CHAPTER - I

OIL ECONOMY OF INDIA
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Oil: The word 'Petroleum' is a combination of two words derived from two different languages. One of these words is 'Petra' German by origin, which means rock and the other is 'Oleum' a Latin word that means oil. Thus this word may technically be used for all the natural hydro-carbons explored from the rock, whether it is liquid, solid or gaseous. But in common usage it refers only to the liquid oils, and this is used to describe a variety of products that are obtained by refining the crude oil. This is uniformly used to denote diesel oil, fuel oil, vaporising oil, motor spirit, aviation spirit, gasoline, petroleum distillates, kerosene oil, lubricating oil and many other forms of residuals. These oils are quite different from the state of oil when it is brought from the wells. In its natural shape it is blackish, thick, sticky and heavy substance which is brought under a highly technical and complicated process to make it usable. Different degrees of heat applied in refining process helps in producing different types of petroleum products used for various purposes.

Origin of Oil:

The origin of petroleum has been controversial issue for a long period. There was a difference of opinion

among the geo-scientists regarding its origin and nature as to whether it is organic or inorganic. But now it is believed that it has been formed from the remains of decomposed plants and animals which once lived in shallow seas and lakes. These plants and animals were carried along with mud, silts and sands etc. by water to settle on sea bottom, in rivers and marshes and were buried underneath. The deposits of these accumulated over millions of years and with the passage of time they underwent some chemical changes. As a result of pressures and temperatures as well as factors not known to us they transformed into petroleum.

**Discovery of Oil:**

petroleum and its various products have been used since before the dawn of recorded history. Sumerians have become familiar with it long before Noah caulked his Ark with bitumen in about 4000 B.C. for the purpose of cementing and water proofing it. Thus the evidence of the use of bitumen in Mesopotamia dates back to the very ancient times. The famous asphalt lake of Trinidad is still being replenished from underlying oil sands, but much too slowly to keep pace with the immense quantity removed each year.  

The history of oil production as we know it today as started only 129 years ago, when Col. Drake drilled his first oil well in Titusville, Pennsylvania in the United States in the month of August, 1859, and oil was struck at a depth of about 69 feet. Before this the scientific and technical aspect of oil production was not known to the world. People were using primitive methods of producing and processing it.

Importance and uses of oil:

The existence of oil, however, has been known to the people of the world for centuries, the evidence of which has already been found in the Bible and other Holy Scriptures. We have already seen that even before the Christian era started, use of crude and asphalt collected from seepages was known to the people. In Middle East countries, in North West India, in Egypt as well as in Peru and Mexico asphalt is known to has been used for building and water proofing purposes. Archaeology has proved that some of the buildings using asphalt were constructed about 6000 years ago. For lighting homes, for tarring the ship's ropes, for repairs of boats and furnitures and even for treatment of leather such type of oil was used.

That is all about the ancient days but in the modern age, the people, all over the world are living in an era of

oil. This is for the simple and apparent reason that the petroleum products have so much infused in our daily lives that it is entirely impossible to be isolated from them. It is highly unimaginary to think of a developed country and of a civilized society without the use of oil and its various derivatives. There are hundreds of commodities which have hardly any resemblance with petroleum, yet they are its by-products and derived from this vital fluid. The colourless petrol used for aeroplanes and cars is derived from the same source as the blue black asphalt on the road. The candle on the mantle-piece and the oil in the gear box are obtained from the very medium as the numerous insecticides and disinfectants. Even the fragrants and scents, perfumes and pomades, creams and numerous other cosmetics are prepared from the by-products of petroleum.

There is an exhaustive list of oil-based chemicals such as resins, phenol, D.D.T., detergents, glue methol, fomaline, moulding powder, Pvc processed goods and items of the plastic industry, linoleum, Pvc leather cloth, Pvc sheets, polythylene, dry batteries, flash light, midget, electrodes, and cinema carbons etc. Thus petro-chemistry has a tremendous impact on today's human life. Through it we get plastics, synthetic rubber, and synthetic fibre etc. Plastic alone has hundreds of uses from home furnishings to satillites. Synthetic detergents have become an effective substitute for soap.
Petroleum has brought wealth and comfort, health and security to millions of people. It has become as necessary to modern civilization as air to human life. In the form of kerosene oil it illuminates millions of houses particularly in rural areas of the world. It is used as a generator of power and as feeder of internal combustion engine. It constitutes the great bulwark of efficient transport services in the world. In the shape of lubricants, it oils the wheels of gigantic machines and thus makes the industrial production possible.

Many of its by-products constitute raw materials for the manufacture of different articles. Thus paraffin wax is used in the manufacture of candles, matches, water proof and grease proof papers, pharmaceutical preparations, ointment, hair oil, coloured ink and so on. White spirit is used for drycleaning, in shoe and furniture polishes and as a substitute for turpentine. Petroleum gases, mainly those which are obtained from cracking plant, are used for a legion of unsuspected purposes. Fertilizer produced from the by-product of petroleum has brought green revolution in agricultural production and its development. Scientists have even extracted protein from oil which is a source of animal nourishment.

Thus we see that we are actually indebted to petroleum and its innumerable products for our all round development in almost all parts of the world.
Estimated World's Crude Oil Reserves

Distribution of world's Crude Oil reserves as estimated in the year 1961 is as follows:

<table>
<thead>
<tr>
<th>Important Regions of the World</th>
<th>Quantity in Millions Metric Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Middle East</td>
<td>25600</td>
</tr>
<tr>
<td>2. North America</td>
<td>6100</td>
</tr>
<tr>
<td>3. Soviet Sphere</td>
<td>4575</td>
</tr>
<tr>
<td>4. South America</td>
<td>3175</td>
</tr>
<tr>
<td>5. Far East</td>
<td>1400</td>
</tr>
<tr>
<td>6. North Africa</td>
<td>700</td>
</tr>
<tr>
<td>7. Rest of the World</td>
<td>825</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42375</strong></td>
</tr>
</tbody>
</table>


Crude Oil Scenario

International scene is very fluid. Crude oil production particularly from OPEC Countries is all the time undergoing changes causing corresponding fluctuations in crude prices. After a phenomenal rise in 70's there was a slump in crude prices in early 80's due to reduction in demand, pressing the crude exporting countries to sell their crude even at lower prices to sustain their economies.
There are indications that in mid 90's once again there would be shortage of crude and the prices would rise steadily.

In India, the annual crude production is expected to reach a level of 34.5 million tonnes per annum by 1990-91. At this level of production, the self-reliance would decrease from 70% in 1984-85 to 61% in 1990-91.

Natural Gas would emerge as an important source of energy. Gas production would go up from 7.2 billion cubic metres in 1984-85 to 14.9 billion cubic metres in 1990-91.

PRODUCTION

The actual pattern of production within the broad framework set by the success of exploration in developing the discovered reserves and by the establishment of production and transportation facility for getting the oil out of the ground and away to the markets is largely determined by a complex set of political and economic factors. Moreover even the degree of exploration effort from place to place and also the willingness or otherwise of companies to finance development of discoveries is similarly related to political and economic considerations. The significance of these factors is thus of paramount importance in establishing the distribution of oil producing facilities and the

extent to which they are used. Outside the United States and the Sino-Soviet sphere eight giant integrated Oil Companies are responsible for over 80% of crude production, 71% of refining capacity and 35% tanker ownership and almost 70% of the distribution and marketing of oil products. Five of the companies are American. They are as follows:

1. Standard Oil of New Jersey (known as ESSO) or Jersey
2. Gulf Oil
3. Standard Oil of New York (known as SO Sony - Mobil)
4. Standard Oil of California (Socal or Stancal)
5. Texas Oil (Texaco)

The rest three Companies are as under:

6. The Dutch/Shell Group (Shell) is Anglo Dutch
7. British Petroleum is British owned (51% owned by the Government)
8. Compagnie Francaise des Petroles (F.C.P.)

is French Company jointly owned by the State and Private share holders. Each of the eight companies has its own separate facilities but they often form partnerships which carry out specific operations. The Iraq Petroleum Company is a consorteum of Jersey, Mobil Shell, B.P. and C.F.P. concerned with production and refining oil in Iraq.
<table>
<thead>
<tr>
<th>Region</th>
<th>Domestic Consumption</th>
<th>Excess Supply over Demand</th>
<th>Domestic Demand over Supply</th>
<th>% of Total Domestic Demand</th>
<th>% of Total Domestic Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. United States</td>
<td>16382</td>
<td>10489</td>
<td>-</td>
<td>5893</td>
<td>30.0</td>
</tr>
<tr>
<td>2. Caribbean</td>
<td>701</td>
<td>3340</td>
<td>2639</td>
<td>-</td>
<td>1.3</td>
</tr>
<tr>
<td>3. Canada &amp; Mexico</td>
<td>2462</td>
<td>2597</td>
<td>135</td>
<td>-</td>
<td>4.5</td>
</tr>
<tr>
<td>4. Other Western Hemisphere</td>
<td>2158</td>
<td>1043</td>
<td>-</td>
<td>1115</td>
<td>4.0</td>
</tr>
<tr>
<td>5. Non-Communist Europe</td>
<td>13545</td>
<td>429</td>
<td>-</td>
<td>13116</td>
<td>24.8</td>
</tr>
<tr>
<td>6. Africa</td>
<td>1029</td>
<td>5416</td>
<td>4387</td>
<td>-</td>
<td>1.9</td>
</tr>
<tr>
<td>7. Middle East</td>
<td>1221</td>
<td>21835</td>
<td>20614</td>
<td>-</td>
<td>2.2</td>
</tr>
<tr>
<td>8. Japan</td>
<td>5057</td>
<td>15</td>
<td>5042</td>
<td>503</td>
<td>9.2</td>
</tr>
<tr>
<td>9. Other E. Hemisphere</td>
<td>2734</td>
<td>2231</td>
<td>-</td>
<td>503</td>
<td>5.0</td>
</tr>
<tr>
<td>10. Communist Areas</td>
<td>9340</td>
<td>10749</td>
<td>1409</td>
<td>-</td>
<td>17.1</td>
</tr>
<tr>
<td><strong>World Total</strong></td>
<td><strong>54629</strong></td>
<td><strong>58144</strong></td>
<td><strong>29184</strong></td>
<td><strong>25669</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>


**CONSUMPTION:** Much of the world's petroleum is consumed in Anglo-American Countries. The U.S.A. and Canada together consume 35% of the world's total products. Non-Communist Europe takes 25%, Japan Consumes 9% and the communist countries 17% and the (contd..)
rest 14% only remains for the rest of the world. Petroleum consumption plainly correlates with a high degree of industrialisation. The bulk of the product is used up in regions, that are rich in both Producers' Goods and Consumers' Goods. Petroleum is an important source of energy after coal.

**Discovery of Oil in India:**

The modern history of oil in India starts in Assam. Oil was struck in India as far back as 1867 at Maukum near Margherita in Assam at a depth of 118 ft. The first and foremost oil well, not in India only but in the entire Asia was completed on 26th March, 1867, just after 8 years of the first well in the world drilled by Col. E.L. Drake in 1859. This first well in India was drilled by steam powered machinery at Maukum in the upper area of the Assam State. In the beginning it produced just 8 barrels of crude oil in a day. The well having a little quantity of oil reserves exhausted very soon and again a darkness of disappointment spread over the country. Twenty years latter a new hope like Vascode Gama's "cape of good hope" appeared in the same state. The engineers of the Assam Railways and Trading Co. during their work came to know about seepages. At that time the company was building the first railway line from Dibrugarh to Margherita, where first oil refinery was set up to refine Maukum Crude Oil. The Assam Railway and Trading Company decided to drill for the oil and after thirteen months in 1890 struck oil
at the depth of 662 feet, in the vicinity of Digboi, (which is named perhaps after 'Dig boy dig') where India's first oil refinery was set up by the Assam Oil Company in 1901. It is situated at about 40 km east of Dibrugarh.

The Digboi field covers an area of 2½ square miles and is the most important oil producing field in India. In all, the oil bearing areas of India cover more than one million square kilometres and include Assam, Himachal Pradesh, Manipur, Tripura, West Bengal, Rajasthan, Kashmir, Ganga valley, Combay, Kutch, Tamil Nadu Coast, Kerala Coast, and Andaman & Nicobar Islands.

**Importance of Oil in the Country:**

Oil is one of the most important factors in the economic development of a country. Petroleum and its various products are highly significant for the growth, expansion and development of a large number of Industries in India. Its different products like fuel oil, lubricants, petrol, diesel and kerosene etc. are used in automobiles, railways, steam engines and machines of manufacturing industries and for so many other purposes.

The importance of oil has become manifold, particularly after independence of the country. After independence India is on the highest point of efforts for her economic reconstruction. A large number of schemes and plans are
being formulated for bringing out radical changes in all spheres of our economy, which are mainly concerned with agricultural and industrial development of the country. The government is trying to revolutionise the means of communication and transportation, not only in urban areas but in rural areas also. Because, the future of a nation is strongly bound up with the progress of transport and communication, the very vitamin of modern trade and commerce. And oil can play a vital role in developing them cheaply and efficiently. With the use of petrol and diesel oil, buses and other vehicles can very well connect the villages with cities. Aeroplane can develop civil aviation. Besides, oil can be used for diesel, power and as a fuel for the industrial furnaces where hydro-electric power is not available. Thus it can be safely said that oil is as important in India for its all round development as anything.

**Importance of Oil in Fuel Economy:**

Sufficient availability of fuel to assist man in his work is an essential requirement for economic development. There are so many solid and liquid things that constitute the elements of fuel economy, like coal and natural gas, petroleum and wood etc.

The increased consumption of different types of energies in recent years has brought a considerable change in the proportionate importance of each of them. And
petroleum has occupied the highest rank in relation to its significance in fuel economy. There are innumerable petroleum products which are used for fuelling different things for different purposes. In the shape of kerosene oil it illumines crores of crores houses in the rural areas, while in the form of furnace oil it is used under the boilers and fertilizer ovens. Under the name of petrol and diesel it moves cars, trucks, buses, scooters and various other diesel and locomotive engines. Aviation fuel carries up the aeroplanes and its sisters high in the air. As a fuel it is used in gas oven and different types of stoves. Not only these, there is a long series of its uses as fuel and thus it has not only become the substitute of coal and wood but became more important and far better in comparison to them due to the following reasons:

1. The case with which large quantity can be handled;
2. The simple method of operating anything which is fired by petroleum as fuel;
3. Considerable reduction in the number of personnel in the handling of oil fuel;
4. It produces a little or no smoke;
5. The oil fuel is automatically fed to the burners and mechanically fired;
6. The maximum heat can be obtained within no time; and
7. finally, it costs less transportation charges.5

Oil fuel thus occupies the highest place in the fuel economy due to the above mentioned advantages in comparison to coal, wood and other fuel. Besides, it provides employment opportunity also. Thousands of thousands people are engaged from prospecting, drilling, producing and refining to marketing and distribution. It earns foreign exchange, no doubt, but due to shortage of crude reserves in our country we pay more for import than earn through export.

Deposits:

Out of India's total area of 3 million square kilometres, the area of land containing sedimentary rocks that are supposed to be potentially oil bearing is 1,26,000 square kilometres. It includes Assam, Himachal Pradesh, Manipur, Tripura, West Bengal, Rajasthan, Kashmir, Ganga Valley, Cambay - Kutch, Tamil Nadu Coast, Kerala Coast, and Andaman & Nicobar Islands.

Oil has already been discovered as a result of geological surveys and exploration efforts that have been made by Oil and Natural Gas Commission in Ankhleshwar, Nawagam, Kalol, Kosamba, Sanaud, Khataua Dholha, Ahmedabad and Kadi Structure in Gujrat and Radrasagar and Lakwa in Assam. Recently the Commission paid its attention towards exploration and got success in stricking oil in Trombay near Bombay.
Though the oil deposit in India is not very significant, even then it is the highest one in Asian countries leaving Middle East. According to Russian experts India has at least 20 oil basins among which eight or nine such as Assam, Cambay and Tripura etc. have good prospects and she can meet her oil requirements from her own resources. They have the opinion that India can increase its crude oil output from 2 to 2.5 million tonnes by intensifying oil extraction from the already discovered deposits. Besides, additional wells can be drilled in Assam and Cambay which will enable the ONGC to increase the oil output by 1 to 1.5 million tonnes. Moreover, they suggest that the basins which have the best prospects should be covered with exploratory wells to assess the oil reserves.\(^6\)

**External Sources of Crude Oil:**

From a meagre 0.25 million tonnes per annum capacity in 1950, the refining capacity in India today is in the region of 45.55 million tonnes. The actual quantity of refined products consumed in 1972 was around 23 million tonnes, consisting 20 million tonnes of indigenously processed products based on imported and indigenous crude and 3 million tonnes of imported products. As the demand of

petroleum product is growing at the rate of 9% per annum, additional refining capacity has to be established to a total of about 48 to 50 million tonnes by the end of the current decade.

The bulk of additional capacity created in January, 1982 on account of the huge refinery at Mathura which was originally capable of processing 6 mts. to be raised to 7.5 million tonnes and another contributing factor would be coast based refinery at Goa that will have an initial capacity of 4 mts. The other project related to the expansion of the capacity of the Koyali Refinery to 7.3 mts from 4.3 mts, and increase in through put of Barauni to 3.3 mts. from 2.2 mts. and the establishment of an industrial refinery at Bongaigaon with a capacity of one mt; the requirement of crude oil has increased tremendously, and difference between production and consumption has been and will have to be imported from various sources of crude oil.

In the year 1970 India imported 11.7 million tonnes of crude oil while her indigenous production was 6.8 mts. much less than that. In the year 1984-85 India imported 11.810 mts. (for Rs. 2919.00 crores) whereas in 1985-86 she imported 15.240 million tonnes (for Rs. 3494.00 crores). Besides, its various domestic sources, India has to import
crude oil from middle east countries, like Iran, Iraq, Saudi Arabia and Kuwait etc.

Under the previous agreement Iran was supplying crude most of which was refined in the semi-government refinery at Manali in which NIOC of Iran has also collaborated. The Government of India had signed another long term agreement with Iraq according to which Iraq was to supply 112 mts. of crude, 5 and 7 mts. in the year 1976 and 77 respectively and 10 mts. subsequently for 10 years. Due to Iran - Iraq war the whole schedule was disturbed. Saudi Arabia had also agreed to supply 3.3 mts. within three years, 1.1 mts. in each year. Thus it is obvious that along with her indigenous crude, India has to depend upon Middle East countries to bridge up the gap between the internal resources and the requirements.

**World Trade and its Contribution to Foreign Exchange**

The Indian Oil Corporation Limited continued to work as canalising agent for import and export of crude oil and petroleum products on behalf of the oil industry in India. A comparison of import and export by the Corporation during the years 1984-85 and 1985-86 is given as under:
In addition, 0.512 million tonnes of crude oil valued at Rs.131.31 crores was also imported in 1985-86 by Madras Refineries Limited directly as against 1.992 million tonnes valued at Rs.489.17 crores in the previous year (1984-85).

Of the imports during 1985-86, crude oil on rupee payment amounted to Rs.592 crores while products to the tune of Rs.551.47 crores.

Out of the Corporation's entitlement of products from Bombay High crude sent abroad for processing, 17,583 tonnes of SKO and 69,339 tonnes of HSD were received for use in India while naphtha and fuel oil were sold abroad leading to realisation of Rs.14.89 crores in foreign exchange.
The Corporation realised Rs.60.06 crores from sales proceeds of various petroleum products exported to Nepal Oil Corporation. An amount of Rs.99.84 crores and Rs.11.99 crores respectively was realised in foreign exchange for supplies of aviation fuel to international airlines and bunker fuel and marine lubricants to foreign flag vessels at Indian ports.

Need of Oil Policy in India:

The policy relating to any matter is a statement of aims and objectives as well as the procedures laid down to be adopted for the attainment of those objectives - the need for having a policy is felt due to the reason that it helps in channelising the resources towards the achievement of a goal. No doubt there are oil resources in our country, though not sufficient enough to meet our requirements. We are in need of oil products for our consumption purposes, hence, we are in need of having a policy regarding it. Such as who will explore and produce the oil, who will refine it and who will distribute? How much we should nationalise and how much allow to private interest and on what terms and conditions? How much of crude oil or oil products we will import and how much of them we will export and what should be the price of the products? In the same manner there must be some well defined and clear cut policy regarding consumption, taxation and other matters.
Oil Policy before Independence:

Although the quest for oil was started in India more than a century earlier, but no sustained effort was made to explore the vast sediments of the country. The alien governments of India never tried to pay attention towards exploration, production, refining and distribution of mineral oil themselves. They made India like a colonial state suitable for business. Like other fields of product manufacturing, trade and commerce they were negligent to oil industry also. What they did was only to give patronage to the outsiders. In the years before the independence the oil policy of the government of India was one of giving all possible protection to the foreign oil companies operating in the country. All the oil requirements were fulfilled by import except for a meagre indigenous refining. Even the distribution of imported products was the preserved right of a few foreign oil cartels operating in India.

The then British government did not learn any lesson from the enterprises of the small trading team in Assam and it fell upon the shoulder of the government of independent India to look for further oil reserves in the country and develop the indigenous product based oil industry.

Policy after Independence:

As the country became free in 1947, it was felt necessary that there must not be any further delay in the
establishment and development of our own oil industry as one of the strategic industries. It was expressed by one of our leaders that "There can be no freedom for the country's economy or its defence, unless the oil industry is owned and controlled by the state". But, unfortunately, even after independence till the second five year plan began the Government could not do much in this direction. From 1950 to 1955 three international Oil Companies were permitted to establish their refineries which have been nationalised a few years back. Besides importing crude oil and refining them, they also imported finished products and sold them in the country. This still left a gap to be bridged up. Gradually this gap became wider and wider, which necessitated the Government stepping in, to explore, produce and to build up refineries in the public sector.

Real foundation of oil industry in the public sector was laid down only during second Five Year Plan when the Government of India launched a planned programme of exploration, production, refining and distribution. The Oil and Natural Gas Commission (ONGC) was set up in 1956. It was only after success in exploration that the Government of India decided to form a Ministry of Petroleum and Chemicals in 1963. Indian Oil Refineries Ltd. and Indian Oil Co. were also brought into existence. Thus the government determinedly came out to fulfil the multi-dimensional programme of (a) initiation of a vigorous search for the
sources of crude oil in India; (b) Planning new public sector refineries based on indigenously discovered and produced crude; and (c) setting up a public sector marketing organisation to distribute and sell the products refined by the public sector refineries.

Petroleum Industry in India made much headway in post-independence period. Starting from a modest level of crude production of around 2.5 lakh tonnes and consumption 31 lakh tonnes in 1950-51, crude oil production during 1984-85 was 2.90 crore tonnes and the consumption level around 3.88 crore tonnes. About 1.36 crore tonnes of crude oil and 60.92 lakh tonnes of petroleum products were imported to meet the country's requirements in 1984-85. During the same period 64.8 lakh tonnes of crude oil and 9.33 lakh tonnes of petroleum products were exported. The net import of crude oil was 71.64 lakh tonnes and the net import of petroleum products was 51.6 lakh tonnes for the same period. The refinery throughput during 1984-85 stood at 3.56 crore tonnes.

The oil industry in India is divided into three broad segments, viz;

a) Oil exploration and Production
b) Oil refining and transportation, and
c) Marketing and Distribution

The entire composite structure of various segments has been shown in the chart:
**INDIAN OIL INDUSTRY AT A GLANCE**

**MINISTRY OF PETROLEUM & CHEMICALS**

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**OIL EXPLORATION & PRODUCTION**

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**REFINING & TRANSPORTATION**

---

**OIL & NATURAL GAS COMMISSION**

---

**FOREIGN COMPANIES**

---

**OIL INDIA LIMITED**

---

**REFINERIES**

---

**PIPPINES**

---

**MINISTRY OF PETROLEUM & CHEMICALS**

---

**OIL CORPORATION LIMITED (I.O.C.)**

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**Bharat Petroleum Corporation Limited (B.P.C.L.)**

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**Hindustan Petroleum Corporation Limited (H.P.C.L.)**

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**OTHERS**

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**HPC PRODUCT PIPELINE**

---

**OIL INDIA CRUDE PIPELINES**

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**IDC PIPELINES**

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**PRODUCT PIPELINES**

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1. Guwahati Refinery
2. Vizag Refinery
3. Bongaigaon Refinery
4. Mumbai Refinery
5. Guwahati-Siliguri Pipeline
6. Goalpara-Kanpur Pipeline
7. Guwahati-Maurigram Pipeline
8. Nalini-Panipat Pipeline
9. Bangalore-Indore Pipeline
10. Madras Refineries Limited

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**INDIAN OIL CORPORATION Limited’s Marketing Division**

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1. 6 Regional Offices
2. 32 Divisional Offices
3. 2 Divisional Offices under Assam Oil Division
4. 35 Storage Terminals (17 port, 12, pipelines and 6 inland)
5. 115 Storage Depots
6. 75 Aviation fuelling stations
7. 15 LPG bottling plants
8. 13,341 Sales points (as on 31st March, as and includes)
9. 4992 Consumer pumps
10. 5145 Petrol/Diesel Station
11. 2757 Kerosene and Light Diesel Oil dealers Points
12. 1227 LPG distribution points
13. 34 Customer Service Cells
EXPLORATION AND PRODUCTION

Oil exploration and production in India started in an extensive and systematic manner only after setting up of Oil and Natural Gas Commission (ONGC) in 1956. With the acquisition of the shares of Burma Shell Oil Company by the Government in 1981, Oil India became the second public undertaking engaged in oil exploration and production in the country. Besides the area of eastern region OIL now extended their exploration activities to Mahanadi basin and parts of Rajasthan and Andaman.

In order to supplement the efforts of ONGC and OIL the Government has invited experienced foreign oil companies to take oil exploration in selected blocks off-shore. There are 27 blocks on offer from six basins, viz; Saurashtra, Kerala -- Konkan, Cauvery, Palar, Krishna - Godavari and Mahanadi. Keeping in view the need for indigenisation Indian companies both in the public and private sectors are encouraged to collaborate with foreign companies of repute and to offer services to ONGC and OIL in the field of exploration and production.

Increased efforts in the field of oil exploration and production have paid dividends by way of increased production of crude oil. In the beginning of the sixth plan the annual production of crude oil in India was 105.1 lakh tonnes which increased to 290 lakh tonnes in 1984-85, the
terminal year of the sixth plan. Thus the production of crude oil increased three fold during the sixth plan period. The production of crude oil for 1985-86 was 301.4 lakh tonnes.

With the increase in the production of crude oil, the production of associated natural gas in the country has also gone up. The natural gas supplied by ONGC and OIL in 1985-86 was 495 crore cubic metres as against 414 crore cubic metres in the year 1984-85. The target of gas to be supplied during 1986-87 was 468 crore cubic metres.

REFINING AND TRANSPORTATION

(A) **INDIAN OIL CORPORATION LIMITED**

Before the Indian Oil Corporation was brought to existence, there were working two companies in the public sector — One Indian Oil Refineries Limited (Estd.1958) responsible for the functions and operations of refineries and the other, Indian Oil Company Ltd. (Estd. 1959) an organization for marketing and distribution. These two were amalgamated in the year 1964 to form I.O.C. Ltd.

The I.O.C. had two divisions, viz:

(i) Refineries and Pipelines Division, and (ii) Marketing Division. The refineries division was responsible for the management of public sector refineries like, Gauhati,
Barauni, Koyali, Haldia and later on Mathura was also added to the series of refineries under I.O.C. while the Pipelines division managed various pipelines.

The marketing division has been and is responsible for the distribution of petroleum products produced by its refineries and also those of two refineries at Cochin and Madras.

After the Government of India took over the Digboi Refinery and Petrochemicals Ltd. in 1981 and handed it over to I.O.C. a new division, The Assam Oil Division came into being and thus I.O.C. now has three divisions, viz:

a) The Refineries and Pipelines Division and its headquarter at Delhi;
b) The Marketing Division with its headquarter at Bombay; and
c) The Assam Oil Division with its headquarter at Digboi (Assam).

The I.O.C. also has a fulfledged Research and Development Centre at Faridabad.

OBJECTIVES AND OBLIGATIONS OF I.O.C.L.

- To serve the national interests in the oil and related sectors in accordance and consistent with Government policies.
- To ensure and maintain continuous and smooth supplies of petroleum products by way of crude refining, transportation and marketing activities and to provide
appropriate assistance to the consumer to conserve and use petroleum products most efficiently.

- To earn a reasonable rate of return on investment.
- To work towards the achievement of self-sufficiency in the field of oil refining, by setting up adequate domestic capacity and to build up expertise for pipe laying for crude/petroleum products.

- To create a strong research and development base in the field of oil refining and stimulate the development of new petroleum products formulations with a view to minimise/eliminate their imports, if any; and
- To maximise utilisation of the existing facilities in order to improve efficiency and increase productivity.

FINANCIAL OBJECTIVES:

- To ensure adequate return on the capital employed and maintain a reasonable annual dividend on its equity capital.
- To ensure maximum economy in expenditure.
- To generate sufficient internal resources for financing partly/wholly expenditure on new capital projects.
- To develop long-term corporate plans to provide adequate growth of the activities of the corporation.
- To continue to make an effort in bringing a reduction in the cost of production of petroleum products manufactured by means of systematic cost control measures.
- To endeavour to complete all planned projects within the stipulated time and within the stipulated cost estimates.

OBLIGATIONS

(a) Towards customers and dealers:

To provide prompt, courteous and efficient services and quality products at fair and reasonable prices.

(b) Towards Suppliers:

To ensure prompt dealings with integrity, impartiality, and courtesy and to promote ancillary industries.

(c) Towards Employees:

- Develop their capability and advancement through appropriate training and career planning.
- Expedition redressal of grievances.
- Fair dealings with recognized representatives of employees in pursuance of healthy trade union practices and sound personnel policies in keeping with public sector philosophy.

(d) Towards community:

- To ensure quality products through proper distribution at fair prices to the people.
- To develop techno-economically viable products for the benefit of the people.
- To encourage progressive indigenous manufacture of products and materials so as to substitute imports.
- To avoid and control environmental pollution in its manufacturing plants and townships by taking suitable and effective measures.
- Improve the condition of SC/ST in pursuance of national policies.
- To help acceleration of all round development of villages by providing assistance to the educated employed to earn a living etc. 7

ADMINISTRATIVE STRUCTURE OF I.O.C.

It is really surprising that Indian Oil Corporation has been able to achieve its various objectives and discharged its obligations towards its customers, dealers, suppliers, employees and the community at large. It could achieve such a great success in making the country self-reliant by fulfilling the petroleum requirements to a great extent in such a short period of its operations. This outstanding success own partly to the band of the enthusiastic, energetic and ambitious men who are engaged in the oil industry in general and oil refining industry in particular and their tireless efforts and zeal in the explorations production, refining and selling their products and partly

to sound policies, healthy organization and well knit administrative structure, which ensure quick decision making and efficient planning. Main source of planning is the Ministry of Petroleum and Chemicals (Estd. 1963) which is headed by a cabinet-rank Minister who is assisted by a Deputy Minister and a state-rank Minister with their respective secretaries and administrative staff. They take decisions and formulate the different aspects of oil policy, project the future requirements of petroleum products in the country, formulate the budget as to production and plan about procurement of crude oil etc. The Ministry concerned negotiates and deals with the oil exporting countries and private interests abroad.

The Indian Oil Corporation looks after three divisions and Research and Development Centre and controls their various functions. They are Refineries and pipelines Division; Marketing Division; Assam Oil Division, and Research and Development Centre at Faridabad in Haryana.

The Corporation is managed by a Board of Directors appointed by the president of India. Besides the Chairman, the Board has the following full-time Directors:

1. Director (Personnel)
2. Director (Finance)
3. Director (Marketing)
4. Director Refineries and Pipelines (R & P)
5. Director Research and Development (R & D)

Among the principal executives in the Chairman's Office, there are following Officers:

1. Chief General Manager Coordination
2. Adviser Excise and Customs
3. General Manager International Trade
4. Chief Vigilance Officer
5. General Manager Internal Audit

Refineries and Pipelines Division at the H.O. has the following executives:

1. Chief General Manager Operations
2. Finance Controller Refineries
3. Finance Controller Projects
4. General Manager Technical
5. General Manager Pipelines
6. General Manager Maintenance & Inspection
7. General Manager Personnel.

Refineries are headed by their respective G.Ms.

They are as follows:

1. General Manager Gauhati
2. General Manager Barauni
3. General Manager Koyali
4. General Manager Haldia  
5. General Manager Mathura  
6. General Manager Assam Oil Division

Pipelines Division is divided into four regions and all regions are headed by their respective General Managers. They are as under:

1. General Manager Northern Region  
2. General Manager Western Region  
3. General Manager Eastern Region  
4. General Manager Southern Region

The Marketing Division has the following main executives at the Head Office:

1. Chief General Manager Marketing Operations  
2. General Manager Supplies  
3. General Manager Technical Audit  
4. General Manager Personnel  
5. General Manager Sales  
6. General Manager Engineering & Planning  
7. General Manager LPG  
8. Financial Controller

(B) BHARAT PETROLEUM CORPORATION LTD.  

The Burma-shell Refinery at Trombay near Bombay together with its marketing associate was taken over by the
Government of India in 1976 and re-named as Bharat Refineries from 12th February, 76. In view of the fact that the company is an integrated refining and marketing unit the name of the Company was again changed to Bharat Petroleum Corporation Limited (B.P.C.L.) with effect from 1, August, 1977.

The objectives of the company have been mainly to manufacture both energy and non-energy petroleum products, store, distribute and market them efficiently.

The market participation of B.P.C.L. in 1984-85 was 18.2% of the total oil industry sales. As on 31 March, 1985 the company had in existence a total 409 cooking gas (LPG) distributorships. The number of retail outlet stood at 3486 and kerosene oil dealership at 809.

The Burma-shell Refineries Ltd. commenced its operations on 30 January, 1955. The crude oil intake in 1970 was 3.75 million tonnes per annum which was coming from Persian Gulf. The through put of this refinery in the same year was 3.45 million tonnes per annum. The present capacity of the refinery is 60.0 lakh tonnes while the actual through put in the years 1981-82, 1982-83, 1983-84 and 1984-85 had been 50.0 lakh, 44.8 lakh, 52.58 lakh and 54.81 lakh tonnes respectively.
The HPCL was set up on 15th July 1974 by acquiring the assets of ESSO EASTERN INC. U.S.A. in India and became wholly Government owned company. On 31 December, 1976, the Government of India acquired Caltex Oil Refinery (India) Ltd. and merged it with HPCL in May, 1978.

The then Esso Standard Refining Company of India Limited is also situated at Trombay, near Bombay. This was established in 1954. The refinery was capable to refine 2.5 million tonnes of crude oil per annum. The throughput during the year 1970 was 2.35 million tonnes. The present refining capacity of this refinery is 35.01 lakh tonnes and the actual throughputs in 1981-82, 1982-83, 1983-84 and 1984-85 were 34.8, 31.2, 33.08 and 33.20 lakh tonnes respectively.

The erstwhile Caltex Oil Refining (India) Ltd. is situated at Visakhapatnam and was established in 1957. Originally, it was capable of processing over 1.5 million tonnes of crude oil per annum. The throughput during the year 1970 was 1.18 million tonnes. The present capacity of the refinery is 45.0 lakh tonnes and the throughput for the years 1981-82, 1982-83, 1983-84 and 1984-85 were 11.8, 10.8, 10.93 and 12.49 lakh tonnes respectively.
The main objectives of HPCL are refining of crude oil, manufacturing of lubricating base oil, manufacturing and blending of lubricants, grease and petroleum products and related automotive accessories all over the country and marketing of LPG.

The market participation of HPCL in 1984-85 was 18% of the total oil industry sale. As on March, 1985 the company had a total of 776 cooking gas (LPG).

**REFINERIES OPERATING UNDER I.O.C.L.**

A brief description of the refineries operating under the control of Indian Oil Corporation Ltd. is given in the following paragraphs.

(i) **GAUHATI REFINERY:**

The first public sector refinery at Gauhati in Assam was commissioned in January, 1962. The Rumanian Government have provided the necessary technical and financial assistance to the refinery. Originally, the refinery had processing capacity of 0.85 million tonnes per annum. Crude oil comes from Nahorkatia, in Assam, through a 400 km long pipeline. The refinery is equipped with Naphtha splitter facilities, so special cut naphtha is made for the manufacture of petro-chemicals like ortho and paraxylene used in the manufacture of polyester staple fibre and yarn. It has also modernised its crude
distillation unit. This has resulted in a saving of 5600 tonnes of fuel oil per year and increased the production of High speed Diesel Oil.

"The Refinery during the financial year 1972-73 had processed 7,92,950 tonnes of crude oil — about 43,000 tonnes more than its designed capacity of 7,50,000 tonnes per year. Similarly the kerosene refining unit of the Refinery processed 1,22,750 tonnes of raw kerosene against 62,710 tonnes during the corresponding period"8

The present refining capacity is 8.5 lakh tonnes and during the years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 its actual throughput was 7.5, 8.0, 8.71, 7.61, 7.66 lakh tonnes respectively and % capacity utilization during the year 1985-86 was only 90.1%.

The petroleum products refined here are distributed to the north-east, and via a 435 km long pipeline to Siliguri, in West Bengal. From here they are transported to other consuming centres.9

(ii) BARAUNI REFINERY:

The second public refinery at Barauni in Bihar was commissioned in July, 1964. This refinery had been constructed with the technical collaboration of the USSR. The

initial capacity of two million tonnes has been expanded to three million tonnes in January, 1969. Further expansion to the tune of 3.3 million tonnes per year was done in 1975. This refinery processes the crude oil received from Nahor Katia Oil field of Assam via 1190 km Nahorkatia - Gauhati -- Barauni pipelines of Oil India Limited.

To meet the increasing demand of diesel, Kerosene and cooking gas, Secondary processing facilities (Coking Units) have been established. Other secondary units yield calcined petroleum coke for the aluminium industry, phenol extract for the carbon black industry and slack wax for the wax industry. A 669 km pipeline from Barauni to Kanpur supplies petroleum products to the surrounding areas in Bihar and the east and central parts of Uttar Pradesh.

At present, Barauni unit is producing major products like Naphtha, Motor Gas, High Speed Diesel Oil, Light Diesel Oil, Aviation Turbine Fuel, Mineral Turpentine Oil and Petroleum coke, etc.

The processing capacity of the refinery, at present is 33.0 lakh tonnes per annum. The actual throughput during the years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 was 30.3, 30.7, 29.07, 28.96 and 27.65 lakh tonnes respectively. The % capacity utilization during the year 1985-86 was only 83.8%.
The refinery for its operations depends upon its own thermal power station comprising two turbogenerators of 12 MW each. There is a battery of eight tube wells to ensure constant flow of water to the refinery.

There are nearly 3000 employees on pay roll. There is an ultra-modern township and a site colony with full amenities for the employees.

(iii) Koyal Refinery

The third public sector Refinery was constructed at Koyal near Vadodra in Gujrat and was commissioned in the second half (October) of 1965. The technical and financial assistance was provided by USSR. The initial capacity of 2 million tonnes was expanded to 3 million tonnes in September, 1967. The capacity was further expanded to 4.3 and then to 7.3 million tonnes in 1978. Thus it became Indian Oil's biggest refinery in India. It processes crude oil from Ankhleshwar, the north Gujrat Oil Fields, Bombay High and imported crudes.

Special products like Benzene and Toluene are processed here. It has a modern fluid catalytic cracking unit of 1.0 million tonnes per annum that converts the surplus heavy residues to much-needed products like diesel, kerosene and cooking gas (LPG).
The refinery feeds a large part of western and central India in the states of Gujrat, Rajasthan and Madhya Pradesh. Most of the products are transported from the refinery in rail tank wagons. A 116 km long product pipeline takes products to Ahmedabad.

This refinery's capacity is being expanded by 2.2 million tonnes. There are plans to install a modern Hydrocracking unit to convert the heavy ends of crude to middle distillates like diesel and kerosene.

The present capacity of the refinery is 73.0 lakh tonnes and the actual throughput during the years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 were 70.4, 70.9, 73.31, 77.77 and 78.30 lakh tonnes respectively and the percentage capacity utilisation during the year 1985-86 was 107.3%.

(iv) HALDIA REFINERY

The fourth refinery under Indian Oil Corporation was commissioned in January, 1975. This refinery is located at Haldia in West Bengal at a distance of 135 km. from Calcutta in the South. It is designed to process 2.5 million tonnes of imported crude oil per annum. The crude oil received through tankers is pumped into refinery by an oil jetty.
The construction of this refinery marked a breakthrough in indigenisation because it was built largely with Indian expertise and equipment.

It is, in fact, one of the three refineries in the country which produce various grades of lube oil base stocks. The lube sector has a propane Deasphalting unit that produces the high viscosity index lube base stocks and bright stocks required for heavy-duty lubricants.

The refinery predominantly feeds West Bengal, Orissa, and parts of Bihar. A 269 km pipeline to Maurigram and Rajbandh and a 525 km pipeline to Barauni facilitate the transportation of various products. Some products are moved along the coastal line in barges.

The refining capacity of Haldia refinery is 25.0 lakh tonnes per year whereas the throughput during years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 were 22.8, 25.0, 25.80, 23.65 and 28.22 lakh tonnes respectively. The capacity utilization during 1985-86 was 112.9%.

(v) MATHURA REFINERY

The fifth and the last refinery till now established in the public sector under I.O.C. Limited was commissioned in January, 1982. It is located at Mathura in Uttar Pradesh. This is India's most modern refinery with the largest single primary distillation column and a processing capacity of six
million tonnes per annum. This refinery was set up with the maximum amount of indigenous technical know-how, equipment and services.

It is equipped with a modern fluid catalytic cracking unit (FCCU) of 1.0 million tonnes capacity. This up-grades heavy ends to more valuable distillate products like LPG and Diesel. The refinery processes Bombay High and imported crude oil pumped along the 1219 km long pipeline from Salaya on West Coast. It has a 513 km long pipeline for transporting products to Jalandhar with tap-off points at Delhi and Ambala. This has substantially helped the distribution of products in the north and north-west of India.

To meet the growing demand of petroleum products in this part of the country, where the rate of growth is higher than the national average growth rate, the capacity of this refinery is being expanded to 7.5 million tonnes per annum by suitable de-bottlenecking measures.

The present refining capacity of 6.0 million tonnes has usually been under utilized during a few years in the immediate past. The throughput in the years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 have been 55.2, 38.4, 52.23, 62.39 and 60.75 lakh tonnes respectively. Only
during the year 1984-85 and 1985-86 it could over utilize its capacity by 2.39 lakh and 0.75 tonnes respectively. The % capacity utilization during the 1985-86 was 101.3.

(vi) DIGBOI REFINERY

The Digboi refinery of Indian Oil's Assam Oil Division is perhaps the world's oldest operating refinery. The Division was found in October, 1981 when the refinery and marketing assets and liabilities of the Assam Oil Company and Burma Oil Company (India Trading) were vested in Indian Oil after nationalisation. Since then it has made rapid growth and taken long strides. This is located at about 40 km east of Dibrugarh in north-east India and has a refining capacity of 0.5 million tonnes per annum. It was set up in 1901 after the oil was discovered in Assam and was re-established in 1923. A few more units were added in the subsequent year. The equipment and machinery in the refinery were also up dated. Further modernisation is also in progress. There are plans to add a few more units like a new crude unit for distillation, coking unit and captive power plant.

The present refining capacity of 5 lakh tonnes has continually been over-utilized over the past few years. Like for example in the years 1981-82, 1982-83, 1983-84, 1984-85 and 1985-86 the throughput were 5.0, 5.2, 5.49, 5.31 and 5.29 lakh tonnes respectively. The % capacity utilization during 1985-86 was 105.8%.
Besides them there are three more refineries all participatory refinery project in the public sector. Their brief descriptions are as follows:

(i) **COCHIN REFINERY**

This is a participatory refinery project in the public sector, the principal collaborators with the Government are Messers Philips Company, U.S.A. It was commissioned in September, 1966. The refinery has originally been designed to produce 2.5 million tonnes petroleum products annually. The refining capacity was later expanded to 4.5 million tonnes per year. The throughput during the years 1981-82, 1982-83, 1983-84 and 1984-85, 31.2, 31.8, 28.47 and 28.72 lakh tonnes respectively.

(ii) **MADRAS REFINERY**

This is also a joint venture of the Government of India as major shareholder and National Iranian Oil Company and AMCO India Incorporated, U.S.A. The refinery was initially designed to process 2.5 million tonnes of crude oil per annum. The crude oil was obtained from Persian Gulf, Iran. It was commissioned in 1969.

To meet the increased demand of petroleum products, the refining capacity was later expanded to 5.6 million tonnes per year. The throughput has continually been much
less than expanded capacity during the last few years. For instance in the years 1981-82, 1982-83, 1983-84 and 1984-85 it has been 28.2, 28.6, 26.47 and 34.13 lakh tonnes respectively.

(iii) **BONGALIGAON REFINERY**

This refinery was also set up in the public sector. It started its production in the year 1979. This refinery is located at Bongaigaon in Assam. Due to variety and nature of its products it was named as Bongaigaon Refinery and Petrochemicals Limited.

The refinery has an installed capacity of 10.0 lakh tonnes whereas its throughput during the years 1981-82, 1982-83, 1983-84 and 1984-85 was 4.5, 6.0, 6.49 and 7.52 lakh tonnes respectively.

Apart from all these refineries discussed in the foregoing pages, the Government has also approved the proposal to set up a refinery with 60 lakh tonnes capacity at Karnal (Haryana) and Manglore in the joint sector.

The refining capacity and production during the last few years of the existing twelve refineries are presented in the following table.
### Actual throughput in lakh tonnes

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Digboi</td>
<td>IOCL</td>
<td>1901</td>
<td>5.0</td>
<td>105.8%</td>
<td>5.0</td>
<td>5.2</td>
<td>5.49</td>
<td>5.31</td>
<td>5.79</td>
</tr>
<tr>
<td>2.</td>
<td>Bombay</td>
<td>HPCL</td>
<td>1954</td>
<td>35.01</td>
<td>-</td>
<td>34.8</td>
<td>31.2</td>
<td>33.08</td>
<td>33.20</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Bombay</td>
<td>BPCL</td>
<td>1955</td>
<td>60.0</td>
<td>-</td>
<td>50.0</td>
<td>44.8</td>
<td>52.58</td>
<td>54.81</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Vishakha Patna</td>
<td>HPCL</td>
<td>1957</td>
<td>45.0</td>
<td>-</td>
<td>11.8</td>
<td>10.8</td>
<td>10.93</td>
<td>12.49</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Gauhati</td>
<td>IOCL</td>
<td>1962</td>
<td>8.5</td>
<td>90.1%</td>
<td>7.5</td>
<td>8.0</td>
<td>8.71</td>
<td>7.61</td>
<td>7.66</td>
</tr>
<tr>
<td>6.</td>
<td>barauni</td>
<td>IOCL</td>
<td>1964</td>
<td>33.0</td>
<td>83.8%</td>
<td>30.3</td>
<td>30.7</td>
<td>29.07</td>
<td>28.96</td>
<td>27.60</td>
</tr>
<tr>
<td>7.</td>
<td>Koyali</td>
<td>IOCL</td>
<td>1965</td>
<td>73.0</td>
<td>107.3%</td>
<td>70.4</td>
<td>70.9</td>
<td>73.31</td>
<td>77.77</td>
<td>78.30</td>
</tr>
<tr>
<td>8.</td>
<td>Cochin</td>
<td>CRL</td>
<td>1966</td>
<td>45.0</td>
<td>-</td>
<td>31.2</td>
<td>31.2</td>
<td>28.47</td>
<td>28.72</td>
<td>-</td>
</tr>
<tr>
<td>10.</td>
<td>Haldia</td>
<td>IOCL</td>
<td>1975</td>
<td>25.0</td>
<td>112.9%</td>
<td>22.8</td>
<td>25.0</td>
<td>25.80</td>
<td>23.65</td>
<td>28.22</td>
</tr>
<tr>
<td>11.</td>
<td>Bongai Baon</td>
<td>BRPL</td>
<td>1979</td>
<td>10.0</td>
<td>-</td>
<td>4.5</td>
<td>6.0</td>
<td>6.49</td>
<td>7.52</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Mathura</td>
<td>IOCL</td>
<td>1982</td>
<td>60.0</td>
<td>101.3%</td>
<td>50.2</td>
<td>38.4</td>
<td>52.28</td>
<td>62.39</td>
<td>60.95</td>
</tr>
</tbody>
</table>

Source: Ministry of Petroleum & Chemicals, Govt. of India.

TRANSPORTATION

PIPESLINES:

Movement of crude oil from oil field to refineries and of petroleum products from refineries to various markets is an important task of oil industry. Initially the transportation of oil was by road, rail and to a limited extent by barges. Pipelines are most economical, energy efficient way to transport crude oil and petroleum products to various parts of the country through terrain where no roads exist. It also helps to reduce burden on railways. With the establishment of inland refineries at Gauhati and Barauni, pipeline transportation facilities have been made available. The first 1152 km pipeline was designed and constructed by Oil India Ltd. for transporting crude oil from Nahorkatia to Barauni via Noonmati. The first phase was completed in 1962 and the second phase in 1964 respectively. The pipeline has a rated capacity of 40 lakh tonnes. For transporting petroleum products from Barauni to specific markets a product pipeline connecting Haldia-Barauni, Barauni-Kanpur was completed in 1966. The Barauni-Kanpur section carried 8 lakh tonnes of product during 1970-71.

The Ankleshwar-Koyali crude pipeline was completed in 1965. Besides, this Gujrat has the Kalol-Koyali crude pipeline, the Cambay-Dhuraran Gas pipeline and the Ankleshwar-Baroda associated Gas pipeline.

The Rajbandh-Durgapur Naphtha pipeline has been completed recently.

Indian Oil's pipeline grid, links its refineries with several distribution channels -- like inland installations and terminals -- to major consuming centres. Indian oil is constantly developing its nation-wide pipeline network. Modern technology is used when laying new systems and even inducted into existing systems. Indian Oil today owns and operates 2631 km of product pipe lines and 1219 km of crude oil pipelines. They transported 18.6, million tonnes of crude oil and petroleum products in 1985-86.

Eighteen pump stations maintain an effective pumping rate along the pipeline routes. These also act as booster stations to increase the capacity of the pipeline when needed.

The Salaya - Viramgam - Koyali - Mathura pipeline not only transport imported crude but also carried waxy Bombay High Curde Oil to Indian Oil's inland refineries at Koyali and Mathura. The Gauhati-Siliguri pipeline besides transporting products for the Gauhati Refinery also carries products
of the Bongaigaon Refinery and Petrochemicals Limited. The Haldia - Mourigram - Rajbandh-Barauni pipeline apart from handling Haldia Refinery products, also transports imported deficit products.  

For the efficient and smooth operations of these pipelines, sophisticated communication and control systems are installed. Besides, normal telephones, telex and teleprinter circuits, high ultra-high frequency and micro-waves channels are utilized. Computerised tele-supervisory systems monitor despatches, detect leakages and control the flow. New developments are taking place in the communications system through fibre optics and satellite communications.  

OFF-SHORE OFF-LOADING  

On India's west coast, off the Gulf of Kutch, Indian Oil has a floating Single Buoy Mooring System (SBM) that moors super tankers and discharges imported crude oil as well as transports Bombay High Crude to giant storage tanks on shore. The SBM handles crude oil tankers ranging from vessels with 50,000 to 80,000 tonnes capacity to the very large crude carriers of 1.5 to 2.69 lakh tonnes.  

10. IOC, Bringing Energy to Life, p.21.  
The crude oil from giant tankers is discharged via a floating pipeline to the SBM. From there it flows through an under water pipeline to the shore tankages of 7.5 lakh kl. capacity. It is then pumped through the pipeline to the Gujrat or Mathura Refinery.

To meet the increased requirements of these two refineries after their expansion it is proposed to install a second SBM at Salaya.

One more pipeline is expected to be commissioned very soon as it is at the verge of completion. This pipeline runs through Hazeera - Bijapur - Jagdishpur (H-B-J).

Indian Oil's expertise in pipeline technology covers every aspect from feasibility studies to designing construction and supervision of a pipeline network. Today it provides consultancy services in pipeline technology. 12

PRODUCT PIPELINES AND CRUDE PIPELINES

The following is the network of product as well as crude pipelines in the country.

<table>
<thead>
<tr>
<th>PRODUCT PIPELINES</th>
<th>LENGTH IN KM</th>
<th>YEAR OF COMMISSIONING</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAST - Gauhati-Siliguri</td>
<td>435</td>
<td>1964</td>
</tr>
<tr>
<td>- Barauni-Kanpur</td>
<td>669</td>
<td>1966</td>
</tr>
<tr>
<td>- Haldia-Mourigram-Rajbandh</td>
<td>269</td>
<td>1974</td>
</tr>
<tr>
<td>- Haldia-Barauni</td>
<td>525</td>
<td>1967</td>
</tr>
</tbody>
</table>

MARKETING & DISTRIBUTION

Indian Oil's marketing and distribution operations began with hardly any infrastructure. It began with selling imported kerosene oil and gradually developed an extensive marketing and distribution network. Today there is a wide range of product that is distributed in every corner of the country. The product range reaches a wide spectrum of customers:

(i) The Domestic Sector - to the households in a small village located in the lap of lofty Himalayas, like Leh situated at 11,300 ft. above sea level, to teeming millions in overpopulated cities like Bombay, Madras, Calcutta and Delhi. For people living in remote and once inaccessible
parts of the country kerosene is very important. It is essential for illumination and cooking needs. I.O.C. distributes its kerosene through 2757 dealers. Reaching to remote places is usually a complex operation because the terrain and climate varies all the time. Sometimes hill areas are cut-off by snow fall and land-slides. To overcome these problems Indian Oil has to make constant innovations in its distribution system. Thus it ensures that kerosene is always available at a reasonable price.

(ii) The Transport Sector - for every conceivable means of locomotion, Indian Oil provides fuel and lubricants. It does so for all transport system -- Petrol for a two wheeler to jet fuel for a modern aircraft. Thus it serves road, rail, sea and air transport in several respects. There are 5165 Indian Oil Petrol/Diesel Stations in the cities, on the highways and even in rural areas, and the number continues to grow. For large users like railways and state transport undertakings pumps and tanks are installed for their exclusive use. Today IOC is India's largest supplier of aviation fuels supplying 70% of the requirements to both national and international airlines. It earns valuable foreign exchange by supplying aviation fuel to foreign airlines.

(iii) The Industrial Sector - for industries big and small, from bicycles to aircraft and steel to power generation and distribution, all industries are obliged to oil and oil
products. Nearly 80% of the major industries in India are Indian Oil's customers. Power, cement, Aluminium, machine tools, Automobiles and small scale industries depend on Indian Oil and other refineries' products for their survival and growth. Special products are developed and produced for specific industries. Indian Oil's objective is not merely to sell but to serve by optimising the use of precious petroleum resources.

(iv) **The Agricultural Sector** - from fuel and lubricants that are essential for mechanised farming in rural areas; to essential daily necessities distributed through its Multi-purposes Distribution centres. I.O.C. and other corporations and refineries have helped substantially in achieving self-reliance by assisting Green Revolution and Industrialisation in the country.

The Green-Revolution has made India a surplus food-grain producer with mechanisation special seeds and fertilizers. Adequate petroleum products like diesel and lubricants are essential for pump sets, tractors and other equipments, Indian Oil and others have adopted innovative strategies for effective marketing in rural areas. Low cost retail outlets, multi-purpose distribution centres were set up. These centres are one-stop-service-points that also sell agricultural items like fertilizers, pesticides, seeds, tractor spare parts etc. The production of fertilizers for
agriculture is largely dependent on the oil industry. It supplies naphtha as feed-stock to the fertilizer industry.

(v) The Defence Sector - the Army, the Navy and the Air Force - all rely on oil industry specially I.O.C. for their petroleum requirements.

LPG DISTRIBUTION: The housewife find it more convenient to-day to cook with LPG. Though its marketing in selected areas had begun as early as in 1950's, but it became popular in mid-sixties. As the petroleum products brought about revolution in agriculture, industry and transport so it did in the kitchen also. LPG, now-a-days, is considered to be a very safe fuel and is greatly in demand. Seven years back less than 2 million households had Indian Oil's LPG, Indane. But to day more than 5,5 million household, have it; 1327 distributors make it available in 665 towns. Over 50% customers use Indane. Apart from Indian Oil's supplies BPCL and HPCL etc. also cater to the LPG needs of the nation at large. Bulk LPG is transported by specially fabricated rail wagons and trucks to bottling plants where it is filled in 14.2 kg capacity cylinders. Indian Oil has 15 bottlings plants with automatic modern filling machines. The effective bottling capacity is 7,59,000 tonnes per annum as on 31st March, 1986, out of which 583,000 tonnes are owned by IOC.
ENVIRONMENTAL PROTECTION MEASURES

The commitment to protect the environment was pursued vigorously during the past few years. The facilities provided for the control of environmental pollution were operated quite satisfactorily. Besides monitoring performance of existing facilities, the pollution control cells in refineries reviewed augmentation and modernisation of facilities for achieving better results and standards.

Water Pollution Control: The quality of the treated effluent from the refineries are monitored on daily basis. The performance of the effluent treatment plants has been found satisfactory. For improving performance facilities were augmented in different refineries.

Air Pollution Control: Ambient air quality is monitored regularly by all the refineries and the concentration levels are well within the national/international standards.

The Taj Mahal at Agra, 60 km. from the Mathura refinery, faces no pollution problem from it. Because Indian Oil has taken extensive anti-pollution measures. Only low sulphur fuel oil and sulphur free fuel gases are used in its furnaces. Three air monitoring stations between Mathura and Agra, out of which one is near the Bharatpur Bird Sanctuary, and a mobile air monitoring van continuously monitor air quality. Consequently in Mathura-Bharatpur-Agra region no adverse impact due to Mathura refinery operations was observed.
Occupational Environment & Health Monitoring:

The occupational health monitoring of Radiographers and workers in Tetra Ethyl Lead (TEL) and Benzene handling areas was continued. Steps have been taken to widen the scope of occupational environment and health monitoring of employees in the refineries.

Tree Plantation: Since trees play an important protective role and also help in improving environment, a planned policy of tree plantation has been carried out over the years. During 1985-86 over 5,000 trees have been planted in townships and at work sites. Over one lakh trees have so far been planted and nurtured in and around refineries operating under IOC.

Assistance from Experts:

Over the years assistance was sought from the Indian Meteorological Department in assessing the likely impact of the additional secondary processing facility proposed to be set up at Gujrat refinery on the air quality in the neighbourhood. The report which have since been received confirms that the equipment and steps planned by IOC for the project would lead to negligible air pollution and would hardly have any impact on the environment.

At the request of the corporation the Aligarh Muslim University has agreed to assist in developing an experimental
agriculture farm at the Mathura Refinery. This farm will use treated effluent from the refinery for irrigation to assess its impact on crops, yield, soil characteristics etc. in a scientific manner.

NATURE OF THE PROBLEMS FACED BY THE INDUSTRY

The Petroleum industry in India is confronted with three major problems viz; low refining capacity, shortage of crude oil/low crude reserves and finally personnel problems. Though the refining capacity of Indian refineries has increased tremendously over a period of more than three and half decades, but still it is not able to cope with the present requirements. With a meagre 0.25 mts. per annum in 1950 the refining capacity has gone up very high and it is somewhere in the region of 45.55 mts. per annum. As the demand for petroleum products was increasing at the rate of 9 per cent per annum during 1970's refining capacity had to be increased to a total of about 48 to 50 million tonnes by the end of the last decade. The Government made valuable efforts to bridge up this gap by establishing additional refineries and also by enhancing capacity of the existing refineries, but still it could not do so and the country has to import huge quantity of petroleum products from outside. Indian Oil as the nation's canalising agency for the import and export of crude oil and petroleum products imported over 3.5 million tonnes of petroleum products and
200 thousand tonnes of lubricants in 1985-86 and that continues even to-day.

So far as the problem of crude oil is concerned, its requirement has been increasing and will continue to increase tremendously in order to cater to the needs of the country. Even to-day there is a big gap between our consumption and refining and also between refining and production due to shortage of crude oil and crude reserves. The difference, to some extent, is being minimised by importing crude from various outside sources. In 1970, India imported 11.7 million tonnes of crude whereas in 1985-86 the imported crude oil was to the tune of 15.24 million tonnes.

Petroleum industry, being a key industry, requires to be assured of continuous operation in production, refining and transportation. This need to be paid full attention, because, stoppage of work even for a short period of time will lead to a lot of dislocations and result into colossal losses. Though strikes are not very common in oil refining industry and industrial relations are very smooth, peaceful and cordial, yet they have been launched several times, causing huge losses to the industry and ultimately to the entire nation. This highlights the significance of the art of managing men and maintaining industrial relations in individual refining units as well as in the industry as a
whole. Personnel Management, policies and practices are important because they help in quick diagnosis, tactful handling and immediate solution of personnel problems and thus avoid unnecessary bottlenecks causing interruption in production, refining and transportation process.