CHAPTER-IV

DEVELOPMENT OF PETROLEUM INDUSTRY IN ASSAM

The petroleum industry of Assam has a significant role in the process of industrialization in the State. The contribution of petroleum industry towards Gross State Domestic Product ranges between 8 to 10 percent over the years. Petroleum sector provides a substantial number of direct as well as indirect employment benefits.

4.1 Historical Background of the Petroleum Industry in Assam:

The steamy rain-forests of Brahmaputra valley in upper Assam provided expression to the buried power of petroleum in India. Cradling fast flowing tributaries, the valley became India’s valley of energy – heralding the petroleum industry in the country.

In April 1828, a young British officer, in charge of one of the upper Assam expeditions, ventured up the Dihing river, a tributary of Brahmaputra river and noticed sticky signs of oil on the surface of
water. The officer recorded his observation of surface evidence of the existence of oil in his report.

In 1865, Mr. H.B. Medicott, a Geologist was deputed to visit the coal areas of Assam. His report recommended experimental borings, to taste the value of oil at Makum, close to Margherita towards the south of Dihing river.

The first boring for oil in Assam began near an oil seepage at Nahorpung, three miles south-west of Jaipur in November 1866. After hitting dry in initial two wells, the efforts of the pioneers were rewarded when they struck crude oil in the third well on 26th March 1867, at a depth of 118 feet. The drillers in Assam created history in India, following closely the success of the drillers in America.

Early reference to the usage of petroleum products was found in the writings of Mr. S.E. Peal, an adventurist tea-planter, who sailed up the Dihing river in early 1879 up to Nongyang lake on the Burmese Frontier. He had mentioned the existence of oil springs near Margherita. Taking to village elders at Insa, just upstream from Makum, he found evidence that kerosene was being extracted from oil obtained from local oil springs. These unknown men were the
initial path finders who started the legacy of petroleum refining industry in India.

In 1882, the Assam Railways & Trading Company (AR&T Co) Ltd. began construction of a railway line from Dibrugarh to Margherita to reach the coal and tea producing areas of upper Assam. While building the railway line, the company engineers noticed oil on the ground near one of their camps in the forest. Some reports say that an elephant they were using guided the discovery by coming into the camp with oil on its feet. The place where oil was noticed soon became the scene of drilling by AR&T Co. They struck oil at the place called Digboi. The well became the first oil well, sunk up to a depth of 162 feet and stands today as a monumental testimony of the first commercial discovery of crude oil in India. In 1893, the Assam Oil Syndicate erected a small refinery at Margherita to refine the crude oil produced at Margherita and Digboi. (IOC Ltd, Report, 2001)

Details of the equipment used in the refinery are lacking but it is almost certain that hemispherical retorts or stills arranged sequentially in 'Bench' formations were used for refining crude. Refining was carried out in batches – a lengthy, messy and
cumbersome task. Products that could be made were barely as handful mainly lamp oil, fuel oil and greases. In the post independence period, the public sector enterprise ONGC undertook the oil exploration activities in upper Assam and it successfully drilled crude oil in a number of oil fields like Rudra Sagar, Lakwa, Geleki since mid sixties.

4.2 Refining of Petroleum in Assam:

There are four oil refineries in Assam. These refineries are - Digboi Refinery, Guwahati Refinery, Bongaigaon Refinery and Numaligarh Refinery. They are playing important role to bring about industrialization in the State.

4.2 (i) Digboi Refinery:

In 1899, AR&T Co. promoted another company, the Assam Oil Company Ltd. to take over the petroleum interests, including the Makum and Digboi, from the Assam Oil Syndicate. A refinery was set up at Digboi in 1901, the first in the country supplanting the earlier one at Margherita. Construction of the new refinery was carried out
with the help of an army of labourers and trained elephants. It initially had a capacity to process 500 barrels of crude oil in a day.

The refinery was almost completely rebuilt in 1923 after the Burmah Oil Company took over from Assam Oil Company in 1921. In addition, steps were taken to incorporate the latest technology. As major discoveries of crude were made in nearby Nahorkatiya and volume of crude availability increased, the refinery capacity was accordingly enhanced, finally reaching a throughput of 0.7 million metric tonnes per annum (MMTPA).

The number of products turned out by the refinery was quite large ranging from fuels like petrol and kerosene to a range of lubricating oils from solvents to waxes and from bitumen to petroleum coke. Over the period of a hundred years of the refinery's operations, production of a number of products has been discontinued and some others have taken their place, this being dictated by the type of crude available, operational flexibility, environmental stipulations and market forces.

On 14th October 1981, by an act of Parliament, Digboi Refinery, along with the marketing functions of the Assam Oil Company was...
vested with the Indian Oil Corporation Ltd. and became Assam Oil Division (AOD) of Indian Oil Corporation Ltd.

Digboi Refinery has the following units -

**Crude Oil Distillation Unit (Bench-C):**

This unit designed and supplied by Foster Wheeler & Co. of U.K. as a two stage atmospheric and vacuum crude oil distillation unit for processing high wax crude, was installed in 1936 with a capacity of 0.25 MMTPA.

**Crude Oil Distillation Unit (Bench-G):**

This unit designed and supplied by Lummus Co. of USA as a two stage atmospheric and vacuum crude oil distillation unit for processing high wax crude, was commissioned in 1940 with a capacity of 0.25 MMTPA.

**HPS (Hansa-Pung Strata) Crude Oil Distillation Unit:**

The unit was installed by utilizing surplus equipment available in the refinery and became operational in 1966.
Kerosene Treating Unit:

This unit was designed and supplied by Edeleanu Gesellschaft of Germany in 1932, for treating kerosene distillate using 100% liquid Sulphur-di-oxide.

Delayed Dubbs Cracking Unit:

The Dubbs unit was designed and supplied by Universal Oil Products of Chicago, USA in 1932. This unit remained in operation for a period of 67 years till the commissioning of the New Delayed Coking Unit in 1999.

Wax Extraction Unit:

The foundation of the present Wax Extraction Unit was laid in 1928 while major improvements and expansion took place during the period from 1950 to 1965. In 1973, the unit was modernized.

Wax Sweating Stoves:

This plant started operations in 1929 and remains in operation till today.
Bauxite Wax Filtration Unit:

This unit too was installed around 1929 and remained in operation until 2001 when the wax Hydro-finishing unit was commissioned.

Wax Rundown Shed:

The operations of Wax Rundown Shed, which came into operation in 1935, cover the operation of moulding, packing and despatch of wax produced by the refinery.

Lube Oil Distillation Unit:

This unit designed and supplied by Foster Wheeler & Co of UK for two stage fractionation of blue oil – the filtrate obtained from wax extraction unit under condition of vacuum was installed in 1954.

Bitumen Blowing Unit:

This unit was first installed in 1938 and expanded in 1971. Presently it has a capacity of 70 tonnes per day.
Drum Plant:

The van Leer Drum manufacturing unit was set up in 1950. While the machinery of the original unit has been modified and upgraded over the years, it continues to manufacture drums even today for packaging of Bitumen.

The Digboi Refinery Modernization Project (DRMP) infused new life to the aging refinery. It opened up new horizons heralding the era of modernity for the century old refinery. The new units include -

New Crude Distillation Unit:

As part of DRMP, a new crude and vacuum distillation unit was commissioned in 1996.

Catalytic Reforming Unit (CRU):

The CRU was installed in 1997 for production of Low Lead and Zero Lead Motor Spirit.
New Delayed Cooking Unit (NDCU) and LPG Recovery Unit (LRU):

The NDCU commissioned in 1999. LRU produces LPG (Liquid Petroleum Gas) from gases.

Vacuum Residue Short – Path Distillation (VRSD) Unit:

The quality of Bitumen produced at Digboi Refinery is adversely affected by the presence of wax in the vacuum residue feedstock obtained from the crude distillation unit. To enable removal of this wax from the vacuum residue, the VRSD has been set up.

Wax Hydro-Finishing Unit (WHFU):

The process is of Acid Treatment and Bauxite Filtration used for the refining of waxes resulted in generation of large amount of harmful waste products and emissions. To eliminate these wastes a process known as Hydro-finishing was adopted by Digboi Refinery. The WHFU has been operating successfully since July 2001.

Solvent Dewaxing Unit (SDU):

The unit produces a high quality, high value microcrystalline wax.
Hydrotreater Unit:

The main function of this unit is to enable catalytic treatment of kerosene and diesel produced in the refinery.

In the Digboi refinery items produced from crude oil include - Motor Spirit (23.2%), Diesel Oil (17.4%), Kerosene (16.9%), Furnace Fuel (16.8%), Wax (7.9%), Lubricant (3.8%), Bitumen (2.2%), Coke (1.7%), Gas (2.4%), Others (4.4%) and the unutilized part (3.2%). (IOC Ltd, Report, 2001)

At present, the installed capacity of Digboi Refinery is 0.7 million metric ton per annum.

Modern technology and new facilities have given new strength to Digboi Refinery.

4.2. (ii) Guwahati Refinery:

Establishment of another new refinery became necessary after the discovery of new fields in upper Assam. But there was a great deal of controversy about the establishment of this refinery in Assam. At last, it was decided to establish this refinery with a production capacity of 0.7 million tonnes at Noonmati area of Guwahati which
was subsequently increased to 1 million tonnes. To meet this purpose one agreement was signed between the Indian Government and Rumanian Government. Rumania Government sanctioned Rs. 52.38 crores long term loan at the interest of 2.5%. Besides, Rumania Government supplied machineries and thus the refinery was established with the help of their skilled personnel. In 1961, establishment work of Guwahati Refinery was completed. This refinery is also under the control of Indian Oil Corporation (IOC) Ltd.

Since then this refinery is producing various types of petroleum products such as Motor Spirit, HSD (High Speed Diesel), Lubricant, Kerosene, Wax etc. The total installed capacity of this refinery is 1 MMTPA.

The Guwahati refinery has been undertaken a massive expansion programme as a hydro-treatment plant already approved by the Indian Oil Corporation (IOC) for the refinery. The refinery aims at increasing its installed capacity to 1.5 MMTPA from the present 1 MMTPA.
Besides the refinery includes -

(i) Delayed Coking Unit (DCU)
(ii) Crude Distillation Unit (DCU)
(iii) Paraffin Wax Unit (PWU).

Different Expansion programmes have been undertaken by the refinery spending about Rs. 1200 crores.

4.2 (iii) Bongaigaon Refinery and Petrochemicals Limited (BRPL):

With the increase in the production of crude in Assam oil fields and also with the increase in the demand of petroleum products in the North Eastern Region, the demand for the establishment of third refinery in Assam was mooted. Considering the requirement position, the Petroleum Ministry finally came to a decision to set up the third refinery in Assam in the public sector. Accordingly, the Bongaigaon Refinery Petrochemicals Limited (BRPL) was registered as a Public Sector Company on February 20, 1974 with head quarter at Dhaligaon in the old Bongaigaon District of Assam. Originally total cost of construction of this refinery was estimated at Rs. 81.10 crores with
Rs. 24.37 crores worth of foreign exchange component. But ultimately this multi-product company was commissioned at a cost of Rs.450 crores.

The refinery units include -

(i) Crude Distillation Unit (CDU)
(ii) Kerosene Treating Unit (KTU)
(iii) Delayed Coker Unit (DCU)
(iv) Coke Calcination Unit (CCU)

The petrochemical units include -

(i) Xylene Plant
(ii) Dimethyl Terephthalate (DMT) Plant
(iii) Polyester Staple Fibre (PSF) Plant

**BRPL Products:**

The main refinery products of BRPL include - Naptha, Motor Spirit (Petrol), Aviation Turbo Fuel (ATF), Diesel, Kerosene, BRPSOL - 100 etc.

The petrochemical products produced by BRPL include - Para Xylene, Orthoxylene, Cee nine Solvent, DMT, Polyester Staple Fibre
(PSF) and PSF Waste. Among these, the most prestigious product is the PSF and trade name 'Bonpoly'.

BRPL proposed a refinery expansion project to raise its installed capacity from 1.35 MMTPA to 2.35 MMTPA involving the capital outlay of Rs. 223 crores, including Foreign Exchange component of Rs. 32 crores, which was subsequently approved by the Cabinet Committee on Economic Affairs (CCEA) and public Investment Board (PIB). The project was sanctioned by the Government of India on December 31, 1991.

The refinery expansion project consists of two units - (i) Crude Distillation Unit (CDU) and (ii) Delayed Coker Unit (DCU). The project also includes LPG recovery facility and debottlenecking of reformer in the existing aromatics plant.

At present refinery installed capacity is 2.35 MMTPA.

Thus different expansion programmes have been taken by BRPL. The details of the industry are discussed in the Chapter V.

(BRPL, Annual Report, 2005)
4.2. (iv) Numaligarh Refinery Limited (NRL):

The Government of India set up the 4th Refinery in Assam at Numaligarh under the Golaghat District of Assam. This new company, Numaligarh Refinery Limited (NRL) was formed in April 22, 1993.

This refinery was set up in the joint sector in pursuance of the commitment in the Assam Accord of 1985 with major equity participation of the IBP (Indo-Burma Petroleum) and Assam Government. After much hue and cry and dilly-dillying of seven years, the State Government has finally agreed to accept 10% equity participation while the IBP got 51% leaving the rest to the primary market.

Numaligarh Refinery is designed to process 3 MMTPA crude oil from Assam fields of oil & ONGC in the ratio of 40:60.

Different units of the refinery are:

(i) Crude Distillation Unit (CDU)
(ii) Vacuum Distillation Unit (VDU)
(iii) Delayed Coker Unit (DCU)
The refinery has objective to maximize middle distillates like kerosene and diesel. The refinery products are Liquid Petroleum Gas (LPG), High Speed Diesel, Aviation Turbine Fuel (ATF), Kerosene and Calcined Coke.

The refinery has made a commendable achievement in its overall progress. After completion, the NRL has absorbed directly around 534 personnel, including some at the marketing terminals.

The refinery was completed by the end of 1998 and was commissioned on April, 1999. This refinery was dedicated to the nation on 9th July, 1999 and commercial production has already started from October' 2000. (NRL, Annual Report, 2000)
Thus, four refineries of Assam are playing important role to bring about industrialization and enrich Assam economy.

The production of crude oil in Assam is shown in the table 4.01

Table 4.01

Production of Crude Oil in Assam

<table>
<thead>
<tr>
<th>Year</th>
<th>Crude Oil (000 MT) (Current Prices)</th>
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<tbody>
<tr>
<td>2001-02</td>
<td>5095</td>
</tr>
<tr>
<td>2002-03</td>
<td>4746</td>
</tr>
<tr>
<td>2003-04</td>
<td>4571</td>
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<td>2004-05</td>
<td>4702</td>
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<tr>
<td>2005-06</td>
<td>4429</td>
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<tr>
<td>2006-07</td>
<td>4570</td>
</tr>
</tbody>
</table>

Source: Indian Bureau of Mines, Nagpur

The table 4.01 depicts the following bar diagram –

![Bar Diagram](attachment:production_of_crude_oil_in_assam.png)

Fig. 4.01
The crude oil production in 2001-02 was satisfactory. The production of crude oil does not show an increasing trend in recent years.

The percentage contribution of petroleum industry towards Gross State Domestic Product in 2003-04 was 8.64%. This percentage was 7.14 and 10.07 in the years 2001-02 and 2002-03 respectively.

Refinery throughputs in thousand metric tonnes of four refineries in seven years from 1999-00 to 2005-06 are shown in the table 4.02

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</thead>
<tbody>
<tr>
<td>IOC, Guwahati (Noonmati Refinery)</td>
<td>914</td>
<td>708</td>
<td>656</td>
<td>458</td>
<td>891</td>
<td>1004</td>
<td>863.9</td>
</tr>
<tr>
<td>IOC, Digboi</td>
<td>603</td>
<td>679</td>
<td>653</td>
<td>581</td>
<td>602</td>
<td>651</td>
<td>614.9</td>
</tr>
<tr>
<td>BRPL, Bongaigaon</td>
<td>1906</td>
<td>1490</td>
<td>1475</td>
<td>1463</td>
<td>2127</td>
<td>2311</td>
<td>2356</td>
</tr>
<tr>
<td>NRL, Numaligarh</td>
<td>205</td>
<td>1451</td>
<td>2307</td>
<td>1877</td>
<td>2200</td>
<td>2042</td>
<td>2132</td>
</tr>
</tbody>
</table>

Source: Annual Reports of the Oil Companies.
The table 4.02 depicts the following multiple bar diagram.

**Refining Throughputs of Four Refineries of Assam**

![Multiple Bar Diagram]

Fig. 4.02

Petroleum industry of Assam earns a substantial amount of profits. In 2006-07 it has earned total profit (after tax) of Rs. 1639.99 crores while it was Rs. 1689.93 crores in 2005-06.

Petroleum Industry provides ample scope of direct and indirect employment. According to the NSS 55th round of employment and unemployment survey, petroleum industry of Assam provides direct employment benefits to 5059 people.

Thus, Petroleum Industry of Assam has important role to play in its process of industrialization. But at present petroleum industry of Assam is facing a serious shortage in the supply of petroleum crude due to the prevailing demand supply gap.
The combined refining capacity of the refineries at Digboi, Guwahati, BRPL and Numaligarh after the completion of their expansion schemes is around 7.5 MMTPA leaving a deficit of around 2.4 MMTPA. The present crisis in the supply of crude arises due to the fact that Oil India Limited (OIL) and Oil and Natural Gas Commission (ONGC) have failed to increase the production of petroleum crude in the entire North Eastern Region. Although the petroleum Industry has projected the total crude production in the North East to be around 7 MMTPA at the end of Eighth Plan and accordingly planned for the expansion programme of BRPL refinery and commissioning of Numaligarh refinery but due to the failure of ONGC to increase crude production both in Assam and Nagaland such projection could not materialize.

In order to avert the crisis of petroleum industry of Assam, the Ministry of Petroleum prepared a Rs. 130 crore project to supply imported crude to the crude starved refineries in Assam. Moreover, the Oil Co-ordination Committee and Engineers India Ltd. (EIL) have been asked to work out a strategy to examine the various alternatives to supply the refineries with imported crude via Haldia Port.
Both the Oil Coordination Committee and the Engineers India Limited have jointly submitted a proposal to the Petroleum Ministry with three options -

(a) to bring in imported crude from Haldia port in wagons,
(b) to use the barges to carry imported crude via Bangladesh and
(c) utilize BRPL’s existing capacity by utilizing the Naharkatiya-Guwahati-Barauni pipeline to pump back imported crude brought from IOC’s 4.2 million tonnes Haldia-Barauni pipeline.

It is understood that the ministry is in favour of the third option, considering the fact that the Haldia-Barauni pipeline capacity can be increased to six million tonnes with the help of boosters. Moreover, the BRPL has also proposed to the Petroleum Ministry to increase the Haldia-Barauni pipeline capacity to 7.5 million tonnes per annum at an additional cost of Rs 400 crores, so as to meet the scarcity of crude for achieving full capacity utilization. The Ministry is not in favour of transportation of crude by rail, since it is not feasible on a long term basis, considering the existing inadequate
railway network under the present situation, it would be better to use existing pipeline between Barauni-Bongaigaon-Naharkatia pipeline which is economically and environmentally more viable and more importantly on the consideration of the optimum utilization of the existing costly pipeline infrastructure.

In the first quarters of 1998, the BRPL and the Oil India Limited (OIL) signed a memorandum of understanding to pump back the required imported crude from IOC’s 7.5 million tonne Haldia-Barauni pipeline by utilizing the existing pipeline between Barauni and Bongaigaon owned by OIL.

Again, the Petroleum Ministry allotted 1.5 million tonnes of Ravva Crude for the year 2003-04. BRPL has already received 1.35 million tonne of crude from Ravva crude source of Krishna-Godavari Basin. This has helped all the four refineries of Assam to improve their capacity utilization.

There are some problems of petroleum industry of Assam like scarcity of crude oil, lack of adequate infrastructural facilities, insurgency problem and so on. Some important steps have been taken by the Government to tackle the problems from time to time.

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