia, Barauni, Jamnagar, Orayia, Gandhar, Vishakhapatnam, Tenughat (Assam), Mangalore, Ludhiana and Mathura. Liberalization policies of the government have attracted foreign companies from USA ,Japan, Britain etc. (MNCs).

Gujrat has the largest concentration of plants in India. They are close to Koyali oil refineries. This complex is the mother plant for many petro-chemical industries in the surrounding region especially for fertilizer industries. He important complexes are which are nearing completion in public and joint sector are by IPCL at Nagothane, Haldia, Salimpur etc. In private sector there is expansion by NOCIL, new units in Gujrat—Reliance Petro Chemical Complex etc. The IPCL has also set up an Aromatic plant at Nagri in Gujrat.

In India, the PC. Industry consists of three kinds of manufacture. At the primary stage, there are large manufactures of base chemicals and resins, at the secondary stage, there are the processing units which process petro-chemicals into end products. Finally, there are equipments manufactures which bring plastics within the reach of the common man.

Other features of India's petro-chemical industry are:

1. The P.Chs. present the highest value addition and resource generation.
2. It has the highest resource generation in terms of investments.
3. It has a powerful effect on the development of chemical engineering, organic polymers dyes etc.
4. Petro-chemicals are capital intensive but they are labor intensive too, and thus have a huge job potential (especially downstream).
5. Lastly, Petro chemical industry gives a big boost to the small scale sector. In 2001 there were nearly 30,000 processing units in India. Thus it has created a large employment opportunity in the country.

Production and export

At the end of 6th Plan production of petro-chemical was put at nearly 0.9 million tons. The demand has been increasingly steadily. Thus in 2001_02 the total petro-chemical production was 6.4 m.t.

However, the demand by now has increased to more than 8 M.T. Hence in 2001_02, import of petro_chemical amounted to Rs. 600 crore per year.

The industry had a rapid growth in recent years, yet the export performance of the petro-chemical industry has been disappointing. The annual export amounts to only Rs. 80 crore.

In spite of many hurdles faced by this industry, it holds great promise for improving the quality of life of the common man and for meeting his basic needs.