







सत्यमेव जयते

**REPORT OF THE  
COMPTROLLER AND AUDITOR GENERAL  
OF INDIA**

**UNION GOVERNMENT  
NO. 20 (COMMERCIAL) OF 1995**

**INDIAN OIL CORPORATION LIMITED  
(REFINERIES AND PIPELINES)**

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Report of the Comptroller  
and Auditor of India

No 20, 21, 22, 23, 24

(Commercial)

(English)

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and Auditor of India

No 20, 21, 22, 23, 24

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## PREFACE

Audit Boards are set up under the supervision and control of the Comptroller and Auditor General of India to undertake comprehensive appraisal of the performance of the Companies and Corporations subject to audit by the Comptroller and Auditor General of India.

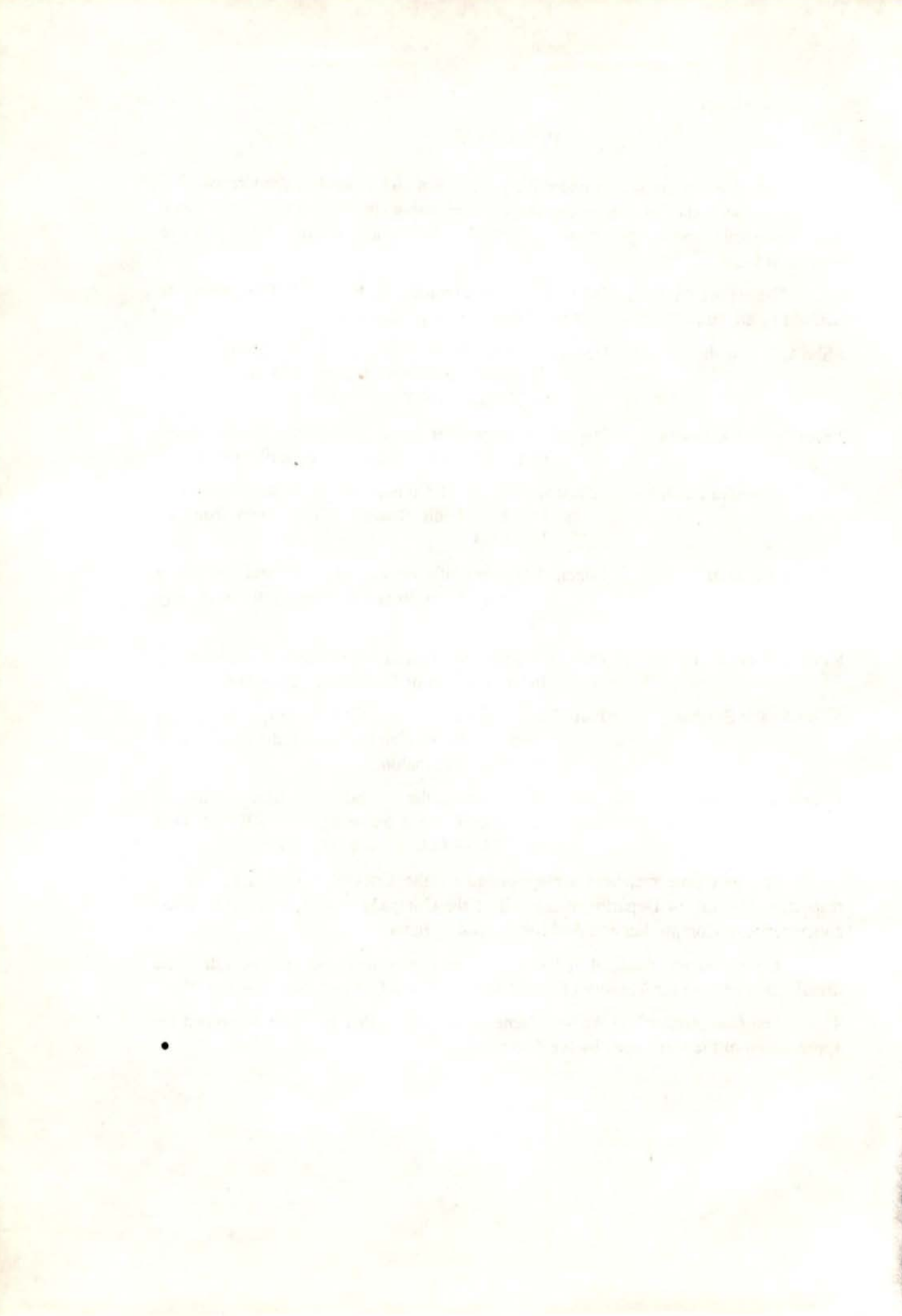
2. The report on Indian Oil Corporation Limited (Refineries & Pipelines) was finalised by an Audit Board consisting of the following members:

1. Shri C.K. Joseph Deputy Comptroller and Auditor General-cum-Chairman, Audit Board from 13 December 1993 to 20 March 1995.
2. Shri Ramesh Chandra Deputy Comptroller and Auditor General-cum-Chairman, Audit Board from 6 April 1995.
3. Shri Shailendra Pandey Principal Director of Commercial Audit and Ex-officio Member, Audit Board-II, New Delhi from 26 July 1993.
4. Shri R.S.Prasad Principal Director of Commercial Audit and Ex-officio Member, Audit Board-II, Bombay from 15 July 1992.
5. Prof.K. Vasudeva Part-Time Member - Head of the Chemical Engineering, Indian Institute of Technology, New Delhi.
6. Shri Sudhir Singhal Part-Time Member-Area Coordinator, Petroleum Products Application Division, Indian Institute of Petroleum, Dehradun.
7. Shri Jagbans Singh Assistant Comptroller and Auditor General (Commercial) and Secretary, Audit Board, O/O the CAG of India from 6 July 1995.

The part time members are appointed by the Government of India (in the respective Ministry or Department controlling the Company or Corporation) with the concurrence of Comptroller and Auditor General of India.

3. The report was finalised by the Audit Board after taking into consideration the discussion held with the Ministry of Petroleum & Natural Gas on 9 November 1995.

4. The Comptroller and Auditor General of India wishes to place on record his appreciation of the work done by the Audit Board. •





## OVERVIEW

Indian Oil Corporation Limited (IOC) was established in September, 1964 after amalgamation of Indian Refineries Limited and Indian Oil Company Limited. The Company at present has six refineries and seven pipelines. The present report contains the results of review in respect of the refineries and pipelines of IOC.

(Paras 1.1, 1.2 & 1.3)

II. (a) Against the total refining capacity of 56.25 MMTPA in the country, the refining capacity of refineries of IOC, stood at 24.40 MMTPA as on 31 March 1995. IOC planned (August, 1994) to increase its refining capacity to 35.10 MMTPA by 30 April, 1997 but it will go upto only 32.60 MMTPA by April, 1997.

(Paras 5.4 and 5.7)

(b) Though it had been anticipated that the capacity of product pipeline would be increased to 21.403 MMTPA by 31 March, 1995 it has remained static at 10.553 MMTPA due to slow progress in the completion of the projects.

(Para 5.11)

III. Analysis of working results of the refineries of the Division for the period 1990-91 to 1994-95 revealed that the profit for the year 1992-93 had fallen to Rs.270.40 crores from Rs.422.23 crores in 1990-91. Similarly, profit for the pipelines of the division had fallen to Rs.1.08 crores in 1994-95 against Rs.73.31 crores in 1991-92.

(Paras 6.1 & 6.2)

IV. The total quantity of Reduced Crude Oil produced in Crude Distillation Units could not be processed in the Vacuum Distillation Units and had, therefore, to be downgraded and sold as Furnace Oil resulting in heavy loss to the Company

(Para 7.02)

V. (a) The energy consumption and hydrocarbon loss in the refineries was higher than the industry average during 1990-91 and 1994-95.

(Para 8(a))

b) During the five years ended 31 March, 1995 there was excess consumption of major chemicals and catalysts in the refineries, amounting to Rs. 66.18 crores.

(Para 8 (b))

(c) There was excessive downtime due to non-availability of feed, ullage, industrial relations, equipment failure, etc. in various units of the refineries resulting in process interruptions.

(Para 8(c))

VI. (a) There had been time over-run in all the refineries set up so far and cost over-run in 3 refineries ranging from Rs.8.12 crores to Rs.59.30 crores.

(Para 9)

(b) The delay on the part of Government, first in taking 18 months to select the co-promoter and then in approving (October 1992) the DPR submitted (May 1988) resulted in increase in the estimated cost of Panipat Refinery by Rs. 1749.77 crores.

(Para 9.2.1(i))

(c) The Gujarat Hydrocracker Project estimated to be commissioned by May 1992 was made fully operational only from January 1994. The capacity utilisation of the Hydrocracker Unit and Feed Preparation Unit ranged from 56 to 59.6% and 58.9 to 74.6 % during 1993-94 and 1994-95 respectively.

(Para 9.2.1(ii))



(d) The work of efficiency improvement of the heaters of the Atmospheric and Vacuum Distillation Units of Mathura Refinery was carried out at a cost of Rs.8.62 crores in August, 1988, but the anticipated fuel saving of fuel was not achieved.

(Para 9.2.2(i))

(e) Modification of Heat Exchanger trains in the Atmospheric Units I,II,& III of the Gujarat Refinery carried out at a total cost of Rs.7.33 crores did not achieve the envisaged fuel savings. On the other hand, there was increase in liquid loss after modifications and IOC suffered loss of Rs.62.75 crores.

(Para 9.2.2(ii))

f) The replacement of heaters in Atmospheric Vacuum Units I and II of Barauni Refinery at an estimated cost of Rs. 9.86 crores had not achieved the envisaged fuel savings. Based on the actual throughput the loss of savings during 1990-91 to 1994-95 worked out to Rs. 1.20 crores.

(Para 9.2.2.(iii))

(g) Though the augmentation of Slack Wax project in Barauni Refinery was carried out (January 1992) at a cost of Rs.11.44 crores, commercial production has not commenced so far (October 1995).

(Para 9.2.2(iv))

h) The LPG Plant of Haldia refinery revamped in October, 1991 at a cost of Rs. 166.11 lakhs had not been utilised fully. Under utilisation of the plant had resulted in a loss of Rs. 101.23 lakhs during 1992-93 to 1994-95.

(Para 9.2.3)(ii))

VII (a) The estimated cost of Kandla Bhatinda Product Pipeline project was revised from Rs. 917.55 crores (March, 1990 price level) to Rs. 2391.84 crores (March, 1993 price level).



The Composite Works Contract (for laying of pipelines with other facilities) was awarded (August 1993) at a cost of Rs. 1259.10 crores against the original estimated cost of Rs. 302.98 crores for this work. While preparing the revised estimates the basis of computation of construction cost was changed by taking the per inch dia per metre laying cost of the pipeline as US\$ 4.4 based on the prevalent rate of international market against US\$ 2.25 taken in the original estimate on the basis of in-house data of construction costs of previous projects executed in India after applying simple escalation.

Although there was only one party 'B' of Czechoslovakia which qualified for the award of the contract and its rates were considered high the work was not split between foreign and Indian parties and tenders reinvited on the ground that this would result in delay in completion. There was, however, delay of 9 months in obtaining Government approval. Further more than 80% of the work was subcontracted by 'B' to indigenous parties.

The performance of 'B' was found to be poor and the project which was scheduled to be completed by May, 1995 has been delayed and the pipeline is now expected to be laid upto Jaipur by the next six months.

(Para 12.2)

(b) The telecommunication system installed at Salaya-Viramgam-Koyali section of Salaya-Mathura pipeline at a cost of Rs. 471.56 lakhs had to be replaced as the efficiency of the system was far below the optimum needed reliability.

(Para 12.3.3)

VIII (a) The expenditure on R & D was insignificant ranging from 0.05 percent to 0.08 percent of the total income and 1.11% to 1.94% of profit.

(Para 13.3)

(b) The R&D centre had concentrated on development of lube formulations and work on refinery process development had been insignificant in comparison. Out of 1568 lube formulations developed upto March, 1995, only 911 had been commercialised.

(Paras 13.5.1 & 13.5.2)

IX . Due to not carrying out the internal inspection, the Haldia refinery had suffered a loss of Rs. 200.15 lakhs owing to collapsing of storage tanks. The loss could also not be recovered from Insurance Company as the Policy taken did not cover such risks.

(Para 14.1)





## CHAPTER 1

### INTRODUCTION

1.1 Indian Oil Corporation Limited (hereafter IOC) was established on 1 September 1964 by amalgamating the Indian Refineries Limited (set up in 1958, to establish and operate refineries and pipelines) and the Indian Oil Company Limited (set up in 1959 for marketing of petroleum products). In October 1981 the assets and liabilities of the erstwhile Assam Oil Company and Burmah Oil Company (India Trading) were taken over by Government and vested in IOC.

1.2 IOC has four divisions as under:

1. Refineries and Pipelines Division,
2. Marketing Division,
3. Research and Development Centre, and
4. Assam Oil Division.

It operates six refineries and seven pipelines as indicated below :

| Refineries at : | Pipelines :                                                         |
|-----------------|---------------------------------------------------------------------|
| (1) Guwahati    | 1. Salaya - Koyali - Mathura<br>crude oil pipeline                  |
| (2) Barauni     | 2. Barauni - Kanpur product<br>pipeline                             |
| (3) Gujarat     | 3. Guwahati - Siliguri product<br>pipeline                          |
| (4) Haldia      | 4. Koyali - Ahmedabad product<br>pipeline                           |
| (5) Mathura     | 5. Haldia - Mourigram -<br>Rajbandh - Barauni -<br>product pipeline |
| (6) Digboi*     | 6. Mathura - Delhi - Ambala -<br>Jullundur - product pipeline       |
|                 | 7. Digboi - Tinsukhia Product<br>pipeline*                          |

\* These function under the Assam Oil Division of IOC

1.3 An audit review of the Guwahati, Barauni, Gujarat and Haldia refineries of IOC appeared in Part XI of the Audit Report (Commercial) of the CAG for the year 1969-70 and the recommendations of the Committee on Public Undertakings (COPU) thereon are contained in their 52nd Report (1973-74). The action taken by Government on these recommendations and further observations of COPU thereon are contained in COPU's 65th Report (1974-75). COPU conducted, suo moto, an examination of the

working of the Pipelines of IOC and presented its report (66th Report of 1969-70) to Parliament in April 1970. The Committee examined the affairs of the Company again in 1994-95 and submitted its report (42nd Report of 1994-95) to Parliament in April 1995.

The present report contains the results of review by Audit of the working of the Refineries and Pipelines Division of IOC including Assam Oil Division and the Research and Development Centre, Faridabad from 1990-91.

## CHAPTER 2

### OBJECTIVES

The main objectives of IOC are as under;

- (i) to serve the national interest in the oil and related sectors in accordance and consistent with Government policies;
- (ii) to ensure and maintain continuous and smooth supplies of petroleum products by way of crude refining, transportation and marketing activities;
- (iii) to earn a reasonable rate of return on investments;
- (iv) to work towards the achievement of self sufficiency in the field of oil refining;
- (v) 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
- (vi) to maximise utilisation of the existing facilities in order to improve efficiency and increase productivity.

## CHAPTER 3

### ORGANISATIONAL STRUCTURE

The Management of the Company is vested in a Board of Directors (11, of whom 5 are functional Directors) under a Chairman. The post of Director (Research & Development) has been vacant since February 1993. The Refineries and Pipelines Division, with its Headquarters at New Delhi is headed by Director (Refineries & Pipelines). All the refineries are headed by either Executive Directors or General Managers.



## CHAPTER 4 CAPITAL STRUCTURE

The authorised share capital of the Company as on 31 March 1995 was Rs. 2500.00 crores against which the paid up capital amounted to Rs. 369.80 crores, subscribed by the Government of India (Rs.369.35 crores) and the Government of Gujarat (Rs. 0.45 crore). During the year 1994-95 , the Government of India disinvested 1,43,63,150 equity shares of Rs.10 each. The average price at which the shares were disinvested was Rs.712. Taking into consideration the bonus shares issued to President of India, the disinvestment worked out to 3.88%. During the year 1994-95, the Company also offered shares to employees at Rs.100 per share (including a premium of Rs.90). The allotment was pending as at the end of 31 March, 1995. In addition the Company received from time to time unsecured loans from OIDB etc.and foreign credits which stood at Rs. 4865.58 crores as on 31 March 1995. State Bank of India has allowed a cash credit facility against hypothecation of raw materials, engagements etc; the amount outstanding on this account as on 31 March 1995 was Rs. 501.13 crores (including interest accrued and due for payment)

The debt-equity ratio of Company as on 31 March 1995 was 0.27 :1.

## CHAPTER 5

### LONG TERM PERSPECTIVE PLAN

#### A Refineries

5.1 With economic growth and industrialisation energy consumption in the country has increased at a rapid rate over the years. Consumption of petroleum products constitutes the major share (more than 50 percent) of the commercial energy consumed in the country. From a modest consumption of about 2.5 million tonnes of petroleum products in 1946-47 the consumption rose to about 60.6 million tonnes in 1993-94.

5.2 A sub-group set up by the Government as a part of the Eighth Plan formulation, estimated (December 1988) the demand of petroleum products as 77.74 million tonnes by 1994-95 and 101.26 million tonnes by 1999-2000.

5.3 Consequent upon the change in the Plan period and also as a result of many major developments which changed the pattern of consumption of petroleum products during 1990-91 and thereafter, these demand projections were revised (September 1991) to 79.37 million tonnes by 1996-97 and 102.51 million tonnes by 2001-02.

5.4 The refining capacity in the country as on 1 April 1995 stood at 56.25 million tonnes as indicated below :

| Refineries under IOC | Capacity (MMTPA) | Others        | Capacity (MMTPA) |
|----------------------|------------------|---------------|------------------|
| Digboi               | 0.50             | BRPL          | 1.35             |
| Guwahati             | 0.85             | BPC-Bombay    | 6.00             |
| Barauni              | 3.30             | HPC-Bombay    | 5.50             |
| Haldia               | 2.75             | CRL-Cochin    | 7.50             |
| Mathura              | 7.50             | MRL-Madras    | 6.50             |
| Gujarat              | 9.50             | HPCL-Vizag    | 4.50             |
|                      | ----             | MRL-Narimanan | 0.50             |
|                      | 24.40            |               | 31.85            |

5.5 Out of 13 refineries in the country, 6 refineries with a capacity of 24.40 MMTPA are under I.O.C accounting for 43.4 percent of the total refining capacity. The capacity in the country is expected to be increased to 61.05 MMTPA by the end of the Eighth Plan through the addition of the Mangalore refinery (3.00 MMTPA), expansion of Guwahati refinery (0.15 MMTPA), BRPL refinery (1.0 MMTPA) and Digboi refinery (0.65 MMTPA). Thus, even if the proposed refineries/expansions are completed in time, the refining capacity at the end of the Eighth Plan would be less than the anticipated demand of 79.37 MMTPA by 18.82 MMTPA.

The Ministry accepted (October,1995) that due to the delay in implementing some expansions and grass-root refineries, refining capacity at the end of Eighth Plan would be lower than planned.

Regarding monitoring the implementation of Projects, the Ministry stated (November 1995) that all the projects were being monitored at the Ministry/Board level. While at the Ministry level, monitoring was done through the mechanism of Quarterly Progress Review (QPR) meeting chaired by the Secretary, at the Corporate level implementation of the projects was being monitored at the Board Meetings.

5.6 The capacity is expected to be increased to 102.05 MMTPA during the Ninth Plan period through commissioning of the Panipat refinery(6.00 MMTPA), Numaligarh refinery (3.00 MMTPA), two refineries in the private sector (15.00 MMTPA) , one refinery in the joint sector (6.00 MMTPA) and expansion of existing refineries (11.50 MMTPA).

5.7 According to the Corporate Plan prepared in August 1994, the Company planned to increase its refining capacity to 35.10 MMTPA by April 1997 as detailed below:

|                               | (in MMTPA) |
|-------------------------------|------------|
| Existing as on 31 August 1994 | 24.40      |
| Panipat refinery              | 6.00       |
| Gujarat refinery expansion    | 3.00       |
| Barauni refinery expansion    | 0.90       |
| Guwahati refinery expansion   | 0.15       |
| Digboi refinery expansion     | 0.65       |
|                               | -----      |
|                               | 35.10      |
|                               | -----      |

However, according to the Ministry's latest assessment(October,1995) the refining capacity will go upto only 32.60 MMTPA by April 1997 as below:

|                              | (MMTPA)      |
|------------------------------|--------------|
| Existing as on 31 March 1995 | 24.40        |
| Barauni refinery Expansion   | 0.90         |
| Guwahati Refinery Expansion  | 0.15         |
| Digboi Refinery Expansion    | 0.15         |
| Haldia Refinery Expansion    | 1.00         |
| Panipat Refinery Project     | <u>6.00</u>  |
| Total                        | <u>32.60</u> |

Haldia Refinery expansion of 1 MMTPA was approved in April, 1995.



Regarding delay in approval of the projects proposed by IOC, Ministry stated that the procedure laid down for approval of projects had to be followed which invariably caused delays. The Ministry was of the view that two stage clearance of projects and multiplicity of agencies were the main causes of delays and felt that time had come to review this system and also find ways for early clearance from various agencies, especially environmental clearance. The Ministry also viewed that there was need to adopt a system which gave more freedom to Public Sector Companies which did not expect any budgetary support from Government for project implementation.

5.8 The table below indicates the original and revised estimated cost, original and revised scheduled date of completion and actual expenditure incurred upto March 1995:

| Name of project             | Estimated cost                         |         | Scheduled date of completion |               | (Rs. in crores)                     |
|-----------------------------|----------------------------------------|---------|------------------------------|---------------|-------------------------------------|
|                             | Original                               | Revised | Original                     | Revised       | Actual Expenditure upto August 1995 |
| Panipat Refinery            | 1044.20                                | 2794.00 | September 1989               | April 1997    | 664.17                              |
| Gujarat refinery expansion  | 225.00                                 | 574.00* | Project not yet approved     |               | 5.42                                |
| Digboi refinery expansion   | 143.74                                 | 346.34  | June 1993                    | November 1995 | 258.62                              |
| Barauni refinery expansion  | **Not initiated so far (March, 1995)   |         |                              |               |                                     |
| Guwahati refinery expansion | *** Not initiated so far (March, 1995) |         |                              |               |                                     |

\* As per the latest DFR submitted to the Government.

\*\* The Ministry stated (October, 1995) that the Barauni Refinery had been debottlenecked to process 4.2 MMTPA crude. However, for sustained production at this level offsite facilities would be required, the work on which had not started because of non-availability of crude.

\*\*\* Regarding Guwahati Refinery it stated that the same had been debottlenecked to process 1 MMTPA subject to availability of crude.

## B Pipelines

5.9 For transportation of petroleum products, IOC has six pipelines with a capacity of 10.553 MMTPA and for transportation of crude oil it has one pipeline with a



capacity for 12.00 MMTPA. The capacity for transportation of petroleum products through pipelines has not increased to match the increased refining capacity of 24.40 MMTPA as on 31 March 1995, although transportation of bulk quantities of petroleum products over long leads by pipelines is the most economical method of transportation.

5.10 For carrying crude and petroleum products, the existing and expected pipeline capacity by 31 March 1995 and 31 March 2000 (as per perspective plan of the company) are given below:-

|                                                                       | Existing capacity |         | (In MMTPA)            |                             |
|-----------------------------------------------------------------------|-------------------|---------|-----------------------|-----------------------------|
|                                                                       | 31.3.90           | 31.3.95 | Expected<br>31.3.1995 | Capacity as on<br>31.3.2000 |
| <b>A. CRUDE PIPELINES</b>                                             |                   |         |                       |                             |
| Salaya - Mathura *<br>pipeline                                        | 10.00             | 12.00   | 17.200                | 17.200                      |
| New Pipeline (s) for<br>additional refining<br>capacity in Ninth Plan |                   |         |                       | 9.000                       |
| <b>Total (A)</b>                                                      | 10.00             | 12.00   | 17.200                | 26.200                      |
| <b>B. PRODUCT PIPELINES</b>                                           |                   |         |                       |                             |
| 1. Guwahati Siliguri                                                  | 0.818             | 0.818   | 0.818                 | 0.818                       |
| 2. Haldia Barauni (+)                                                 | 1.400             | 1.400   | 1.400                 | 1.400                       |
| 3. Haldia Mourigram<br>Rajbandh (x)                                   | 1.250             | 1.250   | 3.000                 | 3.000                       |
| 4. Barauni Kanpur                                                     | 1.800             | 1.800   | 1.800                 | 1.800                       |
| 5. Mathura Jalandhar                                                  | 3.700             | 3.700   | 3.700                 | 3.700                       |
| 6. Koyali Ahmedabad                                                   | 1.100             | 1.100   | 1.100                 | 1.100                       |
| 7. Digboi Tinsukhia                                                   | 0.485             | 0.485   | 0.485                 | 0.485                       |
| 8. Kandla Bhatinda                                                    | -----             | -----   | 3.000                 | 6.000                       |
| 9. Haldia Budge Budge                                                 | -----             | -----   | 1.100                 | 1.700                       |
| 10 Pradeep Allahabad                                                  | -----             | -----   | 3.000                 | 6.000                       |
| 11. North East Barauni                                                | -----             | -----   | 2.000                 | 3.000                       |
| <b>Total(B)</b>                                                       | 10.553            | 10.553  | 21.403                | 29.003                      |
| <b>Total A+B</b>                                                      | 20.553            | 22.553  | 38.607                | 55.203                      |

Note :-

----- New Projects

\* SMPL capacity is restricted to 10 MMTPA as against installed capacity of 12.00 MMTPA due to SBM tanker configuration.

(+) derated to 1.130 in April, 1985.

(x) derated to 1.160 in October, 1984 and again uprated to 1.250 in February, 1988

5.11 Though it had been anticipated that the capacity of product pipelines will be increased to 21.403 MMTPA by 31 March 1995, the capacity has remained static at 10.553 MMTPA, due to slow progress in the projects given below:

| Name of Project                     | Estimated Cost | Actual expenditure incurred upto March 1995 | (Rs. in crores)<br>Scheduled date of completion |
|-------------------------------------|----------------|---------------------------------------------|-------------------------------------------------|
| Haldia Mourigram Augmentation       | 12.48          | 6.50                                        | October, 1992                                   |
| Kandla Bhatinda Product pipeline    | 2081.84        | 995.49                                      | December, 1994                                  |
| Haldia Budge-Budge                  | 31.06          | 2.24                                        | March, 1994.                                    |
| Paradeep Allahabad (under approval) | 457.00         | 6.29                                        | N.A.                                            |
| North East Barauni (under approval) | 957.75         | Nil                                         | N.A.                                            |

The Management stated (July 1994) that the implementation of projects depended on various factors like clearance from Government, demand projections which were dynamic in nature and the Government Policy on import of products/crude, etc.

The Ministry stated (October, 1995) that the main shortfall in the capacity was on account of proposed pipelines like Paradeep-Allahabad and North-East pipeline, which were linked with Eastern India Refinery Project and Assam Accord Refinery Project at Numaligarh.

The above two pipelines, however, account for only 5.0 MMTPA out of the shortfall of 10.85 MMTPA.

On a query by the Audit Board regarding stagnation of pipeline capacity of IOC at the level of 10.553 MMTPA against the target of 21.403 MMTPA by 31.3.1995, Ministry stated that approval of Railways had to be obtained before taking up any pipelines project, which was not readily forthcoming. It added that granting of full freedom to the laying of pipelines to the Oil companies was under active consideration of the Ministry.

5.12 As regards crude pipelines, the increase in capacity of Viramgam-Chaksu-Karnal Crude Pipeline by 5 MMTPA is now expected to be achieved by April, 1997 to coincide with the Panipat Refinery commissioning. The actual expenditure incurred upto March 1995 was Rs.52.49 crores against the esimated cost of Rs.569.10 crores.



## CHAPTER 6

### FINANCIAL POSITION AND WORKING RESULTS

#### 6.1 Refineries (Refineries & Pipeline Division)

6.1.1 The financial position of the refineries of the Division for the five years ended 1994-95 are given below:

|                                                                        | (Rs. in crores) |                |                |                |                |
|------------------------------------------------------------------------|-----------------|----------------|----------------|----------------|----------------|
|                                                                        | 1990-91         | 1991-92        | 1992-93        | 1993-94        | 1994-95        |
| <b><u>FUNDS EMPLOYED</u></b>                                           |                 |                |                |                |                |
| Allocated Share Capital                                                | 105.80          | 105.80         | 105.80         | 105.80         | -- @           |
| Reserves and surplus                                                   | 1508.11         | 1814.86        | 1966.25        | 2293.73        | 2989.49        |
| Total shareholder's funds                                              | 1613.91         | 1920.66        | 2072.05        | 2399.53        | 2989.49        |
| Borrowings                                                             | 314.22          | 245.87         | 297.55         | 284.73         | 455.19         |
| <b>Total</b>                                                           | <b>1928.13</b>  | <b>2166.53</b> | <b>2369.60</b> | <b>2684.26</b> | <b>3444.68</b> |
| <b><u>APPLICATION OF FUNDS</u></b>                                     |                 |                |                |                |                |
| Gross block                                                            | 941.00          | 1023.33        | 1441.73        | 1956.38        | 2077.08        |
| Less: depreciation                                                     | 635.99          | 634.08         | 682.81         | 753.49         | 831.50         |
| Net fixed assets                                                       | 305.01          | 389.25         | 758.92         | 1202.89        | 1245.58        |
| capital work in progress                                               | 447.35          | 723.83         | 596.77         | 343.48         | 750.63         |
| Investments                                                            | 0.14            | 0.14           | 0.01           | 0.01           | 0.01           |
| Current assets/<br>Loans and advances                                  | 1365.30         | 1647.75        | 1902.11        | 2764.41        | 3067.37        |
| Less-Current liabilities<br>and Provisions                             | 642.51          | 549.01         | 442.29         | 1366.90        | 1498.68        |
| Working capital                                                        | 722.79          | 1098.74        | 1459.82        | 1397.51        | 1568.69        |
| Inter unit balances                                                    | 452.84          | (-)45.43       | (-)445.92      | (-)259.63      | (-)120.23      |
| <b>Total</b>                                                           | <b>1928.13</b>  | <b>2166.53</b> | <b>2369.60</b> | <b>2684.26</b> | <b>3444.68</b> |
| Capital employed                                                       | 1027.80         | 1487.99        | 2218.74        | 2600.40        | 2814.27        |
| Capital employed in IOC                                                | 3531.99         | 2661.47        | 6297.50        | 6989.36        | 5488.10        |
| %age of capital employed<br>in refineries to total<br>Capital employed | 29.10           | 55.91          | 35.23          | 37.21          | 51.28          |

@ Share capital shown only in Registered Office Accounts.

The working capital available with the refineries of the company rose from Rs.722.79 crores during 1990-91 to Rs.1568.69 crores during 1994-95.

The capital employed in the refineries constituted 51.28 percent of the total capital employed in the Company at the end of the year 1994-95.

6.1.2 The working results of the refineries for the five years ended 1994-95 are given below :-

|                                                                   | (Rs. in crores) |                |                |                |                |
|-------------------------------------------------------------------|-----------------|----------------|----------------|----------------|----------------|
|                                                                   | 1990-91         | 1991-92        | 1992-93        | 1993-94        | 1994-95        |
| <b>A Income</b>                                                   |                 |                |                |                |                |
| Transfer of products to Marketing Division                        | 5423.34         | 5641.41        | 5694.03        | 5961.65        | 6325.90        |
| Pool account adjustment                                           | 886.12          | 952.23         | 922.57         | 1061.51        | 1851.24        |
| Company's use of own fuel                                         | 1.55            | 1.43           | 2.44           | 2.59           | 2.12           |
| Stock variation                                                   | 36.43           | 13.51          | 75.44          | 20.30          | (-)9.40        |
| Interest                                                          | 7.33            | 3.75           | 6.04           | 6.33           | 6.39           |
| Other income                                                      | 11.12           | 13.05          | 13.98          | 169.99         | 20.60          |
| Provision written back                                            | 0.69            | 0.34           | 0.22           | 0.26           | 0.33           |
| <b>Total(A)</b>                                                   | <b>6366.58</b>  | <b>6625.72</b> | <b>6714.72</b> | <b>7072.63</b> | <b>8197.18</b> |
| <b>B. Expenditure</b>                                             |                 |                |                |                |                |
| Cost of raw material                                              | 5084.75         | 5235.45        | 5231.30        | 5342.32        | 6248.39        |
| Transfer of products from other Divisions                         | 79.92           | 132.16         | 217.21         | 250.20         | 96.14          |
| Consumption of stores, spares, chemicals & packages               | 90.88           | 98.98          | 108.11         | 109.43         | 107.17         |
| Manufacturing and other expenses                                  | 265.90          | 298.02         | 345.39         | 399.11         | 444.18         |
| Duties                                                            | 463.50          | 489.32         | 475.95         | 472.20         | 698.99         |
| Depreciation                                                      | 33.67           | 33.20          | 48.13          | 70.72          | 81.47          |
| Interest                                                          | (-)48.11        | (-)50.26       | 16.11          | 38.58          | 11.32          |
|                                                                   | 5970.51         | 6236.87        | 6442.20        | 6682.56        | 7687.66        |
| Less transferred to construction period expenses/ other Divisions | 11.13           | 10.83          | 19.12          | 28.91          | 40.26          |
| <b>TOTAL 'B'</b>                                                  | <b>5959.38</b>  | <b>6226.04</b> | <b>6423.08</b> | <b>6653.65</b> | <b>7647.40</b> |
| <b>Profit (A-B)</b>                                               | <b>407.20</b>   | <b>399.68</b>  | <b>291.64</b>  | <b>418.98</b>  | <b>549.78</b>  |
| Add income/less expenditure relating to extra ordinary items      | 9.25            | 24.02          | (-)18.77       | 0.29           | 148.23         |
| <b>Profit for the year</b>                                        | <b>416.45</b>   | <b>423.70</b>  | <b>272.87</b>  | <b>419.27</b>  | <b>698.01</b>  |
| Less expenditure relating to previous year                        | (-)1.51         | (-)1.47        | (-)2.47        | (-)2.01        | (-)2.25        |
| <b>Profit after depreciation and interest</b>                     | <b>414.94</b>   | <b>422.23</b>  | <b>270.40</b>  | <b>417.26</b>  | <b>695.76</b>  |
| <b>Profit before depreciation and interest</b>                    | <b>400.50</b>   | <b>405.17</b>  | <b>334.64</b>  | <b>526.56</b>  | <b>788.55</b>  |
| <b>Profit after depreciation, but before interest</b>             | <b>366.83</b>   | <b>371.97</b>  | <b>286.51</b>  | <b>455.84</b>  | <b>707.08</b>  |
| <b>Return on capital employed</b>                                 | <b>40.37</b>    | <b>28.38</b>   | <b>12.19</b>   | <b>16.06</b>   | <b>24.72</b>   |
| <b>Return on net worth</b>                                        | <b>25.71</b>    | <b>22.01</b>   | <b>13.05</b>   | <b>17.39</b>   | <b>23.27</b>   |
| <b>Percentage of cost of refining to total income</b>             | <b>5.60</b>     | <b>5.99</b>    | <b>6.75</b>    | <b>7.19</b>    | <b>6.73</b>    |

Analysis of the working results of the refineries of IOC revealed as under :-

(i) The profit for 1992-93 fell to Rs.270.40 crores, from Rs.422.23 crores in 1991-92 resulting in lowest return on capital employed (12.19%) and return on net worth (13.05%) for 1992-93 compared to 28.38% and 22.01% respectively during 1991-92. Though the return on capital employed and return on net worth improved to 24.72% and 23.27% respectively in 1994-95, these were below the returns during 1990-91. The major reason for decrease in profit during 1992-93 was increase in interest charges (Rs.66.37 crores ), extra ordinary expenditure (Rs.42.79 crores ) and manufacturing and other expenses ( Rs.47.37 crores ).

(ii) The percentage of refining cost to total income also showed an increasing trend from 5.60% in 1990-91 to 7.19% in 1993-94, but declined to 6.73% in 1994-95.

(iii) Cost of raw materials increased by 22.88% in 1994-95 compared to the cost during 1990-91, whereas the transfer of products to the marketing division increased only by 16.64% during this period.

## 6.2 Pipelines (Refineries & Pipelines Division)

6.2.1 The financial position of pipelines of the Division for the five years ended 1994-95 are given below:

|                                                                     | Rs. in crores |         |          |         |           |
|---------------------------------------------------------------------|---------------|---------|----------|---------|-----------|
|                                                                     | 1990-91       | 1991-92 | 1992-93  | 1993-94 | 1994-95   |
| <u>Funds employed</u>                                               |               |         |          |         |           |
| Allocated share capital                                             |               |         |          |         |           |
| Reserves & surplus                                                  | 367.51        | 440.82  | 435.85   | 455.97  | 457.06    |
| Total shareholders fund                                             | 367.51        | 440.82  | 435.85   | 455.97  | 457.06    |
| Borrowings                                                          | 2.56          | 10.14   | 10.95    | 161.01  | 325.52    |
|                                                                     | 370.07        | 450.96  | 446.80   | 616.98  | 782.58    |
| <u>Application of funds</u>                                         |               |         |          |         |           |
| Gross Block                                                         | 419.06        | 422.42  | 440.23   | 474.78  | 500.09    |
| less depreciation                                                   | 312.82        | 312.53  | 320.23   | 329.91  | 340.22    |
| Net Block                                                           | 106.24        | 109.89  | 120.00   | 144.87  | 159.87    |
| Work in progress & capital goods in stock                           | 9.38          | 68.99   | 180.10   | 431.20  | 1164.35   |
| Current Assets/<br>loans & advances                                 | 39.70         | 57.85   | (-)1.23  | 75.16   | 97.04     |
| less current liabilities<br>& provisions                            | 13.21         | 19.88   | 35.96    | 58.66   | 65.29     |
| Working capital                                                     | 26.49         | 37.97   | (-)37.19 | 16.50   | 31.75     |
| Inter unit balances                                                 | 227.96        | 234.11  | 183.89   | 24.41   | (-)573.39 |
| Total Assets                                                        | 370.07        | 450.96  | 446.80   | 616.98  | 782.58    |
| Capital employed                                                    | 132.73        | 147.86  | 82.81    | 161.37  | 191.62    |
| Capital employed in IOC                                             | 3531.99       | 2661.47 | 6297.50  | 6989.36 | 5488.10   |
| % of capital employed in pipelines to total capital employed in IOC | 3.76%         | 5.56%   | 1.31%    | 2.31%   | 3.49%     |



The working capital available with the pipelines of the company fell from Rs.26.49 crores in 1990-91 to Rs.(-)37.19 crores in 1992-93, but increased to Rs.31.75 crores in 1994-95. The capital employed in the pipelines (Rs.191.62 crores) as on 31 March, 1995 constituted 3.49 percent of the total capital employed in the company.

6.2.2 The working results of the pipelines of the division for the five years ended 1994-95 are given below:-

|                                                              | (Rs. in crores) |         |          |          |         |
|--------------------------------------------------------------|-----------------|---------|----------|----------|---------|
|                                                              | 1990-91         | 1991-92 | 1992-93  | 1993-94  | 1994-95 |
| <b>A Income</b>                                              |                 |         |          |          |         |
| Pipeline transportation charges                              | 126.54          | 134.96  | 140.74   | 120.75   | 121.31  |
| Cost escalation recoverable from pool account                | 10.27           | 6.97    | 0.99     | 0.93     | 2.97    |
| Interest                                                     | 0.41            | 0.69    | 0.88     | 0.98     | 2.60    |
| Other income                                                 | 0.88            | 0.82    | 1.23     | 1.54     | 3.16    |
| Provision for doubtful debts written back                    | 0.09            | 0.04    | 0.01     | 0.02     | 0.04    |
| <b>TOTAL 'A'</b>                                             | 138.19          | 143.48  | 143.85   | 124.22   | 130.08  |
| <b>B Expenses</b>                                            |                 |         |          |          |         |
| Admin., selling and other expenses                           | 57.73           | 76.56   | 96.54    | 104.56   | 158.57  |
| Transfer of expenses from other divisions                    | 4.34            | 4.80    | 5.28     | 5.94     | 6.89    |
| Depreciation                                                 | 11.68           | 8.48    | 8.85     | 10.58    | 10.33   |
| Interest                                                     | 0.10            | 0.09    | 0.12     | 10.76    | 20.55   |
|                                                              | 73.85           | 89.93   | 110.79   | 131.84   | 196.34  |
| <b>Less</b>                                                  |                 |         |          |          |         |
| Transferred to construction period expenses                  | 1.42            | 12.73   | 5.76     | 29.27    | 69.66   |
| <b>TOTAL 'B'</b>                                             | 72.43           | 77.20   | 105.03   | 102.57   | 126.68  |
| <b>Profit(A-B)</b>                                           | 65.76           | 66.28   | 38.82    | 21.65    | 3.40    |
| Add income/less expenditure relating to Extra ordinary items | 0.42            | 6.96    | (-)43.71 | (-)00.93 | (-)1.76 |
| Add income/less expenditure relating to previous year        | (-)0.96         | 0.07    | (-)0.08  | (-)00.59 | (-)0.56 |
| <b>Profit after depreciation and interest</b>                | 65.22           | 73.31   | (-)4.97  | 20.13    | 1.08    |
| <b>Profit before depreciation and interest</b>               | 77.00           | 81.88   | 4.00     | 41.47    | 31.96   |
| <b>Profit after depreciation but before interest</b>         | 65.32           | 73.40   | (-)4.85  | 30.89    | 21.63   |
| <b>% Return on capital employed</b>                          | 49.14           | 49.58   | 4.83     | 12.47    | 0.56    |
| <b>% Return on net worth</b>                                 | 17.75           | 16.63   | (-ve)    | 4.41     | 0.24    |
| <b>% Pipeline transportation cost to total income</b>        | 41.78           | 53.36   | 67.11    | 84.17    | 121.90  |

Analysis of the working results revealed as under:

(i) Profit had fallen from Rs.65.22 crores in 1990-91 and Rs.73.31 crores in 1991-92 to Rs.1.08 crores in 1994-95. This was due to (a)fall in pipeline transportation earnings from Rs.126.54 crores (1990-91) to Rs.121.31 crores (1994-95), and (b)increase in administration, selling and other expenses (transportation cost) from Rs.57.73 crores (1990-91) to Rs.158.57 crores (1994-95).

The pipeline transportation cost to total income increased from 41.78% in 1990-91 to 84.17% in 1993-94 and spurted to 121.90% in 1994-95.

(ii) Return on capital employed fell significantly from 49.14% in 1990-91 to 0.56% in 1994-95.

(iii) Return on net worth also showed a declining trend from 17.75% in 1990-91 to 0.24% in 1994-95.

### 6.3 Assam Oil Division

6.3.1 The financial position of Assam Oil Division(AOD) which includes Digboi refinery and Digboi Tinsukhia Pipeline is given below:

|                                                                 | 1990-91  | 1991-92       | 1992-93   | 1993-94   | (Rs. in crores.)<br>1994-95 |
|-----------------------------------------------------------------|----------|---------------|-----------|-----------|-----------------------------|
| <b>Funds employed</b>                                           |          |               |           |           |                             |
| Allocated Share Capital                                         |          | Not Allocated |           |           |                             |
| Reserves & Surplus                                              | 18.72    | 19.80         | 26.20     | 27.85     | 31.60                       |
| Total shareholders funds                                        | 18.72    | 19.80         | 26.20     | 27.85     | 31.60                       |
| Borrowings                                                      | 1.72     | (-)12.30      | (-)14.84  | 6.78      | 14.27                       |
| <b>Total</b>                                                    | 20.44    | 7.50          | 11.36     | 34.63     | 45.87                       |
| <b>Application of funds</b>                                     |          |               |           |           |                             |
| Gross Block                                                     | 85.82    | 122.15        | 134.62    | 159.56    | 198.30                      |
| less                                                            |          |               |           |           |                             |
| Depreciation                                                    | 46.65    | 53.05         | 65.66     | 76.38     | 91.09                       |
| Net Block                                                       | 39.17    | 69.10         | 68.96     | 83.18     | 107.21                      |
| Work-in-Progress                                                | 41.75    | 55.15         | 94.22     | 203.78    | 269.59                      |
| <b>Total</b>                                                    | 80.92    | 124.25        | 163.18    | 286.96    | 376.80                      |
| Current Assets                                                  | 46.35    | 53.56         | 71.26     | 76.74     | 75.99                       |
| Loans & Advances                                                | 26.40    | 23.90         | 47.82     | 10.69     | 20.84                       |
| <b>Total</b>                                                    | 72.75    | 77.46         | 119.08    | 87.43     | 96.83                       |
| Less: Current Liabilities & Provisions.                         | 50.90    | 63.39         | 67.11     | 60.41     | 69.26                       |
| Working Capital                                                 | 21.85    | 14.07         | 51.97     | 27.02     | 27.57                       |
| Inter-unit Balances                                             | (-)82.33 | (-)130.82     | (-)203.79 | (-)279.35 | (-)358.50                   |
| <b>Total Assets</b>                                             | 20.44    | 7.50          | 11.36     | 34.63     | 45.87                       |
| Capital Employed                                                | 61.02    | 83.17         | 120.93    | 110.20    | 134.78                      |
| Capital Employed in IOC                                         | 3531.99  | 2661.47       | 6297.50   | 6989.36   | 5488.10                     |
| Percentage of Capital employed in AOD to total capital employed | 1.73     | 3.12          | 1.92      | 1.58      | 2.46                        |

The working capital of AOD, increased from Rs. 21.85 crores at the end of 1990-91 to Rs.27.57 crores at the end of 1994-95.

6.3.2 The working results of the Assam Oil Division for the five years ending 1994-95 are given below:

|                                                        | (Rs. in crores) |               |               |               |               |
|--------------------------------------------------------|-----------------|---------------|---------------|---------------|---------------|
|                                                        | 1990-91         | 1991-92       | 1992-93       | 1993-94       | 1994-95       |
| <b>A.Income</b>                                        |                 |               |               |               |               |
| Transfer of Products to Marketing Division             | 110.35          | 109.06        | 108.66        | 135.97        | 161.16        |
| Sale of Products                                       | 302.54          | 325.08        | 343.22        | 340.30        | 380.16        |
| Company's use of own fuel                              | 1.09            | 1.23          | 1.29          | 1.17          | 0.94          |
| AOD's share of marketing margin                        | 4.29            | 4.44          | 9.40          | 5.00          | 4.75          |
| Stock variation                                        | (-)2.51         | 3.54          | 14.22         | 6.10          | (-)1.75       |
| Recovery of main installation & other charges          | 0.01            | 0.01          | 0.02          | 0.04          | 0.04          |
| Interest                                               | 1.16            | 0.92          | 0.73          | 0.63          | 0.68          |
| Other Income                                           | 2.43            | 2.98          | 3.38          | 5.55          | 4.34          |
| Provision for Doubtful debts etc. written back         | 0.28            | 0.14          | 0.10          | 0.18          | 0.83          |
| <b>TOTAL A</b>                                         | <u>419.64</u>   | <u>447.40</u> | <u>481.02</u> | <u>494.94</u> | <u>551.15</u> |
| <b>B.Expenditure</b>                                   |                 |               |               |               |               |
| Purchase of crude & Products                           | 13.98           | 13.25         | 13.90         | 13.55         | 15.43         |
| Transfer from other Divisions                          | 184.50          | 209.95        | 217.04        | 225.32        | 264.69        |
| Raw-material                                           | 96.42           | 93.55         | 95.14         | 95.60         | 92.33         |
| Stores chemical& Packing material                      | 8.01            | 8.78          | 10.79         | 11.20         | 10.86         |
| Repairs & Maintenance                                  | 8.41            | 8.81          | 12.31         | 10.44         | 13.26         |
| Other manufacturing expenses                           | 48.28           | 52.82         | 59.45         | 61.71         | 73.31         |
| Duties                                                 | 41.54           | 44.85         | 53.97         | 60.25         | 75.81         |
| Depreciation                                           | 8.61            | 9.27          | 12.93         | 10.94         | 14.93         |
| Interest                                               | 8.59            | 7.80          | 14.81         | 22.07         | 0.18          |
|                                                        | <u>418.34</u>   | <u>449.08</u> | <u>490.34</u> | <u>511.08</u> | <u>560.80</u> |
| Less: Transferred to construction period/ drum cost    | 2.12            | 1.84          | 1.65          | 3.21          | 2.80          |
| <b>Total B</b>                                         | <u>416.22</u>   | <u>447.24</u> | <u>488.69</u> | <u>507.87</u> | <u>558.00</u> |
| Profit/Loss(-) (A-B)                                   | 3.42            | 0.16          | (-)7.67       | (-)12.93      | (-)6.85       |
| Add: Income relating to extraordinary items            | 2.20            | 0.78          | 14.37         | 14.58         | 10.58         |
| Add: Income/Less expenditure relating to previous year | 0.32            | 0.14          | (-)0.30       | Nil           | Nil           |
| Net Profit after depreciation & interest               | <u>5.94</u>     | <u>1.08</u>   | <u>6.40</u>   | <u>1.65</u>   | <u>3.73</u>   |
| Net Profit before depreciation & interest              | 23.14           | 18.15         | 34.14         | 34.66         | 18.84         |
| Return on Capital employed                             | 9.73            | 1.30          | 5.29          | 1.50          | 2.77          |
| Return on Networth                                     | 31.73           | 5.45          | 24.43         | 5.92          | 11.80         |
| Refining cost to Total income                          | 15.42           | 15.74         | 17.16         | 16.84         | 17.68         |



Analysis of the working results of AOD revealed as under :

(i) Profit for the year excluding extra ordinary income and prior period adjustments changed from Rs.3.42 crores in 1990-91 to a loss of Rs.6.85 crores in 1994-95.

This was mainly due to (a) increase in depreciation from Rs.8.61 crores (1990-91) to Rs.14.93 crores (1994-95) and (b) increase in duties from Rs.41.54 crores (1990-91) to Rs.75.81 crores (1994-95),

The refining cost to total income increased from 15.42% in 1990-91 to 17.68% in 1994-95.

(ii) The return on net worth reduced from 31.73% in 1990-91 to 11.80% in 1994-95 .

(iii) Return on capital employed declined to 1.50 in 1993-94 and 2.77 in 1994-95 from 9.73% in 1990-91.

The Ministry stated (October,1995) that the financial analysis based on the Balance Sheet would not show the real performance of the Division as i) the liabilities for payment in respect of crude oil of refineries were reflected in the books of Marketing Division, ii) the expenditure of the Division on capital account (on projects) gets reflected in the inter-divisional account, iii) pool accounts are centrally maintained by Marketing Division and the proper ratio analysis without a proper bifurcation between the Divisions would indicate erroneous results, iv) the networth of a Division would not be real as the share capital was an allocated one.

The Ministry's reply is not tenable as the trends indicated are valid over a five year period. Further, the Company is required to prepare the financial position and working results of its division/units so as to reflect the real performance.

## CHAPTER 7

### PRODUCTION PERFORMANCE OF REFINERIES

7.01 The table below indicates the quantity of crude processed at various refineries during the 5 years ended 31 March, 1995:

(Quantity in Th.MT)

| Name of refinery | Capacity     | 1990-91      | 1991-92      | 1992-93      | 1993-94      | 1994-95      |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Guwahati         | 850          | 783          | 856          | 815          | 911          | 884          |
| Barauni          | 3300         | 2416         | 2262         | 2287         | 2222         | 2220         |
| Gujarat          | 9500         | 9334         | 9378         | 9780         | 9434         | 9888         |
| Digboi           | 500          | 566          | 546          | 547          | 554          | 536          |
| Haldia           | 2750         | 2835         | 3021         | 3040         | 3106         | 3258         |
| Mathura          | 7500         | 7808         | 8231         | 7844         | 8518         | 8377         |
| <b>Total</b>     | <b>24400</b> | <b>23742</b> | <b>24294</b> | <b>24313</b> | <b>24745</b> | <b>25163</b> |

It may be seen that although the total crude throughput of the refineries of the IOC put together had increased every year, the installed capacity of 24.40 MMT was not achieved during 1990-91 to 1992-93. The capacity utilisation was less than the installed capacity in all the years in Barauni refinery, during 1990-91 and 1992-93 in Guwahati refinery and during 1990-91, 1991-92 and 1993-94 in Gujarat refinery.

The Ministry stated (October, 1995) that main reason for non-achievement of the installed capacity of 24.4 MMTPA was the non availability of Assam Crude for Barauni Refinery.

## 7.02 Vacuum Distillation Unit

The table below indicates the design capacity and actual quantity of reduced crude oil (RCO) processed in three refineries during the five years ended 31 March 1995:

| Sl. No. | Refinery | Design Capacity | (Quantity in Th.MT)       |         |         |         |         |
|---------|----------|-----------------|---------------------------|---------|---------|---------|---------|
|         |          |                 | Actual Quantity processed |         |         |         |         |
|         |          |                 | 1990-91                   | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1.      | Gujarat  | 800             | 825.8                     | 805.30  | 777.53  | 676.55  | 666.75  |
| 2.      | Haldia   | 1100            | 1364.60                   | 1512.10 | 1404.10 | 1393.10 | 1589.20 |
| 3.      | Mathura  | 2300            | 2434.02                   | 2692.91 | 2598.13 | 2875.33 | 2836.50 |

It may be seen that the capacity utilisation was more than the design capacity in all the years except in Gujarat refinery during 1992-93 to 1994-95. It was observed that total quantity of RCO produced in the CDU's could not be processed due to capacity limitations of the Vacuum Distillation Units. Details of RCO produced in CDU's and its processing in subsequent units are given in (Annexure I).

The quantity of RCO not processed had to be down-graded and sold as Furnace Oil(FO) resulting in heavy loss to IOC in terms of the price realised and that which could have been realised for high value products.

The Management stated (August 1993) that since the VDU capacity had been saturated with RCO generated from the CDU, the excess RCO was diverted to FO pool only as it could not be disposed of elsewhere. The Ministry stated (October 1995) that crude throughput was to be maximised even without matching secondary facilities to meet the higher demand of petroleum products.

## 7.03 Fluid Catalytic Cracking Unit

In two refineries, Fluid Catalytic Cracking Units(FCCU's) have been installed to process the Vacuum Gas Oil(VGO) obtained from the CDU's for producing middle distillates. The table below indicates the design capacities and actual quantities of VGO processed in the FCCU of these refineries for the five years ended 31 March 1995:

| S.No | Name of Refinery | Design Capacity | (Quantity in Th.MT)       |                |                |                |                |
|------|------------------|-----------------|---------------------------|----------------|----------------|----------------|----------------|
|      |                  |                 | Actual quantity processed |                |                |                |                |
|      |                  |                 | 1990-91                   | 1991-92        | 1992-93        | 1993-94        | 1994-95        |
| 1    | Mathura          | 1000.00         | 1168.68                   | 1240.64        | 1111.49        | 1130.10        | 1233.50        |
| 2    | Gujarat          | 1000.00         | 1239.82                   | 1178.89        | 1293.25        | 1211.00        | 1150.00        |
|      | <b>Total</b>     | <b>2000.00</b>  | <b>2408.50</b>            | <b>2419.53</b> | <b>2404.74</b> | <b>2341.10</b> | <b>2383.50</b> |



It may be seen that the capacity utilisation was more than the design capacity in all the years in both the refineries. The Management stated that FCCU was designed considering amorphous catalyst, but due to advancement in technology the catalyst quality was improved and capacity utilisation in excess of 100 percent was achieved.

#### 7.04 Visbreaker Unit (VBU)

The table below indicates the design capacity and the actual quantity of VB feed processed in three refineries during the five years ended 31 March 1995:

(Quantity in Th.MT)

| Sl.No. | Name of the Refinery | Designed Capacity | <u>Actual quantity processed</u> |         |         |         |         |
|--------|----------------------|-------------------|----------------------------------|---------|---------|---------|---------|
|        |                      |                   | 1990-91                          | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1      | Mathura              | 1000              | 824.80                           | 860.86  | 881.76  | 958.61  | 1038.88 |
| 2      | Gujarat              | 1000              | 465.03                           | 586.34  | 621.85  | 1447.17 | 1361.75 |
| 3      | Haldia               | 462               | 403.35                           | 464.90  | 451.60  | 490.90  | 424.20  |
| Total  |                      | 2462              | 1693.18                          | 1912.10 | 1955.21 | 2896.68 | 2824.83 |

It may be seen that the capacity utilisation was less than the design capacity in all the years in all the three refineries except in Haldia during 1991-92 and 1993-94, in Gujarat during 1993-94 and 1994-95 and in Mathura during 1994-95.

The Ministry stated (October 1995) that "the feedstock to Visbreaker Unit is RCO from imported crude, after meeting the reduced crude requirement for bitumen production. In view of lower imported crude processing as compared to the design at Gujarat and Mathura Refinery, adequate feedstock was not available to sustain full capacity utilisation of the Units."

#### 7.05 Bitumen Blowing unit

The table given below indicates the design capacity and actual quantity of short residue processed in three refineries during the five years ended 31 March 1995:

(Quantity in Th.MT)

| Sl.No. | Name of the Refinery | Design Capacity | <u>Actual quantity processed</u> |         |         |         |         |
|--------|----------------------|-----------------|----------------------------------|---------|---------|---------|---------|
|        |                      |                 | 1990-91                          | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1.     | Mathura              | 500             | 335.61                           | 358.34  | 395.90  | 430.18  | 411.55  |
| 2.     | Gujarat              | 250             | 235.43                           | 296.83  | 305.20  | 280.70  | 279.75  |
| 3.     | Haldia               | 250             | 206.30                           | 201.30  | 219.90  | 219.80  | 293.50  |
| Total  |                      | 1000            | 777.34                           | 856.47  | 921.00  | 930.68  | 984.80  |

About low capacity utilisation, the Management stated (January, 1993) that bitumen is a demand-oriented product and the capacity of the unit was utilised to the extent of product demand/off take.

#### 7.06 Catalytic Reforming Unit (CRU)

The table given below indicates the design capacity and actual quantity of reformat processed for production of benzene and toluene in two refineries during the five years ended 31 March 1995:

(Quantity in Th.MT)

| Sl. No. | Name of the Refinery | Design Capacity | <u>Actual quantity processed</u> |         |         |         |         |
|---------|----------------------|-----------------|----------------------------------|---------|---------|---------|---------|
|         |                      |                 | 1990-91                          | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1.      | Haldia               | 196             | 143.45                           | 153.85  | 149.21  | 143.90  | 157.30  |
| 2.      | Gujarat              | 300             | 254.2                            | 307.79  | 309.20  | 257.55  | 296.45  |

It may be seen that the capacity utilisation was less than the design capacity in all the years except in 1991-92 and 1992-93 in Gujarat refinery. In respect of Gujarat Refinery, the Management stated (January, 1993) that with the commissioning of FCCU in December 1982 the requirement of high octane reformat for MS blending, hitherto produced by the CRU, was replaced and this led to under-utilisation of CRU. It was also stated that the spare capacity was now being utilised for supply of xylene reformat feed stock to IPCL.

The Ministry stated (October 1995) that in Haldia Refinery, the Reformer capacity utilisation was governed by the demand for Motor Spirit in the region.

#### 7.07 Kerosene Refining unit

The table below indicates the design capacity and actual quantity of coker kero cut processed in two refineries during the five years ended 31 March 1995:

(Quantity in Th.MT)

| Sl.No. | Name of the Refinery | Design Capacity | <u>Actual quantity processed</u> |         |         |         |         |
|--------|----------------------|-----------------|----------------------------------|---------|---------|---------|---------|
|        |                      |                 | 1990-91                          | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1.     | Barauni              | 600             | 284.29                           | 259.72  | 244.08  | 235.26  | 124.36  |
| 2.     | Guwahati             | 230.2           | 126.2                            | 157.7   | 155.37  | 191.89  | 192.78  |
| 3.     | Digboi               | 250             | 204.1                            | 186.4   | 172.54  | 185.10  | 189.12  |



It may be seen that the capacity utilisation was less than the installed capacity in all the years.

The Management stated (July 1993) that the reasons for poor utilisation in Barauni Refinery were :

- (i) lower availability of crude resulting in lower availability of Kero, and
- (ii) lower yield of straight run from Atmospheric Vacuum Unit (AVU).

The Ministry stated (October 1995) "Guwahati Refinery was designed to produce superior and inferior kerosene from feedstocks ex-CDU and Delayed Coker Unit respectively. However, with the development of naphtha based solvents in paint industry, demand for inferior kerosene got phased out. Also Bureau of Indian Standards relaxed smoke points of kerosene from 22 mm to 18 mm (minimum) over the years. This resulted in stoppage of processing of feedstock ex-Delayed Coker Unit and increased back blending of straight run kero for production of SKO".

Reasons for decreasing trend of the utilisation of KRU in Digboi Refinery upto 1993-94 and action proposed to be taken towards full capacity utilisation of these units were not stated.

#### 7.08 Solvent Dewaxing Unit (SDU)

The table below indicates the design capacity and actual quantity of feed stock processed in two refineries during the five years ended 31 March 1995:

(Quantity in Th.MT)

| Sl.No. | Name of Refinery | Design capacity | Actual quantity processed |         |         |         |         |
|--------|------------------|-----------------|---------------------------|---------|---------|---------|---------|
|        |                  |                 | 1990-91                   | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| 1.     | Haldia           | 264             | 230.0                     | 244.65  | 255.80  | 262.20  | 268.40  |
| 2.     | Barauni          | 131             | 71.8                      | 64.26   | 63.33   | 59.40   | 90.51   |

It may be seen that the capacity utilisation in all the years was less than the design capacity except in 1994-95 in Haldia Refinery.

The Management stated (July 1993) that originally the unit in Barauni refinery was designed for producing lube based stock but due to no demand for them, the unit was being operated for production of slack wax, which was again not in good demand. Under utilisation in Haldia refinery was stated to be due to non production of low viscosity index grade of lubes which have no market demand.



## 7.09 Yield Pattern

The table below indicate the yield pattern achieved during the five years ended 31 March 1995:

|                        | (Quantity in Th.MT) |                    |                    |                    |                    |
|------------------------|---------------------|--------------------|--------------------|--------------------|--------------------|
|                        | 1990-91             | 1991-92            | 1992-93            | 1993-94            | 1994-95            |
| Light Distillates      | 4168.1<br>(17.56)   | 4222.6<br>(17.38)  | 4081.9<br>(16.79)  | 4055.7<br>(16.39)  | 4511.4<br>(17.93)  |
| Middle distillates     | 11642.3<br>(49.04)  | 11947.6<br>(49.18) | 12036.7<br>(49.51) | 12415.5<br>(50.17) | 12744.6<br>(50.65) |
| Heavy ends             | 6292.1<br>(26.50)   | 6537.2<br>(26.91)  | 6567.8<br>(27.01)  | 6596.9<br>(26.66)  | 6099.8<br>(24.24)  |
| Lubes                  | 168.9<br>(0.71)     | 168.4<br>(0.69)    | 181.2<br>(0.74)    | 187.2<br>(0.76)    | 189.4<br>(0.75)    |
| Total product recovery | 22271.4<br>(93.81)  | 22875.8<br>(94.16) | 22867.6<br>(94.05) | 23255.3<br>(93.98) | 23545.2<br>(93.57) |
| I.S.D.                 | (-)21.1<br>(-0.09)  | 1.2<br>(0.01)      | 34.6<br>(0.15)     | (-)11.0<br>(-0.04) | (-)38.7<br>(-0.15) |
| Fuel & loss            | 1491.6<br>(6.28)    | 1417.1<br>(5.83)   | 1410.6<br>(5.80)   | 1500.3<br>(6.06)   | 1656.8<br>(6.58)   |
| Total                  | 23741.9             | 24294.1            | 24312.8            | 24744.6            | 25163.3            |

(Figures in bracket indicate percentage of total throughput).

It may be seen that the production of light distillates decreased from 4.223 MMT in 1991-92 to 4.055 MMT in 1993-94 despite increase in the total crude processed.

## 7.10 Downgradation of Aviation Turbine Fuel into Superior Kerosene Oil And High Speed Diesel (HSD)

The Aviation Turbine Fuel(ATF) produced during processing of crude in the CDU and Atmospheric Vacuum Unit (AVU) is blended for final gradation of the product as ATF,SKO and HSD depending upon the quality of products.

The table below indicates the total production of ATF in CDU's/AVU's (of the refineries) and final gradation of product after blending of ATF during the five years ended 31 March 1991:

|                 | (Quantity in Th.MT) |                    |                    |                    |                    |
|-----------------|---------------------|--------------------|--------------------|--------------------|--------------------|
|                 | 1986-87             | 1987-88            | 1988-89            | 1989-90            | 1990-91            |
| ATF produced    | 737.068             | 744.447            | 819.789            | 834.371            | 836.747            |
| Final gradation |                     |                    |                    |                    |                    |
| • ATF           | 676.405<br>(91.77)  | 686.885<br>(92.27) | 716.307<br>(87.38) | 755.406<br>(90.54) | 782.585<br>(93.53) |
| SKO             | 60.663<br>(8.23)    | 56.616<br>(7.60)   | 99.066<br>(12.08)  | 78.965<br>(9.46)   | 54.162<br>(6.47)   |
| HSD             | NIL                 | 0.946<br>(0.13)    | 4.416<br>(0.54)    | NIL                | NIL                |
| Total           | 737.068             | 744.447            | 819.789            | 834.371            | 836.747            |

(From 1991-92 the details of production of ATF and final gradation had not been shown separately in the record)

It may be seen that the production of ATF varied from 87.38 percent during 1988-89 to 93.53 percent during 1990-91. The product was also downgraded to HSD during 1987-88 and 1988-89. No norms of production of ATF/SKO have been fixed for final gradation after being processed in merox units. Reasons for variation in production of ATF/SKO had not been analysed.

In Barauni and Guwahati Refineries the entire production of ATF was downgraded to SKO during 1987-88 and 1988-89, due to failure in meeting the conductivity specification.

The Management stated (July 1993) that in Barauni refinery the difficulties in producing on-grade ATF were due to traces of elemental sulphur resulting in failure in respect of Silver Corrosion test. Despite this, they were continuing to produce 500 MT per month of on-grade ATF on an average from 1990-91. It was, however, noticed that during 1991-92 there was no production of ATF and during 1992-93 the production was 3,422 MT only.

The Ministry while accepting the position in respect of Guwahati and Barauni refineries stated (October, 1995) that in case of Haldia, Gujarat and Mathura refineries, ATF production was restricted as per demand. It was, however, seen that during 1994-95, the country had imported (through IOC) over 78 thousand MT of ATF. This import could have been avoided had the production of ATF been suitably increased.

## CHAPTER 8

### OTHER SELECTED PERFORMANCE PARAMETERS

Some of selected parameters having a bearing on the production performance of the refineries of IOC are discussed below:

(a) Fuel consumption and fuel loss

The table below indicates the fuel and loss percentage of the refineries from 1990-91 to 1994-95 as compared to OPC/OCRC/OEB norms:-

| Year    | Crude throughput     | Fuel & Loss | Percentage of norms (as fixed by OPC/OCRC/OEB) | Percentage of actual fuel & loss to Crude Throughput |
|---------|----------------------|-------------|------------------------------------------------|------------------------------------------------------|
|         | (In thousand tonnes) |             |                                                |                                                      |
| 1990-91 | 23743                | 1491.6      | 6.77                                           | 6.28                                                 |
| 1991-92 | 24295                | 1417.11     | 6.73                                           | 5.83                                                 |
| 1992-93 | 24313                | 1410.73     | 6.84                                           | 5.80                                                 |
| 1993-94 | 24745                | 1500.33     | 6.85                                           | 6.06                                                 |
| 1994-95 | 25163                | 1656.81     | 7.27                                           | 6.58                                                 |

Though the fuel and loss was within the norms fixed, the energy consumption plus hydrocarbon loss was higher than the industry average during 1990-91 & 1994-95 as indicated below:

|                  | 1990-91 | 1991-92 | 1992-93 | (In MBTU/BBL/NRGF) |         |
|------------------|---------|---------|---------|--------------------|---------|
|                  |         |         |         | 1993-94            | 1994-95 |
| Guwahati         | 206.2   | 186.5   | 165.8   | 153.0              | 145.0   |
| Barauni          | 185.7   | 180.0   | 172.4   | 174.7              | 161.7   |
| Gujarat          | 158.4   | 136.0   | 132.3   | 143.0              | 168.5   |
| Haldia           | 129.2   | 126.2   | 118.6   | 115.5              | 113.0   |
| Mathura          | 146.5   | 142.8   | 148.6   | 140.7              | 123.7   |
| Digboi           | 251.6   | 260.7   | 264.7   | 256.8              | 252.9   |
| Overall IOC      | 158.1   | 145.9   | 144.0   | 143.9              | 148.5   |
| Industry average | 155.1   | 151.9   | 145.7   | 147.8              | 145.4   |

During its meeting with the Audit Board, the Management stated (October 1994) that the consumption of fuel gas was on the higher side due to the installation of captive thermal plants in various secondary units which were not very fuel efficient. It further stated (December, 1994) that energy consumption plus hydrocarbon loss performance in IOC refineries in terms of MBTU/BBL/NRGF came down due to



effective managerial control of operations and implementation of various energy conservation and loss reduction schemes. However, during the Audit Board meeting held in November, 1995, the Ministry confirmed that both fuel consumption and fuel loss in refineries of IOC were on the higher side.

(b) Consumption of chemicals and catalysts

No norms have been fixed by the IOC with regard to consumption of chemicals and catalysts in the refineries. An analysis of the consumption of chemicals, catalysts, etc. revealed that there was excess consumption of major chemicals and catalysts in the refineries, amounting to Rs. 6618.28 lakhs, calculated on the basis of the least quantity consumed in any year during the period from 1990-91 to 1994-95 as indicated below:

| Refinery | Catalysts/Name of Chemical | (Rs. in lakhs) |              |
|----------|----------------------------|----------------|--------------|
|          |                            | Amount         | Total Amount |
| Mathura  | (a)Catalysts               | 752.40         | 1427.67      |
|          | (b)TEL                     | 675.27         |              |
| Gujarat  | (a)Catalysts               | 204.99         | 1331.40      |
|          | (b)TEL                     | 1126.41        |              |
| Guwahati | (a)TEL                     | 129.08         | 347.01       |
|          | (b)IPN (Cetane improver)   | 217.93         |              |
|          | DII                        |                |              |
| Barauni  | (a)TEL                     | 1054.39        | 1801.36      |
|          | (b)IPN (Cetane improver)   | 746.97         |              |
|          | DII                        |                |              |
| Haldia   | (a)TEL                     | 497.85         | 1710.84      |
|          | (b)MEK (SDU)               | 283.20         |              |
|          | (c)Toluene(SDU)            | 69.35          |              |
|          | (d)Furfural (FFU)          | 860.44         |              |
| Total    |                            |                | 6618.28      |

The Ministry stated (October, 1995) that it had been monitoring this aspect and that the consumption pattern of almost all the major chemicals showed a downward trend over the years. It, however, did not state why no norms had been fixed to monitor whether there was efficient utilisation of chemicals/catalysts.

(c) Process Interruptions

Process interruptions are generally caused due to non-availability of feed, ullage, industrial relations, equipment failure, power and utility failure, etc. and the production capacities have been determined at the design stage after giving reasonable allowances for these factors. The table at Annexure-II indicates the downtime considered adequate at the design stage and the actual that occurred during the five years ended 31 March 1995 at the refineries.

It would be seen that there was excessive downtime, the excess ranging upto 343 days in a year in the refineries during the years mentioned below:

| <u>Refinery</u> | <u>Unit</u>   | <u>Year</u>                  |
|-----------------|---------------|------------------------------|
| 1. Guwahati     | Coker         | All the years                |
| 2. Barauni      | All the units | All the years                |
| 3. Gujarat      | AU I          | 1990-91, 1991-92 & 1993-94   |
|                 | AU-II         | 1993-94                      |
|                 | AU-III        | 1991-92 and 1993-94          |
|                 | AU-IV         | 1992-93 to 1994-95           |
|                 | FCCU          | 1991-92 to 1994-95           |
| 4. Haldia       | CDU           | 1990-91, 1993-94 and 1994-95 |
|                 | VDU           | 1992-93 to 1994-95           |
|                 | PDA           | All the years                |
|                 | SDU           | 1990-91, 1993-94 and 1994-95 |
| 5. Mathura      | CDU           | 1990-91 & 1992-93            |
|                 | VDU           | 1990-91 & 1992-93            |
|                 | FCCU          | All the years                |
| 6. Digboi       | CDU-I         | 1990-91 and 1994-95          |
|                 | CDU-II        | 1991-92 & 1992-93            |
|                 | KTU           | All the years                |

The total down time in excess of that projected worked out to 4,061.74 days during 1990-91 to 1994-95.

The Ministry stated (October 1995) that the downtime of process units at design stage considered only that which was required for carrying out the scheduled shutdown, and that exigencies like non-availability of crude/feed, product ullage constraint, industrial relations and extreme weather conditions etc. were not considered.

Non-availability of crude/feed, product ullage constraint and industrial relations are controllable factors and should, therefore, be suitably considered to minimise downtime in subsequent years.

## CHAPTER 9

### REFINERY PROJECTS AND THEIR IMPLEMENTATION

One of the stated objectives of the IOC is to endeavour to complete all planned projects within the stipulated time and cost. However, there had been time over-runs in all the refineries of IOC set up so far and cost over-runs in three refineries as indicated below:

| Sl. No. | Name of the Refinery | Annual Capacity (Th.TPA) | Schedule date of completion                       | Actual date of completion | Time over-run (months) | Estimated cost as per DPR | Actual cost (Rs.in crores) | Cost over-run |
|---------|----------------------|--------------------------|---------------------------------------------------|---------------------------|------------------------|---------------------------|----------------------------|---------------|
| 1.      | Mathura              | 7500                     | December 1979                                     | December 1981             | 24                     | 192.32                    | 251.62                     | 59.30         |
| 2.      | Haldia               | 2750                     | September 1972 (Fuel Sector)                      | January 1975              | 27                     | 46.00                     | 83.87                      | 37.87         |
|         |                      |                          | October, 1972 (Lube Sector)                       | Ist Quarter of 1977       | 51                     |                           |                            |               |
| 3.      | Gujarat              | 9500                     | Middle of 1965 (Say June 1965)                    | June 1966                 | 12                     | 27.78                     | 26.26                      | ---           |
| 4.      | Barauni              | 3300                     | First part of 1968 upto AVU (III) (say June 1968) | January 1969              | 7                      | 38.21                     | 46.33                      | 8.12          |
| 5.      | Guwahati             | 850                      | October 1961 (DPR)                                | December 1961             | 2                      | 16.42                     | 15.99                      | ----          |

The four refineries namely Barauni, Gujarat, Guwahati and Haldia were discussed in the Audit Report(Commercial) 1969-70 of the Comptroller and Auditor General of India. Based on the Audit Report, the COPU in its fifty second report(1973-74) had observed as under with regard to Haldia refinery:

The Committee found that as per the original time schedule proposed in August, 1967, the main refinery was expected to be completed by the second half of 1970 and the Lube Oil Units by early 1971. The construction schedules had been revised several times and it was expected that the fuel part of the refinery would be completed by the middle of 1974 and the lube part of it by the end of 1974. The Committee regretted to note that the construction of the Haldia refinery had been delayed by about 4 years.



The Committee further observed that any further delay in the construction and commissioning of the refinery would only accentuate the oil crisis in the country. Despite the above observations of the COPU, the fuel part of the refinery was commissioned in January, 1975 and the lube part of it in the first part of 1977.

The Ministry stated (October, 1995) that the projects commented upon by the Audit were all executed long time back and hence the causes of time overrun could not be indicated and that project monitoring and reviewing had been given a thrust during recent years and the endeavour of the Company would be to complete the projects in time and within the approved cost.

9.1 The projects undertaken by the company from 1989-90 and completed/on going upto March 1995 are given in Annexure-III. It is evident therefrom that none of the four projects was completed in time within the original approved cost. The points noticed during review of the individual projects are given in the succeeding paragraphs.

#### 9.2.1 New Projects

##### (i) **Panipat Refinery Project**

An Expert Committee constituted (March, 1979) by Government of India recommended (April, 1980) setting up of two grass-root refineries of 3.00 MMTPA and 6.00 MMTPA capacity, to be operative by 1985-86, in the North West Region and West Coast respectively. It was decided (September, 1981) that the refinery in the North West should also be of 6.00 MMTPA capacity, and for this the Site Selection Committee constituted (August, 1980) by Government of India recommended (February, 1981) a site near village Baholi in the Karnal District. IOC submitted (December 1982) a Feasibility Report and the Government approved (September, 1984), setting up of a refinery at Karnal of 6.00 MMTPA with Hydrocracker Unit of 1.7 MMTPA at a total cost of Rs. 1144.20 crores (inclusive of foreign exchange component of Rs. 185.25 crores and marketing facilities of Rs. 100 crores approximately) based on March, 1984 prices with completion schedule of 5 years from the date of approval i.e. by September, 1989.

- On receipt of Government approval, IOC engaged Engineers India Ltd. (EIL) as the prime consultant for the implementation of the project.

The job of designing of the thermal power station and fabrication of Atmospheric and Vacuum columns was awarded to M/S Bharat Heavy Electricals Limited (BHEL) and M/S Bharat Heavy Plates and Vessels Limited (BHPVL) in

February 1985. Advances of Rs. 1.0 crore and Rs. 35 lakhs respectively were paid to them in February 1985. However, in October, 1985 IOC informed BHEL and BHPVL not to proceed with any activity on these works as Government had decided to set up the refinery as a joint venture. The refund of the advances was obtained in August 1989 and July 1991 respectively after incurring cancellation charges of Rs. 14.57 lakhs and Rs. 3.50 lakhs respectively. In addition to these cancellation charges, IOC suffered a loss of interest of Rs. 123.45 lakhs (Rs. 82.50 lakhs and Rs. 40.95 lakhs respectively), on the advances that remained with the suppliers from February, 1985/January, 1985 to October, 1989/July, 1991.

Though it was decided to set up the refinery as a Joint venture in October, 1985, it took the Government over one and half year to select (April 1987) Tata Chemicals Limited (TCL) as co-promotor of the Joint Venture Company. A Memorandum of Understanding was signed in May 1987 between IOC, TCL and Government of India for forming a Joint Venture Company to implement the project. In November 1987, an agreement was signed between the Government of India and the Government of USSR according to which USSR credit was also offered for the construction of the refinery. However work could not be started as neither of the offers of USSR, the one based on technical assistance and the other on turn-key basis was found to be economically viable.

A detailed project report (DPR) estimating the cost of the project at Rs. 1400 crores (including foreign exchange component of Rs. 450.50 crores) prepared by IOC and TCL was submitted in May 1988 with a schedule of mechanical completion within 60 months of receiving Government approval. The Government, however, directed (September 1988) the joint sector Company to consider inter alia, the extent of Russian assistance for the project that could be used. This was despite the fact that the refinery based on USSR assistance had been found to be not economically viable. In the first quarter of 1989 the Government again advised the Joint Venture Company to proceed on the basis of Russian Technical Assistance offer. However, as TCL had reservations in accepting this offer, IOC was directed (October 1990) to proceed with the implementation of the Karnal refinery project without the participation of TCL. The revised detailed feasibility report was submitted in May 1991 with estimated cost of Rs. 1876.80 crores (including foreign exchange component of Rs. 170.60 crores) on the basis of October 1990 prices. The estimate was revised and the Government approved (October 1992) the project at an estimated cost of Rs. 2793.97 crores (including foreign exchange component of Rs. 295.97 crores) on March 1992 price basis with a provision that the entire funding of the project be done from the internal resources of IOC. The project was re-named as Panipat Refinery and was scheduled for



mechanical completion within 54 months from the date of Government approval i.e. by March 1997. The actual expenditure incurred on the project up to September, 1995 was Rs. 714 crores while the committed expenditure was Rs. 1766 crores. The physical progress achieved up to September, 1995 was stated to be 47.8 %.

Thus the delay on the part of the Government, first in taking 18 months to select TCL as the co-promoter and then in approving (October, 1992) the DPR submitted to them in May, 1988 resulted in increase in the estimated cost of the refinery from Rs. 1044.20 crores (March 1984 price basis) to Rs. 2793.97 crores (March 1992 price basis) i.e. an increase of Rs. 1749.77 crores. The various components of the increased cost are as under:

|                                                       | (Rs. in crores) |
|-------------------------------------------------------|-----------------|
| a. Escalation in prices from March 1984 to March 1992 | 994.01          |
| b. Change in taxes & duties                           | 259.60          |
| c. Variation in foreign exchange rate                 | 181.55          |
| d. Change in scope of work                            | 133.70          |
| e. Increase in financing charges                      | 180.91          |
|                                                       | -----           |
| Total                                                 | 1749.77         |
|                                                       | -----           |

The Ministry stated (October 1995) that the delay in execution of Panipat Refinery project was mainly on account of resource constraints during the Seventh Plan, the long time taken for negotiating with USSR for financial and technical tie-up and the prolonged negotiations with TCL on the issue of terms and conditions as co-promoter under Joint-Venture.

#### (ii) Gujarat Hydrocracker Project (GHP)

The Company submitted (May, 1985) a proposal to the Government of India for setting up of a Hydrocracker Unit of 1.2 MMTPA capacity mainly to upgrade the residue (Reduced Crude Oil) that would be obtained with the increased processing of North Gujarat Crude by Gujarat Refinery. Subsequently, at the instance of the Pollution Control Board, a Sulphur Recovery Unit was added.



The estimated cost of the project as per Feasibility Report (1985) was Rs.553 crores (including a foreign exchange component of Rs.105.70 crores). Subsequently, with inclusion of the Sulphur Recovery Unit the cost was revised to Rs.635 crores (foreign exchange component of Rs. 121.58 crores) based on December, 1985 prices, which the Government of India approved in February, 1987, stipulating completion by February, 1992 and commissioning within 3 months thereafter.

The approved cost of Rs.635 crores was again revised to Rs.757.24 crores (including foreign exchange component of Rs.66.12 crores) in August 1992 based on September, 1990 prices with the rescheduled commissioning to February,1993.

However, the Hydrocracker project was made fully operational at a cost of Rs.717.68 crores from January, 1994 with a time overrun of 24 months against the original schedule (11 months against the revised schedule) with a cost overrun of Rs.168.68 crores against the original estimate.

The main reasons for delay were as under;

- i) delay in approval by the Government for selection of Process Licensor,
- ii) late delivery of reformer tubes,
- iii) late receipt of piping materials and instruments,
- iv) change in design of power plant from IC Engine to Gas Turbine,
- v) unassessed delay in completion of piping work in Hydrocracker Unit by the contractors, and
- vi) rupturing of catalyst tube while loading the catalyst in the Hydrogen Unit in July, 1993.

Thus, there was significant time overrun due to delays in approval and non-synchronisation of procurement of certain materials. It was seen in audit that the work regarding SS heavy wall piping job was off-loaded from one contractor to another contractor at an extra cost of Rs.27.70 lakhs (not recovered from the earlier contractor). Additional payments of Rs. 13.26 lakhs were to be made to another contractor on similar grounds.

The Management stated (July, 1994) that as work materials were not made available to the contractor in time, he refused to undertake the work. Nevertheless, this indicates the failure to synchronise different activities of the project.

It was also noticed that during the commissioning of the hydrogen unit in July 1993, one catalyst tube got ruptured, delaying the commissioning. Further, 23 m<sup>3</sup> of catalyst got irretrievably damaged. The total cost of replacement of the tube and catalyst was Rs.135.72 lakhs. The claim for recovery from the Insurance company was pending (September, 1995).

The Feed Preparation Unit (FPU) of Gujarat Hydrocracker Project was commissioned in March 1993. The Hydrocracker Unit (HCU) was commissioned in November, 1993 and its full operations commenced in January 1994. The capacity utilisation of HCU during 1993-94 and 1994-95 was 56 and 59.6 per cent respectively and that of FPU was 58.9 and 74.6 per cent respectively.

The Ministry stated (October 1995) that due to nonavailability of North Gujarat Crude to the desired extent, efforts were being made to saturate GHP capacity with feed stock from imported stock.

### **9.2.2 Expansion Schemes**

- (i) Efficiency improvement of Atmospheric and Vacuum Distillation Unit Heaters(Mathura refinery)

The existing Natural Draft Cabin type heaters in AVU were based on the Russian design and operated at a thermal efficiency of 70-75% resulting in high fuel consumption. A proposal for improving the efficiency of the heaters to 90% was approved (February, 1985) by the Board of Directors at an estimated cost of Rs. 9.30 crores (inclusive of foreign exchange component of Rs. 1.30 crores) for completion in 30 months i.e. by August, 1987 (subsequently extended to March 1988). The project was commissioned in August 1988 at a cost of Rs. 8.62 crores. It was estimated that with the commissioning of this project there would be a fuel saving of 17,500 tonnes per annum. However the fuel saving achieved was only 12,400 tonnes.

The Ministry stated (October, 1995) that further revamp for full benefit was under study.

- (ii) Efficiency Improvement of Atmospheric Unit Heaters (Gujarat refinery)



As part of the energy saving programme, Heat Exchanger trains in Atmospheric Units I, II & III were modified. It was estimated that these modifications would result in fuel saving as given below :

|        | <b>Anticipated fuel saving<br/>(in tonnes)</b> |
|--------|------------------------------------------------|
| AU-I   | 6600                                           |
| AU-II  | 11000                                          |
| AU-III | 13350                                          |

However, after the modifications of Heat Exchanger trains in Atmospheric Units I, II & III at the cost of Rs. 732.85 lakhs, the refinery had not achieved the fuel saving anticipated. Rather the position deteriorated .

Prior to revamping, the percentage of liquid loss was 0.81% of crude throughput (1986-87). It was noticed that after revamping the liquid loss was higher during 1987-1991 and 1993-95 when it ranged between 1.02 and 1.50.

Thus, not only had the refinery not achieved the fuel saving but that there was also increase in liquid loss to the tune of Rs. 6275 lakhs based on average cost of crude during the relevant years.

The Ministry stated (October, 1995) that rise in BS&W (Basic Sediments and Water) of Gujrat crude contributed to the higher fuel and loss.

Elaborating on the problem of BS&W associated with North and South Gujarat, the Ministry informed the Audit Board in November 1995 that the quality of North Gujarat Crude had improved. It, however, added that under the present system of Administered Pricing Mechanism, there was no incentive for the oil producing Companies to produce better quality crude as price of crude was not linked to its quality.

(iii) Replacement of Fired Heaters in AVUs- I & II :(Barauni refinery)

The refinery decided (1982) to replace the existing outdated fired heaters by new high efficiency heaters for crude and vacuum service in each of AVU - I and AVU - II units at an estimated cost of Rs. 9.86 crores. The new crude & vacuum heaters were to have a thermal efficiency of 90% and 88.7% against 72% and 66% respectively of the existing ones. It was further envisaged that due to this replacement



the total saving in fuel would be 15,600 tonnes per year (345 onstream days) estimated at Rs. 274.56 lakhs per year. The project was completed in August, 1987 against the scheduled date of October 1986 .

The savings in fuel (direct & indirect) were also much less than projected as shown below:-

|                                     | Envisaged     | 90-91        | 91-92        | 92-93        | 93-94        | 94-95        |
|-------------------------------------|---------------|--------------|--------------|--------------|--------------|--------------|
| a) Direct fuel saving (MT)/year     | 12,430        | 8221         | 10588        | 10863        | 10580        | 10128        |
| b) Indirect fuel saving (MT) / year | 3,186         | 2186         | 2617         | 2686         | 2615         | 2520         |
| <b>TOTAL</b>                        | <b>15,616</b> | <b>10407</b> | <b>13205</b> | <b>13549</b> | <b>13195</b> | <b>12648</b> |

Thus the full benefit of the investment as envisaged has not accrued to the refinery as yet. The Management stated (July 1993) that the savings in fuel have been lower due to lower throughput (2.19 MMTPA as against the base figure of 2.3 MMTPA). In this connection it may be mentioned that the envisaged savings based on the actual throughput had been less than projected in all the years resulting in loss of savings to the extent of 9231 MT of fuel (valued at Rs. 120.46 lakhs) from 1990-91 to 1994-95 .

The Ministry stated (October 1995) that due to operational requirements, some of the crude was also processed through AVU-III, where the furnace efficiency was low, resulting in overall lower benefit than envisaged.

**(iv) Augmentation of Slack Wax Project: (Barauni refinery)**

To meet the increased demand for slack Wax in the small scale industrial sector in the country, the Company decided (July 1986) to augment production of slack wax from the existing 3000 tonnes to 5000 tonnes per month.

The cost of the project was estimated at Rs. 665 lakhs and it was scheduled to be completed within 36 months from the date of approval i.e. August 1989. Both the cost and the completion date were subsequently revised to Rs. 1270 lakhs and August 1991 respectively. The Project was commissioned in January, 1992 at a cost of Rs. 1144.12 lakhs. Despite the commissioning of the project in January 1992, commercial production had not yet started (September, 1995).

According to the Management (July 1993) the anticipation of the Refinery that the Small Scale manufactures would be in a position to produce paraffin wax type I &

II by upgrading their facilities did not come true. Hence the demand for Slack Wax did not exceed 3000 MT per month

Thus the decision to augment the facility was taken without assessing the marketability of the product and the investment had been unproductive so far.

In the Audit Board meeting held in November 1995, the Ministry stated that there was no sophisticated machinery with the small scale industries to process the Slack Wax into paraffin wax and therefore, it was decided to set up the facility for production of paraffin wax which was a value added product.

### **9.2.3 Modernisation/Modification of existing facilities**

#### **(i) Heavy Naphtha Facilities in AVU I & II and AU III\* : (Barauni refinery)**

As there was a surplus of naphtha and deficit of HSD in the country, the Board of Directors approved (September 1983) a proposal for modification of AVU I & II for producing 103500 MTPA of HSD in lieu of 86250 MTPA of naphtha and 17250 MTPA of LSHS. It was estimated that the capital cost of the modifications would be Rs. 284 lakhs and would yield a net return of Rs. 290.54 lakhs per year. The modifications were completed at a cost of Rs. 175.77 lakhs in August 1987 against the scheduled date of September 1985.

The Board had also approved (March 1983) another modification in Atmospheric Unit (AU)-III for production of 21,000 MTPA of HSD in lieu of 16,000 MTPA of naphtha and 5,000 MTPA of LSHS, at a cost of Rs. 77 lakhs against which a net return of Rs. 75.88 lakhs per year was anticipated. The modification was completed at a cost of Rs. 53.38 lakhs in August 1986 against the scheduled date of March 1984.

An analysis of the actual costs, which were substantially lower than those estimated (AVU I & II by Rs. 108.23 lakhs and AU III by Rs. 23.62 lakhs), in spite of delay indicates that the estimation in both the cases was on an unrealistic basis.

The net return which was estimated at Rs. 290.54 lakhs for AVU-I & II and Rs. 75.88 lakhs per year for AU-III could not be achieved as the facilities created remained inoperative due to low availability of crude and higher demand for Motor Spirit (petrol). Thus the very purpose of the investment of Rs. 229.15 lakhs (Rs. 175.77 lakhs for AVU- I & II and Rs. 53.38 lakhs for AU - III) was defeated.



Heavy Naphtha production and its blending in HSD started in AVU - II from 6 February 1992.

(ii) Revamping/Modernisation of LPG bottling plant (Haldia refinery)

To overcome the deficiencies in operational safety, a proposal for modernisation of the LPG Bottling Plant was approved (November, 1989) at an estimated cost of Rs.306.13 lakhs.

The revamped plant was commissioned in October, 1991 against the scheduled date of completion of May 1991, at a cost of Rs. 166.11 lakhs. However, the Company could utilize only 65.7%, 75.1% and 79.58% of its capacity in 1992-93, 1993-94 and 1994-95 respectively. Under utilisation of the revamped plant capacity has resulted in a financial loss of Rs. 101.23 lakhs in terms of recovery rate differential for the packed and bulk LPG.

As regards under utilisation, the Management stated (August, 1993) that under the pricing mechanism under recovery on account of lower filling in cylinders was adjustable in the pool mechanism, and thus there was no loss to the Company.

The Management's reply is not tenable as under utilisation of the facilities installed in the Refinery resulted in loss to the country.

(iii) Revamping of Lube Oil Block (Haldia Refinery)

Haldia Lube Oil Block was designed to produce 2,00,000 MTPA of Lube Oil Base Stocks (LOBS) comprising of 1,20,000 MTPA of HVI (High Viscosity Index) grade and 80,000 MTPA of LVI (Low Viscosity Index) grade. However, since commissioning, only HVI grade had been produced due to non-availability of designed crude, low demand of LVI grade and operating constraints in the Solvent De-waxing Unit (SDU).

It was estimated that the revamping of the Lube Oil Block would increase the LOBS production to 2,22,000 MTPA (2,10,000 MTPA HVI grade and 12,000 MTPA LVI grade). A proposal for revamping in VDU, PEU and SDU at a cost of Rs.1411 lakhs was submitted by EIL but was deferred due to paucity of funds. Instead a low cost revamp, which envisaged increase in LOBS (HVI) production by about 26000



MTPA, was approved (October, 1986) by the Board at a cost of Rs. 585 Lakhs for completion within 36 months.

The project was commissioned in April, 1990 at a cost of Rs. 616.77 lakhs. However, the projected increase in production of LOBS (26000 MTPA) was achieved only during 1992-93.

A Feasibility Report for full scale Revamp of Lube Oil Block (for production of 60,000 MTPA of additional LOBS) was submitted to the Government in July, 1988. The estimated cost of the project was Rs. 2650 lakhs with the period of completion as 36 months.

The project was taken up in 1991-92 and the project cost was revised (January, 1992) to Rs. 4800 lakhs against which Rs. 4996.90 lakhs had been spent upto September, 1995. The increase in Revised Cost Estimate over that in the Feasibility Report (1988) was due to price escalation (Rs. 859 lakhs), change in tax & duties (Rs. 269 lakhs), abnormal market condition (Rs. 292 lakhs), financial cost on account of World Bank Loan (Rs. 149 lakhs), foreign exchange rate variation (Rs. 135 lakhs), under provision /savings (Rs. 146 lakhs) and change in scope of work (Rs. 250 lakhs).

The total cost of revamping of Lube Oil Block would thus, come to Rs. 5613.67 lakhs (including low cost revamp of Rs. 616.77 lakhs) comprising Rs. 4321 lakhs for the plant and machinery alone against Rs.1411 lakhs estimated by EIL in 1985-86. Thus, due to delay in taking up the project the cost of the plant and machinery increased by more than 300% and the Company could not get additional quantity of LOBS till April 1994.

The Ministry stated (October 1995) that while carrying out the detailed engineering and development of process package for full scale revamp, scope of the work had to be extended with the inclusion of additional Heat Exchangers, pump, inert gas generator, vacuum elector system, electrical system etc. Further, the cost also includes off-site facilities covering 6 additional storage tanks for inter-mediate/finished products and process piping to handle the increased production levels. Investment for the above were not included in the EIL's preliminary cost of Rs.1411 lakhs.

## CHAPTER 10

### PHYSICAL PERFORMANCE AND CAPACITY UTILISATION OF PIPELINES

10.1 The table below indicates the installed capacity, target fixed, actual throughput and percentage utilisation of the pipelines for the five years ended 31 March 1995.

| Year    | (Quantity in Th. MT)          |            |                   |                               |                                             |
|---------|-------------------------------|------------|-------------------|-------------------------------|---------------------------------------------|
|         | Installed capacity at the end | SPM Target | Actual Throughput | Percentage utilisation of (2) | Percentage achieved with ref. to SPM Target |
| 1990-91 | 19798                         | 21021      | 20896             | 105.55%                       | 99.405%                                     |
| 1991-92 | 21798                         | 22438      | 22056             | 101.18%                       | 98.30%                                      |
| 1992-93 | 21798                         | 22872      | 23156             | 106.23%                       | 101.24%                                     |
| 1993-94 | 21798                         | 23918      | 23659             | 108.53%                       | 98.92%                                      |
| 1994-95 | 21798                         | 24702      | 24018             | 110.18%                       | 97.23%                                      |

The Supply Plan Meeting (SPM) targets could not be achieved except in 1992-93. The pipeline-wise targets and actual throughput indicated at Annexure IV reveal that the following pipelines could not achieve the SPM targets during the years mentioned:

|       |                                       |
|-------|---------------------------------------|
| GSPL  | 1990-91, 1991-92 and 1993-94          |
| BKPL  | 1990-91, 1991-92, 1993-94 and 1994-95 |
| HBPL  | 1991-92, 1992-93, 1993-94 and 1994-95 |
| MJPL  | All the years                         |
| SMPL  | 1991-92 and 1993-94                   |
| KAPL  | 1993-94 and 1994-95                   |
| HMRPL | 1994-95                               |

The non-achievement of targets was attributed mainly to the following :-

|       |                                                  |
|-------|--------------------------------------------------|
| GSPL  | Ullage problem and non availability of products. |
| BKPL  | Non availability of products.                    |
| HBPL  | Ullage problem                                   |
| MJPL  | Non availability of products and ullage problem  |
| SMPL  | Ullage problem                                   |
| HMRPL | Ullage problem                                   |

10.2 The achievement in respect of total quantity of product transported was reported to be more than 100 percent of the installed capacity fixed on the basis of 8000 hours working per annum. The actual number of hours worked were, however, more than 8000 hours. An analysis in audit revealed that the transportation capacity per hour (flow rate worked out on the basis of capacity installed divided by 8000) was not achieved in respect of GSPL (during 1990-91 and 1991-92), BKPL (all the years except

1991-92) and MJPL (all the years except 1994-95) from 1990-91 to 1994-95 as shown below:

|       | Installed capacity<br>per hour (MT) | Actual transportation per hour (MT) |         |         |         |         |
|-------|-------------------------------------|-------------------------------------|---------|---------|---------|---------|
|       |                                     | 1990-91                             | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| GSPL  | 102.25                              | 98.00                               | 95.00   | 104.86  | 120.67  | 129.75  |
| KAPL  | 137.50                              | 145.00                              | 145.10  | 155.40  | 173.34  | 179.88  |
| BKPL  | 225.00                              | 223.50                              | 225.30  | 224.42  | 219.60  | 228.75  |
| MJPL  | 462.50                              | 449.10                              | 447.90  | 450.40  | 452.40  | 516.50  |
| HBPL  | 141.25                              | 161.00                              | 164.66  | 176.24  | 178.70  | 185.13  |
| HMRPL | 156.25                              | 195.40                              | 201.40  | 197.65  | 199.80  | 208.25  |

(uprated capacity-192.5)

The Ministry confirmed (October,1995) that the pipelines had operated below the design capacity for want of product or ullage in each year in case of GSPL. In the case of MJPL, the design capacity was achievable with delivery pattern of 40% at Delhi, 24% at Ambala and 36% at Jalandhar. In actual practice the delivery pattern varied depending upon the demand at various locations and logistics requirements. In the case of HBPL, it stated that the operation depended upon the products requirement at BKPL feed areas, products availability ex-Barauni and ullage available at Barauni.



## CHAPTER 11

### OPERATIONAL EFFICIENCY OF PIPELINES

#### 11.1 Freight Recovery

The cost of transportation of the products and crude by the pipelines during the five years ended 31 March 1995 worked out as under:

|                                               | 1990-91 | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
|-----------------------------------------------|---------|---------|---------|---------|---------|
| 1. Total throughput in lakhs MTs              | 208.96  | 220.56  | 231.56  | 236.58  | 240.18  |
| 2. Length of pipeline (in Kms.)               | 3745    | 3745    | 3745    | 3745    | 3745    |
| 3. Throughput per KM of pipeline (in MTs.)    | 5579.71 | 5889.45 | 6183.18 | 6317.22 | 6413.35 |
| 4. Total operating cost (Rs. in lakhs)        | 7132    | 7624    | 8841    | 10065   | 12163   |
| 5. Cost of Transportation per MT (Rs.)        | 34.13   | 34.57   | 38.18   | 42.54   | 50.64   |
| 6. Cost of transportation per MT per KM (Rs.) | 0.009   | 0.009   | 0.010   | 0.011   | 0.014   |
| 7. Total freight recovered (Rs. in lakhs)     | 13680   | 14193   | 12657   | 12168   | 12427   |
| 8. Freight recovered per MT (Rs.)             | 65.47   | 64.35   | 54.66   | 51.43   | 51.74   |

It may be seen that:-

(i) The cost of transportation per MT increased from Rs. 34.13 in 1990-91 to Rs. 50.64 in 1994-95.

(ii) The freight recovered per MT of throughput decreased from Rs. 65.47 in 1990-91 to Rs. 51.74 per MT in 1994-95 despite increase in throughput by 31.22 lakh MTs during this period.

• The Ministry stated (October, 1995) that the reasons for decrease in the freight recovery was on account of revision in the parameters of standard throughput from 80% of installed capacity to 100% of the installed capacity with retrospective effect during cost updation.

## 11.2 Pipeline Transportation Loss

The table below indicates pipeline-wise loss/gain suffered/achieved as a percentage of the total quantity of product transported during the five years ended 31 March 1995.

|       | 1990-91   | 1991-92  | 1992-93   | 1993-94   | 1994-95 |
|-------|-----------|----------|-----------|-----------|---------|
| GSPL  | (+).03894 | (+).0383 | (+).00802 | (-).0769  | (-).055 |
| KAPL  | (+).02984 | (+).006  | (-).002   | (+).004   | (+).005 |
| HBKPL | (-).1188  | (-).0495 | (-).0412  | (-).0206  | (-).028 |
| HMRB  | (-).0752  | (-).0685 | (+).0075  | (+).0046  | (+).009 |
| MJPL  | (-).0184  | (-).0173 | (-).0172  | (-).01615 | (-).016 |
| SMPL  | (+).0206  | (+).004  | (-).0014  | (-).2     | (-).051 |

It may be seen that there were losses in the pipelines during the years given below:

|        |                            |
|--------|----------------------------|
| GSPL   | during 1993-94 & 1994-95,  |
| KAPL   | during 1992-93             |
| HBKPL  | all the years              |
| HMRBPL | during 1990-91 & 1991-92   |
| MJPL   | all the years              |
| SMPL   | during 1992-93 to 1994-95. |

IOC had not analysed the reasons for the losses.

The Ministry stated (October, 1995) that the losses occur due to variation in density within the permissible limits. However, no data with regard to variation based on density of products transported was furnished. As there were losses in some years and gains in other years in certain pipelines, the reasons for the same should have been analysed.

## CHAPTER 12

### PIPELINE PROJECTS AND THEIR IMPLEMENTATION

12.1 As already stated in Para 1.2, IOC had 7 pipelines as on 31 March 1995. The year of completion and the actual cost incurred on each of these pipelines is indicated below:

| Sl. No. | Name of the Pipelines      | Cost<br>(Rs. in crores) | Month of completion                         |
|---------|----------------------------|-------------------------|---------------------------------------------|
| 1.      | Guwahati Siliguri          | 8.47                    | October, 1964                               |
| 2.      | Koyali Ahmedabad           | 2.72                    | April, 1966<br>(Transferred to IOC in 1970) |
| 3.      | Haldia Barauni )           | 15.81                   | February, 1974                              |
| 4.      | Haldia-Maurigram-Rajbandh) |                         |                                             |
| 5.      | Barauni-Kanpur             | 14.50                   | September, 1966                             |
| 6.      | Salaya-Mathura             | 226.85                  | March, 1981                                 |
| 7.      | Mathura-Jalandhar          | 51.72                   | December, 1982                              |

The cost over run and time over run in the latest two pipelines completed in 1981 and 1982 was as under:

| Sl.no. | Name of project                   | Estimated cost  | Actual cost | Cost over run | Scheduled date of completion | Actual date of completion | Time over run |
|--------|-----------------------------------|-----------------|-------------|---------------|------------------------------|---------------------------|---------------|
|        |                                   | (Rs. in crores) |             |               |                              |                           |               |
| 1.     | Salaya-Mathura pipeline           | 119.90          | 226.85      | 106.95        | April 1980                   | March 1981                | 11 months     |
| 2.     | Mathura-Jalandhar Pipeline (MJPL) | 35.32           | 51.72       | 16.40         | April 1982                   | December 1982             | 8 months      |

The Ministry stated (October, 1995) that the time overruns were due to synchronisation with the commissioning of Mathura Refinery (completed in December, 1981).

After December 1982, no pipeline project was undertaken in the eighties. The next major product pipeline project was taken up only in the nineties i.e. the Kandla-Bhatinda Product Pipeline Project, which is discussed below:

### 12.2 Kandla-Bhatinda Product Pipeline

The Kandla-Bhatinda Product Pipeline (KBPL) project (pipeline length 1443 kms: Kandla to Karnal-1113 kms, Karnal to Bhatinda- 218 kms and branch line Kot to Salawas- 112 kms) was approved (August, 1990) by the Government of India at an



estimated cost of Rs.917.55 crores (including a foreign exchange component of Rs.204.5 crores) at March 1990 price level with completion schedule of 33 months. The estimate was revised from time to time and the latest estimated cost is Rs.2391.84 crores (including foreign exchange component of Rs.891.30 crores) on 10.8.1993 at March, 1993 price level with mechanical completion schedule of 21 months from the date of approval.

For implementation of the KBPL Project, global tenders had been invited (March 1991) for prequalification for Composite Works Contract(CWC) i.e. for laying of pipelines with other facilities, which was a part of the total Project work. Fifteen parties submitted their bids, out of which the IOC short listed four parties. On their being asked (March 1992) to submit their technical and price bids, only two parties, 'A' of Italy and 'B' of Czechoslovakia responded. Their technical and price bids were opened on 15 July 1992 and 30 October 1992 respectively.

'A' and 'B' quoted Rs.1310 crores and Rs. 1498 crores respectively against the approved estimates of Rs.302.98 crores for the work excluding branch line from Kot to Salawas (included in the total estimated cost of Rs. 917.55 crores).

On evaluation, the price offered by both the parties was considered high. The offer of 'A' was not considered further on the ground that it had taken a number of deviations in commercial as well as technical conditions and the other party 'B' was called for negotiations on 21-23 December 1992, when it reduced its price to Rs. 1280.63 crores. This negotiated price was 423% as compared to the cost estimates(Rs 302.98 crores ) included in the approved cost estimates of March 1990.

Meanwhile, the revised cost estimates of the total work went up to Rs.2214.67 crores (including foreign exchange component of Rs. 728.06 crores) at December 1992 prices. These estimates were further updated and approved by the Government in August 1993 for Rs.2391.84 crores (including foreign exchange component of Rs.891.30 crores) at March 1993 prices. The cost of CWC included in the approved estimates was Rs. 1259.10 crores.

Immediately after Government had approved the revised enhanced cost estimates, negotiations were again held on 13 and 17 August 1993 with 'B' which reduced its price to Rs.1199.70 crores and the negotiated price was accepted as it "matched" the provision of Rs.1259.10 crores approved by the Government in August, 1993.

The following are some of the important points noticed during audit:

- (i) The acceptance of the offer of 'B' was virtually on single tender basis. It was not on record why, when the offers had been considered to be high, the other party 'A' was not also called for negotiations. Further, it was noticed that after December, 1992 no negotiations were held with 'B' for further reduction in its prices. It was only in August, 1993 when the revised estimate was approved by Government, that 'B' was called for negotiations.
- ii) The Detailed Project Report (DPR) sent to the Government for approval alongwith the revised estimates, stated that as per data published in the 25th Anniversary issue of International Petroleum Encyclopaedia- 1992, the average onshore construction cost of the pipeline in the year 1991 was Rs.1.14 crores per km. of pipeline, against which the average construction cost of KBPL as per revised estimates was Rs.1 crore per km. and thus appeared to be in line with the current international pipeline construction costs. Since labour cost in India was substantially cheaper, such a comparison lacked justification.
- iii) DPR, giving reasons for increase in estimates, stated that in the March,1990 estimates the construction cost was assumed as Rs.38.59 per inch dia per metre (US \$ 2.25) for normal terrain on the basis of in-house data of construction cost of previous projects executed by applying simple escalation. In the revised estimates prepared in December,1992, this was, however, taken as US \$4.4 (Rs.132 approximately) per inch dia per metre based on the prevalent rates in the international market. There were no reasons on record for changing the basis of computation of the construction cost. It would have been more appropriate and the comparison would have been meaningful if the revised estimates had been prepared on the same basis as the original estimates and then the offer of 'B' considered. In this connection it is pertinent to note that a major portion of the pipeline laying work (over 80 %) was sub-contracted by 'B' to indigenous parties (para iv below).
- iv) During the discussions held with the World Bank in November,1992, the World Bank had also felt that the rates quoted were on the higher side and the line of action agreed to was that the offers would be negotiated and in the event of negotiations with 'B' not yielding the desired results, the work may be split between foreign and Indian parties and tenders re-invited. IOC, however, did not go in for re-tendering on the ground that the same needed extra time of about 12 months and would ultimately result



in delay in the completion of the Project. It was, however, seen that the Company took nearly 9 months from November, 1992 to August, 1993 to obtain Government approval. Thus, while on the one hand the project was delayed by about the same length of time, on the other the Company lost the advantage that might have accrued to it on re-tendering. It was further noticed that `B' had sub-contracted most of the work of laying pipelines (1155 kms.) allotted to it to indigenous parties and only 181 kms. i.e. 13.6% of the total work was carried out by it. IOC could have derived the advantage of contracting part of the work to indigenous parties directly had it re-tendered the work after splitting it between foreign and Indian parties.

The Ministry stated (October, 1995) that negotiations with the other party `A' were not held because it had taken a number of deviations from tender conditions and the same was considered non-responsive as per the guidelines of the World Bank. Regarding increase in the laying rates in the revised estimates as compared to those taken in the original estimates, it stated that there had been a lull in pipeline construction activities in India in the past decade except for gas pipeline of GAIL and so all indigenous pipeline construction contractors diverted their activities abroad and no experienced Indian contractors were readily available within India. Further, according to the Ministry coordination of all activities could be ensured by awarding the job to one party only.

The fact remains that out of two parties only one party was called for negotiations and the contract (CWC) was, therefore, awarded virtually on single tender basis as no comparison of the rates of different parties could be made. Further, the World Bank had also felt (November, 1992) that the rates quoted were on the higher side and had suggested splitting of the work between foreign and Indian parties and re-inviting of tenders. Regarding increase in the laying rates in the revised estimates due to change in the basis of computation of construction cost, the Ministry's reply is not tenable as it was known that the work would be done through Indian labour and as such adoption of international rates was not appropriate.

v) The Project was to be completed within 21 months from the date of issue of approval i.e. by May, 1995. The project has not been completed so far (November, 1995). The actual expenditure incurred upto 15 October, 1995 was Rs. 1286.43 crores against Rs. 2081.84 crores for pipeline portion and the likely date of completion is now stated to be the 1st quarter of 1996-97. The reasons for delay in completion of the project, according to the Management, were mainly attributable to the Composite Works contractor `B' whose performance was rated as poor in detailed design and



engineering, procurement of materials specially pipes and fittings and slow progress of mainline and station construction activities etc.

The Ministry admitted in the Audit Board meeting (November,1995) that the party 'B' was bad and there had been no effective progress as it had financial problems. The Ministry also stated that the strategy now was to minimise the damage and make the best of a bad bargain. Explaining the ramifications of delay in the completion of Kandla Bhatinda Pipeline ,the Ministry stated that the demand of the petroleum product had grown as the growth rate of the economy had risen to 6.5% with the result that a large fleet of tank lorries had to be deployed for transporting petroleum product from Western India to the North West which was much more expensive besides being hazardous.

vi) As per DPR the cost of transportation through pipelines in the first year of its operation worked out to Rs. 851 per metric tonne against Rs. 1020 per metric tonne by Railways (transportation by road is even more expensive). At these rates, the delay in completion of the pipeline (one year as per current estimates as stated in (v) above) has already resulted in extra expenditure of about Rs. 101.40 crores on transportation of products.

12.3 Some other pipeline projects of expansion etc. undertaken by IOC are discussed below:

#### 12.3.1 Expansion Programme at Mathura-Jalandhar Pipeline

The capacity of this pipeline is 3.7 MMTPA, 2.2 MMTPA and 1.35 MMTPA in Mathura-Delhi, Delhi-Ambala & Ambala-Jalandhar sections respectively. According to the Feasibility Report, the maximum capacity was to be brought upto the level of 6.0 MMTPA in three stages. The first stage (i.e. 3.7 MMTPA) was to be completed by 1980-81 and in the second stage the capacity was to be upgraded to the level of 4.7 MMTPA by 1985-86 by adding one more pump at each station. The third stage was to be completed by 1989-90 to raise the capacity to 6.00 MMTPA by replacing pumps at Ambala Pump station and adding one intermediate pump station in Ambala - Jalandhar section. Though the pipeline has the potential for further expansion in capacity by incurring an expenditure of Rs. 1.00 crore and Rs. 8.50 crores only in the later stages, IOC has not so far(October,1995) increased its original capacity to meet the increased demands as envisaged in the Feasibility Report.

The Management stated (September, 1993) that the additional cost involved for this pump station was expected to be around Rs. 14.00 crores and the expected completion period was around 30 months from the date of approval and that this station may not be desirable after the commissioning of Kandla-Bhatinda Pipeline.

#### 12.3.2 Tap-off Point Ex-G. S. P. L at Betkuchi (G.S.P.L.)

To overcome the constraints experienced in increased tank-truck loading ex-Guwahati Refinery and also to avoid traffic congestion inside Guwahati City, a proposal for installation of a tap-off point Ex-GSPL was approved by the Board of Directors in August, 1988 at an estimated cost of Rs. 673 lakhs. Out of this a sum of Rs. 81.35 lakhs was allotted to GSPL and the balance to AOD for providing tap-off facilities in its Oil Terminal. The project was scheduled to be completed within 30 months from the date of approval.

The project was commissioned in November, 1991 against the scheduled date of February, 1991 without installing pressure control valves and motor operated valves. While pressure control valves costing Rs. 19 lakhs were finally installed in April 1993, the motor operated valves have still not been received (October, 1995). The operation of the Pipeline is being carried out through hand operated valves.

Against the projected delivery of 30,000 KLs per month, actual average monthly delivery was 8464 KLs during 1991-92, 16451 KLs during 1992-93, 23138 KLs during 1993-94 and 34252 KLs during 1994-95. The low availability of products was stated (April 1993) to be the reason for variation.

#### 12.3.3 Installation of Telecommunication system (SMPL)

The pipeline communication of the Salaya -Viramgam - Koyali section of SMPL was provided with the UHF System supplied, erected and commissioned by a Government of India Undertaking 'X' in 1981 at a cost of Rs. 1.83 crores. Though the efficiency of performance was below 80 per cent as against 99.99 per cent considered as the reliability level, a tele-supervisory system was installed in March 1986 at a cost of Rs. 2.88 crores for the purpose of detection of any malfunctioning in the pipeline, initiation of appropriate corrective action in time, closing/opening of valves, and supply of operational data for monitoring of pipeline performance etc. As the efficiency of the telecommunication system was below the optimum needed (99.99%) and the performance of the telesupervisory system entirely depended upon the performance of



the telecommunication system, the Board appointed (July) 1986 another Government of India Undertaking 'T' for suggesting remedial measures.

`T' concluded that the required reliability of 99.99% could not be realised from the equipment in its existing form and as `X' had discontinued manufacture of the UHF system, improvement of the existing system was not feasible and therefore, suggested replacement of the existing system.

Accordingly a contract was entered into on 23 July, 1991 with a Public Sector Undertaking 'G' for the replacement of the existing system 400MHZ Radio equipment by 900 MHZ radio equipment at an estimated cost of Rs. 4.65 crores.

Thus the unit could not derive full benefit from the telecommunication system installed earlier at a cost of Rs. 4.72 crores.

The Ministry confirmed (October, 1995) that the system supplied by `X' was found falling short of the required efficiency and that the suppliers could not improve the performance of the system as the manufacture of the same had been discontinued resulting in a new system having to be installed in July, 1993.

#### 12.3.4. Replacement of Very High Frequency System (VHF) with Ultra High Frequency System (UHF) at G.S.P.L.

GSPL was utilising communication facilities of M/s. Oil India Limited on lease basis. As the VHF communication system utilised by M/s. Oil India Limited was very old and inadequate to meet their requirement, they decided to replace it with UHF communication system. In the revamping process, they offered to replace Sonapur-Siliguri spur link which was being used by GSPL. Therefore, the Board approved the proposal for replacement and revamp of GSPL telecom system in January, 1986 at an estimated cost of Rs. 160.34 lakhs.

Although the project was scheduled to be completed by January, 1988. the same was actually commissioned in March 1992 after a delay of more than 4 years.

- Even after delayed commissioning of the system the facilities installed at Madarihat and Bongaingaon were not operative till July 1993 due to non-functioning of Flat -cum- Boost Charger/floppy drive etc.



Thus due to delayed execution of the project and also non functioning of the system till July 1993 G.S.P.L. failed to derive the full benefit of the investment.

The Ministry stated (October, 1995) that the delay in project completion was a result of various factors which were beyond their control and any loss due to the delayed commissioning, therefore could not be avoided.

## CHAPTER 13

### RESEARCH & DEVELOPMENT

13.1 As already stated in Para2(iv), one of the main objectives of the IOC was to create a strong research and development base in the field of oil refining and stimulate the development of new petroleum products and formulations so as to minimise/eliminate their imports, if any. Towards this objective, the Research and Development Centre of the IOC was set up in 1972 at Faridabad and it was planned to work on the following in two phases:

- Phase I :
- a) development of petroleum products with(1972-1984) special emphasis on lubricating oils, greases and specialities and
  - b) provision of technical service to customers.

Phase-II : Refinery process development (from 1984 onwards)

With the onset of the oil crunch in the early eighties, several projects relating to conservation of petroleum products, had to be initiated as part of Phase-I. The objectives of Phase-II were extended to include new schemes relating to crude flow studies, development of synthetic and long life lubricants, pollution control studies and establishment of pilot plants for refinery process development.

#### 13.2 Administrative Control :

The R&D Centre is headed by the Director(R&D) who is also a full time Director of the IOC and is assisted by an Executive Director and a General Manager on functional basis. The post of Director (R&D) has been vacant since February 1993.

There are eight divisions for carrying out different activities as given below:-

| <u>DIVISION</u>                                    | <u>ACTIVITY</u>                                           |
|----------------------------------------------------|-----------------------------------------------------------|
| 1. Product Development Division                    | development of lubricants, fuels & specialities           |
| 2. Chemical Engineering Division                   | refinery processes & pipeline transportation              |
| 3. Analytical Division                             | analytical support & test method development              |
| 4. Engine Testing & Test Car Laboratories Division | performance evaluation of fuels & lubricants              |
| 5. Tribology & Applied Metallurgy Division         | rig tests & metallographic analysis & domestic appliances |

- |                                        |                                                                                                       |
|----------------------------------------|-------------------------------------------------------------------------------------------------------|
| 6. Synthetic Chemistry Grease Division | development of grease & additives synthesis                                                           |
| 7. Engineering services Division       | technical support to R&D activities                                                                   |
| 8. Co-ordination Division              | interfacing research & development work with sister divisions & outside agencies, collaborations etc. |

13.3 The annual expenditure of the R&D Centre during the five years ended 31 March 1995 ranged between Rs.13 to Rs.19 crores as detailed below:

| Year    | (Rs. in crores)     |       |                     |       |        |       |
|---------|---------------------|-------|---------------------|-------|--------|-------|
|         | Capital Expenditure |       | Revenue Expenditure |       | Actual |       |
|         | B.E.                | R.E.  | ACTUAL B.E.         | R.E.  |        |       |
| 1990-91 | 8.00                | 8.00  | 5.72                | 6.97  | 8.14   | 7.49  |
| 1991-92 | 8.00                | 8.00  | 8.12                | 7.95  | 7.73   | 7.68  |
| 1992-93 | 10.00               | 8.50  | 6.08                | 9.15  | 9.87   | 9.72  |
| 1993-94 | 7.00                | 7.16  | 7.68                | 10.36 | 11.78  | 10.98 |
| 1994-95 | 13.47               | 16.73 | 4.80                | 11.87 | 11.99  | 10.46 |

The percentage of expenditure on the R&D Centre to total income/profit of IOC was as under:-

|                                                      | (Rs. in crores) |          |          |          |          |
|------------------------------------------------------|-----------------|----------|----------|----------|----------|
|                                                      | 1990-91         | 1991-92  | 1992-93  | 1993-94  | 1994-95  |
| Total income of IOC                                  | 20847.92        | 21507.81 | 25108.89 | 24521.98 | 28972.66 |
| Total profit of IOC                                  | 907.04          | 1084.78  | 934.99   | 964.11   | 1369.84  |
| Total expenditure on R&D Centre (Including Capital)  | 13.21           | 15.88    | 15.70    | 18.65    | 15.26    |
| Percentage of R&D expenditure to Total income of IOC | 0.06            | 0.07     | 0.06     | 0.08     | 0.05     |
| Percentage of R&D expenditure to total profit of IOC | 1.46            | 1.46     | 1.69     | 1.94     | 1.11     |

The project-wise allocation was not made available by the R&D Centre. It may be seen, however, that the expenditure on R & D is nominal as compared to the total income/profit of the Company.

The Ministry stated (October 1995) that the projectwise cost allocation was not done as most of the projects taken up by R&D Centre were short-term projects. With



regard to the meagre investment in R&D, the Ministry informed the Audit Board (November, 1995) that R&D efforts of IOC had concentrated only on Lube oil formulations and an Advisory Committee on R&D had now been set up with experts taken from outside to plan R&D activities.

### 13.4 Targets and Achievements

Upto the year 1990-91, the activities of the R&D Centre were covered/controlled through Annual Plans framed within the broad parameters of five year plans. From the year 1990-91, the activities/projects of the R&D Centre were incorporated in the M.O.U. signed by the Company with the Government of India. The targets as specified in the various M.O.U.s. and achievements there against are given in the table below :-

| Activity                                 | 1990-91 |        | 1991-92 |        | 1992-93 |        | 1993-94 |        | 1994-95 |        |
|------------------------------------------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|
|                                          | Target  | Actual | Target  | Actual | Target  | Actual | Target  | Actual | Target  | Actual |
| 1. Product Formulation (Nos.) as per MOU | 80      | 88     | 80      | 84     | 80      | 82     | 80      | 80     | 80      | 80     |
| 2. MOU Project (Qualitative Progress)    | 100     | 81.20  | 97.25   | 83     | 100     | 77.25  | 100     | 87.15  | 100     | 84     |

It will be seen that while the actual number of formulations exceeded the targets upto 1992-93, the qualitative progress of MOU projects was always below the targets .

#### 13.5.1 Development of Lubricant Formulations

In the first Phase of its activities, the R&D Centre concentrated on development of lubricant formulations. The actual number of formulations developed by the R&D Centre since 1974 and the number of formulations for which field trials were conducted are given below:-

|                             | Upto 1990 | 1990-91 | 1991-92 | 1992-93 | 1993-94 | 1994-95 | Total |
|-----------------------------|-----------|---------|---------|---------|---------|---------|-------|
| Formulations developed      | 1154      | 88      | 84      | 82      | 80      | 80      | 1568  |
| Formulations commercialised | 712       | 26      | 14      | 57      | 50      | 52      | 911   |

It would be seen that out of a total of 1568 only 911 formulations i.e. about 58.1%, were commercialised. The Management stated that the remaining formulations could not be commercialised due to non-availability of facilities at blending plants, some of the formulations developed not being competitive due to higher costs, and the market being captured by other Oil Companies including private ones.

The Centre has not maintained any records to show the expenditure incurred on formulations, their trials and eventual commercialisation. In the absence of this, it could not be ascertained whether there were avoidable slippages in obtaining approval from users.

The Ministry stated (October 1995) that as R&D centre was primarily involved in developing numerous formulations and their trials etc. it would not be feasible to maintain records of expenditure for each formulation. Further it was stated that approvals from users were obtained only at the commercialisation stage of a particular formulation and not at the time of initiating the development of formulation or during its trial runs.

### **13.5.2 Process Development**

In the second phase of R&D activities starting from 1984 in the refining technology area, a full fledged FCC laboratory equipped with modern and sophisticated lab equipments & FCC pilot plant established for selection/screening and condition monitoring and development of catalysts for FCC plants of the Corporation. Distillation Pilot Plant facility has also been set up for efficiency evaluation & design modifications of distillation columns.

According to the IOC, based on one of the recommendations of the R&D Centre, on selection of FCC catalysts/additives the Gujarat & Mathura refineries are reported to have got increased yields of the order of 1% & 6% for LPG and gasoline respectively with about 2% reduction in clarified oil yield. This was stated to have resulted in savings of about Rs.14 crores during 1992-93 alone.

When asked about the slow progress in the field of refinery process developments, the Management stated during the Audit Board Meeting (October 1994) that out of 25 technologies relating to refinery process development, 12 had been developed, 7 were under development and only 6 were yet to be developed at the



centre. It was, however, admitted that work in the area of FCCU technology had been taken up by the Centre only recently.

Three projects test-checked by audit in the area of refining process development are discussed below:

a) During October, 1990 the R&D Centre had concluded that doping of gasoline with appropriate detergent/dispersant additive would result in cleaner intake system of vehicles and in turn, in substantial savings of fuel. Accordingly, recommendation regarding additive treatment were made in June, 1991 and it was envisaged that this would result in net fuel saving of 29 paise/litre and that at the macro level(national level) this would result in saving of Rs. 150 crores per year.

However, even though a decision was taken by the Ministry on 22 January, 1992 to add multifunctional additives in gasoline to control fuel intake system deposits, the above product had not been commercialised so far (October, 1995).

The Ministry stated (October 1995) that necessary steps had already been taken by the Refineries & Pipelines Division for doping detergent/dispersant multifunctional additive in motor gasoline and that the schemes would be implemented in 1995 in IOC refineries.

b) The Centre prepared (November 1990) a presentation on the production of olefins and fatty acids from coker kerosene of Barauni Refinery, but the same is yet to be implemented (October, 1995).

The Ministry stated (October 1995) that a demonstration R&D Pilot Plant was being set up at Barauni Refinery for scale up studies as well as ascertaining commercial viability of project.

c) In November, 1990, the Centre had formulated a catalyst for the FCC unit of Mathura Refinery. An MOU with a private firm 'H' for manufacture of this catalyst was signed in March 1992, but commercial production of the catalyst is yet to take place (October, 1995). The delay in commercialisation of the product has resulted in import of FCC catalyst involving foreign exchange of Rs.6 crores upto March 1994 .



The Ministry stated (October 1995) that the commercial production of the catalyst could not take place as the firm 'H' could not scale up the product and that alternative approaches were being examined.

### **13.6 Avoidable extra expenditure of Rs.27.36 Lakhs**

In response to a global tender inquiry (January, 1986) for the supply and installation of a climatic chamber by the R&D Centre, five bids (3 foreign and 2 indigenous) were received (May, 1986). After opening the technical bids (June, 1986), the Centre decided to award work to only those suppliers who had executed similar jobs earlier.

In July/August, 1987 a three-man team visited the prospective foreign tenderers' installations in Europe to firm up the engineering specifications and to collect the relevant information on the performance of the said equipment, following which the three foreign parties (who had executed similar jobs earlier) were asked to submit fresh bids. The revised offers were received in the month of November, 1987 and offers of all the 3 suppliers were considered technically acceptable. The price bids were offered only in June 1988 and it was found that the price DM (3630200) quoted by 'A' of West Germany, (which was valid upto 21 April, 1988) was the lowest.

On examination it was noticed that there was variation in the price bid and technical bid of A while in the price bid, the erection and commissioning charges were included in the price of DM 36,30,200 in the technical bid it was mentioned that erection and commissioning charges were extra on the basis of man days. When the firm was asked to confirm the lumpsum erection and commissioning charges, they informed (July, 1988) that the erection and commissioning charges would be extra and increased the price by 25% including 5% as inflation charges on account of extension of validity period. After discussion 'A' agreed & withdrew some of the increased charges but insisted on payment of inflation charges of 5% due to extension of the validity period.

The work was finally awarded (September 1988) to 'A' at a total cost of Rs.6.30 crores (including erection & commissioning charges of 0.41 crore) which included an amount of Rs.27.36 lakhs on account of 5% inflation charges etc.

Thus, the company incurred avoidable extra expenditure of Rs. 27.36 lakhs due to non-finalisation of the tender during the original period of validity even though it had about 5 months to do so. Incidentally, the company took 27 months to finalize the

case from June 1986, i.e. date of opening of technical bid to September, 1988 date of Board's approval.

The Management stated (June, 1993) that complete specifications could be firmed up sometime in October, 1987 after evaluation of techno-commercial bids, and certain further clarifications from the bidders which were supplied in July, 1988. It further stated that as a result of hard negotiations 'A' had to withdraw certain claims and accept certain payments in Indian rupees and that there was an overall saving of Rs.65 lakhs in the total price even after off-setting the inflationary charge of Rs.27.36 lakhs which in any case was inevitable.

The management's reply is not tenable as the inflation charges of Rs.27.36 lakhs could have been avoided if the work was awarded within the validity period. The other reductions/terms of payments in rupees etc. would have been negotiated in any case. The management had taken an unduly long time of 27 months to finalise the order. Further even though revised offers were received in November, 1987 the Board's approval was taken only in September 1988 i.e. after a gap of 10 months.

## CHAPTER 14

### OTHER TOPICS OF INTEREST

#### 14.1 Collapsing of tanks

Tank No T-403 for storing motor spirit constructed at the time of construction of the Haldia refinery collapsed on 25 September 1986. According to the investigation Committee, the roof of the tank submerged as a result of the weight due to accumulation of water.

Similarly, tank No. T-105 and T-103 for storage of crude oil also collapsed on 25 September 1986 and 28 September 1986 respectively due to accumulation of water on the roofs.

It was pointed out in the investigation report that the internal inspection, which was to be done once in five years, was not conducted at all since commissioning of the tanks and that the emergency roof drains were inoperative as the same were plugged with metallic plugs.

The fourth tank was damaged on 23 February, 1988 due to creation of excessive vacuum inside caused by very fast cooling, condensation of water vapour inside the tank and inadequate breathing capacity.

In the first three cases, there was a loss of Rs. 160.61 lakhs (including loss of crude oil and motor spirit) and the claim of the company was rejected by the Insurance Company as the reasons assigned for the loss were not covered by the Policy undertaken.



The claim of the Company for Rs. 43.77 lakhs in respect of the fourth case was settled at Rs. 4.23 lakhs only.

The Ministry stated (October 1995) that the soundness of the tank roof can be adequately ascertained by external inspection. Based on the external inspection observations as well as prioritisation, the tanks were being taken up for internal inspection and maintenance, subject to feasibility of emptying out/sparing of the tanks and that as per the policy followed by the Company, the insurance cover was not taken for this type of risk.

Thus, due to not carrying out the internal inspections and also as result of not taking proper insurance cover, the Company suffered a loss of Rs. 200.15 lakhs.

#### **14.2 Injudicious expenditure on purchase of Double Roll Crusher**

A double roll crusher was procured by Barauni refinery at a cost of Rs. 4.97 lakhs for crushing raw petroleum coke (RPC) in suitable sizes. Though the equipment was received in 1984 it was not used at all. It was declared surplus in December, 1986 and was put on sale thrice in 1987 but no offer was received. The equipment is still lying unused (November, 1995).

#### **14.3 Blocking of funds and consequent loss of interest due to storing of Imported Crude in non-bonded tank**

The Haldia Refinery has ten crude oil tanks for storage of imported crude. Of these, two were bonded while the balance eight were duty paid. A study conducted by the Internal Audit Department during 1990-91 revealed that on an average 117,456 MT of crude per day has been lying unutilised in the non-bonded tank. As a result, a sum of Rs. 17.62 crores was locked up throughout the year by way of customs duty paid on

such unutilised stock. The incidence of interest on such locked up capital alone was of the order of Rs. 3 crores per annum. The Company could have avoided such locking up of funds along with consequent loss of interest if all non-bonded tanks had been brought under bonded coverage.

The Ministry stated (October, 1995) that all the crude oil tanks had since been got bonded.

*B.P. Mathur*

New Delhi

(B.P. MATHUR)  
Deputy Comptroller & Auditor General  
-cum-Chairman, Audit Board

04 MAR 1996

Countersigned



New Delhi

(C.G.SOMIAH)  
Comptroller & Auditor General Of India

04 MAR 1996

ANNEXURE-I  
(Refer para 7.02)

DETAILS OF RCO PRODUCED

MATHURA REFINERY

| Years   | Qty. of RCO<br>From CDU<br>(MTs) | Qty Processed<br>in VDU<br>(MTs) | Qty Processed<br>in VBU<br>(MTs) | Total<br>(MTs) | Balance<br>(MTs) |
|---------|----------------------------------|----------------------------------|----------------------------------|----------------|------------------|
| 1990-91 | 32,35,229                        | 24,34,015                        | 2,65,517                         | 26,99,532      | 5,35,697         |
| 1991-92 | 34,65,957                        | 26,92,910                        | 2,95,336                         | 29,88,246      | 4,77,711         |
| 1992-93 | 34,07,984                        | 25,98,128                        | 5,09,459                         | 31,07,587      | 3,00,397         |
| 1993-94 | 36,92,961                        | 28,75,334                        | 7,01,382                         | 35,76,716      | 1,16,245         |
| 1994-95 | 36,68,975                        | 28,36,500                        | 5,43,121                         | 33,79,621      | 2,89,354         |

HALDIA REFINERY

| YEAR    | QTY. OF RCO<br>FROM CDU<br>(MTs) | QTY PROCESSED<br>IN VDU<br>(MTs) | BALANCE<br>(MTs) |
|---------|----------------------------------|----------------------------------|------------------|
| 1990-91 | 14,32,600                        | 13,64,600                        | 68,000           |
| 1991-92 | 15,74,379                        | 15,12,100                        | 62,279           |
| 1992-93 | 15,93,151                        | 14,04,100                        | 1,89,051         |
| 1993-94 | 16,07,856                        | 13,93,100                        | 2,14,756         |
| 1994-95 | 16,52,083                        | 15,89,200                        | 62,883           |

GUJARAT REFINERY

| YEAR    | QTY OF RCO<br>FROM AU<br>(MTs) | VDU<br>(MTs) | QTY PROCESSED IN<br>VBU<br>(MTs) | FPV<br>(MTs) | TOTAL<br>(MTs) | BALANCE<br>(MTs) |
|---------|--------------------------------|--------------|----------------------------------|--------------|----------------|------------------|
| 1990-91 | 47,22,329                      | 8,25,790     | 2,90,942                         | 18,30,770    | 29,47,502      | 17,74,827        |
| 1991-92 | 47,67,299                      | 8,05,300     | 4,09,046                         | 19,79,870    | 31,94,216      | 15,73,083        |
| 1992-93 | 49,94,146                      | 7,77,530     | 4,22,480                         | 22,44,250    | 34,44,260      | 15,49,886        |
| 1993-94 | 48,95,345                      | 6,76,550     | 5,97,200                         | 15,67,400    | 28,41,150      | 20,54,195        |
| 1994-95 | 49,98,674                      | 6,66,750     | 3,55,150                         | 16,11,750    | 26,33,650      | 23,65,024        |



## ANNEXURE-II

{Referred to in Para 8(c)}

| Refinery<br>Unit   | Down time<br>per annum<br>considered<br>at cession<br>stage | TOTAL DOWN TIME (DAYS) |         |         |         |         |
|--------------------|-------------------------------------------------------------|------------------------|---------|---------|---------|---------|
|                    |                                                             | 1990-91                | 1991-92 | 1992-93 | 1993-94 | 1994-95 |
| <b>A. GUWAHATI</b> |                                                             |                        |         |         |         |         |
| 1. CDU             | 20                                                          | 37.33                  | 2.33    | 12.58   | 19.21   | 1.20    |
| 2. COKER           | 35                                                          | 75.62                  | 45.12   | 55.04   | 46.29   | 38.13   |
| <b>B. BARAUNI</b>  |                                                             |                        |         |         |         |         |
| 1. AVV-I           | 20                                                          | 105.10                 | 124.70  | 36.80   | 53.30   | 114.08  |
| 2. AVV-II          | 20                                                          | 98.80                  | 69.00   | 111.70  | 113.60  | 76.20   |
| 3. AVV-III         | 10                                                          | 193.70                 | 338.20  | 348.90  | 353.10  | 318.90  |
| 4. COKER (A)       | 44                                                          | 130.30                 | 199.60  | 220.00  | 216.90  | 211.60  |
| 5. ADD. COKER (B)  | 59                                                          | 135.50                 | 95.80   | 72.30   | 92.20   | 31.90   |
| <b>C. GUJARAT</b>  |                                                             |                        |         |         |         |         |
| 1. AU-I            | 20                                                          | 22.20                  | 20.62   | 3.58    | 26.54   | 7.16    |
| 2. AU-II           | 20                                                          | 9.10                   | 33.00   | 4.25    | 31.71   | 4.62    |
| 3. AU-III          | 20                                                          | 8.10                   | 25.75   | 25.04   | 60.21   | 19.87   |
| 4. AU-IV           | 20                                                          | 17.00                  | 20.21   | 21.42   | 32.79   | 23.30   |
| 5. FCCU            | 20                                                          | 28.70                  | 42.17   | 12.50   | 46.96   | 64.25   |
| <b>D. HALDIA</b>   |                                                             |                        |         |         |         |         |
| 1. CDU             | 30                                                          | 30.58                  | 8.00    | 12.58   | 34.42   | 31.46   |
| 2. VDU             | 30                                                          | 25.58                  | 8.96    | 41.46   | 63.08   | 37.50   |
| 3. PDA             | 24                                                          | 36.29                  | 41.92   | 30.54   | 63.33   | 33.58   |
| 4. FEU             | 23                                                          | 31.87                  | 8.83    | 38.21   | 65.71   | 35.42   |
| 5. SDU             | 30                                                          | 45.08                  | 7.00    | 27.67   | 52.71   | 42.58   |

E. MATHURA

|    |      |    |       |       |       |       |       |
|----|------|----|-------|-------|-------|-------|-------|
| 1. | CDU  | 20 | 21.70 | 2.30  | 27.40 | 7.30  | 12.10 |
| 2. | VDU  | 20 | 31.60 | 4.50  | 32.80 | 13.50 | 14.30 |
| 3. | FCCU | 20 | 57.50 | 40.90 | 76.60 | 53.80 | 45.30 |

F. DIGBOI

|    |       |    |       |       |       |       |       |
|----|-------|----|-------|-------|-------|-------|-------|
| 1. | CDU-I | 20 | 22.03 | 15.70 | 20.00 | 18.00 | 44.60 |
| 2. | CDU-2 | 20 | 12.75 | 25.00 | 29.00 | 18.00 | 14.50 |
| 3. | COKER | 40 | 17.72 | 33.50 | 14.00 | 36.00 | 14.00 |
| 4. | KTU   | 20 | 46.75 | 54.70 | 69.00 | 31.00 | 43.46 |

ANNEXURE-III  
(Referred in para 9.1)

| (Rs. in crores) |                                                                        |                               |                                                        |                     |             |                                   |                                        |
|-----------------|------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------|---------------------|-------------|-----------------------------------|----------------------------------------|
| S.No.           | Name of project                                                        | Schedule months of completion | Cost @ Rs. approved by Government. (Original)          | Month of completion | Actual cost | No. of months delay w.r.t. to DPR | Excess of cost over original estimates |
| 1.              | 2.                                                                     | 3.                            | 4.                                                     | 5.                  | 6.          | 7.                                | 8.                                     |
| 1.              | Low cost revamp of CDU of Haldia Refinery                              | October, 1989                 | 5.85                                                   | April, 1990         | 6.17        | 6 months                          | 0.32                                   |
| 2.              | Revamping (Heat Exchanger optimisation) AVU-I & II at Barauni Refinery | January, 1990                 | 11.00                                                  | December, 1990      | 11.64       | 11 months                         | 0.64                                   |
| 3.              | Addl. Secondary processing Facilities at Gujarat Refinery              | February 1992                 | 635.00                                                 | December, 1993      | 717.68      | 22 months                         | 82.68                                  |
| 4.              | Increase in production of slack wax at Barauni Refinery                | August, 1989                  | 6.65                                                   | November, 1991      | 11.44       | 26 months                         | 4.79                                   |
| 5.              | Panipat Refinery                                                       | March, 1997                   | 2794.00                                                | --                  | 664.17      | --                                | --                                     |
| 6.              | Full scale revamp of Lube Oil Block at Haldia Refinery                 | February, 1993                | 26.50                                                  | May, 1994           | 49.97       | 14 Months                         | 23.47                                  |
| 7.              | Catalytic Reformer unit at Barauni Refinery                            | August, 1993                  | 77.95<br>(Revised Rs. 248.11 crores in February, 1994) | --                  | 38.38       | --                                | --                                     |



|     |                                                                                |              |                                                        |            |        |                          |      |
|-----|--------------------------------------------------------------------------------|--------------|--------------------------------------------------------|------------|--------|--------------------------|------|
| 8.  | Addl. product<br>Tankage at Haldia<br>Refinery (Phase-II)                      | --           | 5.52                                                   | --         | 4.02   | --                       | --   |
| 9.  | Addl. product<br>tankage at Mathura<br>Refinery (Phase-III)                    | --           | 7.01                                                   | --         | 5.92   | --                       | --   |
| 10. | Udex debottlenecking<br>at Gujarat Refinery                                    | October,1992 | 16.10                                                  | March,1994 | 26.06  | 12 months<br>(Generator) | 3.96 |
| 11. | Seperation of<br>Propylene at Mathura                                          | --           | 47.53                                                  | --         | 26.88  | --                       | --   |
| 12. | Sulphur Recovery<br>Unit, Haldia                                               | --           | 26.12                                                  | --         | 24.60  | --                       | --   |
| 13. | Atmospheric<br>Distillation<br>Unit (3 MMTPA)<br>at Gujarat<br>Refinery (AU-5) | --           | 540.00                                                 | --         | 4.75   | --                       | --   |
| 14. | Catalytic Reformer<br>at Mathura Refinery                                      | --           | 545.00                                                 | --         | 4.81   | --                       | --   |
| 15. | Modernisation of<br>instrumentation<br>& DDCS at<br>Refineries                 | --           | 366.00                                                 | --         | 15.83  | --                       | --   |
| 16. | Production of<br>Paraffin wax at<br>Barauni Refinery                           | --           | 41.50                                                  | --         | 5.27   | --                       | --   |
| 17. | Digboi Refinery<br>Modernisation<br>Project                                    | June,1993    | 143.74<br>(Revised to Rs.346.34 crores<br>in May 1993) | --         | 233.31 | --                       | --   |

|     |                                   |              |                                                               |    |       |    |    |
|-----|-----------------------------------|--------------|---------------------------------------------------------------|----|-------|----|----|
| 18. | Catalytic Reformer<br>Unit-Digboi | August, 1993 | 34.17<br>(Revised to Rs. 112.00 crores<br>in September, 1993) | -- | 16.03 | -- | -- |
| 19. | Wax Hydrofinishing<br>Unit-Digboi | --           | 16.46                                                         | -- | 2.91  | -- | -- |

ANNEXURE-IV  
(Refer to Para 10.1)

STATEMENT SHOWING INSTALLED CAPACITY, SPM TARGETS AND ACTUAL THROUGHPUT OF PIPELINES

(In MTPA)

| Name of Pipeline         | Installed capacity        | 1990-91    |             |                        |                        | 1991-92    |             |                        |                        | 1992-93    |             |                        |                        | 1993-94    |             |                        |                        | 1994-95    |             |                        |                        |
|--------------------------|---------------------------|------------|-------------|------------------------|------------------------|------------|-------------|------------------------|------------------------|------------|-------------|------------------------|------------------------|------------|-------------|------------------------|------------------------|------------|-------------|------------------------|------------------------|
|                          |                           | SPM target | through put | Percentage utilisation | Installed SPM capacity | SPM target | through put | Percentage utilisation | Installed SPM capacity | SPM target | through put | Percentage utilisation | Installed SPM capacity | SPM target | through put | Percentage utilisation | Installed SPM capacity | SPM target | through put | Percentage utilisation | Installed SPM capacity |
| <b>Product Pipelines</b> |                           |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |
| 1. GGL                   | 0.818                     | 0.757      | 0.621       | 75.92                  | 02.03                  | 0.757      | 0.680       | 83.13                  | 89.83                  | 0.763      | 0.790       | 96.81                  | 103.54                 | 0.967      | 0.943       | 115.56                 | 95.5*                  | 0.975      | 1.038       | 126.89                 | 106.46                 |
| 2. GPL                   | 1.10                      | 1.208      | 1.254       | 112.10                 | 102.15                 | 1.214      | 1.273       | 115.73                 | 104.86                 | 1.330      | 1.345       | 122.27                 | 101.13                 | 1.553      | 1.504       | 136.73                 | 96.84                  | 1.500      | 1.439       | 130.82                 | 95.83                  |
| 3. BGL                   | 1.8                       | 1.756      | 1.695       | 94.17                  | 96.53                  | 1.714      | 1.687       | 93.72                  | 98.42                  | 1.894      | 1.904       | 105.78                 | 100.53                 | 1.883      | 1.870       | 103.83                 | 99.31                  | 1.894      | 1.830       | 101.69                 | 96.66                  |
| 4. HMPL                  | 1.40/1.16                 | 1.549      | 1.595       | 103.57                 | 101.66                 | 1.601      | 1.638       | 106.36                 | 102.31                 | 1.587      | 1.578       | 102.47                 | 99.43                  | 1.598      | 1.597       | 103.70                 | 99.94                  | 1.669      | 1.665       | 108.12                 | 99.76                  |
| 5. HPL                   | 1.25/1.13                 | 1.293      | 1.345       | 119.03                 | 104.02                 | 1.457      | 1.388       | 128.34                 | 95.26                  | 1.539      | 1.522       | 134.69                 | 98.90                  | 1.503      | 1.423       | 125.93                 | 94.68                  | 1.489      | 1.481       | 131.06                 | 99.46                  |
| 6. MPL                   | 3.7                       | 3.773      | 3.522       | 95.46                  | 93.61                  | 3.965      | 3.761       | 101.65                 | 94.85                  | 3.754      | 3.683       | 99.54                  | 98.11                  | 4.114      | 4.059       | 109.70                 | 98.66                  | 5.225      | 4.248       | 114.81                 | 81.30                  |
| <b>CRUDE OIL</b>         |                           |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |            |             |                        |                        |
| 1. SML                   | 10.0/12.0<br>1981/1991-92 | 10.665     | 10.874      | 108.74                 | 101.96                 | 11.731     | 11.629      | 96.81                  | 99.12                  | 12.005     | 12.334      | 102.78                 | 102.74                 | 12.280     | 12.262      | 102.18                 | 99.85                  | 11.950     | 12.317      | 102.64                 | 103.07                 |



## GLOSSARY OF ABBREVIATIONS USED

|          |                                                    |
|----------|----------------------------------------------------|
| ATF      | AVIATION TURBINE FUEL.                             |
| AVU      | ATMOSPHERIC VACUUM UNIT.                           |
| AU       | ATMOSPHERIC UNIT                                   |
| AOD      | ASSAM OIL DIVISION                                 |
| BH       | BOMBAY HIGH                                        |
| BRPL     | BONGAIGAON REFINERY & PETROCHEMICALS LIMITED       |
| BBU      | BITUMEN BLOWING UNIT.                              |
| BS & W   | BASIC SEDIMENTS & WATER                            |
| BHEL     | BHARAT HEAVY ELECTRICALS LIMITED.                  |
| BPMEL    | BHARAT PROCESS & MECHANICAL ENGG. LTD.             |
| BKPL     | BARAUNI KANPUR PRODUCT PIPELINE                    |
| CDU      | CRUDE DISTILLATION UNIT                            |
| CCU      | COKE CALCINATION UNIT                              |
| COPU     | COMMITTEE ON PUBLIC UNDERTAKINGS                   |
| CRL      | COCHIN REFINERY LTD.                               |
| CRU      | CATALYTIC REFORMING UNIT                           |
| DPR      | DETAILED PROJECT REPORT.                           |
| DCU      | DELAYED COKING UNIT.                               |
| DM PLANT | DEMINERALISED WATER PLANT                          |
| DESU     | DELHI ELECTRICITY SUPPLY UNDERTAKING               |
| DTPL     | DIGBOI TINSUKHIA PRODUCT PIPELINE                  |
| EIL      | ENGINEERS INDIA LTD.                               |
| FCCU     | FLUID CATALYTIC CRACKING UNIT                      |
| FPU      | FEED PREPARATION UNIT                              |
| FO       | FURNACE OIL                                        |
| FEU      | FURFURAL EXTRACTION UNIT                           |
| FFS      | FERTILISER FEED STOCKS                             |
| GSPL     | GUWAHATI SILIGURI PRODUCTS PIPELINE                |
| HCU      | HYDRO CRACKER UNIT                                 |
| HVI      | HEAVY VISCOSITY INDEX                              |
| HSD      | HIGH SPEED DIESEL                                  |
| HBKPL    | HALDIA-BARAUNI-KANPUR PRODUCT PIPELINE             |
| HDC      | HINDUSTAN DEVELOPMENT CORPORATION                  |
| HMRPL    | HALDIA MOURIGRAM RAJBANDH BARAUNI PRODUCT PIPELINE |
| IOC      | INDIAN OIL CORPORATION LIMITED.                    |
| IPCL     | INDIAN PETROCHEMICAL LIMITED                       |
| IPN      | ISO PROPYL NITRATE                                 |
| KERO     | KEROSENE                                           |
| KTU      | KEROSENE TREATING UNIT                             |
| KAPL     | KOYALI AHMEDABAD PRODUCT PIPELINE                  |
| KBPL     | KANDLA BHATINDA PRODUCT PIPELINE                   |
| LPG      | LIQUIFIED PETROLEUM GAS                            |
| LDO      | LIGHT DIESEL OIL                                   |
| LSHS     | LOW SULPHUR HEAVY STOCK                            |
| LVI      | LOW VISCOSITY INDEX                                |
| LOBS     | LUBE BASE OIL STOCK                                |
| LABFS    | LINEAR ALKYL BENZENE FEED STOCK                    |
| LOI      | LETTER OF INDENT                                   |

|       |                                                        |
|-------|--------------------------------------------------------|
| MMTPA | MILLION METRIC TONNE PER ANNUM                         |
| MMT   | MILLION METRIC TONNE                                   |
| MT    | METRIC TONNE                                           |
| MJPL  | MATHURA -DELHI-AMBALA - JULLUNDHAR<br>PRODUCT PIPELINE |
| MOU   | MEMORANDUM OF UNDERSTANDING                            |
| MEK   | METHYL ETHYL KETONE                                    |
| MS    | MOTOR SPIRIT                                           |
| MTO   | MINERALS TURPENTILE OIL                                |
| MWH   | MEGA WATT HOUR                                         |
| NG    | NORTH GUJARAT                                          |
| OCRC  | OIL COST REVIEW COMMITTEE                              |
| OEB   | OIL ECONOMY BOARD                                      |
| OPC   | OIL PRICING COMMITTEE                                  |
| OCC   | OIL CO-ORDINATION COMMITTEE                            |
| ONGC  | OIL & NATURAL GAS COMMISSION                           |
| OIL   | OIL INDIA LIMITED                                      |
| OIDB  | OIL INDUSTRY DEVELOPMENT BOARD                         |
| PDU   | PROPANE DEASPHALTING UNIT                              |
| PDF   | PILOT DISTILLATION FACILITIES                          |
| PEU   | PHENOL EXTRACTION UNIT                                 |
| PDA   | PROPANE DE ASPHALTING UNIT                             |
| R & P | REFINERIES & PIPELINE DIVISION                         |
| RCO   | REDUCED CRUDE OIL                                      |
| SKO   | SUPERIOR KEROSENE OIL                                  |
| SRN   | STRAIGHT RUN NAPHTHA                                   |
| SDU   | SOLVENTS DEWAXING UNIT                                 |
| SRU   | SULPHUR RECOVERY UNIT                                  |
| SMPL  | SALAYA MATHURA CRUDE OIL PIPELINE                      |
| SPM   | SUPPLY PLAN MEETING                                    |
| TOP   | TAP OFF POINT                                          |
| TEL   | TETRA ETHYL LEAD                                       |
| UPSEB | U.P. STATE ELECTRICITY BOARD                           |
| UHF   | ULTRA HIGH FREQUENCY                                   |
| VBU   | VISBREAKER UNIT                                        |
| VB    | VIS BREAKER                                            |
| VDU   | VACUUM DISTILLATION UNIT                               |
| VGO   | VACUUM GAS OIL                                         |
| VHF   | VERY HIGH FREQUENCY                                    |