

REPORT OF THE COMPTROLLER & AUDITOR GENERAL OF
INDIA - UNION GOVT. (AMMENDMENT) PART-VI 1982

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

UNION GOVERNMENT (COMMERCIAL)

1982

PART VI

MADRAS REFINERIES LIMITED

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REPORT

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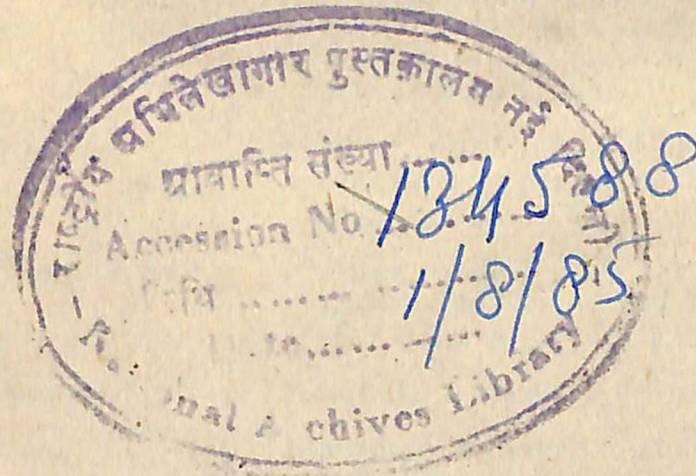
PART VI

MADRAS REFINERIES LIMITED

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PREFATORY REMARKS

A reference is invited to paragraph 5 of the Prefatory Remarks in Part I of the Report of the Comptroller and Auditor General of India—Union Government (Commercial) 1981—wherein it was *inter alia*, mentioned that the draft report on the working of Madras Refineries Limited, an undertaking selected for appraisal by the Audit Board was under finalisation. In this case, the Audit Board consisted of the following members :

S/Shri

1. P. P. Gangadharan Chairman, Audit Board and Ex-officio Additional Deputy Comptroller and Auditor General (Commercial) from 1st March, 1980 to 30th November, 1981.
2. A. R. Shirali Chairman, Audit Board and Ex-officio Additional Deputy Comptroller and Auditor General (Commercial) from 1st December, 1981 to 31st January, 1982.
3. P. P. Dhir Chairman, Audit Board and Ex-officio Additional Deputy Comptroller and Auditor General (Commercial) from 1st February, 1982 to 9th June, 1982.
4. R. C. Suri Chairman, Audit Board and Ex-officio Additional Deputy Comptroller & Auditor General (Commercial) with effect from 10th June, 1982.
5. K. N. Murthi Member, Audit Board and Ex-officio Director of Commercial Audit, Madras upto 16th June, 1982.
6. Smt. Saraswathi R. Rao Member, Audit Board and Ex-officio Director of Commercial Audit, Madras with effect from 17th June, 1982.
7. M. Ramachandran Accountant General, Orissa.
8. T. K. Sinha Managing Director, Indian Oil Corporation Limited (Refineries and Pipeline Division) New Delhi. Part-time Member.

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9. C. R. Das Gupta*

Ex-Chairman, Indian Oil Corporation
Limited, New Delhi.

2. The Report was finalised by the Audit Board after taking into account the results of discussions held with the representatives of the Ministry of Energy (Department of Petroleum) and the Company at its meeting held on 30th November 1982 and the additional information furnished by the Ministry in January/February 1983.

3. The Comptroller and Auditor General of India wishes to place on record the appreciation of the work done by the Audit Board and acknowledges with thanks the contribution, in particular of the members who are not officers of the Indian Audit and Accounts Department.

*Shri C. R. Das Gupta did not attend the meeting on 30th November, 1982.

COMPREHENSIVE APPRAISAL OF THE WORKING OF MADRAS REFINERIES LIMITED : MADRAS

1. Introduction

1.01 At a meeting of the Planning Commission held in May 1963, it was agreed that there was need for additional Petroleum refining capacity in Madras and Calcutta-Haldia Regions. The demand for refining capacity in the Madras Region was indicated at 2.5 million tonnes per annum (MTPA), by mid-1967. Study of the demand and supply position made by the Indian Institute of Petroleum (IIP) in March 1964 supported the above conclusions and visualised that if a new refinery in Madras Region was not established by 1967, there would be an annual deficit in that area of 0.87 MTPA, after taking into account the off-shore movement of products from Cochin Refinery. The Government, therefore, proposed that a refinery having a capacity of 2.5 MTPA should be set up keeping in mind the anticipated growth rate also, and it should attain half the throughput in 1967 and full throughput in 1968.

1.02 After the conclusion of an agreement with M/s. Phillips Petroleum Company of USA in April 1963 for establishment of a Refinery in Cochin, different parties expressed interest in or submitted proposals for establishment of a refinery at Madras in collaboration with the Government of India (GOI). The GOI examined (September 1964) the offers received between December 1963 and June 1964 from fourteen parties and found the offer of M/s. National Iranian Oil Company (NIOC) and American International Oil Company (AIOC) most acceptable. Various aspects of this offer are discussed in paragraph 1.08.

1.03 After acceptance of the offer by Government in November 1964 and negotiations with the collaborators, the following

draft agreements were initialled by Government of India on 21st March 1965.

- (i) Formation Agreement providing, inter alia, the formation of a Company, limited by shares, to own and operate the refinery to be set up and offering loans upto 27 million dollars for setting up this refinery plus 38 million dollars for petrochemicals and/or fertilisers plant.
- (ii) Crude Oil Sales Agreement indicating the terms and conditions for supply of crude oil for the proposed refinery.
- (iii) Technical Assistance Agreement in connection with the design, construction and initial operation of the the refinery.

1.04 The Memorandum of Agreement signed on the same date provided that, pending formation of a Company to own and operate the proposed refinery, a Founders Committee, comprising the representatives of GOI, NIOC and AMOCO India Incorporated (AMOCO), successors to AIOC, would be constituted for the work of the project. The Founders Committee was constituted in April 1965.

1.05 The Formation Agreement and the Crude Oil Sales Agreement were signed on 18th November 1965 and a Company, by the name of Madras Refineries Limited (MRL) was incorporated on 30th December 1965. The Technical Assistance Agreement was signed on 4th February 1966. The actual construction of the refinery commenced in January 1967 and it was commissioned in June 1969. Government stated (December 1982) that during the period of delay in commissioning of the Project, petroleum products to the extent of 34 lakh tonnes had to be imported for supply to the deficit area.

Selection of Collaborators

1.06 Of the fourteen collaboration offers received, the Ministry of Petroleum and Chemicals felt (September 1964) that

only three proposals from (i) NIOC/AIOC, (ii) Burmah Oil Company/Burmah-Shell (BOC/Shell) and (iii) Gulf Oil Company/Continental French Petroleum (Gulf/CFP), merited serious consideration. The matter was further examined by a Committee constituted by the Ministry to guide negotiations and a working group constituted by that Committee.

1.07 The findings of the working group indicated, inter alia, the following :

If profitability of the proposed refinery was the criterion, the Gulf/CFP offer based on Aghajari crude would be the most attractive proposal. The NIOC/AMOCO offer based on Darius crude could be preferred to the other two offers based on Aghajari crude provided :

- (i) the criterion for the choice of the crude was saving in foreign exchange (and not return on invested capital) and
- (ii) the pattern of demand in Madras was such that the full quantity of naphtha produced from the Refinery (which would be substantially more than the naphtha produced from Aghajari and Kuwait crude) would be fully utilised or exported.

On the criterion of foreign exchange saving alone, the Gulf/CFP offer based on Kuwait crude was to be preferred to the NIOC/AIOC offer. But in terms of facilities, NIOC/AIOC had offered a slightly longer period for loan repayments than those offered by the other two parties and had also offered higher suppliers' credit for the crude. They had also agreed to invest US \$ 25 million on petro-chemicals development. There were other intangible factors like the repercussions of acceptance, or otherwise, of this offer on Oil and Natural Gas Commission's (ONGC) proposed venture in oil exploration in Iran.

1.08 The report of the working group was considered by the Committee to guide negotiations, which felt that these three offers were very close to one another. After examining all these

proposals, the Ministry of Petroleum and Chemicals, finally recommended in October 1964 to GOI that the offer of NIOC/AIOC might be accepted for the following reasons :

The overall package comprising—

- (i) supply of crude oil at an attractive price;
- (ii) terms and conditions of foreign exchange loan,
- (iii) extent of equity participation by the foreign collaborators;
- (iv) conditions of crude supply credit;
- (v) rate of interest on the foreign exchange loan; and
- (vi) the offer of US \$ 31.4 millions for development of petro-chemicals and fertilisers, than the package offered by BOC/shell or GULF/CFP was more attractive.

Also, rejection of the NIOC/AIOC offer would have adverse repercussions on ONGC's bid for oil concession as also political reactions.

1.09 The following table shows the relative particulars of the overall package offers.

	Culf/CFP	BOC/Shell	NIOC/AIOC
(1) Crude oil price per barrel	US \$ 1.29 (Agha-jari)	US \$ 1.65 (Murban)	US \$ 1.35 (Darius crude— untried so far),
	US \$ 1.34 (Kuwait)	US \$ 1.40 (Kuwait)	
(2) Equity Participation	US \$ 4 million	49% of capital cost estimated at Rs. 18.10 crores (\$ 38.02 million)	25% of equity, the capital estimated at US \$ 45 million
(3) Amount of foreign exchange loan offered.	\$ 35 million for two refineries or \$ 17.50 million for one refinery; alternatively \$ 20 to 25 million in case of equity participation.	BOC/Shell will fund the entire foreign exchange expenditure assessed at \$ 38.34 million.	(i) \$ 27 million for refinery. (ii) \$ 6.4 million for Ammonia Plant. (iii) In addition \$ 25 million offered through equity loan.

	Gulf/CFP	BOC/Shall	NIOC/AIOC to meet the requirements of Petrochemicals / Fertilizers project.
(4) Rate of interest on foreign exchange loan.	5%	5½%	5½%
(5) Terms and conditions of foreign exchange loan	Repayment in 9 annual instalments starting after 2 years after each draw down	To be repaid 10 years after start up	Repayment in 21 equal six monthly instalments commencing 12 months after commercial start up.
(6) Condition of crude supply credit	No credit	90 days	180 days for the first 5 years, 90 days for the next 5 years.

1.10 However, the actual equity participation was \$ 4.68 millions only (vide paragraph 2.01); the foreign exchange loans were repaid much earlier (vide paragraph 2.04). The agreed price of crude was subsequently enhanced (vide paragraph 3.17); the supply of crude under this package deal was discontinued invoking *force majeure* from November 1978 (vide paragraph 3.11) and subsequent crude supply, under annual agreements allowed 60 days credit only (vide paragraph 3.26). As such, the projected financial attractions did not materialise.

1.11 At the instance of GOI, a statement was prepared in November 1964 comparing the profitability and foreign exchange saving of the three offers, which were based on three different sources of crude. The position that emerged was as indicated below :

	(Rs. in crores)		
	Gulf/CFP		NIOC/AIOC
	Agha-jari	Kuwait	Darius
(i) Capital Investment	21.5	27.2	27.8
(ii) Gross Profit	7.6	7.8	7.4
(iii) Percentage of profit on investment	35.3	28.6	26.7
(iv) Foreign exchange saving	11.3	11.9	11.7

1.12 The Ministry of Finance had observed that "they were hesitant to accept the view that NIOC/AIOC offer had been clearly established as being superior to the other two when considered as a total package". The Ministry of Petroleum disagreed with this opinion in view of the conclusions of the Working Group. The Working Group had stated (September 1964) that the price negotiated for Darius crude (US \$ 1.35 per bbl) was relatively high compared to the prices that had been obtained for Agha-jari (US \$ 1.29 per bbl) and Kuwait crude (Gulf/CFP-US \$ 1.34 per bbl and BOC/Shell-US \$ 1.40 per bbl, not taking indirect discount into account). In fact, the working group had clearly stated that even in respect of the main criterion of foreign exchange saving, Kuwait crude was to be preferred. The Working Group had also stated that the main advantage in the NIOC/AIOC offer was that it carried an undertaking to finance foreign exchange requirements, not only for an Ammonia Plant but for a petro-chemicals Project to the tune of US \$ 25 million.

1.13 The proposal of the Ministry to accept the NIOC/AIOC offer was approved by GOI on 4th November 1964 subject to the following conditions :

- (i) Suitable guarantees and indemnities were to be given to provide reasonable safeguards to the refinery against major variations in the characteristics of crude, judged in terms of throughput, product pattern, refinery investment and operating costs;
- (ii) The 'most favoured' customer treatment was to be given to India *i.e.* no subsequent purchaser of Darius crude would get a lower price without similar benefit being extended to India ; and
- (iii) In addition to assuring full foreign exchange requirements of the refinery and lubricating oil plant, the need for increasing the quantum of foreign exchange for development of fertilizers and Petro-chemicals (beyond US \$ 31.4 million already offered) would be

recognised, in view of the fact that a nitrogenous fertiliser plant of 2 lakh tonnes capacity would have to be put up to absorb the higher production of naphtha from the Darius crude.

1.14 A fertilizer Plant based on Naphtha supplied by MRL was set up at Madras under a Formation Agreement entered into on 14th May 1966 with the AMOCO (investment of US \$ 31.90 million comprising Equity (US \$ 8.9 million) and foreign exchange loan (US \$ 23.00 million).

1.15 It was also provided in this Agreement (Article 4.4 that the foreign collaborator's obligation to make finance available for investment in the Fertilizer Project was limited to a maximum of US \$ 38 million less US \$ 3 million or such other amount as may be agreed for being committed to Gujarat Petro-chemical Complex plus any amount by which the foreign exchange required for MRL was less than US \$ 27.00 million.

1.16 The total foreign exchange component of the cost of MRL and proposed provision for MFL amounted to \$ 54.40 million (MRL 22.50 million and MFL 31.90 million) leaving a balance of \$ 10.60 million to be utilised for Gujarat Petro-chemicals or other fertilizer projects the commitment to invest in which was one of the reasons for acceptance of their collaboration in MRL. However, this commitment for investment of the balance (\$ 10.60 million) in a petro-chemical complex or other Fertilizer projects was not fulfilled.

1.17 ONGC entered into a joint-structure agreement on 17th January 1965 with NIOC for exploitation of certain structures in the Iranian off-shore in Persian Gulf.

Organisational Set Up

1.18 The overall management of MRL is vested in a Board of Directors, consisting of the Chairman and Managing Director as the Chief Executive and 12 other Directors eight of whom are elected annually by the shareholders. NIOC and AMOCO, the collaborators, are authorised to appoint two Directors each,

out of the total 12 so long as their share of the total equity is 13% each.

The organisational set up of MRL as on 31st March 1982 is indicated in Annexure-I.

2. Capital Structure

2.01 *Equity Capital*

The Formation Agreement contemplated an authorised share capital of Rs. 900 lakhs comprising 90,000 equity shares of Rs. 1,000/- each to be contributed by GOI (74%), NIOC (13%) and AIOC (13%). The authorised capital was increased to Rs. 1350 lakhs in September 1966, on account of devaluation of the rupee (June 1966). The paid up capital as on 31st March 1982 amounted to Rs. 1,287.49 lakhs contributed as follows :

	Rs. in lakhs
GOI	952.75 (74%)
NIOC	167.37 (13%)
AMOCO	167.37 (13%)

(Successors of AIOC).

2.02 *Loan Capital*

(i) To meet the cost of constructing the refinery which was estimated at 45 to 50 million US Dollars or rupee equivalent (with a foreign exchange content of 27 million US Dollars), the Formation Agreement envisaged that GOI, NIOC and AMOCO would, apart from equity capital, grant loans to MRL directly or arrange for them from financial institutions, to the following extent.

	Upto
GOI	US \$ 4,680,000
NIOC	US \$ 11,160,000
AMOCO	US \$ 11,160,000
Total	US \$ 27,000,000

Loan Agreement

2.03 On 20th December 1966, MRL entered into a Loan Agreement with seven financial institutions of U.S.A. for a total

amount of US \$ 22.32 million. The loans were completely drawn by June 1968.

2.04 The Project estimate drawn up in January 1967 envisaged a Dollar expenditure of \$ 21.986 millions. This was revised in December 1967 to US \$ 22.236 millions. With the drawal of the entire dollar loans (US \$ 22.32 millions) and equity capital (US \$ 4.68 millions) contributed by NIOC and AMOCO, MRL had dollar funds to the extent of US \$ 27.00 millions against the estimated requirement of US \$ 22.236 millions for construction of the refinery. Actual expenditure amounted to \$ 22.50 millions.

The dollar loan was repaid in half-yearly instalments by January 1979 and the loan in excess of the requirement was pre-paid in March 1969 (US \$ 3.00 million) and October 1969 (US \$ 1.5 million).

Rupee Loan

2.05 GOI advanced rupee loans to the extent of Rs. 2,025.31 lakhs between December 1967 and February 1970 at 6% to 7% per annum (i.e. 1% above the Reserve Bank of India rate). MRL repaid the loan with interest (Rs. 611.18 lakhs) by February 1979 in nine instalments commencing from February 1971.

3. Agreements

3.01 Agreement for Process Design

The Founders Committee decided on 28th April 1965 to invite quotations from twelve selected firms for the process design of the refinery. Of the five firms which expressed their willingness to undertake the work, one stated that it should be allowed to undertake engineering and construction work also. Hence only the other four firms were asked in June 1965, to give their quotations and ultimately, EIL, a Government of India undertaking, was selected in September 1965. An agreement was entered

into with EIL on 10th December 1965. EIL assigned the contract in favour of their collaborator M/s. Bechtel Overseas Corporation, San Francisco (BECHTEL).

3.02 The agreement for Process Design envisaged that the work should be completed by the contractor within 18 calendar weeks plus three working days from 21st October 1965 subject to extension of time for changes and additions that might be made at the request of the MRL. Thirteen change orders were approved by the company, as a result of which the time stipulated for the completion of work was extended by 90 working days, the work having to be completed by 24th May 1966. It was actually completed only on 29th June 1966. A sum of US \$ 3,96,000 was paid to BECHTEL for the process design work. A further sum of US \$ 1,24,778 towards thirteen change orders accepted by MRL was also paid, thereby raising the contract price to US \$ 5,20,778.

3.03 Crude Oil Sales Agreement

A crude oil sales Agreement was entered into (November 1965) between GOI and NIOC/Pan American International Oil Company (an affiliate of AMOCO) for sale by the latter to GOI of crude oil from the Darius field in Iran for processing in the refinery at Madras.

3.04 The terms and conditions of sale as regards quantity and price as included in the agreement, were as follows:

(i) Quantity

A total quantity of 42 million tonnes, commencing from the commercial operation of the refinery, the supply being regulated at the rate of 250,000 tonnes per quarter in the first year, 500,000 tonnes per quarter in the second year; not exceeding 750,000 tonnes per quarter during the next five years and the balance purchases during the next 15 years at the rate of not more than 40,000 BCD (5429 tonnes per day).

3.05 MRL started purchasing crude under the Agreement as a nominee of GOI from 26th January 1969. Regular shipments commenced from June 1969 when the refinery went on stream and commercial operations commenced from February 1970. The suppliers invoked *force majeure* clause in November 1978 on ground of disruption in delivery of crude at the terminals and promised resumption of supply as soon as normal operations were restored. MRL purchased 22.69 million tonnes upto 30th November 1978. The supplies under the agreement have not been resumed (January 1983).

Price

3.06 The original offer of NIOC/AIOC in January 1964 quoted a price of US \$ 1.42 FOB per barrel (bbl) of Darius Crude. This was reduced to US \$ 1.35 bbl in August 1964 at the time of negotiation. This figure was reported to have been arrived at keeping in view the difference in quality between Darius and Agha-jari Crude and on the basis that the then price of Aghajari crude was US \$ 1.49/bbl (after allowing a discount of 29 cents per bbl over the posted price of US \$ 1.78 per bbl). Darius Crude being an untried crude had no posted price. However, considering that the Gulf/CFP package offer had indicated a price of US \$ 1.29 per bbl (vide Paragraph 1.09) for Aghajari crude, the benchmark price of US \$ 1.49 per bbl taken for fixing the price of Darius Crude should be considered to be on the high side. The base price of crude oil was subject to escalation for variations in API gravity and arithmetical average of the posted prices of other listed oil companies.

3.07 In their note to OPC in February 1970 MRL stated, *inter alia*, as follows :

“On the question of benefits which other refineries have been able to get but not MRL; it is pertinent to mention that the price for Darius crude which MRL purchases will have to remain firm under the crude oil supply agreement. Recently Aghajari crude price

was reduced to US \$ 1.28 by Burmah Shell, Caltex etc. under persistent pressure from Government. But such reduction has, presumably been within the terms of existing agreements in terms of which price of the crude oil has to be competitive with world market rates. Thus the refineries at Bombay, Vizag and Cochin will pay less for the crude than before. The price of indigenous crude which is based on import parity will also come down correspondingly. In the case of Darius Crude, the agreement itself will call for a revision and GOI are presumably following it up. MRL, would, however, like to mention that in the price of Darius Crude being fixed at a firm US \$ 1.35. GOI may have been guided by other considerations at the time when the crude deal was negotiated. However, MRL does not derive any benefit from such considerations. If there are such considerations, there may not be any change at all in its price or appreciable change. MRL has, therefore, to assume that for the time being it cannot look for savings in its crude costs".

3.08 In August 1965, GOI took up with the suppliers the question of revision of the price in the context of the then existing level of prices. The suppliers, while recognising (September 1969) the reduction in the level of world crude oil prices, did not agree to revise the prices in view of the understanding reached at the time of negotiations, that while the general level of prices might rise or decline, the other benefits derived by payment terms, technical assistance, magnitude of financing and other inducements provided by the sellers would make the effective price paid for Darius Crude well below the price paid for other crude oil. It was proposed by the shareholders representing NIOC during the shareholders meeting held on 1st December 1969, that GOI should take up the question with the suppliers in a meeting at Tehran. A delegation headed by the Special Secretary, Ministry of Petroleum and Chemicals, went to Tehran in April 1970 to discuss the matter but the

suppliers did not agree to any reduction in prices as they held the view that it was a package deal and GOI was not entitled to any reduction in prices even legally as the agreement referred only to posted prices.

3.09 The posted prices had not changed since 1960. While negotiating the agreement in 1964-65, GOI was aware of the trade practice of discounts offered by the suppliers. Reference to this fact was, however, not made in the agreement finally signed and hence the legal aspect referred to in the previous paragraph.

3.10 In May 1970, Cochin Refineries Ltd. another GOI undertaking, signed an agreement for the purchase of Aghajari crude at US \$ 1.26 per bbl (after allowing a discount of 53 cents over the posted price). As the price of US \$ 1.35 per bbl of Darius Crude was based on the price of US \$ 1.49 bbl of Darius Crude after taking into account a discount of 29 cents per bbl (vide paragraph 3.12) the price of Darius Crude, in May 1970, should have been reduced by 10 cents per bbl; the extra payment on crude price being Rs. 1.36 crores (approximately) per annum. In view of the failure of the attempts at getting the crude price reduced to general level of prices, GOI decided, in July 1970, to carry on negotiations at political level and also examine whether a legal case could be built on the basis of provision in the agreement. Further progress, if any, was not known to MRL nor clarified by the Ministry of Petroleum to audit.

3.11 On account of increase in the posted price of Kuwait Arabian and Gach Saran Crude referred to in the agreement, the suppliers increased the price of Darius Crude to US \$ 1.41 per bbl from 14th November 1970, to US \$ 1.74 per bbl from 15th February 1971 and US \$ 1.81 per bbl from 1st June, 1971. The suppliers increased the rates for subsequent supplies also on the basis of increase in posted prices as detailed in Annexure II.

Quality of Crude

3.12 The agreement provided that for each full degree API by which the gravity of the crude oil supplied is above 34.0° API gravity or below 34.9° API gravity, the base price of US \$ 1.35 per bbl should be increased or decreased by 2 cents. The tests conducted in MRL showed that in respect of eleven shipments received upto 31st July 1969, the API gravity indicated in sellers' quality certificate was not correct and ranged between 33.1° and 33.9° (only in one shipment it was 34.1°).

3.13 The Director representing NIOC on the Board of Directors of MRL informed the Company in June 1969 that there was a confidential Memorandum exchanged between GOI and NIOC/AMOCO on 21st March, 1965 treating the provision in the agreement on gravity variations, inoperative unless mutually agreed to. When MRL (June 1969) requested for a copy thereof, the Ministry could not locate a copy of this Memorandum.

3.14 In August 1969, GOI suggested to the suppliers a review of the non-operation of this provision in the agreement as the crude oil supplied in eleven shipments upto July 1969 did not correspond to the stipulated quality. The suppliers, however, replied (September 1969) that the suspension was agreed to on the basis that, as long as the crude oil had characteristics similar to those indicated in the agreement, none of the parties wished to speculate on price adjustment resulting from minor deviations in gravity.

3.15 Thereupon GOI decided (September 1969) to convene a meeting of the shareholders but at the meeting held in December 1969, the representatives of NIOC and AMOCO pleaded that they could not speak on behalf of the suppliers.

3.16 In April 1970, the Ministry of Law advised GOI that the provision relating to gravity variations was operative and

could not be considered as suspended as the formal agreement signed on 1st November 1965 was certified to contain all the terms of the crude oil sales agreement initialled by the parties on 21st March 1965 as modified by the latter agreement of 18th November 1965 and did not mention about the suspension of this clause. GOI thereafter advised MRL (June 1970) to make adjustments for gravity variations in the price in all the future consignments and to take up with the suppliers, the refund of excess payments made in the past. The gravity variations in 73 out of 78 shipments received upto June 1970, were to the disadvantage of MRL. MRL made adjustments in price for gravity variations in all the shipments received from December 1969 (bills for which were received in June 1970) and disallowed a sum of Rs. 15.73 lakhs in respect of shipments received upto September 1970. After protracted correspondence, GOI agreed in April 1971, in view of NIOC's consent to discuss the matter, to the request of the suppliers for payments as if the gravity escalation clause in the agreement was held in abeyance, and asked MRL to release the sum of Rs. 15.73 lakhs disallowed earlier, as a sign of 'goodwill and understanding'. The amount was remitted to the suppliers on 5th May 1971. In respect of 43 shipments received since inception (January 1969) to December 1969, the deductions on this account amounting to Rs. 11.58 lakhs were not even made initially.

3.17 After discussions with the suppliers in the last week of January 1972, GOI informed MRL in April 1972 that the gravity escalation would be applicable from 15th February 1971 to 1st December 1972 as per agreement (14th February 1971) between OPEC countries and oil companies.

3.18 On this basis, MRL disallowed an amount of Rs. 46.89 lakhs in respect of 124 shipments received during 15th February 1971 to 1st December 1972. The suppliers, however, contended (April 1972) that the basic price was constant for the gravity range of 34.0° to 34.09° API and that

the price would have to be decreased by 0.15 cent per barrel for each 0.1° API by which the gravity was less than 34.09° API while it would have to be increased by 0.15 cent per barrel for each 0.1° API by which the gravity was above 34.0° API i.e. on the same basis as the Tehran Agreement between OPEC countries. GOI did not accept this contention (November 1972), on the ground that it was not as per Crude Oil Sales Agreement; on reconsideration, GOI accepted (November 1973) the suppliers' contention as a "demonstration of goodwill" and MRL was advised to remit the amount disallowed. Accordingly, the amount of Rs. 32.89 lakhs was refunded by MRL (December 1973).

The total amount, thus, foregone by MRL as "a demonstration of goodwill and understanding" worked out to Rs. 60.20 lakhs.

3.19 The GOI stated September 1982 that during the above noted period they were negotiating for suitable discounts on the prices charged by crude suppliers; as a result of negotiations, GOI could get from the suppliers a total discount of Rs. 355.56 lakhs which justified foregoing of the amount in respect of API gravity adjustments. Further it was also considered advantageous for the refinery to process slightly heavier crude than 34.0° API as the product mix was more suitable for the market conditions prevailing at that time.

Thus the adjustments arising in respect of API gravity variations as per the Crude Oil Sales Agreement, were given up by GOI in order to obtain discount on prices which were allowed by the suppliers outside posted prices on their sales for which a provision was omitted to be made in the Crude Oil Sales Agreement as mentioned in Paragraph 3.05.

Purchase of Crude

3.20 As supplies under the Crude Oil Sales Agreement were discontinued invoking *force majeure* from November 1978

(Paragraph 3.05), GOI entered into Sale/Purchase contracts with NIOC for supply of crude as shown below :

Date & No. of contract	Period of supply	Quantity	Price
1. No. 149 dated 7th May 1979	1st June 1979 to 31st December 1979	45000 bbl per day (1,356 million tonnes)	US \$ 16.31 plus a premium of 16 cents per bbl subject to revision as determined by NIOC
2. 227 dated 2nd January 1980	1st January 1980 to 31st December 1980	2.78 million tonnes	\$ 28.61 plus 28 cents per bbl subject to revision as in (1) above. Payment to be made within 60 days from the date of bill of lading.
3. 400/81 dated 8th December 1980	1st January 1981 to November 1981	2.7 million tonnes	US \$ 33.17 plus premium of 28 cents per bbl subject to revision as in (1) above. Rest as in (2) above.

3.21 According to a letter exchanged between GOI and NIOC dated 7th May 1979, the sale/purchase contract dated 7th May 1979 operationally substituted the Crude Oil Sales Agreement and NIOC agreed to advise AMOCO, the other party to the agreement about the contents of the letter as well the relevant provision of Sale/Purchase contract. AMOCO intimated MRL on 10th July 1979 that the Sale/Purchase contract dated 7th May 1979 would not supersede or in anyway affect their rights under Crude Oil Sales Agreement and they would be entitled to half of the proceeds of the sales by virtue of their rights under 1958 Joint Structure Agreement with NIOC and the Iranian Govt. They also raised invoices against MRL (Rs. 366.7 million) for some of the supplies received under the Purchase contract dated 7th May 1979. MRL informed GOI about this on 17th December 1979. GOI

stated (February 1980) that the contract of 7th May 1979 was between GOI and NIOC and the supplies made by NIOC in terms of the said agreement had to be paid for only to NIOC and AMOCO would not be entitled to any payment in respect of the supplies. AMOCO did not accept this view and had informed MRL (September 1980) that they reserved their right under the 1965 agreement to institute appropriate action against MRL and GOI. On a reference from MRL (October 1980) in this regard, GOI advised them (June 1981) that a reply may be sent to AMOCO (i) pointing out that unless AMOCO revokes the suspension of supplies due to *force majeure*, in terms of the 1965 Agreement and makes supplies accordingly, no claim for payments could be validly made in terms of the said agreement, and (ii) including a general denial of the various allegations made by AMOCO in their reference of September 1980. Accordingly MRL sent a reply to AMOCO.

3.22 The supplies made by NIOC under the Sale/Purchase contracts dated 7th May 1979, 2nd January 1980 and 8th December 1980 were paid for at the rates determined by NIOC, the supplies from time to time applicable to their term contracts plus a premium of 16 cents/28 cents/28 cents per bbl. for the respective contracts. The Indian Oil Corporation Ltd. (IOC) was also purchasing crude from NIOC during this period. The supplies made to IOC were, however, invoiced by NIOC only at the ruling rates and no premium was collected from IOC. Against a total quantity of 485.22 lakh barrels of crude supplied to MRL, the amount collected towards premium alone worked out to Rs. 1048.16 lakhs.

3.23 GOI stated in February 1982 that payment of a premium for crude supplied to MRL was due to the following reasons :

- (i) Supply was assured by long term contracts unlike supply to IOC which are based on annual contracts.

(ii) NIOC had provided technical support to MRL and arranged for foreign exchange loan capital; and

(iii) taking into effect the inflation, variation in exchange rates and tax on dividends, the return on NIOC's investment in MRL was not satisfactory.

3.24 The supplies to MRL are also regulated on yearly contracts. The reasons (ii) and (iii) above would also not seem justified as there was no commitment to pay higher rates for crude on this account in the Formation Agreement. MRL had declared dividends from the third year of operation *i.e.* 1971-72 at the rate of 12% or above. The amount of premium (Rs. 1048.16 lakhs) paid for the three years (June 1979 to November 1981) amounted to 626.25% of the investment of NIOC (Rs. 167.37 lakhs) in MRL.

3.25 The contract entered into for supply of crude during 1982 did not, however, involve payment of premium in addition to the basic price.

4. Construction of Refinery

Project Estimates

4.01 According to the Formation Agreement (March 1965), the cost of establishing the refinery of 2,474,700 tonnes/year capacity was estimated to be US \$ 45 to 50 million or the rupee equivalent, with US \$ 27 million in foreign exchange.

4.02 The first Detailed Project Estimate for Rs. 43.70 crores was drawn up and was approved by the Board of Directors after the finalisation of contracts for process design, on-site and off-site facilities by which time all the capital commitments were known to MRL. This was further revised in December

1967 and August 1969. The Table below shows the first and revised estimates and the actual expenditure on completion.

Description of items	Project estimates			Actual expenditure	Variation with reference to August 1969 estimates (+) Excess (-) Savings
	January 1967	December 1967	August 1969		
1. On-site and related facilities .	2859.42	2928.12	2928.12	2838.91	(-)89.21
2. Off-site works .	850.83	812.06	776.49	696.99	(-)79.64
3. Administration and Engineering expenditure .	148.63	199.15	202.50	238.88	(+)36.38
4. Transport Equipment & furniture	10.36	11.49	11.76	10.20	(-)1.56
5. Catalysts, Chemicals and spare parts .	101.10	136.49	136.49	132.81	(-)3.68
6. Process design contract and other preliminary expenditure .	32.99	35.46	35.46	35.46	..
7. Deferred Expenditure, and Advances less recoveries .	367.03	356.72	352.13	348.11	(+)0.98
TOTAL .	4370.36	4479.49	4437.95	4301.25	(-)136.70

4.03 The main reasons for increase of Rs. 109.13 lakhs in the first Revised Estimate of December 1967 over that of January 1967 were as follows :

- (i) Increase in escalation factors in on-site contract due to general price increase (Rs. 31 lakhs).
- (ii) Provision for product pipelines to IOC terminal (Rs. 43 lakhs).
- (iii) Switching over from provisional to detailed estimates in respect of some items (Rs. 30.2 lakhs).

The net decrease of Rs. 41.54 lakhs in the August 1969 estimate was due to shifting of dollar expenditure to rupee expenditure.

4.04 The actual expenditure (Rs. 43.01 crores) was approved by GOI in August 1975. While there was saving of Rs. 50 lakhs due to non-execution of employee housing, the increase of Rs. 36.38 lakhs under Administration and Engineering expenditure was due to depreciation (Rs. 28.97 lakhs), interest payment (Rs. 1.81 lakhs) and start up expenditure (Rs. 2.61 lakhs) which had not been provided for.

On-site Works

4.05 The work involved in the construction of the refinery was divided into "on-site works" (i.e. processing units, pipeline connecting process units to storage tanks and the electrical system) and "off-site works" (i.e. facilities and services like soil investigation, site improvement, crude oil transfer facilities, storage tanks, ancillary process facilities etc.).

4.06 In February 1966, a sub-Committee of the Board of Directors selected a panel of 11 firms to whom preliminary enquiries were addressed for on-site works. On the basis of replies received, the Board of Directors considered (March 1966) various methods of tendering and "taking into account all aspects" affirmed that a lumpsum bid should be preferred and advised the Managing Director to address four bidders. One of these firms (M/s. Lummus) was later on (April 1966) excluded as "their stand was far removed from the desired basis". The remaining three firms, M/s. Pacific Procon Limited of USA (PROCON), M/s. SNAM PROGETTI of Italy (SNAM) and M/s. Japan Gasoline Company Limited (JGC) were required to submit bids on two alternatives viz.

- (i) Lumpsum basis for foreign exchange and rupee cost ;

- (ii) Lumpsum basis for foreign exchange plus lumpsum rupee cost covering field supervision only, plus reimbursement of other actual rupee costs.

4.07 The instruction to the firms were communicated in May 1966 and the process design furnished in June/July 1966. The firm submitted their quotations in October 1966, which were considered by the Technical Advisory Committee (TAC) of MRL. The quotation of PROCON for US \$ 24,340,000 was considered to be very high i.e. 25% in excess of the bids of JGC or SNAM) and therefore, further clarifications were obtained only from SNAM and JGC, the other two firms. After detailed examination by the Technical Advisory Committee and the Sub-Committee of the Board of Directors, the offer of SNAM PROGETTI was recommended for acceptance in November 1966 for the following reasons:

- (i) Minimum foreign exchange US \$ 14,729,000 against US \$ 17,306,000 quoted by JGC and a lumpsum rupee content (JGC's quotation for rupee expenditure did not include contingencies).
- (ii) Technical superiority.
- (iii) Minimum time for completion of work. SNAM PROGETTI offered to complete the work within 24 months from the date of contract while JGC agreed to complete it within 24 months from the date of receipt of blank import licence.

In addition to the on-site works, the Sub-Committee of the Board of Directors also recommended that the following items of work should be included in the contract awarded to SNAM PROGETTI.

4.08 (a) Power Generation

The site selection Committee had indicated in their Report (July 1964) that power should be supplied to the refinery at

a specially negotiated price of the order of 6 paise per KWH. The State Government, however, quoted in September 1965 a rate of 11.75 paise per unit. On this basis, MRL worked out the economics of captive power generation and arrived at a pay-out period of one year and seven months based on incremental costs for power generation as given in SNAM PROGETTI's offer. The Board of Directors decided that in the absence of firm commitment from the State Electricity Board for supply of power at the rate of 6 paise per unit, the refinery should have its captive power generation facility. Consequently, provision was made in the contract with SNAM PROGETTI for an option to entrust the construction of power plant at the price quoted by them.

(b) Redesign of Kerosene Unit

The smoke point of kerosene was reduced from 25 mm to 22 mm by ISI in September 1966 which necessitated redesigning the kerosene unit. The Institute of French Petroleum (IFP) estimated (November 1966) the cost of redesigning at US \$ 15,000 and the process group of MRL estimated (October 1966) a saving of US \$ 500,000 in the cost of construction on account of redesigning the unit. M/s. SNAM PROGETTI, however, offered, during negotiations, a reduction of US \$ 274,000 and Rs. 82,000 only in the total cost, if the redesigning of the unit, including process design, was entrusted to them. On the recommendations of TAC, and its sub-committee, the Board of Directors accepted this offer from SNAM and suitable provision was made in the contract, though the estimated savings were very much below what was assessed by MRL.

4.09 The award of the work including redesigning of Kerosene unit to the SNAM on a lumpsum of US \$ 14,655,000 Rs. 131,282,000 subject to escalation as per agreed formula was approved by GOI in December 1966. The lumpsum price included US \$ 200,000 on account of cost of modification proposed by MRL.

4.10 The contract, interalia, provided for the following :—

- (i) The contractor would design, supply all the materials and equipment and construct the on-site portion along with some of the battery-limit facilities, of a complete refinery with a throughput of 50,000 BCD in accordance with the instructions issued by MRL.
- (ii) The contract price of US \$ 14,655,000 (Rs.131,282,000) would be subject to adjustment for changes, modifications, deletions and/or additions made at MRL's written request and as per escalation clause in respect of labour and Indian materials.
- (iii) On receipt of intimation from the contractor that the work was "ready for use". structural and operability tests would be conducted before acceptance.
- (iv) The contractor would repair or replace all materials or workmanship found defective within the period commencing from the beginning of the construction of the refinery and ending one year after operability acceptance by MRL. The materials or workmanship so repaired or replaced would be guaranteed for a period of one year from the date of such replacement or repair.
- (v) The work would be ready for use on or before 25th November 1968 or any extended date as agreed to.
- (vi) Liquidated damages would be paid by the contractor for delay in completion, while he would be entitled to bonus for early completion as specified.
- (vii) The contractor would be reimbursed all sales tax and import duties or fees connected with the import of materials forming part of the permanent work, including construction equipment.

4.11 MRL issued 73 change orders between April 1967 and November 1969 revising the contract price from US \$ 14,655,000 (Rs. 131,282,000) to US \$ 15,253,542 and (Rs. 131,217,814). During final review of change orders (July 1969), MRL observed that they had no information about receipt of certain materials which were to have been transferred to MRL stores.

4.12 The crude distillation unit was commissioned on 13th June 1969 and the provisional acceptance certificate to the effect that permanent works, as a whole, had met the operability tests, was issued on 8th March 1970 as against the scheduled completion date of 25th November 1968 as per the contract.

4.13 The Board of Directors constituted (July 1969) a Committee of Directors to finalise and settle all outstanding issues with the contractor. According to the Memorandum of Agreement, signed on 31st July 1969, it was agreed among other things, that neither any liquidated damages would be levied by MRL nor any claim for bonus would be made by SNAM for completion of the construction of the refinery.

4.14 After issue of Provisional Acceptance certificate on 8th March 1970, MRL released (April 1970) the security deposit of US \$ 760,422 (Rs. 6,644,017) except for US \$ 7224 (Rs. 68,433) in respect of sulphur plant in lieu of a bank guarantee valid upto 8th March 1971. MRL, however, faced several technical problems in the refining units from the start up and, in January 1971, a list of major items on which corrective measures were to be taken was sent to the contractor for settlement before end of February 1971 i.e. before the expiry of bank guarantee.

4.15 The following were the major defects listed by MRL.

- (i) Poor performance of vacuum towers resulting in substantial loss of yield in premium heavy neutral tube distillates.

- (ii) Unsatisfactory performance of thermal cracker furnace (6F-1) with gas leaking into atmosphere from the inlet to conversion zone.
- (iii) Poor performance of exchangers—(11E-11, 3E-8 and 3E-2) resulting in damage to catalysts.
- (iv) Excessive vibration and noise in gearbox of hydrogen compressors resulting in restricted production in the hydrogen unit and consequent effect on other units.
- (v) Inadequate low pressure steam system restricting the operation of turbo generators, etc.

The Company estimated a notional loss of earnings due to poor performance of the vacuum overhead system at Rs. 1.07 crores till 1973.

4.16 At a meeting held on 28th January 1971 the contractor agreed to send his representatives for collecting data before the shut-down of the refinery scheduled for February 1971 and for carrying out necessary tests during and after shutdown. In respect of gearbox mentioned above the contractor stated that the guarantee was passed on to the plant supplier, as this was not claimed by MRL at the time of provisional acceptance certificate. The contractor, however, furnished a bank guarantee for Rs. 76,27,000 valid upto 28th February 1972 representing the estimated cost of materials, fabrication and erection in connection of defects reported by MRL. These developments were reported to GOI in April 1971.

4.17 The contractor deputed four technical personnel during February 1971 and March 1971 and after further discussions, the following settlement was made on 7th September 1971.

The contractor would (i) provide an additional condenser for the vacuum system ;

(ii) examine the question of their liability with regard to legal expenses for a court case against the supplier of equipment for Thermal Cracker furnace ;

(iii) supply new exchangers and ;

(iv) use their good offices with the suppliers for rectifying defects in compressors and pumps.

They, however, said that there was no provision either in the contract or in the change order, making them liable for any expenses or indirect damages, especially in regard to equipment not supplied by them. Hence no liability was, therefore, accepted by the contractor for defects in turbines.

4.18 A bank guarantee in lieu of the earlier one, for US \$ 100,000 and Rs. 11,25,000 valid till December 1972, was furnished by the contractor to complete the work. As satisfactory action was stated to have been taken on major outstanding items and assurance given by the contractor to complete the remaining items expeditiously, the bank guarantee for US \$ 100,000 was released in July 1972. The rupee guarantee, which was extended upto 30th September 1973, was released in July 1973 after the supply, erection and test-run of an additional overhead condenser was completed in the first week of July 1973. The final acceptance certificate was issued by MRL in August 1973.

4.19 The defects in other equipment were set right by MRL while carrying out modifications from time to time to improve efficiency and adjust production capacities based on operational experience.

Off-site works

4.20 In June 1965, the GOI decided to nominate Engineers India Limited (E.I.L.) to act as engineering contractor for off-site works for the following reasons :

- (i) GOI has a stake and interest in this firm, and it must be put to work to meet the growing costs of running the company.

- (ii) This will provide the EIL Unit at Gujarat Refinery with a continuing job of work and EIL will have a much easier job of mobilising an experienced group of design engineers, draftsmen etc.
- (iii) This will be a quicker arrangement than going in for bids (including foreign firms). EIL's nomination was also subject to their giving an acceptable basis of work.

4.21 As GOI considered EIL as the most competent and equipped firm to undertake this job, the Founders Committee decided on 29th June 1965 to award the work to them. An agreement for engineering services relating to off-site facilities was entered into with EIL on 10th February 1966. The engineering services, inter alia, covered, professional, technical and administrative services for engineering and designing off-site facilities. EIL was to be reimbursed actual costs like pay roll costs plus indirect costs equivalent to 97.5% of pay roll costs, cost of office materials and supplies, communication printing and reproduction costs, cost of temporary facilities, travel, subsistence and sub-contract costs. In addition, a fee of 20 per cent of reimbursible costs mentioned above was to be paid.

4.22 According to the agreement, MRL intended to complete the construction of the Refinery by 30th November 1968 and it was stipulated that a mutually agreed schedule would be prepared for this purpose in consultation with the engineering contractor. This schedule was not prepared. The off-site works were, completed in various phases by March-April 1969 and the contract with EIL came to an end in January 1970.

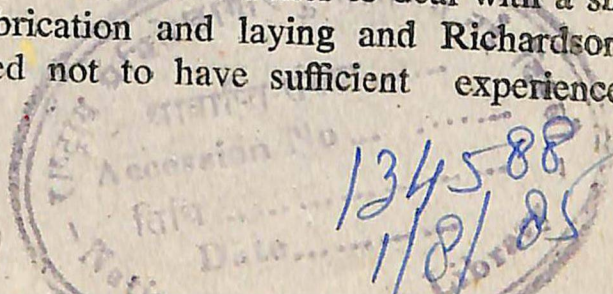
4.23 A total payment of Rs. 60.93 lakhs (Rs. 51.63 lakhs as reimbursible costs and Rs. 9.30 lakhs as fee) was made to EIL. This amount represented 9.58 per cent of the total value of off-site works (Rs. 635.95 lakhs).

Laying of crude oil pipeline

4.24 In response to tenders invited in March 1967, MRL received thirteen offers for fabrication and laying of crude oil pipeline from the Madras Port to the refinery. Eleven of the offers were rejected for the reasons that (i) they did not quote for all items (Four). (ii) they did not have previous experience of similar jobs (Four) or (iii) their rates were highest (three). Of the remaining two offers, one was the third lowest (Rs. 22.71 lakhs subsequently reduced to Rs. 20.17 lakhs) and the other was the sixth lowest (Rs. 30.56 lakhs). The third lowest offer of M/s. Richardson and Cruddas Ltd., Madras was not considered as they were found to have only the capability and experience of fabrication but not for pipe-laying.

4.25 The sixth lowest offer of M/s. Dodsall Private Ltd., Bombay, which was reduced to Rs. 21.16 lakhs after negotiations, was accepted and the work awarded in July 1967. According to the agreement, the work was to be completed by 15th September 1968. It was actually completed on 18th January 1969 and the pipeline was commissioned on 5th February, 1969. Initially the Contractor applied for extension, in September/October 1968, on account of labour strike, poor performance of sub-contractors, (Richardson and Cruddas Limited, Madras) and unforeseen obstruction in excavations. The extension of time was granted in October 1968. In November 1968, the contractor applied for extension of time upto the actual date of completion, without assigning any reason, which was granted (December 1969). EIL did not seem to have apprised MRL about the progress of work, although in terms of their agreement, they were required to do so.

4.26 The work was awarded to M/s. Dodsall Private Limited in preference to lower quotation of Richardson & Cruddas Limited, as it was considered better to deal with a single agency for pipeline fabrication and laying and Richardson & Cruddas were considered not to have sufficient experience in



pipe laying. One of the reasons for delay in completion of work was the poor progress of sub-contractors (Richardson and Cruddas Limited).

Delay in completion of Refinery

4.27 According to the Formation Agreement (March 1975) the Refinery was expected to be ready for operation in the second half of 1967. The work involved in the commissioning of the refinery mainly consisted of—

- (i) Selection of process design.
- (ii) Construction of on-site works.
- (iii) Construction of off-site works.

4.28 The Founders Committee was formed on 24th April 1965 and the working group of the Founders Committee prepared a construction schedule in June 1965 according to which the refinery was expected to be commissioned in June 1968 (advanced to middle of May 1968 by the Founders Committee).

4.29 Action for selecting a process design contractor was initiated on 29th April 1965 and the agreement with EIL signed on 10th December 1965. The process design contractor completed the work by the end of June 1966 against the stipulated date of February 1966, which was extended to May 1966 (*vide* paragraph 3.01).

4.30 Tenders for on-site works were invited in May 1966 and an agreement with SNAM was signed on 26th November 1966 according to which the refinery was to be ready for use on or before 25th November 1968. The refinery went on stream only in June 1969.

4.31 The MRL stated (August 1971) that "the delay in project completion was due to closure of Suez Canal in June 1967, requiring longer delivery time for imported equipment, lock-out

and strikes in contractors' shops causing further delays in vessel fabrication etc. and finally strike of the contractors workers at the construction site".

4.32 The expenditure incurred by MRL during the extended period (April to June 1969) was Rs. 91.80 lakhs comprising interest charges (Rs. 39.24 lakhs), expenses towards administration and operation (Rs. 23.59 lakhs) and depreciation on assets (Rs. 28.97 lakhs).

4.33 The Formation Agreement contemplated that the refinery would be ready for operation in the second half of 1967, while it was actually commissioned in June 1969. On the basis of demand projection for products of the refinery, the need for import of products for meeting the requirements of MRL supply zone between July 1967 and June 1969 had been worked out at 34.05 lakh tonnes.

5. Modifications, Improvements and Expansion

5.01 Soon after commissioning the refinery (June 1969), and in the following years, MRL carried out several modifications to the Plant for the following purposes :

- (i) to remove bottlenecks noticed during operations;
- (ii) to increase the capacity of some of the plants to cope with market demands, the projection of which at the time of designing of the plant, was unrealistic ;
- (iii) to firm up refinery capacity from 2.47 MTPA to 2.8 MTPA; and
- (iv) to improve operational performance.

5.02 These projects undertaken by MRL, expenditure incurred thereon and their present position are indicated in Annexure III. Though the progress in executing each item of works in physical terms is reported to the Board of Directors periodically, the extent to which the economics in operation and

additional production, assumed while approving the investment were actually realised, was not assessed after completion of the capital works. Government stated (December 1982) that while, it is difficult to quantify the actual benefit item-wise in respect of some of the projects implemented for achieving operational flexibility, the overall impact of the benefits derived from various projects could be gauged from (i) the improvement in production pattern and (ii) the reduction in fuel and loss achieved by the Refinery over the years.

5.03 The details of major capital works undertaken by MRL are mentioned below :

(i) *Debottlenecking project*

In June 1970, it was reported by the Management to the Board that, as a result of operating experience gained, the following changes and improvements, among others, would be necessary :

- (a) Modification to plant air system to ensure uninterrupted supply of dry air to instruments.
- (b) Piping modification so as to assign separate tanks for separate grade of lube oil base stocks to prevent products going off-specification.
- (c) Introduction of heating system in thermal cracker feed tanks to prevent water-logging.
- (d) Facilities to reduce the blow down and maintain a favourable water conservation ratio to save chemicals.
- (e) Drainage facilities for cooling tower basin to provide on stream cleaning of tower basin in parts and thus avoid exchangers getting plugged with dirt.
- (f) Fire proofing of supporting skirts of vessels to provide safety to vessels against ground fires in the battery.
- (g) Incinerators for burning acid gases in plant 12 to provide against choking by Sulphur deposits.

- (h) Supply of dry air to lube oil tanks and blanketing of lube oil (feed stock) tanks to prevent formation of cloudiness.

5.04 All these except item (g) were completed in 1972-73 at a cost of Rs. 11.91 lakhs. They were carried out by MRL as part of their efforts towards operational improvement, better control over operations, reducing operational cost and improving profitability. Item (g) was reviewed again and it was decided not to instal the incinerator.

Firming up of Refinery Capacity

5.05 In the capital budget estimates for 1972-73, submitted to the Board in March 1972, the Management had stated that they could increase the annual crude throughput to 2.8 million tonnes, as against the design capacity of 2.5 million tonnes, after provision of some additional facilities to crude distillation unit to handle crude oil at 400 M³ per hour against the designed throughput at 350 M³ per hour. The work estimated to cost Rs. 45 lakhs was, expected to be completed in about two years time and the pay-back period was estimated at less than 2 years.

5.06 The preliminary process engineering report prepared by MRL was referred to the collaborators and on the basis of comments received from them, provision of following facilities at revised estimated cost of Rs. 42 lakhs was approved by the Board in December 1972 :

- (a) Installation of additional studded tubes soot blowers, burners, crude preheat exchangers, overhead condensor and certain piping modifications in Crude Distillation Unit.
- (b) Installation of cooling water pump in the off vacuum system.
- (c) Installation of diesel feed heater and HSD reactor feed/effluent exchanger.

5.07 During the turn-around of the refinery in February 1973, installation of soot blowers, burners, additional studded tubes and crude preheat exchangers was completed at a cost of Rs. 14.50 lakhs. Firm orders for additional heat exchangers, overhead condensor and cooling water booster pump and drive were released in May 1974 and their supply was scheduled for December 1975. The Management reported to the Board in July 1977 that all the proposed facilities except an additional heat exchanger in vendor's works at Hyderabad was in progress and that delivery of the same was expected by middle of 1978. Actually, the heat exchanger was received in February 1979 and the Management had proposed installation of the same during the turnaround scheduled for March 1980, but actually carried out the installation in June 1980. The total expenditure incurred on completion of this project was Rs. 46.01 lakhs. As a result of this delay, the return on fixed assets included in the refinery retention price applicable from July 1975 to March 1981 did not take this investment into account.

5.08 The refinery processed 2.61 million tonnes in 1973-74 as a result of the additional facilities installed in February 1973 and reached a maximum crude throughput of 2.82 million tonnes in 1979-80 when most of the additional facilities were in operation.

Provision of Additional Fuel Gas Compressor

5.09 The fuel Gas compressor (IK-1) supplied by SNAM PROGETTI was reported to have failed several times (January 1971). Due to defect in the Lube Oil System, the cooler was found to be insufficient and the gear pump was unable to develop the required pressure. The matter was reported to the contractors in January 1971 for rectification. The contractors indicated in March 1971 that they would use their good offices with the German manufacturers of the equipment for rectification of defects.

5.10 It was reported in March 1972 that the service factor of the compressor was only 60 per cent resulting in inadequate

fuel gas production necessitating vapourisation of costlier LPG to meet the refinery demand for fuel gas. The representative of the manufacturer was reported (March 1972) to have viewed that jobs like replacing seals and bearings might take as much as 12 shifts and since a high order of precision was involved, it was desirable to carry out such jobs on the shift/day basis. As protracted shut down of this equipment could not be ruled out, the Management felt the need for a spare compressor estimated to cost Rs. 10.00 lakhs, to enable them to discontinue the vaporisation of LPG of about 20 MT valued at Rs. 1,950 per day which works out to Rs. 6.81 lakhs per annum (approximately). The pay-out period was estimated at 3½ years.

5.11 The Technical Advisory Committee (TAC), however, desired in May 1973, that the Management should furnish a process scheme prior to sanctioning the project expenditure and also obtain vendor's quotation for full capacity compressor to handle all the gases at 2.85 MTPA crude run as well as for reduced capacity. After studying the various process schemes submitted by Management, TAC agreed (February 1974) that an additional gas compressor of 3,000 NM³/hr. was necessary and requested details of final price, delivery price etc. to be furnished. In May 1974, the Management submitted a proposal to purchase two compressors each of 1,500 NM³/hr. capacity at a cost of Rs. 29.86 lakhs, being the lowest quotation and consuming less power. It was also stated that with these two compressors, MRL would be able to meet the requirements at 3.5 MTPA crude capacity as well. It was estimated that the loss to the refinery would be Rs. 2.4 lakhs per year with only the present compressor on without the additional compressor and Rs. 33,000 per day when the present compressor was down. This proposal was approved in June 1974 by TAC and supply orders were released during the month. The total estimated cost of the project was Rs. 32 lakhs.

5.12 MRL stated that it could not visualise that the operating factor of the original compressor would be as low as 60 per cent

and it took some time to consider alternative solutions to improve operating levels. The proposal to instal two additional compressors (Rs. 32.60 lakhs) was to meet the refinery's requirement at a throughput of 3.5 MTPA. The present scheme of expansion of refinery, however, provides for parallel units to attain a capacity of 5.6 MTPA.

5.13 The additional compressors were received in 1976 and installed in March 1977 at the time of refinery turnaround. On the basis of the reduced service factor of 60 per cent as reported by the Management, the loss to the refinery worked out to Rs. 8.60 lakhs, since December 1975 (scheduled for completion originally).

Asphalt storage and handling facilities

5.14 On the basis of indications given by IOC, the Founders Committee estimated (June 1965) the demand for Asphalt in Madras supply area at 79,000 tonnes in 1966, 87,000 tonnes in 1967, 95,000 tonnes in 1968, 1,04,000 tonnes in 1969, 1,14,000 tonnes in 1970 and 1,26,000 tonnes in 1971. The process design contractor was, however, asked (June 1965) to design the Asphalt plant for a production of 80,000 tonnes per year. This was stated to have been based on the estimates obtained from IOC.

5.15 In June 1970, the Management reported to the Board that IOC had revised their offtake from 80,000 tonnes a year to 1,10,000—1,40,000 tonnes per year. As it was possible to meet this demand without major modifications to process units, only the filling plant was proposed to be modified to increase the filling rate from 1400 drums to 3000 drugs per shift, at an estimated cost of Rs. 6.75 lakhs. The cost was revised to Rs. 12.05 lakhs in the 1970-71 budget to include facilities for increasing the Asphalt storage and filling from 80,000 tonnes to 1,10,000 tonnes. Even though the provision of additional facilities was thought of in June 1970, the work commenced after January 1971 only. In February 1971, it was reported by the

Management that IOC had further revised their off-take from 1,10,000 tonnes to 1,80,000 tonnes per year, necessitating additional modifications at an estimated cost of Rs. 9 lakhs. This increased the total cost of modifications to Rs. 21.05 lakhs. The entire expenditure was expected (February 1971) to be paid out in 2½ years on the basis of incremental netback of Rs. 8.70 lakhs per year.

5.16 The modifications were completed in March 1973 at a cost of Rs. 16.32 lakhs (savings of Rs. 4.73 lakhs due to non-installation of certain equipments which became unnecessary on account of other modifications).

5.17 In March 1972, MRL reported that the demand for Asphalt was the highest during December and January every year (of about 26,000 tonnes per month, out of the total production of about 2,20,000 tonnes a year). As the then existing storage capacity was about 12,000 tonnes only, MRL found that it would be insufficient for storing the surplus production of 40,000 tonnes during off season (February—November).

5.18 It was, therefore, proposed to provide additional storage (Rs. 2.25 lakhs) and handling facilities (Rs. 7.50 lakhs) for about 40,000 tonnes. The Management reported to the Board that these facilities were required for maintaining the increased production from 1,80,000 tonnes to 2,20,000 tonnes a year by matching the storage and filling capacity and worked out the incremental realisation at Rs. 11.80 lakhs per annum and the payback period as 2½ years after providing for tax.

5.19 In December 1972, the Management proposed some additional facilities at an additional estimated cost of Rs. 28.00 lakhs to handle the production of Asphalt of 3.6 lakh tonnes per year based on projected requirements of IOC. The project was approved by the Board in July 1973. Civil works for relocation of Sulphur solidification plant, railway dock extension, additional storage area for filled drums and empty drums and

installation of 2 numbers of 5,000 bbl Asphalt tanks were completed by May 1977 at a total cost of Rs. 19.37 lakhs. However, work on other items of the project was temporarily kept in abeyance since Asphalt demand ex-MRL did not increase as anticipated, though many roads in the country suffer from inadequate or no, black topping at all, for want of asphalt.

5.20 Based on the GOI's decision as communicated to TAC on 21st April 1977, MRL felt that there was no need to provide any more additional facilities with a view to increasing the production to 3.6 lakhs tonnes per year.

5.21 The following table shows the annual Asphalt production and the progressive expenditure on the project.

Year	Production (in tonnes)	Progre- ssive ex- penditure (Rs. in lakhs)
1969-70	61,500	Nil
1970-71	1,32,800	1.15
1971-72	2,18,500	7.83
1972-73	2,01,000	16.32
1973-74	2,12,400	24.88
1974-75	1,59,000	26.96
1975-76	1,88,000	29.87
1976-77	1,64,800	35.69
1977-78	1,69,800	37.58
(9 months)		
1978-79	1,73,000	39.34
1979-80	2,05,900	40.27
1980-81	1,51,200	40.27

5.22 The monthly demand for Asphalt has been generally uniform and MRL achieved a peak production of 2,18,500 tonnes during 1971-72. Since then, the production has been in the range of 1,51,200 tonnes to 2,12,400 tonnes with the existing storage tanks of 12,000 tonnes capacity and improved filling facilities. The additional projects proposed in July 1973 and completed partially by May 1977, at a cost of Rs. 19.37 lakhs,

have not resulted in incremental realisation on increased production and despatch of Asphalt, in view of the varying demand projections furnished by IOC and the improved facilities to handle increased production even by 1973.

Kerosene Hydro-de-sulphurisation (HDS) Unit

5.23 The redesigning of kerosene Treating Unit was withdrawn from the process design contractor and awarded to the on-site works contractor on account of reduction in the smoke point of kerosene. On the basis of estimated yield and properties of different fractions at different boiling ranges, as given in the Formation Agreement and the Crude Oil Sales Agreement, kerosene HDS unit was designed for a feed rate of 62.4 m³ per hour. While submitting the capital budget estimates for 1972-73 to TAC, the Management stated (March 1972) that, in actual operation, the kerosene yield had been around 95 m³/hr., a maximum of 100 m³/hour could be drawn off from the atmospheric tower at design crude throughputs and that, at such high feed rates, proper control of the stripper operation was not possible and the product went off-specification, on quite a few occasions. The main limitation had been observed to be the heat exchangers connected with the strippers. It was, therefore, proposed by MRL to provide at an estimated investment of Rs. 10 lakhs additional heat exchangers to improve stripper operations and feed filters to minimise deposit of scales to be provided, so that the facilities would be suitable for handling upto 120 m³/hour, when crude rate was increased to 400 m³/hour. It was anticipated that the work could be completed by June 1974. It was also estimated by the Management that increased net realisation, on account of these modifications, would be Rs. 11.5 lakhs per annum due to upgradation of 5 m³/hour (approximately 4 tonnes/hour). The onsite works contractor (SNAM PROGETTI) to whom the matter was referred at the instance of the foreign collaborators, intimated in March 1973, that the cost of additional equipment/modifications would be about Rs. 47.5 lakhs. This was subsequently increased to

Rs. 65 lakhs in May 1974 on account of increase in cost of materials etc. and these estimates were approved by the Board of Directors in July 1973 and August 1974 respectively.

5.24 It was reported to TAC in June 1974 that one of the items of work in this project, viz., installation of feed filter, was completed during the turnaround in February 1973, while the other item, installation of recycle gas compressors with amine wash system, was completed in May 1979. The total cost was Rs. 14.46 lakhs.

5.25 The feed filter and recycle gas compressor could not give improvement in product pattern, by themselves, since the other facilities like feed pump, exchangers and furnace were not installed. MRL's plan for increasing the refinery capacity to 5.6 MTPA provides for an additional parallel kerosene HDS Unit. The expenditure (Rs. 14.46 lakhs) incurred so far was treated (November 1980) by MRL as expenditure for preventing scale deposits in the reactor, operational flexibility and reducing hydrogen. Return envisaged in the initial proposal has not materialised.

General

5.26 The total investment of Rs. 621.97 lakhs on these projects did result in reduction in fuel and loss, increase in production of LPG, and also an increase in throughput from 2.5 MTPA to 2.80 MTPA. In the absence of clear spelling out and monitoring of specific objectives, the taking up of debottlenecking projects soon after commissioning of the Refinery made it impossible to assess how much of it was necessitated by the inbuilt deficiencies in the design and initial execution of the project but the paragraphs 5.10 to 5.13 would clearly indicate how that project was necessitated specifically due to such initial flaws in design and execution of the installation of the gas compressor. Paragraph 5.25 would also indicate that the project did not result in commensurate benefits.

Additional LPG Storage sphere

5.27 The storage capacity for LPG, originally provided, consisted of 5 bullets of about 85 tonnes each for bulk storage and a capacity of 225 tonnes for filled cylinders. A Horton sphere of 550 tonnes capacity was constructed at a cost of Rs. 36.76 lakhs and commissioned in November 1976. The total storage capacity thus reached about 1200 tonnes.

5.28 The TAC, while considering (June 1974) a proposal for construction of another storage sphere of 550 tonnes capacity, decided that a comprehensive study of the storage requirement for the next three to five years should be made taking into account IOC's marketing requirements of the production capacity of the refinery and that, for this purpose, 15 days storage requirement might be considered adequate. In the quarterly performance review meeting of the Ministry of Petroleum held on 4th October 1974, it was observed that, in view of serious shortage of LPG experienced by consumers during shutdown, a firm decision about the need for immediate construction of additional storage facilities for LPG was called for. At the Oil Industry Co-ordination Meeting held on 15th January 1976, refineries were advised to provide at least 15 days storage capacity for LPG.

5.29 MRL had estimated in 1974 that production of LPG would ultimately reach 42,000 tonnes per annum on completion of expansion of then refinery capacity. Based on this, 15 days storage would require a capacity of 1800 tonnes and the additional capacity to be provided would be about 600 tonnes. The TAC which considered the issue in detail in November 1974 had accepted that there was potential need to have increased storage capacity for LPG and had suggested that one more storage sphere could be considered when MRL production potential reached 42,000 tonnes per annum. The Management reported in March 1976 that on account of several improvements made, like maximising LPG from platformer unit, conservation of fuel gas utilisation in the refinery heaters and better operating factor of fuel gas compressor, there had been increase in LPG production

corresponding to 42,000 tonnes per annum. It was, therefore, considered necessary to have adequate storage capacity to meet 15 days minimum requirements and approval for construction of one storage sphere of 550 tonnes capacity at an estimated cost of Rs. 45.00 lakhs *i.e.* about Rs. 10.00 lakhs higher than that proposed in November 1974, was sought. The proposal was, however, not approved by the TAC in the meeting held on 19th July 1976.

5.30 The proposal was again considered in September 1976 when the Management reported that the additional production envisaged on completion of certain modifications was about 8000 tonnes per annum and that LPG being one of the most valued consumer products and its market potential being unlimited, it would be desirable to maximise production with increased storage capacity. While the representatives of GOI and NIOC in the TAC agreed to the project on the merits of the case, the representative of AMOCO did not agree, stating that they "preferred to wait till the OPC recommendations are published and accepted" by GOI. The decision of GOI on OPC was implemented effective from 16th December 1977 which provided for compensation to the refinery from Industry Pool account for capital costs and operating cost thereon towards improving pattern of production and/or reducing the incidence of own consumption of fuel and loss etc.

5.31 While the need for the investment was found acceptable as an operational necessity in the context of social objectives and unlimited demand potential, the proposal for the additional storage sphere was not considered by the Board despite GOI decision on OPC's recommendation an additional investment of this nature. In the absence of adequate storage capacity, the increased production of LPG since 1976-77 (from 28,400 tonnes in 1974-75 to 43,100 tonnes in 1978-79), had to be filled in cylinders and marketed resulting in the market being fed during shut down periods from out of zone supplies at considerable cost to the Industry Pool Account.

5.32 The estimated cost of the storage sphere which stood at Rs. 35 lakhs in June 1974 increased to Rs. 45 lakhs even by March 1976.

EXPANSION OF REFINERY CAPACITY

5.33 M.R.L. has embarked on a project for expanding crude oil refining capacity from 2.8 MTPA to 5.6 MTPA by installing a new crude distillation unit (2.8 MTPA), a vacuum distillation unit (1.15 MTPA) and matching secondary processing facilities. The total project cost was approved by Government (8th June 1982) at Rs. 158.8 crores including financing charges of Rs. 23.8 crores.

5.34 Process design for Fluid Cat Cracking unit (0.6 MTPA) and Merox Units for LPG, gasoline and kerosene was done by Universal Oil Products, USA and the design for the other units was done by EIL.

5.35 The work on expansion project commenced in December 1980. Process design work has since been completed and detailed engineering work by EIL is in progress (December 1982). The total expenditure incurred upto 31st December 1982 is Rs. 40 crores. The project is expected to be completed by July 1984 (Crude Distillation Unit), January 1985 (Fluid Cat Cracking Unit).

5.36 The entire investment for this project is being financed out of loans arranged by GOI, including loans from World Bank.

6. PRODUCTION PERFORMANCE

6.01 According to the Formation Agreement, the refinery has to process 50,000 BCD attaining a throughput of 24,74,700 tonnes per annum. In the Directors' report for 1974-75, it was stated that "the crude furnace has since been able to operate at the rate of 400 M³ throughput as compared to 350 M³".

It is seen from the Formation Agreement that one barrel of crude is equal to 0.158987 M³. As distillation was initially designed for a throughput of 350 M³ per hour (*i.e.* about 2201 barrels per hour), the refinery has to work for 345 days in a year (approximately 7160 tonnes per stream day) to achieve a

capacity of 2,474,700 tonnes per annum (*i.e.* 50,000 BCD). At the higher operating level (*i.e.* 400 M³ per hour), the throughput per stream day should work out to 8116 tonnes (approximately) and the annual capacity would increase to 2.8 million tonnes. However, this capacity was not achieved until the related facilities for processing and storage were firmed up in June/July 1980.

6.02 The table in Annexure IV indicates the details of throughput *vis-a-vis* capacity from 1969-70 to 1981-82.

It is seen from the Annexure that the throughput was less than that designed during 1969-70, 1970-71, 1972-73 and 1976-77 as number of streamdays was less than 345 days in a year, and the average throughput per streamday was also less than that designed.

During 1973-74, the number of streamdays as well as average throughput was higher than design, but that number of streamdays was less than the design in all the years except during 1971-72, 1973-74, 1977-78 (9 months), 1978-79 and 1979-80.

6.03 While the shortfall in crude throughput per streamday was generally attributed to low crude inventory due, initially, to limited draft availability at Madras Port upto January 1973 and later to tanker slippage, the reduction in number of streamdays, as compared to 365 days available in a year (when refinery turn-around is not being done), was attributed to the following factors in the various years.

- | | |
|--|-------------------|
| (a) Phased start-up of process units in the first year | 1969-70 |
| (b) Planned shut-down for maintenance | 1970-71 (16 days) |
| | 1972-73 (22 days) |
| | 1974-75 (27 days) |
| | 1976-77 (31 days) |
| | 1980-81 (38 days) |
| (c) Unplanned shut-down (crude distillation units for replacement of corroded overhead vapour lines) | 1975-76 (11 days) |
| (d) Critical ullage due to poor upliftment by marketing company | February 1975 |

Refinery Material Balance

6.04 The Formation Agreement provided for refinery material balance consisting of 10 products in addition to refinery fuel and gas. This material balance could, however, be changed by mutual agreement, if further studies, which were being made, warranted any revision. No formal amendment to the material balance, as specified in the Formation Agreement was made, but at the time of designing the refinery, the process design contractor indicated a revised material balance.

6.05 Even though MRL prepares an annual production budget, actual production is regulated according to marketing requirements approved by GOI in the monthly Supply Plan Meetings (SPM). MRL has executed several capital works for improving individual plant capacity, and reduction of own fuel consumption. These have been referred to in paragraph 5.02. As a result, MRL has achieved higher than process design production in fuel products.

6.06 The table in Annexure V indicates the design capacity (as per process design), requirements as per supply plan and actual throughput and production during 1974-75 to 1981-82. It will be seen that, even though crude throughput for these years have been only marginally less than that assumed for marketing requirements, the production has fallen short of Supply Plan targets in respect of :

1. LPG, NAPHTHA, ATF, LDO and Asphalt in 1974-75 ;
2. ATF, HSD, LDO and Asphalt in 1975-76 ;
3. NAPHTHA, ATF and HSD in 1976-77 ;
4. NAPHTHA, SKO, LDO and FO in 1977-78 and
5. LPG, NAPHTHA, SKO, LDO and Asphalt in 1978-79;
6. LPG, NAPHTHA, SKO, ATF, LDO, Asphalt and Lube in 1979-80 ; and
7. LPG, NAPHTHA, SKO, Asphalt & Lube in 1980-81.

6.07 The variations from SPM targets have resulted in movement of products into or out of the refinery supply area, the cost of such movement being borne by the Freight Surcharge Pool Account. The actual additional cost of out of zone transportation is not available.

6.08 *Production of Sulphur*

The guaranteed properties of Darius Crude indicated a Sulphur content not exceeding 2.5 Wt% and the process design contractor was required to design the Sulphur plant for a Sulphur content of 2.6 Wt%. The plant was, therefore, designed for a production of 19,900 tonnes of sulphur per annum. The plant was, however, not working satisfactorily since start up in August 1969 and its operating factor was about 40 per cent and the unit was shut down 26 times for a total period of 33 months in about 48 months since start up. MRL requested its collaborator (AMOCO) in December 1973 to provide assistance. On the basis of studies conducted by AMOCO in April 1974, they made some recommendations to overcome the following problems :

- (i) Concentration of hydrocarbons in acid gas feed is high at 5 per cent to 8 per cent as against the design of 1 per cent/vol.
- (ii) The plant also received heavy hydrocarbon slorts which resulted in upsetting the plant operation.
- (iii) The thick layers of carbon deposits on catalyst beds of the converter reduced the life and efficiency of the catalyst and activity.

This resulted in low recovery of sulphur, reduction in the operating fatcor of the plant and limitations in the plant capacity due to high back pressure in the system.

6.09 In order to overcome the problems, MRL proposed, in March 1976, to instal a Surge drum in the combined stream

of rich Methyl Ethyl Amine coming from various hydro-desulphurisation absorbers at a total cost of Rs. 4.00 lakhs. The increase in production of sulphur on this account was estimated at 960 tonnes per annum which was, otherwise, being flared. There was delay in the supply of the equipment as the party on whom the order was initially placed did not supply it; the equipment was procured through another party and commissioned in March 1981.

6.10 The actual production of sulphur varied from 7,900 tonnes to 10,800 tonnes between 1975-76 and 1978-79 and came down to 6,100 tonnes in 1979-80, 5,300 tonnes in 1980-81 and 6,700 tonnes in 1981-82. MRL stated that actual production of sulphur was lower than the plant capacity due to changed conditions. Product specifications had undergone changes resulting in reduced sulphur availability as well as need to recover it as the cost of production of sulphur estimated at Rs. 1,440 per tonne was higher than the landed cost of imported sulphur which was about Rs. 1,200 per tonne.

7. Energy conservation

7.01 GOI, while implementing the OPC's recommendations stipulated that the refinery would be allowed fuel and loss for purposes of crude oil price equalisation claims on the basis of actuals subject to a ceiling of 9.42 wt/per cent from 14th July 1975 and 9.69 wt./per cent from 16th December 1977. The refinery fuel consumption and loss varied from 10.79 wt/per cent in 1970-71 to 9.81 wt/per cent in 1974-75.

In May 1974, MRL on its own, set up an energy conservation cell in the refinery to monitor refinery fuel consumption and loss and to pay attention to the following :

- (i) Reducing steam losses, changing traps and improved steam trap maintenance.

- (ii) Eliminating/reducing cold feed to platformer and gas oil desulphuriser.
- (ii) Lowering sulphur pit temperature by reducing steam.
- (iv) Controlling flared gas by installing anemotherm in flareline and blowdown lines in individual units.
- (v) Frequent monitoring of excess air in furnaces.
- (vi) On stream clearing of exchangers.
- (vii) Changing of seals in the crude tanks and gasoline tank to improved type to minimise evaporation losses.

7.02 The percentage of fuel and loss after 1974-75, as compared to the ceiling allowed in the refinery retention price improved and was as indicated below :

Year	Actual fuel and loss Tonnes (%)	Ceiling in retention price Tonnes	Difference (+ gain)/ (-Loss)	
			Tonnes	Value (Rs. in lakhs)
1975-76	261,100(9.8)	251,412	(-)9688	(-)83.39
1976-77	233,307(10.0)	221,351	(-)11,956	(-)101.65
1977-78	200,198(9.6)	199,734	(-)464	(-)4.20
1978-79	258,781(9.4)	267,322	(+)8,541	(+)77.21
1979-80	260,807(9.2)	273,453	(+)12,646	(+)124.43
1980-81	235,091(9.0)	253,000	(+)17,909	(+)271.04
1981-82	240,300(8.5)	271,446	(+)31,146	(+)580.32

7.03 MRL also planned 14 items of capital works at an estimated cost of Rs. 170.35 lakhs between March 1975 and March 1981 for improvement in the fuel consumption and reduction in fuel loss. Six of these items were completed between December 1978 and March 1982 at a cost of Rs. 204.40 lakhs (estimated cost Rs. 223.75 lakhs). The saving in refinery fuel on completion of these eight items was estimated at 15,457 tonnes per annum (estimated cost being Rs. 356.28 lakhs at the crude price prevailing in January 1982).

MRL has not assessed the savings attributable to individual items. There was overall improvement in energy consumption due to measures taken in the course of refinery operations, in addition to the capital works mentioned above. In respect of other items in progress, fuel saving of 9215 tonnes per annum (valued at Rs. 186.10 lakhs at current crude price) has been estimated.

7.04 MRL could claim fuel and loss under the pricing scheme upto a ceiling of 8.2 per cent/wt and 8.77 per cent/wt of throughput with effect from 14th July 1975 and 16th December 1977 respectively for bulk petroleum products. The ceiling for lube base stock production applicable from the above noted dates was 22.5 per cent/wt and 20 per cent/wt respectively. On the above basis, MRL had to absorb the excess fuel and loss amounting to Rs. 189.24 lakhs upto March, 1978. The fuel and loss for the subsequent years being less than the ceiling of 8.77 per cent/wt allowed in the retention price, the MRL's claim from Industry pool account had to be restricted to actuals only.

8. FINANCIAL MANAGEMENT

Financial Position

8.01 The summarised financial position of MRL for the period 1974-75 to 1981-82 is given below :

(Rs. in lakhs)

	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Liabilities :								
(a) Paid-up Capital	1287.49	1287.49	1287.49	1287.49	1287.49	1287.49	1287.49	1287.49
(b) Reserves & Surpluses	1547.34	1613.34	1358.65	1412.63	1431.08	1490.90	1545.03	1620.07
(c) Borrowings :								
(1) From GOI	611.69	386.64	161.61	24.07	14.00	59.00	Nil	Nil
(2) Foreign Loans	458.58	323.19	187.80	120.10	..	Nil	Nil	Nil
(3) OADB . . . . .	..	..	..	..	..	..	178.00	2774.05
(4) Public Deposits . . . . .	..	..	..	..	..	..	..	157.57
(d) Trade dues and other current liabilities	5523.76	8083.17	6047.84	7237.65	8225.54	19381.26	48253.79	40870.52
TOTAL	9228.86	11693.83	9043.39	10081.94	10958.11	22218.65	51264.31	46709.70
Assets :								
(e) Gross Block	4132.02	4162.57	4265.86	4341.93	4359.69	4453.71	4733.19	5007.55
(f) Less : Depreciation	2036.07	2386.14	2735.42	3001.93	3355.96	3715.83	4026.48	4187.59
(g) Net Fixed Assets	2095.95	1776.43	1530.44	1340.00	1003.73	737.86	706.71	819.96
(h) Construction work-in-progress	12.41	68.42	62.34	55.29	118.14	235.50	972.24	3135.53
(i) Investments . . . . .	..	..	..	0.46	0.41	0.41	0.51	0.51
(j) Current Assets	7054.73	9784.65	7391.39	8655.60	9810.79	21221.27	49567.11	42741.45
(k) Miscellaneous Expenditure	65.77	64.33	59.22	30.59	25.04	23.59	17.74	11.85
TOTAL	9228.86	11693.83	9043.39	10081.94	10958.11	22218.65	51264.31	46709.70

8.02 The retention price for each of the products was determined by GOI on a standard pattern of production and the revenue realised on the production for sale was limited to the admissible crude throughput inclusive of actual refinery fuel and loss upto the ceiling fixed. In actual practice, the standard production pattern assumed by GOI for fixing the retention price was not realised either due to the monthly supply plan requirements for products fixed by Government or change in the crude mix. The margin in the retention price towards refining costs and return on net fixed assets and working capital were based on the recommendations of O.P.C. in November 1976. The basis on which the margins were fixed had undergone changes since then and the refinery found them to be inadequate on account of the increase in cost of refinery operations, higher crude oil cost and expenditure on capital projects incurred to improve production which did not get included in the capital cost for which margins as per GOI Policy (i.e. 15 per cent) were allowed. This was represented to GOI by MRL on an industry-basis and the GOI allowed the refinery's additional claims from Industry Pool Account to the extent of additional cost of refinery operations and expenditure on capital projects from 1st April 1978 onwards.

8.03 The Table below shows the operating expenses of MRL and the amount realised by them through retention price and claim from Industry Pool Account from 1978-79 to 1981-82.

	1978-79	1979-80	1980-81	1981-82
				(Rs. in lakhs)
(1) Operating expenses	765.86	835.06	1202.90	1113.11
(2) Amounts realised				
(a) Retention price	656.68	672.85	633.10	851.53
(b) Claims from Pool account	15.00	26.59	146.52	..
(c) Filling charges for LPG and Asphalt	53.40	53.40	56.41	53.40
(d) Adjustment of differential retention price on non-formula products	..	3.42	31.02	32.58
TOTAL (2)	725.08	756.26	867.05	937.51
(3) Net difference				
Total (Rs. in lakhs)	40.70	78.80	335.85	175.60
per tonne (Rupees)	1.48	2.79	12.86	6.27

8.04 The GOI formulated a scheme (July 1982) for suitable cost adjustment towards repairs and maintenance as against the parameters used in retention price build-up from 1978-79. The MRL is in the process of working out the claims on this basis for approval of GOI (December 1982).

8.05 For allocating that total cost of refinery to individual products, OPC evolved a set of relative indices after taking into account factors like present and prospective demand and supply, ability of individual products to bear additional charges, their end use patterns, refinery economics and other relevant technical factors. Broadly, these indices reflected the national requirements, as then assessed by the OPC.

8.06 The Table below shows the indices evolved by OPC and the retention price fixed for MRL from 14th July 1975 (being the date from which the recommendations of OPC were implemented) and subsequent revisions thereof as also the rate of excise duty levied thereon.

Product	OPC Cost Index	Retention price (Rs. per tonne/KL)					
		Excise Duty					
		14.7.75	16.12.77	18.8.79	12.6.80	13.1.81	11.7.81
LPG	1.15	816.89	982.69	1312.46	1830.71	2018.80	2485.3
		*250.00	*250.00	*262.60	*262.50	*262.50	*262.50
MS	1.05	528.60	897.24	1198.32	1671.52	1843.24	2269.24
		*2110.06	*2110.06	*2215.56	*2215.56	*2215.56	*2215.56
Naphtha	0.98	896.13	837.43	1118.44	1560.08	1720.36	2117.96
ATF	1.20	661.81	1025.42	1369.52	1910.30	2106.56	2593.42
		*383.38	*383.38	*402.56	*333.52	*333.52	*333.52
SKO	1.00	552.80	854.52	1141.26	1591.92	1755.47	2161.18
		*383.46	*383.46	*402.63	*333.59	*333.59	*333.59
HSD	0.95	557.70	811.79	1084.20	1512.33	1667.69	2053.12
		*380.14	*380.14	*399.15	*330.00	*330.00	*330.00
LDO	0.91	551.54	777.60	1038.54	1448.66	1597.49	1966.69
		*146.62	*146.62	*153.96	*153.96	*153.96	*153.96
FO	0.70	464.27	598.16	798.58	1114.34	1228.83	1512.83
		*119.83	*119.83	*125.82	*125.82	*125.82	*125.82
Asphalt	0.73	518.55	623.80	833.12	1162.10	1289.41	1577.67
		*150.05		*110.30	*110.30	*110.30	*110.30

*Excise duty applicable.

8.07 The ex-Refinery price for the products fixed uniformly for all the refineries in the country is based on the weighted average of retention prices which are fixed with reference to the standard production pattern assumed for the refineries concerned. The retail price charged from the consumers, however, had no relationship to the above noted indices developed by OPC to reflect the national requirements, in view of varying rates of excise duty levied and also the products price adjustments made by GOI. The MRL has been allowed very limited flexibility in maximising revenue, either by improving production pattern or reducing operational costs.

8.08 While, the assured margins included in the retention price were in general realised by MRL, as the average operational level was not attained in the years 1976-77 to 1978-79 and 1980-81 and 1981-82 vide paragraphs 7.02 and 7.04, fuel and loss exceeded the percentage fixed and loss due to excess fuel and loss to the extent of Rs. 189.24 lakhs had to be absorbed upto March 1978. Government stated (December 1982) that effective from 1-11-1977 they had approved, in principle, that the entire retention value for any improvement in the production pattern or reduction in fuel and loss achieved by a refinery through new investments or managerial efficiency would accrue to the refinery on a yearly basis and claims for the period 1-11-1977 to 31-3-1982 submitted by MRL on this basis are under review by the Oil Coordination Committee/Ministry.

9. Sale of Products

9.01 The Formation Agreement provided that GOI would purchase directly or through its nominee all products at the prices determined on a basis no less favourable to MRL at the

time of sale than those prevailing at that time for similar products of any other refinery in India. Accordingly, GOI nominated (March 1968) MFL for the purchase of Naphtha and permitted MRL to sell sulphur directly to the consumers. The IOC was nominated by the Govt. to undertake the sale of all the products of the refinery excepting those for which other arrangements had been made.

9.02 Sales made by MRL during 1974-75 to 1981-82 are indicated in Annexure VI.

9.03 On the basis of an agreement, made in June 1969, MRL allowed a credit period of 42 days to IOC, for supplies made. This was reduced to 30 days in June 1973 and to 28 days in December 1973 by GOI.

9.04 The Oil Prices Committee set up in March 1974 recommended, in its interim report, payment of products prices by the marketing companies within 3 days of delivery of the products. GOI accepted this recommendation and implemented it with effect from 14th June 1975. Thus, while MRL got a credit facility upto 60 days for the crude throughout, they were in the advantageous position of having to allow only 3 days' credit for payment to be received for their products.

10. Costing System

10.01 The finished products of MRL flow out of the crude oil processed in the crude distillation unit and it is not possible to prepare product-wise cost accounts. The international practice is, therefore, to do joint costing.

10.02 When joint products are produced in proportion, a marginal increase or decrease in the output of one of the products is necessarily accompanied by a proportionate decrease or increase in the output of other products in the group keeping in view the monthly supply plan requirement estimated by GOI. The product-mix for the years 1977-78 to 1981-82 shown below would clarify this position.

('000 tonnes)

Productmix	1977-78	1978-79	1979-80	1980-81	1981-82
1. Lightends (LPG, M.S. and Naphtha)	312.4	394.1	395.9	344.5	366.9
2. Middle distillates (ATF, SKO, HSD & LDO).	927.2	1268.3	1260.0	1195.4	1268.9
3. Heavy ends—					
(a) Lube base stocks	136.6	164.3	174.5	151.4	134.4
(b) Asphalt	169.8	173.0	206.0	151.4	221.3
(c) F.O., Sulphur etc.	342.2	495.8	527.5	532.4	571.4
	1888.2	2495.5	2563.9	2375.1	2562.9

10.03 Under the pricing scheme for petroleum products administered by GOI, the MRL has been allowed a retention price for each of the products supplied to the marketing company. The retention price includes, besides cost of crude allocated to individual products, provision towards refining costs, and margins calculated on net fixed assets and working capital requirements as recommended by the Oil Prices Committee (which was set up by GOI in March 1973). While the excess of cost of crude over that included in the retention

price is reimbursed monthly through a Crude Oil Price Equalisation Account administered by the Oil Co-ordination Committee set up by GOI, the incidence of other elements in the retention price, i.e., refinery costs and margins, are reviewed by MRL periodically and excess of refining cost and shortfall in accrual of margins are assessed and MRL has been representing to GOI for compensation therefor. GOI allowed the refineries to claim from the industry pool account the increase in operating expenses for 1978-79 onwards on account of long term wage settlement with employees, consumption of chemicals and utilities. The retention prices were also revised in 1981-82 to provide for the increase in refining cost.

For the above reasons, MRL has not made attempts to determine profit or loss on individual products.

10.04 An annual operating budget is prepared for the throughput levels, production pattern, various items of operating costs both in physical and fiscal terms. Monthly reports comparing the actuals with the budget are circulated to the Departmental managers and the Board of Directors in the following month. The variance analysis with reference to budget is also included in the Monthly Reports.

11. Manpower Analysis .

11.01 The man power requirements for construction and operation of the refinery were not indicated in the Formation Agreement. At the instance of the Board of Directors, the man-power requirements upto 31st March 1968 were assessed by the Management of MRL in January 1967. The Board decided (August 1967) that the Technical Advisory Committee (TAC) of the Board should assess the man-power scheduling during

construction, start-up and operation of the Refinery. Accordingly, the report of TAC was presented to the Board in October 1967 which approved the following as the requirements.

	Indian nationals		Expatriates	
	Supervisory	Others	Long term	Short term
(i) Manufacturing	41	125	10	4
(ii) Maintenance	29	103	1	6
(iii) Technical services	27	21	2	2
(iv) Project	4	..	3	..
(v) Administration & Finance	25	81	..	..
TOTAL	126	330	16	12

The MRL obtained the approval of the Board, from time to time, for the man-power requirements since then.

11.02 The following table shows the actual man-power in position as compared to the Budgeted strength :

Departments	31-3-78		31-3-79		31-3-80		31-3-81	
	B	A	B	A	B	A	B	A
(1) Manufacturing	184	178	200	192	199	193	199	179
(2) Maintenance & construction	212	195	193	193	191	187	191	178
(3) Technical services & Project	52	52	55	53	59	55	59	57
(4) Administration & Finance	79	78	79	76	79	71	79	73
TOTAL	527	503	527	514	528	506	528	487

B-Budget; A-Actual.

These details would show that MRL has been maintaining adequate control over man-power requirement.

12. Overall Summary

The following are the important features emerging out of the detailed analysis given in the preceding paragraphs :—

12.01 Introduction

The Madras Refineries Limited was incorporated in December 1965 with a capacity of 2.5 million tonnes per annum. According to initial project estimate, Madras Refineries Limited was required to attain half the through-put in 1967 and the full through-put in 1968. The Refinery was actually commissioned in June 1969. The delay necessitated the import of 3.4 million tonnes of petroleum products between July 1967 and June 1969 for supply to the deficit region. (Paragraph 1.05).

12.02 Selection of collaborators

Of the three collaboration proposals from (i) National Iranian Oil Company/American International Oil Company (NIOC/AIOC), (ii) Burmah Oil Company/Burmah-Shell (BOC/Shell and (iii) Gulf Oil Company/Continental French Petroleum (Gulf/CFP) which were considered by Government, collaboration with NIOC/AIOC was finally approved by Government in November 1964. The Ministry of Petroleum preferred the NIOC/AIOC offer on the considerations of :—

(i) Extent of equity participation ; (ii) terms and conditions of foreign exchange loan ; (iii) supply of crude oil at attractive price ; (iv) better credit term ; and (v) offer of foreign exchange beyond U.S. \$ 31.4 millions for development of Fertilizers and/or Petro-chemicals Plant. However, the actual equity participation was US \$ 4.68 millions only, the foreign exchange loans were repaid much earlier, the agreed price of crude was subsequently enhanced and out of the promised foreign exchange allocation for Madras Refineries Limited and for development of Fertilizers and/or Petro-chemicals Plants, to the extent of US \$ 54.40 millions, there was a shortfall to the extent of US \$ 10.60 millions. (Paragraphs 1.10 and 1.16).

12.03 Crude Oil Sales Agreements

(i) Supplies under the agreement entered in November 1965 were discontinued by the suppliers in November 1978 on grounds of disruption of delivery of crude at the terminals. Resumption of supply were promised after restoration of normal operations. The supplies have, however, not been resumed so far (January 1983). In May 1970, another Government of India undertaking—Cochin Refineries Limited signed an agreement for the purchase of Aghajari Crude at a discount of 53 cents over the posted price. Accordingly, the price of crude under the agreement with NIOC/AIOC (for Darius Crude) should have been reduced by 10 cents per barrel or to the extent of Rs. 1.36 crores per annum. Government of India's attempts to get the crude price reduced, however, failed. Government of India decided in July 1970 to carry out negotiations at political level and also to examine the case legally. Further progress in this respect is not known (January 1983). (Paragraph 3.10).

(ii) The quality of crude supplied did not conform to the American Petroleum Institute (API) gravity provided in the agreement. The claim of Rs. 60.20 lakhs for inferior supplies was foregone by the Company as a "demonstration of goodwill and understanding". (Paragraphs 3.12 to 3.18).

(iii) The Company obtained supplies from NIOC against contracts dated May 1979, January 1980 and December 1980 at premia of 16 cents/28 cents/28 cents per barrel respectively and the total premium paid amounted to Rs. 1048.16 lakhs. During the same period another Government of India undertaking, Indian Oil Corporation, however purchased crude from NIOC without any premium (paragraphs 3.21 & 3.22).

12.04 Construction of Refinery

(i) The initial project estimate of Rs. 43.70 crores (January 1967) contained a provision of Rs. 28.59 crores for On-site and related facilities and Rs. 8.50 crores for Off-site

works. There was a saving of Rs. 1.69 crores in these two items due to non-execution of housing for employees and other on-site/off-site facilities. However, there was an increase of Rs. 0.36 crore in the estimate of Rs. 1.49 crores for administration and engineering expenditure. The final overall project estimate (August 1969) stood at Rs. 44.38 crores (Paragraphs 4.02 to 4.04).

(ii) The Company faced several technical problems in the refining units from the start up on which corrective measures were to be taken by the contractor. The additional loss of earnings due to poor performance of one equipment—Vacuum Overhead System—alone was estimated at Rs. 1.07 crores till 1973. These defects were set right by the Company while carrying out modifications from time to time to improve efficiency (Paragraphs 4.14 and 4.19).

12.05 Modifications, improvements and expansion

(i) Fuel Gas Compressor supplied by a firm failed several times during 1971 due to defects in the Lube Oil System. Representatives of the manufacturers estimated the pay-out period for repairs at 3½ years and also suggested the need for a spare compressor at a cost of Rs. 10.00 lakhs. However, the Company decided to purchase two additional Gas Compressors at an estimated cost of Rs. 32 lakhs in 1974 and compressors were installed in March 1977. Loss to the Refinery during the intervening period due to the reduced service factor of 60 per cent worked out to Rs. 8.60 lakhs (Paragraphs 5.09, 5.10 to 5.13).

(ii) The Company created additional facilities for increasing the production of asphalt to 3.6 lakh tonnes per year at a cost of Rs. 19.37 lakhs. As the production ranged between 1.51 lakh tonnes to 2.12 lakh tonnes, the additional expenditure has not resulted in additional benefit (Paragraphs 5.14 to 5.22).

(iii) Although the need for additional storage capacity for L.P.G. was recognised, it was not actually implemented and the

increased production of L.P.G. from 28,400 tonnes in 1974-75 to 43,100 tonnes in 1978-79 had to be filled in cylinders and marketed, resulting in the market being fed during shut-down periods from out-of-zone supplies at avoidable cost to the Industry Pool Account (Paragraph 5.31).

12.06 Production Performance

(i) The annual capacity of 2.8 million tonnes, calculated at the throughput per streamday of 8,116 tonnes for 345 streamdays in a year, was not achieved until the related facilities for processing and storage were firmed up in June/July 1980. (Paragraph 6.01).

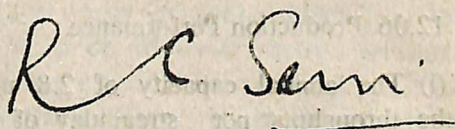
(ii) The throughput was less than that designed during 1969-70, 1970-71, 1972-73 and 1976-77 as the number of streamdays was less than 345 in a year and the average throughput per streamday was also less than that designed. (Paragraph 6.02).

(iii) Even though crude throughput has been marginally less annually than that assumed for marketing requirements, the production of certain crude products has fallen short of supply plan targets in certain years. These variations have resulted in movement of products into or out of the refinery supply area, the cost of which is borne by the Freight Surcharge Pool Account. The actual additional cost of transportation out of zone is not available (Paragraphs 6.06 and 6.07).

(iv) Production of sulphur designed at 19,900 tonnes per annum was not achieved. It ranged between 7,900 tonnes to 10,800 tonnes between 1975-76 and 1978-79 and declined to 6,100 tonnes, 5,300 tonnes and 6,700 tonnes 1979-80, 1980-81 and 1981-82 respectively. This resulted in higher cost of production estimated at Rs. 1,440 per tonne as compared to landed cost of imported sulphur of Rs. 1,200 per tonne (Paragraph 6.10).

12.07 Energy Conservation

The refinery had to absorb excess fuel and loss amounting to Rs. 189.24 lakhs up to March 1978 as the actual fuel and loss was more than the ceiling allowed in the retention price (Paragraph 7.04).



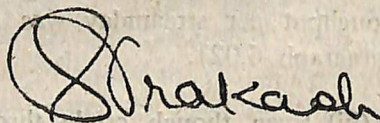
(R. C. SURI)

Chairman, Audit Board and Ex-officio
Additional Deputy Comptroller and
Auditor General (Commercial)

New Delhi
The

21-7-1983

Countersigned



(GIAN PRAKASH)

Comptroller and Auditor General
of India

New Delhi
The

21-7-1983

13. GLOSSARY

Sl. No.	Abbreviation used	Full Form
1	2	3
1.	MTPA	Million Tonnes per annum
2.	IIP	Indian Institute of Petroleum
3.	GOI	Government of India
4.	NIOC	National Iranian Oil Company
5.	AIOC	American International Oil Company
6.	MRL	Madras Refineries Limited
7.	AMOCO	AMOCO India Incorporated
8.	SNAM PROGETTI	Snam Progetti of Italy
9.	EIL	Engineers India Limited
10.	BOC/Shell	Burmah Oil Company/Burmah Shell
11.	Gulf/CFP	Gulf Oil Company/Continental French Petroleum
12.	ONGC	Oil and Natural Gas Commission
13.	API	American Petroleum Institute
14.	BECHTEL	Bechtel Overseas Corporation, San-Francisco.
15.	ISI	Indian Standards Institution
16.	BCD	Barrels per Calendar day
17.	OPC	Oil Prices Committee
18.	IOC	Indian Oil Corporation
19.	JGC	Japan Gasoline Company Limited
20.	TAC	Technical Advisory Committee
21.	IFP	Institute of French Petroleum
22.	PROCON	Pacific Procon Limited
23.	SPM	Supply Plan Meeting
24.	LPG	Liquified Petroleum Gas
25.	MS	Motor Spirit (Petrol)
26.	HSD	High Speed Diesel Oil
27.	SKO	Superior Kerosene Oil
28.	LDO	Light Diesel Oil
29.	FO	Furnace Oil, Fuel Oil
30.	ATF	Aviation Turbine Fuel
31.	MFL	Madras Fertilizers Limited

ANNEXURE I

(Referred to in paragraph 1.18)

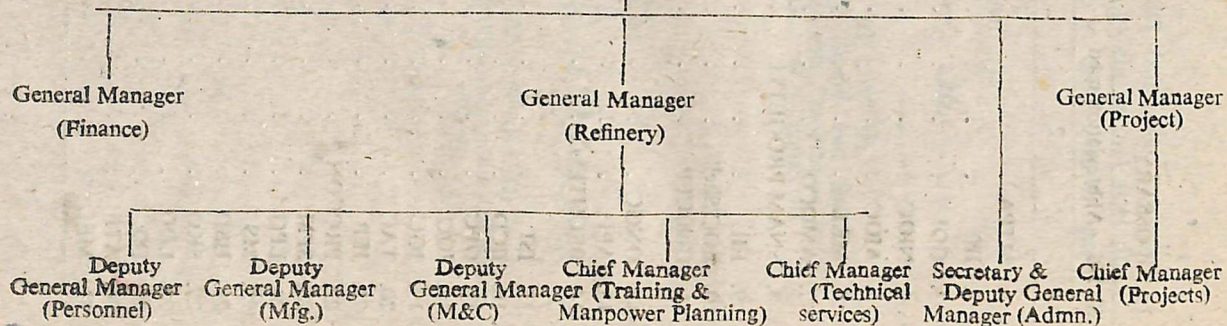
MADRAS REFINERIES LIMITED

MANALI, MADRAS—600 068

ORGANISATION CHART

BOARD OF DIRECTORS

CHAIRMAN & MANAGING DIRECTOR



ANNEXURE II

(Paragraph 3.11)

Price Charged for Supplies of Drrius Crude since Inception

Period	Contract price \$/bbl	(-) Discount (+) premium \$/bbl	Price actually paid \$/bbl
1	2	3	4
1-1-69 to 13-11-70 . . .	1.35	..	1.35
14-11-70 to 14-2-71 . . .	1.41	..	1.41
15-2-71 to 31-5-71 . . .	1.887	(-)0.067	1.74
1-6-71 to 19-1-72 . . .	1.910	(-)0.100	1.81
20-1-72 to 31-12-72 . . .	2.099	(-)0.179	1.92
1-1-73 to 31-3-73 . . .	2.21	..	2.21
1-4-73 to 31-5-73 . . .	2.3703	..	2.3703
1-6-73 to 30-6-73 . . .	2.510	(+)0.161	2.671
1-7-73 to 31-7-73 . . .	2.5655	(+)0.1615	2.727
1-8-73 to 30-9-73 . . .	2.6737	(+)0.1633	2.837
1-10-73 to 15-10-73 . . .	2.6204	(+)0.1626	2.783
16-10-73 to 31-10-73 . . .	4.681	..	4.681
1-11-73 to 30-11-73 . . .	4.7367	..	4.7367
1-12-73 to 31-12-73 . . .	4.6313	..	4.6313
1-1-74 to 31-10-74 . . .	11.287	..	11.287
1-11-74 to 30-9-75 . . .	10.887	..	10.887
1-10-75 to 13-2-76 . . .	11.972	(-)0.230	11.742
14-2-76 to 31-5-76 . . .	11.938	(-)0.230	11.708
1-6-76 to 8-6-76 . . .	11.913	(-)0.180	11.733
9-6-76 to 31-12-76 . . .	11.888	(-)0.180	11.708
1-1-77 to 30-11-78 . . .	12.921	(-)0.090	12.831

ANNEXURE III
(referred to in paragraph 5.02)
Details of Capital Projects Undertaken

(Rs. in lakhs)

Year	No. of items	Budget Estimates		Actual Expenditure	Completed in		
		Original	Revised	end of March 1982			
1	2	3	4	5	6		
		Rs.	Rs.	Rs.			
<i>(i) Debottlenecking Projects</i>							
1970-71	1	10.00	11.59	11.84	72-73	79-80	
					1 item (11.84 lakhs)		
1972-73	1	10.00	15.00	14.77	..	1 item (14.77 lakhs)	
<i>(ii) Improvement in operational performance and increasing plant capacity</i>							
1970-71	12	63.30	84.55	75.14	71-72	72-73	73-74
					(2 items)	(8 items)	(2 items)
					(Rs. 7.87 lakhs)	(Rs. 47.81 lakhs)	(Rs. 19.46 lakhs)

1971-72	25	54.98	46.55	44.91	<u>72-73</u> 2 items (Rs. 5.96 lakhs)	<u>73-74</u> 19 items (Rs. 31.15 lakhs)	<u>74-75</u> 4 items (Rs. 7.00 lakhs)
1972-73	9	39.60	71.88	70.67	<u>73-74</u> 3 items (Rs. 3.28 lakhs)	<u>74-75</u> 1 item (Rs. 2.55 lakhs)	<u>75-76</u> 2 items (Rs. 5.60 lakhs)
					<u>76-77</u> 2 items (Rs. 3.63 lakhs)	<u>77-78</u> 1 item (Rs. 32.68 lakhs)	<u>80-81</u> 1 item (Rs. 23.01 lakhs)
1973-74	3	19.50	47.00	43.76	<u>74-75</u> 1 item (Rs. 3.00 lakhs)	<u>75-76</u> 1 item (Rs. 4.00 lakhs)	<u>79-80</u> 1 item (Rs. 36.76 lakhs)
1974-75	1	26.00	26.00	25.71		<u>80-81</u> 1 item (Rs. 25.71 lakhs)	
1975-76	15	72.65	60.60	50.78	<u>76-77</u> 1 item (Rs. 0.85 lakh)	<u>77-78</u> 8 items (Rs. 18.68 lakhs)	<u>78-79</u> 2 items (Rs. 7.69 lakhs)
					<u>79-80</u> 3 items (Rs. 19.05 lakhs)	<u>80-81</u> 1 item (Rs. 4.51 lakhs)	

1	2	3	4	5	6	7	
1976-77 .	2	8.00	8.00	8.03	<u>77-78</u> 1 item (Rs. 3.68 lakhs)	<u>80-81</u> 1 item (Rs. 4.35 lakhs)	
1977-78 .	7	44.95	39.95	34.26	<u>78-79</u> 2 items (Rs. 2.27 lakhs)	<u>79-80</u> 2 items (Rs. 7.22 lakhs)	<u>80-81</u> 3 items (Rs. 24.77 lakhs)
1978-79 .	5	63.10	186.00	150.34	<u>80-81</u> 3 items (Rs. 7.83 lakhs)	<u>W.I.P.</u> 2 items (Rs. 142.51 lakhs)	
1979-80 .	14	90.45	115.70	83.10	<u>79-80</u> 3 items (Rs. 15.52 lakhs)	<u>80-81</u> 5 items (Rs. 47.95 lakhs)	<u>W.I.P.</u> 3 items (Rs. 19.63 lakhs)
1980-81 .	3	29.50	..	8.66	All items in progress.		

ANNEXURE IV

(Referred to in paragraph 6.02)

Details showing the Design and Actual Throughput

Year	Annual Throughput (in Million tonnes)			Average throughput per calendar day		Number of stream days		Average throughput per stream day	
	Design	Budget	Actual	Design (in barrels)	Actual	Design	Actual	Design (in tonnes)	Actual
1	2	3	4	5	6	7	8	9	10
1969-70 . . .	2.50	1.81	1.88	50000	37885	345	325	7160	5636
1970-71 . . .	2.50	2.13	2.09	50000	42150	345	338	7160	6206
1971-72 . . .	2.50	2.40	2.47	50000	49805	345	348	7160	7107
1972-73 . . .	2.50	2.45	2.43	50000	49025	345	340	7160	7123
1973-74 . . .	2.50	2.65	2.61	50000	52614	345	346	7160	7531
1974-75 . . .	2.50	2.47	2.47	50000	49817	345	338	7160	7299
1975-76 . . .	2.50	2.71	2.67	50000	53378	345	339	7160	7873
1976-77 . . .	2.50	2.36	2.35	50000	46996	345	332	7160	7018
1977-78 . . . (9 months)	1.85	2.08	2.10	50000	55852	259	274	7160	7651
1978-79 . . .	2.50	2.81	2.76	50000	55175	345	365	7160	7558
1979-80 . . .	2.50	2.86	2.82	50000	56285	345	366	7160	7710
1980-81 . . .	2.72	2.61	2.61	56000	58588	345	327	7877	7982
1981-82 . . .	2.80	2.81	2.80	56000	59668	345	346	8116	8096

ANNEXURE V
(Referred to in paragraph 6.06)
Quantity in '000 MT

Product	Capacity as per agreement		Capacity as per process design		Production 1974-75			Production 1975-76			Production 1976-77			Production 1977-78			Production 1978-79			Production 1979-80			Production 1980-81			Production 1981-82		
	MT/Year	Wt %	MT/Year	Wt %	Budget	Actual	Wt %	Budget	Actual	Wt %	Budget	Actual	wt %	Budget	Actual	Wt %	Budget	Actual	Wt %	Budget	Actual	Wt %	Budget	Actual	Wt %	Budget	Actual	Wt %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Crude throughput	2474.7	100	2474.7	100	2450	2467	..	2705	2668.9	..	2356	2349.8	..	2082.3	2096.4	..	2814	2758.7	..	2857.0	2822.0	..	2614.2	2610	..	2811.9	2801.3	..
LPG	20	0.8	10.0	0.4	30	28.4	1.1502	37	37	1.3863	34.8	36	1.5320	33.3	34.1	1.6266	44.4	43.1	1.5623	43.3	42.60	1.5096	35.0	33.9	1.3	38.5	38.0	1.4
Naphtha	342	13.8	290.2	11.7	236.9	227	9.1940	268.8	261.7	9.8055	210.5	207.5	8.8305	190.5	184.3	8.7913	249.7	235.5	8.5366	231.6	219.10	7.7640	213.5	206.5	7.9	222.3	229.1	8.2
M.S.	120	4.8	113.1	4.6	116	122	4.9412	132.4	134.2	5.0283	126	122.2	5.2004	92	94	4.4839	115.4	115.5	4.1868	117.0	133.90	4.7449	98.8	104.1	4.0	111.1	99.6	3.5
S.K.O.	375	15.2	380.4	15.4	296.7	293	11.8671	338	393.1	14.7289	404.1	333.8	14.2055	297	267.9	12.7790	317.4	305.9	11.8886	326.5	337.0	11.9419	378.8	326.3	12.5	396.2	360.8	12.9
A.T.F.	..	..	29.9	1.2	69.3	77	3.1180	70	82.8	3.1024	96	101.6	4.3238	121	144.1	6.8880	225.9	247.6	8.9752	214.1	198.50	7.0340	160.6	187.3	7.2	174.0	202.9	7.2
H.S.D.	549.9	22.3	508.3	20.5	614.3	626	25.3543	609	590.4	22.1215	441.4	534.6	22.7509	423	445.9	21.2698	649.4	622.8	22.5759	597.6	625.90	22.1793	552.7	570.2	21.8	628.7	640.7	22.9
L.D.O.	100	4.0	..	..	69.6	76	3.0782	70	59.3	2.2219	67	56.5	2.4045	71	69.3	3.3057	93.2	92	3.3350	82.2	98.6	3.4940	105.4	111.0	4.3	76.2	64.4	2.3
F.O.	560	22.6	557.3	22.0	401.7	417	16.8894	513.1	488.7	18.7231	434.5	418.6	17.8143	326	332.2	15.8462	460.1	485	17.5807	510.5	521.50	18.4796	487.1	518.2	19.9	548.2	595.9	20.6
ASPHALT	120	4.8	79.9	3.9	203.2	189	7.6549	189	188	7.0478	163	164.8	7.0134	169	169.8	8.0996	211	173	6.2711	210.9	205.90	7.2962	167.0	151.2	5.8	231.1	222.2	7.9
LUBE	16.1	0.7	200.2	8.1	167.1	156	6.3183	169	171.8	6.4371	127.5	134.9	5.7409	141.4	136.6	6.5160	172.3	164.3	5.9557	181.0	174.50	6.1871	159.1	152.2	5.8	142.4	134.6	4.8
SULPHUR	..	..	20.0	0.8	5.1	4.2	0.1701	7.6	8.9	0.3335	6.3	7.9	0.3362	9.8	10.0	0.4770	12.4	10.8	0.3915	6.1	6.10	0.2162	9.0	8.6	0.3	8.0	6.7	0.2

ANNEXURE VI
(Referred to in paragraph 9.02)

Details of Sales made to IOC, MFL & Others

(Figures in '000 tonnes)

Sl. No.	Product	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
1	2	3	4	5	6	7	8	9	10
1.	LPG	28.6	36.5	35.6	34.1	43.1	42.4	34.1	38.2
2.	MS	128.9	135.8	122.6	92.8	115.6	134.4	103.5	99.4
3.	ATF	76.1	86.1	95.8	143.8	244.2	204.0	186.3	205.0
4.	SKO	288.1	396.5	339.4	263.0	304.3	341.2	320.5	368.4
5.	HSD	631.5	594.4	529.7	446.6	623.2	628.4	562.7	645.7
6.	LDO	76.9	59.1	58.1	70.9	87.5	98.2	111.2	65.7
7.	FO	404.9	519.9	410.9	326.9	489.7	525.0	518.6	543.1
8.	Lube Base stocks	145.7	163.7	148.7	140.6	154.8	177.3	139.4	131.6
9.	Asphalt	195.0	191.0	163.4	170.5	176.6	205.5	154.4	219.8
10.	Naphtha	241.9	249.1	215.6	185.6	236.8	208.3	217.2	223.4
11.	Naphtha sales to MFL included in Sl. No. 10	145.3	220.6	166.2	153.3	220.8	189.4	208.9	211.3
12.	Sulphur	3.6	7.5	7.1	7.5	7.3	3.5	4.7	4.5
13.	Slack wax	0.1	1.9	2.7	1.1	3.3	1.4
14.	Extracts etc.	1.8	1.5	0.6	1.0	0.7	0.9	0.9	1.1

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