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Minister of Heavy Ind. & Public Enterprises

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OF THE RAJYA SABHA
ON 15 MAY 2007

Report of the Comptroller and Auditor General of India

for the year ended March 2006

Union Government (Commercial)

Public Sector Undertakings

Review of Activities of selected PSUs

(Performance Audit)

No. 9 of 2007

CONTENTS

PREFACE

A reference is invited to the prefatory remarks in Report No. 9 of 2007 – Union Government (Commercial) of the Comptroller and Auditor General of India where a mention was made that Report No.9 of Performance Audit contains reviews on some of the activities of the Companies and Corporations other than Companies under the Telecommunications Sector.

This Report contains reviews on the following activities of selected PSUs:

Name of the Ministry/Department	**Title of the Review**
Ministry of Coal	a) Rajrappa Project - Central Coalfields Limited b) Performance of Thermal Power Stations – Neyveli Lignite Corporation Limited
Ministry of Defence	a) Performance of Engine Division – Bharat Earth Movers Limited b) Outsourcing activities – Hindustan Aeronautics Limited
Ministry of Mines	Acquisition and operation of Rolled Product Unit – National Aluminium Company Limited
Ministry of Petroleum and Natural Gas	a) Solvent Dewaxing Unit of Digboi Refinery and Microcrystalline Wax Plant at Haldia Refinery– Indian Oil Corporation Limited b) Performance of offshore rigs in shallow water areas – Oil and Natural Gas Corporation Limited
Ministry of Shipping	System of collection and accounting of freight and other charges from agents – The Shipping Corporation of India
Ministry of Steel	Coal Dust Injection system in the blast furnaces – Steel Authority of India Limited

OVERVIEW

This volume of Audit Report represents reviews on nine selected areas of operation involving nine Public Sector Undertakings under six Ministries. These areas were selected in audit for review on the basis of their relative importance in the functioning of the concerned organisation. The total financial implication of these reviews is Rs.2987.47 crore.

MINISTRY OF COAL

Central Coalfields Limited

❖ Rajrappa Project

The Draft Project Report (DPR) of Rajrappa Open Cast Project (OCP) was approved in June 1983 by the Government of India at an estimated capital cost of Rs.91.46 crore with targeted output of three million metric ton (MMT) of coal and 8.5 Mcum of overburden (OB) removal. However, it never achieved the production level as per the Project Report. Considering the accumulation of backlog of OB removal, the World Bank agreed to fund this project with the main emphasis on procurement of Heavy Earth Moving Machinery (HEMM) amounting to Rs.91.56 crore. The HEMM were inducted in 1998-99. Various aspects of the working of the OCP were examined in performance audit and the significant findings were as under:

- The Area Management deviated from the mining practice as per DPR and undertook selective mining from upper seams at a favourable stripping ratio in the earlier years. This resulted in huge backlog in OB removal during the later period.
- Systematic method of OB dumping was not followed which resulted in re-handling of 3.69 Mcum of OB to sustain coal production with an extra expenditure of Rs.58.57 crore during 1997-98 to 2005-06.
- In spite of spare departmental capacity being available, the mismatch of equipment imposed severe constraints on production and transportation of coal resulting in extra expenditure of Rs.6.73 crore during 2001-02 to 2005-06 on engagement of contractors for coal production.
- During 2001-02 to 2005-06, on an average 13 out of 58 dumpers on roll remained under breakdown each year and the availability (23 to 44 *per cent*) of working dumpers was far below the norms (72 *per cent*) due to poor maintenance.
- The Management did not initiate any action to acquire 1512.69 hectares of land for starting operation in Block II. As the construction work on a high level bridge on Damodar was incomplete, Block II (having 70 MMT of coal reserves worth Rs.6,650 crore) remained inaccessible
- The Management did not take possession of tenancy land in two villages compelling the Company to virtually abandon Section III where 2.9 MMT coal reserves valuing Rs.287.97 crore remain blocked.

- The Company could not provide documentary evidence on diversion of 510.82 hectares of forest land for mining purposes prior to 1980 and paid Rs.68.59 crore towards compensatory afforestation, penal charges, etc.
- In spite of average annual production falling below half the target of three MMT, the Rajrappa area management did not initiate any action towards rationalisation of the workforce and paid Rs 4.80 crore towards idle salary and wages during the five years ending March 2006. It continued to pay an average amount of Rs.3.76 crore as overtime allowance per annum to different categories of employees.

Neyveli Lignite Corporation Limited

❖ **Performance of Thermal Power Stations**

- Neyveli Lignite Corporation Limited (Corporation) was incorporated in 1956 for excavating lignite in the Neyveli area and generating power therefrom. The Corporation had three lignite based Thermal Power Stations (TPS I, TPS II and TPS I expansion) with dedicated mines and generating capacity of 2,490 MW. A performance audit of TPS I and TPS II was carried out and the major audit findings were as below.

- Power Plants were operated for more hours than planned and generation exceeded the targets during 2001-02 to 2005-06 but the generation targets were not revised in the light of actual achievement. Although the plants were in service for more hours than planned, the actual generation fell short of potential generation (i.e., generation at full capacity for the actual hours of operation) by 7,623 MU. Forced outages and non-availability of lignite were the major constraints which caused a loss of generation of 5,661 MU. Thermal Power Station II came under the Availability Based Tariff (ABT) system from January 2003 and declaration of availability equal to 75 *per cent* of the installed capacity was required as per the Central Electricity Regulatory Commission norms to recover the full capacity charges. While actual PAF achieved in TPS II during 2001-02 to 2005-06 was consistently higher than 75 *per cent*, the Corporation had declared lower availability of 71.29 *per cent* and 72.75 *per cent* during 2004-05 and 2005-06 because of the anticipated shortfall in lignite production. This led to non-recovery of capacity charges of Rs.16.59 crore. The quantity of lignite consumed by both the TPS did not tally with the quantity of lignite transferred from the mines. While the quantity of lignite consumed was accounted on volumetric basis in Mine I, it was derived in TPS I based on the station heat rate norms fixed by CERC and the difference was attributed to the loss of moisture during storage. The Corporation had not independently fixed norms for loss of weight of lignite due to moisture. Considering the calorific value of lignite adopted by the Management and the average boiler efficiency achieved by the TPS, the consumption of lignite worked out in Audit varied significantly from that recorded by the Management. As such, the consumption worked out by the Management did not depict the impact of boiler efficiency actually achieved. The operation and maintenance expenses exceeded the norms of Bulk Power Supply Agreement/Central Electricity Regulatory Commission.

MINISTRY OF DEFENCE

Bharat Earth Movers Limited

❖ Performance of Engine Division

To meet the requirement of engines for the production of Earth Moving (EM) equipment, the Government accorded approval (1988) to establish manufacturing facilities of engines at the Mysore Complex of the Company. The first phase of the project was commissioned in April 1991 and the second phase (with establishment of Flexible Manufacture System) in March 1998. The project envisaged manufacture of 2400 engines in the sixth year of commencement of production. A performance audit of the Engine Division was carried out and the major audit findings were as below.

- The Company fixed the annual production targets between 15 and 57 *per cent* of the installed capacity during 2000-01 to 2005-06. However, the Company could not achieve even these low targets as there were shortfall of 23 and 27 *per cent* in achieving these targets during 2003-04 and 2005-06 respectively.
- The Company resorted to manufacture of EM equipment with engines of other make despite availability of in-house capacity. As a result, the Company could utilise only 14 to 42 *per cent* of the installed capacity for captive consumption during 2000-01 to 2005-06.
- The Company could not recover even the material cost in nine out of twenty models of engines produced during 2005-06. The excess cost incurred by the Company worked out to Rs.2.09 crore. The manufacturing cost was higher mainly due to high cost of raw material and components, under utilisation of installed capacity and low volume of production for captive consumption.
- The diversification efforts (1998-99) made to manufacture and sell Company's engines for use in Diesel Generator sets were not successful resulting in loss of Rs.2.49 crore besides accumulation of unsold stock valuing at Rs 3.14 crore as on 31 March 2006. Another diversification effort made (2004-05) to use the Company's engines in compressor application was also not successful as there was no demand for the compressors made by the Company in the market.

Hindustan Aeronautics Limited

❖ Outsourcing activities

The Company had been outsourcing components, tools and assemblies since 1980. However, a major thrust to outsourcing was given from 2002-03 by formulating (April 2002/March 2003) the procedures and systems for outsourcing. The Company had outsourced works amounting to Rs.625.61 crore which worked out to 3.72 *per cent* of the turnover of Rs.16795 crore during 2002-03 to 2005-06. A performance audit was taken up to review the outsourcing activities in the Company during the period 2001-02 to 2005-06. The major audit findings were as below.

- Determination of available in-house capacity, which was vital for deciding quantum of outsourcing, was not realistic and uniform among divisions. In-house capacity was not

properly utilised before resorting to outsourcing. The method adopted for working out savings from outsourcing was also not uniform.

- A systematic database of the items to be outsourced had not been developed.
- The vendors list was not updated regularly, mandatory documents during registration process were not obtained and orders were placed on unregistered vendors in certain cases.
- Developed vendors were not nurtured by placing continuous orders. Dependence on limited sources and non-development of alternative sources were also noticed.
- Placement of orders in excess of capacity of the vendors was noticed. Repeat orders were being placed on selected vendors in spite of poor performance.
- It was noticed that orders were split, repeat orders were placed without entering into any Long Term Agreement (LTA) with vendors and adequate security was not taken for the raw material issued. There were also lacunae in the system of physical verification and reconciliation of material lying with vendors.

MINISTRY OF MINES

National Aluminium Company Limited

❖ **Acquisition and operation of Rolled Products unit**

While acquiring (March 2000) International Aluminium Products Limited, a 100 *per cent* Export Oriented Unit (EOU) to manufacture rolled products promoted by Mukund Limited, National Aluminium Company Limited (Company) did not adequately consider the problems consequent on takeover of a partially completed unit with imported equipment lying in prolonged storage. The Company entered the rolled product segment through acquisition route but its performance in the downstream segment was not upto the mark. The Company failed to fully commission the plant in time. The absence of competitive marketing strategy for rolled products led to low capacity utilisation. In the absence of any significant export order in hand coupled with technically deficient and incomplete equipment the Company was unlikely to fulfil its export commitment. The inability of the RPU to export would call for payment of duty of Rs.78.35 crore because of the EOU status of RPU. As the Company failed to generate any significant sales volume, Rs.361.74 crore invested (September 2006) in acquiring and commissioning of the unit remained unproductive.

MINISTRY OF PETROLEUM AND NATURAL GAS

Indian Oil Corporation Limited

❖ **Solvent Dewaxing Unit (SDU) of Digboi Refinery and Microcrystalline Wax (MCW) Plant of Haldia Refinery**

SDU of Digboi Refinery

Indian Oil Corporation Ltd set up a solvent dewaxing and de-oiling unit at its Digboi refinery in May 2003 to process Heavy waxy distillates (HWD) for production of Micro crystalline wax (MCW). Initial tests of HWD indicated that it was hard to deoil and process into MCW and the same was also indicated in the test conducted by the process licensor selected to set up the Unit. Still the Company went ahead with the project. The process licensor to whom the contract was awarded did not have proven technical credentials. Consequently, even after mechanical completion of the Unit, modifications in two phases had to be conducted at a cost of Rs.6.86 crore which could not be recovered from the contractor. Processing of HWD in the unit resulted in clogging up of the filters and could be used for this purpose only for 16 days after commissioning. Thereafter the Unit was primarily used only for processing Pressable waxy distillates (PWD). The capacity utilisation ranged from 49 *per cent* to 72 *per cent* during 2003-04 to 2005-06. The paraffin wax produced from processing PWD also did not meet the quality norms and could be used for production of lower value products resulting in a loss of revenue of Rs.8.33 crore.

MCW plant of Haldia Refinery

The availability of input for MCW was not considered for fixation of capacity of MCW plant of Haldia Refinery resulting in oversizing of the plant with an additional capital investment of Rs. five crore. The capacity utilisation of MCW plant was only 1.8 *per cent* to 6.1 *per cent* during the period from 2001-02 to 2005-06. The Bright Neutral slack wax not processed for production of MCW was diverted to other unit for production of low value products resulting in loss of revenue of Rs.25.06 crore.

Oil and Natural Gas Corporation Limited

❖ **Performance of offshore rigs in shallow water areas**

- Exploration of hydrocarbon reserves in the blocks awarded by the Directorate General of Hydrocarbon (DGH) and development of proved reserves for production by drilling exploratory and development wells are the two main activities of Oil and Natural Gas Corporation Limited (Company). To carry out drilling in shallow water areas, the Company deployed owned as well as hired rigs.

- In addition to owned rigs, the Company also deployed charter hired rigs which were often hired at higher rates due to lack of advance planning and delay in tender finalisation. Rig requirement was also not assessed correctly.

- The Company did not plan adequate number of exploratory wells to achieve the target of reserve accretion during the 10th Five Year Plan. Even the planned exploratory wells were not drilled. DGH had also raised a demand for liquidated damages for shortfalls/delays in the Minimum Work Programme and extension sought in respect of five blocks under New Exploration Licensing Policy (NELP)-I to III. Advance planning and coordination was lacking in providing support services resulting in idling of rigs. The Company had not hired adequate number of modular rigs to carry out work-over jobs. Instead, costlier jack up rigs were used.

- The Company had not laid down any dry dock policy for owned jack up rigs due to which dry dock repairs were delayed resulting in higher cost of repairs, condition of class and non-availability.

- Four major Exploratory and Production (E&P) projects with drilling of 183 wells were started during the period 2002-03 to 2005-06 without obtaining mandatory environmental clearance from the Government of India, Ministry of Environment and Forests. Monitoring and internal control system was not adequate for effective planning, charter hiring, deployment and dry dock repairs of rigs.

MINISTRY OF SHIPPING

The Shipping Corporation of India

❖ **System of collection and accounting of freight and other charges from agents**

- The Shipping Corporation of India Limited did not have an effective system to ensure compliance of contractual terms by agents regarding opening of separate bank accounts for depositing freight and other charges collected within prescribed time; opening of a separate bank account for expenditure and preventing netting of expenditure from freight collected; timely receipt of accounts and furnishing of bank guarantee. The Company failed to carry out timely reconciliation of accounts or resolution of ambiguities in the agreement. This led to blocking of Rs.3.29 crore, loss of Rs.14 crore and excess charging of Rs.85.31 lakh by the agents besides involving the Company in unnecessary litigation.

MINISTRY OF STEEL

Steel Authority of India Limited

❖ **Coal Dust Injection system in the blast furnaces**

- Steel Authority of India Limited (SAIL) operates 24 Blast Furnaces (BF) with an annual production capacity of 13.60 million tonne (MT) of hot metal. Metallurgical Coke (Met Coke or BF Coke) forms a major portion of the cost of hot metal production. For replacement of expensive metallurgical coke with non-

coking coal, SAIL introduced Coal Dust Injection system (CDI) in six blast furnaces in Bhilai Steel Plant and Bokaro Steel Plant. The Company was eager to modernise its BFs for making them cost effective but it did not ensure availability of commensurate infrastructural facilities for successful operation of CDI. This resulted in under utilisation of the capacity for CDI created at a cost of Rs.146.80 crore and loss of Rs.142.60 crore due to shortfall in the targeted substitution of BF coke.

- SAIL also has a Corporate Plan to introduce CDI in all the Plants in a phased manner. Proposals for installation of CDI in five more blast furnaces in Durgapur Steel Plant, Bokaro Steel Plant and Rourkela Steel Plant at an estimated cost of Rs.406.08 crore have been approved. Before committing fresh investments in the installation of CDIs in other blast furnaces, the Management had not rectified or improved the condition of the selected BFs nor created commensurate infrastructure to achieve the optimum utilisation of CDI System.

DEPARTMENT OF COAL

CHAPTER I

Central Coalfields Limited

Rajrappa Project

Highlights

Concurrent mining of various sections was not carried out in accordance with the mining scheme as laid out in the Detailed Project Report (DPR). Selective mining from upper seams with favourable stripping ratio in the initial years led to sharp deepening of the quarry profile and rise in stripping ratio to the current adverse level of 4.71.

(Para 1.4.1.1)

The aggregate of reported over-burden (OB) removal was 146.37 Mcum[♣] and outstanding OB reserves would be 53.79 Mcum at the end of 2005-06. These two together exceeded the projected OB reserves of 165.25 Mcum as per DPR. This indicated a clear possibility of over reporting of OB removal.

(Para 1.4.1.1)

Formation of unplanned and scattered internal and external dumps led to rehandling of OB and avoidable expenditure of Rs.58.57 crore during 1997-98 to 2005-06. The left over 0.7 Mcum of OB would also need rehandling at an expenditure of Rs.15.96 crore.

(Para 1.4.1.3)

The utilisation of Heavy Earth Moving Machinery (HEMM) during 2001-02 to 2005-06 was 19 *per cent* to 25 *per cent* of total shift hours envisaged in the DPR.

(Para 1.4.2.1)

The Project Management had not properly attended to preventive maintenance of equipment and did not adhere to the norms of overhaul leading to high incidence of breakdown of critical equipment.

(Para.1.4.2.2)

The Regional Stores did not carry out any analysis of critical stores and as such, non moving items valued at Rs.6.55 crore had piled up at the end of March 2006.

(Para 1.4.2.3)

The Company failed to provide documentary evidence on diversion of 510.82 hectares of forest land for mining purposes prior to 1980 and paid Rs.68.59 crore towards compensatory afforestation, penal charges, etc.

(Para 1.4.3.4)

♣ ***Million cubic metres***

Despite excess manpower of 169 in 2001-02 to 72 in 2005-06, the Area Management did not initiate any action towards rationalisation of the workforce and paid Rs 4.80 crore towards idle salary and wages to different categories of surplus employees during the above period. Further, though annual production was below norm during the said period, on an average, overtime allowance of Rs.3.76 crore per annum was paid.

(Paras 1.4.4.1 and 1.4.4.2)

Gist of recommendations

- Quarry profile needs to be developed in a manner which is suitable for smooth deployment and operation of HEMM. A detailed section wise bench formation should be prepared every year in advance.
- Avoidance of scattered OB dumping in an unplanned manner would reduce operational cost.
- Mismatch among different categories of critical equipment should be immediately corrected to maintain balance between excavation and haulage capacity and raise the operational efficiency of the Project.
- The Area Management should adhere to the Preventive Maintenance Schedules to reduce the extent of unplanned downtime.
- The HEMM workshop should improve the Depot agreements with equipment manufacturers for supply of spares on 'as and when required' basis.
- The Management should strengthen internal control to check over provisioning of spares.
- Replacement requirement of tyres for dumpers should be reassessed, and provided promptly as an one time measure to improve haulage capacity of the mine.
- The Company should vigorously pursue acquisition of land in Block II and forest clearance for the high-level bridge over Damodar to sustain the continuity of Rajrappa Opencast Project (OCP). More emphasis needs to be laid on early solution of land acquisition issues.
- Overtime norms should be fixed for operational and support staff separately with reference to production.

1.1 Introduction

1.1.1 Rajrappa Opencast Project of Central Coalfields Limited (Company), a subsidiary of Coal India Limited (CIL), is situated in the Hazaribagh District of Jharkhand. The Government of India (GOI) approved the draft project report (DPR) for Rajrappa OCP in June 1983 at an estimated capital cost of Rs.91.46 crore with targeted output of three MMT[♣] of coal and 8.5 Mcum of overburden (OB) removal per annum. The Cost Estimates were revised (September 1989) to Rs.133.63 crore by the GOI. Rajrappa OCP was envisaged as a capital-intensive mechanised mine. Rajrappa OCP is divided into four major blocks. Blocks I and IV are located on the southern bank of the river Damodar and Blocks II and III are located on the northern bank. Blocks I, IV and the eastern part of Block II contained medium coking coal and were included in the DPR. In terms of

[♣] ***MMT-million metric ton, Mcum- million cubic metres***

geological factors, the mining scheme, stripping ratio, etc these blocks were further sub divided into sections. Blocks I and IV comprise sections 1, 1a, 1b, 2, 2a, 2b and 3 and Block II was divided into 4, 5, 6 and 7 sections having seams VII (B), VII (T) and VIII (A). The total mineable reserve of coal was estimated as 127.99 MMT with a corresponding volume of OB of 373.47 Mcum and the stripping ratio[♥] was estimated as 2.91. Block I and IV were envisaged to be worked first. The OCP was declared complete in 1989-90 as coal production reached 2.57 MMT (86 *per cent* of the target capacity) during that year.

1.1.2 As coal production was below target and the backlog of OB removal was accumulating, the World Bank agreed to fund this project in view of the high potential for profit and large reserves under the Coal Sector Rehabilitation Project (CSRP) scheme as a 'Replacement project' with the main emphasis on procurement of Heavy Earth Moving Machinery (HEMM) and clearing the arrears of over burden removal. The loan amounting to Rs.91.56 crore was disbursed during the period 1998-99 to 2001-02 and equipment under CSRP was in operation since 1998-99.

Details of HEMM thus procured were as under:

Table -1

Sl No.	Equipment	Specification	Nos.	Cost of equipment (Rs. in crore)
1	Shovel/Excavator	6.1 cubic metre	1	3.09
2	Dumper	85 MT	16	58.42
		50 MT	15	
3	Drills	160 mm	1	2.17
		250 mm	1	
4	Dozers	D 355 Dozer	6	9.92
		Wheel Dozer	2	
5	Spares			17.96
	Total			91.56

1.2. Audit objectives

The objective of this review was to evaluate the activities under the Project, their impact on profitability and to find out the reasons for the gradual decrease of production and profitability in spite of sizeable investment on equipment with the support of the World Bank. The audit objectives were to evaluate and assess whether:

(i) The Area Management put in place adequate system of controls to address the risks associated with mining, operation of HEMM and rehabilitation issues;

(ii) Land problems were effectively tackled so that required land was available in time to carry out mining activities;

(iii) Utilisation of HEMM in the area was adequate with reference to CMPDIL's[♣] norms of working hours;

[♥] ***Stripping Ratio- It is the ratio between coal and OB extracted and stands for the volume of OB (in cubic metres) to be removed for extraction of one tonne of coal. It is expressed in cubic metres per tonne.***

[♣] ***Central Mine Planning and Design Institute Limited***

(iv) Departmental capacity was fully utilised in transportation of coal and OB.

The period covered in audit was 2001-02 to 2005-06. Prior periods were also included wherever found necessary.

1.3 Audit methodology and acknowledgement

1.3.1 An entry level discussion was held with the Management at the Company's Headquarters at Ranchi in April 2006 which was followed by a detailed questionnaire on the performance of Rajrappa Area in May 2006. Fieldwork was undertaken at Rajrappa during May to July 2006. Detailed audit involved examination of documents relating to project report, mining, project formulation, planning, production, operational plan, survey reports, HEMM utilisation, log books, transport contract files, compensation for land, stock position of coal , over time (OT) payment, cost sheet data, etc. The audit team also made a number of visits to the quarry sections to make on-site observations. The audit findings are based on the documents so collected and the observations made by the audit team.

1.3.2 Audit takes this opportunity to thank the Management and the staff of the Rajrappa OCP and the Headquarters of the Company for their co-operation and assistance in the conduct of this Performance audit.

Audit findings

1.4. Financial results of the project

Financial results of the project for the five years between 2001-02 and 2005-06 are shown below:

Table-2

Year		2001-02	2002-03	2003-04	2004-05	2005-06
Sl No.	**Particulars**					
1.	Coal Production (MMT)	1.47	1.3	1.4	1.5	0.72
2.	OB removal Production (Mcum)	6.32	5.98	5.81	5.29	3.22
3.	Manpower (Nos.)	1997	1972	1929	1913	1819
4.	Man shifts (000')	330.98	299.06	314.34	360.21	283.62
5.	OMS[♦] (in MT)	4.45	4.50	4.46	4.19	2.56
6.	Cost of Production (Rs./MT)	699.01	790.38	791.14	842.86	1337.55
7.	Average Selling Price (Rs./MT)	755.97	791.96	860.67	974.77	993.38
8.	Profit/Loss(-) (Rs./MT)	27.15	27.55	59.87	133.64	(-) 344.19
9.	Profit (Rs. in crore)	8.34	0.21	9.73	19.89	(-) 24.94

The table above includes various items of the operations that were done by contractors. Frequent breakdown of departmental HEMM, delays in repairing work and poor maintenance resulted in non-availability of adequate departmental equipment. For this

[♦] ***OMS- Out put per Man Shift***

private transporters were engaged for loading and transportation of coal (0.58 MMT annually on an average between 2001-02 and 2004-05) from the quarry face to the washery. Examination of records in Audit revealed that the project never achieved the production level as per DPR. In the last 30 years, it produced a maximum of 2.84 MMT of coal in 1992-93 as against the projected production of three MMT per year and removed a maximum of 7.31 Mcum of OB in 1999-2000 against the projected 8.5 Mcum per year. While there was a profit of Rs.65.09 crore in 1996-97 prior to availing of the World Bank loan, it turned into a loss of Rs.24.94 crore in 2005-06 despite purchase and induction of HEMM valued at Rs.91.56 crore. It would be observed from the above table that during the five years 2001-02 to 2005-06, the average annual production was only 1.29 MMT of coal (50 *per cent* of target) and removal of 5.32 Mcum of OB (65 *per cent* of target). Profits generated from the area were below the target of Rs.156 per MMT. Some improvements were noticed in overall profit during 2003-04 and 2004-05. The profit of the area shot up due to a sharp upward revision in coal prices (by 20 *per cent*) in 2004-05. However, during 2005-06, the OCP suffered loss of Rs.24.94 crore which was due to shortfall in production. The reasons for such poor performance of the OCP are analysed in the succeeding paragraphs.

1.4.1 Mine Geometry and improper planning

1.4.1.1 General mining scheme

Major project parameters like mine geometry, dimension of coal and OB benches, HEMM specifications and requirements were drawn up as per the DPR. In view of frequent occurrence of faults and complex geological formation, simultaneous working of seams (VIIIA, VIIT and VIIB) was envisaged under the scheme that would maintain a fixed ratio of coal extracted from seams to avoid sharp increase in the running stripping ratio (from the average value of 2.91). Extraction from the VIIB seam was proposed to be 36 *per cent* of the annual quarry output. To facilitate such an extraction pattern, making horizontal slices across the strike of the seams, from the roof of VIIT to the floor of VIIB was recommended for development of coal seams VIIT and VIIB. However, the operating practices deviated from the scheme as no systematic pattern of extraction was followed in spite of the objections raised by CMPDIL in its operational plans (1999-2000, 2003-04, 2004-05). The Management adopted defective mining practices such as selective mining from upper coal seams with less extraction of OB in the earlier years with a considerable variation of coal extracted from the lowest seam. This resulted in accumulation of OB for the later period.

The benches♠ were to be laid as per the working plan in the DPR, with the width of each bench to be more than its height. It was also found in Audit that the mining profile of every working section was vertical with most of the benches having a non-workable width and height. The benches were narrow at many places with varying dimensions in sections I and III in contravention to dimensions of 13 metre height and 20 metre width as approved by Director General of Mines Safety (DGMS). Poor mining practices led to vertical benching with the result that equipment were unable to cope with the slope of the seams. The height of each bench was more than the maximum reach of shovels, making

♠ ***Benches: Tier roads running all round the mine where excavation work and movement of vehicles go on simultaneously. These are crucial in the mine for ensuring stability of sides and slopes.***

extraction difficult. Such improper benching severely restricted the available working space for equipment.

These operational deviations resulted in sharp increase in the stripping ratio from 3.17 to 4.71. While the extraction schedule laid out in the Calendar Plan envisaged that mining in Blocks I and IV would be over by 2000-01, the backlog of coal extraction was 20 *per cent* of the reserves as on March 2006.

Further, scrutiny of internal survey reports regarding balance reserves in blocks I and IV revealed that 146.37 Mcum of OB had been removed till March 2006 and the required OB removal for the remaining life of the mine would be 53.79 Mcum. However, total OB in these mining blocks as per Project Report should have been 165.25 Mcum only. Thus, over reporting of OB removal of 34.91 Mcum could not be ruled out. This required urgent re-evaluation.

The Management stated (October 2006) that variation in volume of OB was due to numerous faults encountered during actual operation that were not anticipated in the DPR.

The Management's reply is not acceptable because occurrence of major and minor faults was extensively surveyed and incorporated in the DPR and a few more minor faults encountered during mining could not have had a major impact on the total volume of OB as confirmed by the CMPDIL. At the instance of Audit (May 2006), the matter of re-evaluation of remaining reserves of coal and OB was referred to CMPDIL in June 2006.

Recommendations

- Keeping in view the experience of working in Block I and IV, strict adherence to the mining scheme would be essential for economic operation in Block II. Further, quarry profile needs to be developed in a manner suitable for smooth deployment and operation of HEMM.
- A detailed section-wise bench formation plan should be prepared every year in advance and implemented strictly.

1.4.1.2 Haul roads [♣]

Haul road alignment plays a vital role in determining the cost of operation and in ensuring safer working conditions. Audit observed that the haul road network had not been constructed and maintained in a proper manner. Since 2001-02, only one haul road had been developed in the area at a cost of Rs.2.87 lakh. The main haul road in Section I was in poor condition with inadequate drainage. Poor condition of haul roads and improper OB benching prompted Director General Mine Safety (DGMS) to prohibit mining operation in Section I since April 2003. The preparation and upkeep of the haul roads also suffered due to minimal expenditure on haul roads and poor condition and lack of maintenance of equipment. Work suffered due to low availability (44 *per cent* of shift hours were lost per annum on an average due to breakdown) and poor utilisation (21 to 22 *per cent* of shift hours) of dozers and breakdown of all the three graders[▼] since 2003-04.

[♣] ***Haul roads are constructed for moving mined coal to the coal receiving pits and overburden to dump yard and are designed based on predetermined parameters.***

[▼] ***Grader: equipment used for grading, leveling and fine-finish of haul roads after preparatory work was done by dozers.***

Further, due to the formation of a network of too many haul roads against the DGMS norm of 1:16 for haul road gradients, the gradient was up to 1:6 at various places. As Dumpers often failed to negotiate the slopes they were pushed by Dozers to cope with the gradient. Such faulty operations resulted in stress on the engines and abnormal wear and tear of tyres. Against the norm of 5500 hours, the actual average life of tyres for 85 MT dumpers was only 3875 hours (i.e. 70 *per cent*) between 2000-2001 and 2005-2006. Further, many Dumpers were in breakdown condition for want of tyres. In March 2006 the area had projected a one-time requirement of 108 tyres for making the available dumpers functional. The total shift hours lost exclusively due to want of tyres was about 42686 hours during 2005-06.

The Management stated (October 2006) that adequate haul road gradient could not be maintained as sufficient land was not available and numerous faults were present that were not envisaged in the DPR. It was, however, observed in Audit that the land problem was limited to a part of Section III where no mine working had been done. Further, the frequent occurrence of major and minor faults had been extensively identified and incorporated in the DPR and haul road alignment could be planned accordingly.

Recommendations

- A detailed study on the condition of the existing haul roads should be undertaken for improvement. The Management accepted this and proposed a study.
- Higher capacity Graders along with Dozers were urgently required for haul road preparation. The equipment under breakdown needed to be urgently attended to. The Management replied (October 2006) that one dozer, water sprinkler and grader had been provided for the purpose as recommended and every additional help necessary would be provided on an urgent basis.

1.4.1.3 Planning of OB Dumps

The DPR envisaged that the scope of internal dumping of OB was limited and could be done only in mined out areas of Block I and IV at a later stage. However, the Management resorted to internal dumping of OB on coal faces, e.g. over VII B seam. This led to re-handling of OB for further extraction of coal. Audit noticed that during the nine years (between 1997-98 and 2005-06) the project Management had re-handled 3.69 Mcum of OB incurring an extra expenditure of Rs.58.57 crore. The Management further assessed (July 2006) that 0.7 Mcum of OB also needed rehandling. This would entail a further expenditure of Rs 15.96 crore. It was also envisaged that bulk of the initial overburden was to be transported mostly to external rock dumps close to the quarry sections. Accordingly, the Management identified four major external dumps with a total area of 735.9 hectares with a detailed section-wise dump linkage plan. However, it failed to adhere to this plan and continued to dump OB in an unsystematic manner. While one planned external dump could not be formed as physical possession of land could not be obtained in village Koihara (129.6 hectares), external dumping was carried on in as many as 13 locations in an irregular manner. The Management did not even lay emphasis on the proper formation of these dumps, as suggested by CMPDIL, and they were left highly uneven resulting in sub-optimal utilisation of space.

The Management stated that actual dumping had been done as per the plan envisaged in the DPR and only 2.85 *per cent* of the total OB removed till 2005-06 was rehandled. The

issue of internal dumping on coal bearing areas leading to rehandling was linked to the non-availability of the northern dump.

The reply was not acceptable as internal dumping was not restricted to the worked out area of Section I as proposed and was taking place on coal faces in each section. Further, many external dumps were formed in a scattered manner. The percentage of rehandling between 2001-02 and 2005-06 was substantial (6.10 to 7.72 *per cent*) and the expenditure incurred was avoidable.

Recommendations

- Scattered OB dumping in an unplanned manner should be avoided and predetermined dump locations should be adhered to.
- The Management should expedite settlement of land issues with the villagers and obtain clearance from the forest Department for OB dumping so that longer lead for transportation may be avoided.

The Management stated (October 2006) that dumping of OB in future would be done in a planned manner.

1.4.2 Performance of HEMM

As per DPR, annual production of coal should be three MMT and OB removal should be 8.5 Mcum. One of the stated objectives of the World Bank funding for replacement of equipment was clearing the backlog of OB as arrears of OB removal reached 35.1 Mcum by 1997-98. It was noticed in Audit that the OB removal during 1997-98 was 6.05 Mcum which increased to 7.53 Mcum in 2000-01. Thereafter it started declining and was 5.29 Mcum in 2004-05. During 2005-06, it was as low as 3.19 Mcum. The production of coal also indicated a similar trend. The low production of coal and OB removal was attributable to poor availability and utilisation of HEMM due to mismatch of equipment, high breakdown hours, delay in acquisition of land and payment of compensation to villagers, etc.

1.4.2.1 Availability and utilisation of HEMM

As per the Project Report, the quarry was to be operated for 330 working days in a year round the clock with three eight-hour shifts per day. 35 days per year was the norm for idle time for equipment. Audit scrutiny of records revealed that during the five years ending 2005-06, HEMM deployed in the quarry could only work for 19 to 25 *per cent* of total shift hours envisaged in the DPR. Low utilisation of equipment was on account of high incidence of breakdown and idling as indicated in the table.

Table-3

Year	Shift hrs. as per DPR for HEMM on roll (no.*330 days*24 hrs)	Actual Shift hrs for working equipment (shift hours *no. of equipment in actual use)	Actual idle hours	Actual Worked hrs	Idle hours to actual shift hours (in percentage) (4/3)	Percentage of worked hrs to DPR shift hrs (5/2)	Worked hrs to actual shift hrs (in percentage) (5/3)
1	2	3	4	5	6	7	8
2001-02	752400	742566	275096	185509	37	25	25
2002-03	760320	702406	385755	176943	55	23	25
2003-04	768240	666524	182441	181663	27	24	27
2004-05	752400	677517	174185	166700	26	22	25
2005-06	673200	555266	127804	125083	23	19	23

Actual idle hours ranged between 23 and 55 *per cent* of shift hours which was above the idle hour norms of the principal equipment (viz.22 *per cent* for dumpers). Part of the high idling of equipment could be attributed to theft of overhead line conductor, pole, HSD and other lubricants. Absenteeism was also a contributing factor. Besides, there was mismatch between actual availability and requirement of equipment of different specifications. This was a major factor for low utilisation of HEMM. It was noticed in Audit that mismatch existed between different categories of shovels, and between shovels and dumpers prior to World Bank funding under CSRP and this was further aggravated after the procurement of HEMM under the replacement project funded by the World Bank. The table below gives the number and design specifications of major equipment held, proposed for procurement under CSRP, actual receipt thereagainst and HEMM on roll in April 2006.

Table 4

Particulars	Size/ Capacity	Provision as per RPR/RCE	Actual as on 31 March 1988 (prior to preparation of RCE)	Provision kept in Staff Appraisal Report (World Bank)	Actual receipt	On roll as on 1 April 2006
Elect. Rope Shovel	10 cubic metre	4	4	0	6.1 cubic metre – 1	6
	4.6 cubic metre	7	3	5 cubic metre - 2 3.5 cubic metre -1	0	3
Dumper	29 MT (BDCH)	19	0	0	0	0
	50 MT	29	25	41	15	14
	85 MT	45	38	28	16	40

As per the DPR, small shovels were suitable for extraction from partings[♣] and coal bearing areas. However, only three small shovels against seven envisaged in the RCE were available to the project Management while there were six big shovels on roll as against the sanctioned strength of only four. Besides, the 29 MT Bottom Discharge Coal Haulers (BDCH) recommended for transportation of coal from seams were never indented.

The Management stated (October 2006) that the BDCH were not indented due to absence of matching equipment and probable low effectiveness in the absence of levelled haul roads. However, the haul road condition was a factor controllable by the Management. Besides, due to the poor availability of small shovels and dumpers the Management faced great difficulty in extracting coal from VII B and VII T seams.

Further, while formulating the equipment requirements for CSRP in 1997, the Management had enhanced the number of 50 MT dumpers from 29 to 35. However, only 15 dumpers were received by the area leading to a shortfall of haulage capacity as compared with the digging capacity that was critical to the performance of the project. As a result, the working hours of shovels were low and showed a declining trend due to shortage of dumpers. The Area Management estimated (2006) an immediate shortage of nine 85 MT Dumpers to match the digging capacity of the Project.

The Management stated (October 2006) that all possible efforts were being made to minimize the capacity mismatch and four 85 MT Dumpers had already been provided to the project to reduce the mismatch. The reply is not acceptable since the equipment mismatch had only been addressed in a partial manner and the Project was suffering from shortage of 50 MT Dumpers for extraction of coal for which private contractors were engaged. Moreover, small size Shovels had not been indented.

Low utilisation of equipment could also be attributed to adoption of wrong mining practices that created regular shortage of working space on the benches and haul roads for which the available HEMM could not be deployed optimally.

An equipment-wise analysis of major machinery in use at Rajrappa showed the following:-

Shovels

The equipment mismatch among small and big shovels was not corrected. A 6.1 cubic metre shovel was procured and commissioned against requirement of two 5 cubic metre shovels. This shovel was unsuitable for the area and was transferred to Piparwar Area. Though availability of big shovels (10 cubic metres) was more than the requirement, poor maintenance led to high incidence of breakdown. Out of six big shovels, actual availability was only two. Out of 10 shovels on roll, two remained out of work round the year on an average. Among the shovels in working condition, availability[♣] of shovels ranged between 58 and 75 *per cent* during 2001-02 to 2005-2006 against the CMPDIL norm[♠] of 80 *per cent* availability. Similarly, utilisation[♥] percentage varied from 51 in

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♣ Parting: The OB layer separating two coal seams; viz. between VII T and VII B seam.

♣Availability: Equipment availability is calculated in percentage as (worked hours +Idle hours)/ available shift hours

♠ CMPDIL has laid down availability and utilisation norms for each category of equipment

♥ Utilisation: Equipment utilisation is calculated in percentage as worked hours/available shift hours

2002-03 to 34 in 2005-06, against the norm of 58 *per cent* utilisation. The high incidence of breakdown hours (20 to 38 *per cent* during 2001-02 to 2005-06) registered by working shovels pointed to the low emphasis on preventive maintenance. As against the minimum maintenance period (15 *per cent* of shift hours) recommended under CSRP, actual maintenance hours for working shovels ranged between four and six *per cent* over the last five years upto 2005-06 as indicated in the table below:

Table 5

Year	Actual worked hours	Shift hrs for working shovels	Idle hours actual	Idle hours in percentage (norm 27) (4/3)	Maintenance hours	Maintenance hours to actual shift hours in percentage (norm 15) (6/3)	Break down hours	Breakdown Hrs in percentage (8/3)
1	2	3	4	5	6	7	8	9
2001-02	36397	90795	25509	28	4858	5	24031	26
2002-03	34110	67388	16209	24	3497	5	13571	20
2003-04	32459	67068	12125	18	3468	5	19016	28
2004-05	31602	70114	18893	27	3932	6	15679	22
2005-06	23182	67872	16008	28	3037	4	25645	38

Audit noticed that idling of shovels was mainly due to inadequate number of dumpers.

The Management stated (October 2006) that old age of the equipment had been a major factor for low availability and utilisation of the system as a whole. Four out of six big (10 cubic metre) shovels were old and close to their rated life of 80,000 hours. However, orders had been placed with Original Equipment Manufacturers (OEMs) to improve the operational reliability of these old shovels by replacing or overhauling different sub-assemblies.

The justification was not acceptable as there was mismatch due to procurement of higher capacity shovels while the requirement was for small (4.6/5 cubic metre) shovels. Further, shovels had been lying idle for 18 to 28 *per cent* of the time as the digging capacity of the Project remained consistently above the hauling capacity.

Dumpers

As many dumpers were lying in breakdown condition for more than three months, the effective availability of dumpers was far below the norm of 67 *per cent*. The working and breakdown position of dumpers on roll during 2001-02 to 2005-06 was as under: -

Table-6

Year	No. on roll			Actual working			No. of Breakdown Dumpers			Breakdowns in percentage
	85 MT	50 MT	Total	85 MT	50 MT	Total	85 MT	50 MT	Total	
2001-02	43	15	58	28	14	42	15	01	16	28
2002-03	44	15	59	27	13	40	17	02	19	32
2003-04	46	15	61	24	14	38	22	01	23	38
2004-05	46	15	61	26	08	34	20	07	27	45
2005-06	40	14	54	16	09	25	24	05	29	54

It would be observed from above table that incidence of breakdown of working dumpers increased from 28 *per cent* to 54 *per cent* since 2001-02. This was due to low emphasis on preventive maintenance. It was noticed in Audit that maintenance hours ranged from three to six *per cent* of the net shift hours against the CMPDIL norm of 28 *per cent*. Dumpers repaired under one-time overhauling were again kept under repair for replacement of brakes and other spares within a short period, thereby adding to the breakdown time of the equipment. It was noticed that 11 Dumpers remained in breakdown condition for a prolonged period for want of tyres and batteries only. Smooth operation of HEMM and overall hauling capacity of the project continued to suffer due to an acute shortage of tyres for dumpers. Among the dumpers in working condition during the year, there was high idle time ranging between 22 and 47 *per cent* against the norm of 22 *per cent* signifying poor control and management of available resources that was critical to the efficiency and effectiveness of the Project. This reduced the working hours to between 21 and 25 *per cent* against the norm of 50 *per cent*. Shortage of dumpers and their poor utilisation imposed severe constraint on production and transportation of coal necessitating deployment of private dumpers and pay loaders in the project. This led to avoidable extra expenditure of Rs.6.73 crore during 2001-02 to 2005-06.

Other equipment

The availability of dozers was found to be low as six out of 15 dozers on roll were lying under breakdown for more than three months during 2005-06. During the five years 2001-02 to 2005-06, the dozers registered a high incidence of breakdown hours (40-53 *per cent* of shift hours). Utilisation of dozers was only between 21 and 22 *per cent* of shift hours. Further, the availability of cranes was also very poor (only one out of five was working) due to which attending to HEMM under breakdown was delayed. This ultimately delayed the production process. Communication facility between supervisors of equipment and the control room was poor as 36 out of 51 walkie-talkies on roll were out of order as on August 2005. The shortfall in production of coal in the area was directly related to the dismal performance of the HEMM.

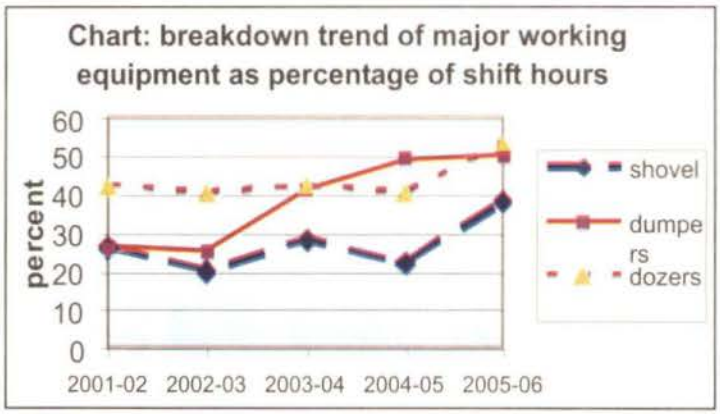
Recommendations

- The Management should devise a coordinated strategy immediately to correct the equipment mismatch, and maintain a balance between excavation and haulage capacity.

- Mine geometry in the currently operated 'quarry sections needed to be corrected by widening of working benches for better deployment of equipment.
- The Management should put adequate emphasis on maintaining haul road gradient to avoid high stress on equipment engines and tyres.
- Haulage capacity should be increased by meeting the requirement of tyres immediately.
- Quality of maintenance needs to be improved for raising the reliability level of each individual HEMM and reduce downtime.
- Supervision in HEMM workshop should be strengthened and communication facilities should be established between the supervisors and the control room.

1.4.2.2 Maintenance schedules and operating issues

Despite the average expenditure of Rs.20.33 crore per annum on repair and maintenance of HEMM, the reliability of major equipment working in the mine remained low due to neglect of routine maintenance of working equipment and poor quality of overhauling work. While CMPDIL recommended adherence to a time-bound programme for scheduled preventive maintenance (as laid down by the OEMs) for change or repair of assemblies, parts, oils for every equipment at regular intervals of 250/500/1000 hours, etc.) audit scrutiny of HEMM logbooks revealed that the schedules were not adhered to. Besides, there was failure in complying with the weekly maintenance schedules for shovels. These deficiencies in maintenance led to rising trend in breakdown of major equipment as shown below:



It would be seen from the chart that downtime for dumpers shot up since 2003-04 and remained at that level mainly for want of tyres and batteries. The total working hours lost exclusively due to dumper downtime for want of tyres was 42686 hours (16 *per cent* of actual shift hours) in 2005-06. Dumpers repaired under one-time overhauling were again kept under repair schedule for replacement of brakes and other spares within a short period. The dumpers lost 132574 hours (i.e. 29 *per cent* of shift hours) in 2005-06 for want of spares. Down time for shovels was 25645 hours (38 *per cent* of shift hours) and for dozers the same was 50089 hours (53 *per cent* of shift hours) during 2005-06 due to non-availability of critical spares.

The project Management had not undertaken any ABC analysis relating to necessity of critical spares and was not adhering to the norm of minimum inventory levels resulting in

delay in procurement of critical spares and consequent delay in repairing of breakdown equipment. In spite of the lacunae in maintenance as enumerated above, the project Management did not consider entering into maintenance contracts, even for the equipment bought from OEMs in 1998-1999, with World Bank loans. However, it was noticed that HEMM received under World Bank loans were running smoothly by entering into an Annual Maintenance Contract (AMC) with Bharat Earth Movers Limited (BEML) at a cost of Rs.14 to Rs.16 crore per annum in Kedla Hesalong (KDH) Project. The availability and utilisation of HEMM at KDH was much higher[♣] during 2004-05 and 2005-06.

The Management stated (October 2006) that the preventive maintenance of equipment had been as per the recommendations of the OEMs and there was a Condition Monitoring Cell for supervision of maintenance. The Management's reply was not correct as even in cases when equipment was put under preventive maintenance for change of oils or repair of assemblies, etc. at recommended intervals of 250/500/1000 hours, jobs were not carried out completely. This resulted in rise in the incidence of breakdown of the equipment from 28 *per cent* of total shift hours in 2001-02 to 49 *per cent* in 2005-06. Besides, documents that could substantiate effective functioning of the Condition Monitoring Cell at Rajrappa were not in evidence before Audit.

Recommendations

- The Company needed to review the HEMM requirement for the project in a consolidated manner and arrange for immediate supply of necessary spares for raising the haulage capacity of the project.
- The Area Management should adhere to the OEM's norms for preventive maintenance and complete jobs need to be carried out in each case.
- Annual repair action plan for equipment lying under breakdown for more than three months should be chalked out and adhered to.

1.4.2.3 Inventory management and control

Rajrappa Regional Stores kept inventory in the form of HEMM spares, E&M spares, POL, Explosives, etc. Audit scrutiny revealed that the Regional Stores did not carry out any analysis of critical stores through a VED (Vital, Essential, and Desirable) analysis. Further, Audit observed that while stock of non-moving items valued at Rs. 6.55 crore had piled up as on March 2006, many HEMM were lying in breakdown condition for want of petty spares. The area failed to take advantage of the easy terms and conditions offered by equipment suppliers following the procurement of HEMM through World Bank loan. Area directly placed orders for decentralized requirement through depot agreement and rate contracts. Test check of records revealed that response time for fast moving spares that were required to be available off the shelf extended up to four months, making the system inefficient. Fast moving items/spares were not identified which further compounded the problem and defeated the purpose of depot agreements.

[♣] ***Shovel availability was above 80 per cent and utilisation was above 50 per cent. Dumper availability was above 65 per cent and utilisation was above 35 per cent.***

It was further noticed that many stores and spares procured during 2003-04 to 2004-05 were not issued till date (July 2006). Some of the indenters had not lifted the material. Material procured but not issued amounted to Rs.2.08 crore. Material was procured despite the availability of the same in unmoved stock. The total value of unmoved stock in Regional store at Rajrappa was Rs.14.06 crore. Out of this, inventory remaining unmoved for less than three years valued at Rs.5.29 crore, three to five years Rs.2.22 crore and more than five years amounted to Rs.6.55 crore as on 31 March 2006. The area had, however, written off unmoved stores valuing Rs.2.84 crore due to obsolescence of inventory remaining unused for a prolonged time.

The Management stated (October 2006) that the identification of fast-moving spares of each category of equipment had been done. However, the Management could not justify procurement of stores which were already available in the stock.

Recommendations

- The HEMM workshop should improve the depot agreements with equipment manufacturers for supply of spares on 'as and when required' basis.
- Management should strengthen internal control to monitor over provisioning of spares.

1.4.2.4 Control mechanisms

Audit noticed poor and ineffective control mechanism at the area level with regard to consumption of diesel and lubricants used in dumpers. The Company norms for diesel consumption in dumpers at Rajrappa was 0.77 litre/cubic metre. Actual consumption during 2001-02 to 2005-06 ranged between 0.84 and 1.11 litres/cubic metre. This resulted in excess consumption of 36.47 lakh litres of diesel for five years (upto August 2005) valued at Rs.7.98 crore. Even with high diesel consumption, some of the dumpers, dozers and drills were regularly getting air locked due to empty fuel tanks which not only affected their performance but also hampered production. Further, on a number of occasions, dumpers under breakdown condition were noticed to have been issued diesel regularly. In some cases such cumulative issue of diesel to the dumper stranded at the workshop due to want of tyres, was more than its tank capacity. Repeated cases of theft of diesel were reported. 30260 litres of diesel and 7940 litres of Hydraulic Oil valuing Rs.11.46 lakh were reported to be stolen from the HEMMs working in the mine during last two years (2004-05 and 2005-06). This indicated that internal control mechanism was weak.

As against the minimum norm of 50 *per cent* fixed by the Company for recovery of burnt oil, the actual recovery for the period between 2001-02 and 2005-06 was less than 25 *per cent* of the quantity of lubricants issued to equipment. During the five years upto 2005-06, out of 16.71 lakh litres of lubricants issued, 3.55 lakh litres was recovered and the short recovery of the lubricants, as per norm, worked out to 4.81 lakh litres whose disposal value was Rs.52.90 lakh.

The Management stated (October 2006) that short recovery of burnt oil was due to high incidence of leakage. This again underlined the poor condition of the equipment and poor control mechanism.

1.4.3 Land related issues

1.4.3.1 Delay in creation of infrastructure to carry out mining

The Management had not taken any action for acquisition of 1512.69 hectares of land for Blocks II and III even after passage of 30 years (since operations began in 1977-78). In 2004, an application for diversion of only 59.04 hectares of forest land of Block II was submitted to Divisional Forest Officer, Bokaro for which even phase I clearance had not been obtained till date (October 2006). Survey work for non-forest land in the said Block had also not been completed as yet. Management could not undertake any action for construction of approach roads as no land had been acquired.

The DPR did not elaborate section-wise calendar plan for mining activity in Block II. Therefore, the Company asked CMPDIL to prepare a DPR for Block II including OB Dump Management plan, as forestry laws did not permit extensive OB dumping on forest land. Considering the limited availability of space, CMPDIL proposed that OB removed in Block II might be used to backfill the void created by opencast mining in quarries of Block I and IV on the other side of the river. It maintained that the dump management plan for Block II could only be prepared when the floor space available following extraction of VII B seam in the presently operated quarries was ascertained. Hence due to absence of OB dump management plan and mining plan for Block II the Management could not undertake land acquisition for operations in Block II in a systematic manner. Since the reserves in presently mined blocks are low and difficult to extract due to increasingly adverse stripping ratio, the continuity of the project might be under serious threat leaving aside profitability.

Further, to access Block II, the construction work of a High level Bridge over River Damodar was awarded to the U.P. state Bridge Corporation (UPSBC) in December 2001 for Rs.7.06 crore. The scheduled date of completion (May 2004) was extended up to June 2006 because the Company could not provide encumbrance free land of 1.52 hectares to the contractor as the property belonged to the Forest Department and needed to be regularised as per the Forest Conservation Act 1980. Even after incurring expenditure of Rs.5.80 crore, construction remained incomplete (June 2006) and UPSBC intimated that if the present situation continued, they would leave the site without completing the work. Thus, due to delay in completion of the Bridge, Block II (having coal reserve of more than 70 MMT worth Rs.6650 crore) remained inaccessible.

The Management stated (Oct 2006) that the remaining reserves of coal in Blocks I and IV were about 11 MMT, of which about eight MMT of coal could be extracted in a span of four years without shifting of Chilamtongri and Dhatuatand villages. It was also stated that the Company had taken all possible steps for physical possession of land in Block-II as well as for clearance of forest land, completion of the high level bridge and other ancillary activities so as to ensure continuity of production from the Rajrappa OCP.

The Management's reply can not be accepted as the DPR envisaged beginning of mining work in Block II in the 17 year of operation when 10.48 MMT of coal would still remain in Blocks I and IV. Though only eight MMT of coal remained to be extracted from Block I and IV, even stage I clearance of 59.04 hectares land was yet to be obtained for Block II.

Recommendations

- The Company should ensure early preparation of mine planning for Block II by CMPDIL.
- Preparatory activities in Block II along with regularisation of acquired land with the Forest department needed to be immediately taken up.
- Efforts were urgently needed to obtain forest clearance for completion of the high-level bridge over Damodar and its approach roads to sustain the continuity of Rajrappa OCP.

1.4.3.2 Failure to take possession of acquired land

As per assessment in the Project Report, the total land requirement for the project was 3812.96 hectares. The land required (1512.69 hectares) in Blocks II and III has not been physically possessed even after passage of 30 years (since operations began in 1977-78). Out of the land acquired (2018 hectares) in Blocks I and IV forest area comprised 775 hectares of which only 484 hectares was in physical possession. Non-regularisation (under Forest Conservation Act 1980) by the Forest Department resulted in shortage of working space and dumping locations compelling deviations in operation from the project-mining plan.

1.4.3.3 Resettlement of villages

The Area Management acquired land measuring 77.11 acres in two villages, Chilamtongri and Dhatwatand. The Company settled compensation for only 66 acres of land and paid compensation for 26 houses and employed 22 people in 1981-82 as per the Company norm. However, the Company did not take physical possession at that time. This intensified the dispute with the villagers who demanded employment against each of the present 57 houses for any vacation of land. As a result, production in Section III, having 2.9 MMT coal reserves valued at Rs.287.97 crore, was virtually abandoned (July 2006). Further, Rs.3.87 crore had been paid towards salaries and wages of people employed who could not be gainfully utilised. It could have been avoided if the Management had taken physical possession of land against compensation and employment given in 1981-82 itself. Resettlement had also failed in village Koihara, adjacent to Section I, resulting in non-availability of a planned external OB dump site.

The Management stated (October 2006) that employments were provided to the land oustees as per the approved rehabilitation policy of the Company. It was also stated that though meetings were held several times to settle the dispute with villagers, resolution of disputes took a long time.

Recommendations

- The Company should review its rehabilitation and resettlement policy and settle the disputes with the help of local administration in a time-bound manner to avoid interruption of mining work in future.
- The Company should expeditiously take physical possession of acquired land.

1.4.3.4 Acquisition of forest land

The forest land of Rajrappa OCP Phase-I (Block I and IV) was acquired under sanction orders issued by the Forest Department after making due payments. Accordingly, 510.82

hectares were broken and cleared before 1980 to undertake mining and allied activities. However, poor documentation and record keeping of these transactions with the Forest Department activities formed the basis for new disputes with the State Government regarding diversion of forest land. As per Section (2) of the Forest Conservation Act 1980, diversion of forestry land for non-forestry use required prior approval of the GOI and compensatory afforestation charges were payable. In case approval had not been taken all users of such land needed to comply with the Act by obtaining *post facto* approval. In 1993 a dispute arose between forest department and the Company regarding identification of diverted forest land and the Company failed to provide documentary evidence that the land in question (510.82 hectares) had been acquired and diverted before 1980. Resultantly, the Company had to make payments amounting to Rs.68.59 crore towards compensatory afforestation, penal charges, etc. upto January 2006. Thus, lack of proper documentation led to payment of Rs.68.59 crore to Forest Department and needed investigation, and fixing of responsibility against the delinquent officials.

The guidelines associated with mining usage of forestry land allowed minimum volume of OB dumping on acquired forest land. However, the Company could not get regularised with the Forest Department the usage of 155.13 hectares of forest land for the purpose. Thus OB dumping in forest area was treated as an irregularity by the Forest Department. Besides, diversion of 41.68 hectares of forest land towards construction of residential colony was also treated as an irregularity. A penalty of Rs.6.38 crore was paid by the Company in June 2004 for the entire forest land utilised earlier as per penal provision of Forest Conservation Act 1980.

Recommendation

- The Company should take up the issue of treatment of dumps with the Forest Department at an appropriate level.

1.4.4 Manpower

1.4.4.1 Availability of manpower and deployment- As per Project Report, the manpower requirement of Rajrappa area was assessed to be 1630 for peak production levels. However, despite the average annual coal production being 1.42 MMT and the OB removal far below the targets the Management continued to deploy full strength of manpower required to achieve the target of three MMT coal and 8.5 Mcum of OB. It failed to rationalise the workforce leading to excess expenditure. Manpower deployed in the area in the last five years upto 2005-06 vis-à-vis requirements in different categories, as worked out by the OCP, was as under:

Table-7

Year	Existing manpower					Assessed manpower					Excess
	Rajrappa GM Unit	AFM Unit	R/ Stores	Rajrappa OCP	Total Manpower	Rajrappa GM Unit	AFM Unit	R/ Stores	Rajrappa OCP	Total Assessed	
1	2	3	4	5	6	7	8	9	10	11	12(6-11)
2001-02	345	20	76	1556	1997	256	22	84	1466	1828	169
2002-03	329	20	69	1554	1972	252	21	79	1459	1811	161
2003-04	318	20	75	1516	1929	246	21	79	1422	1768	161
2004-05	312	18	61	1522	1913	241	21	74	1505	1841	72
2005-06	299	21	62	1437	1819	211	20	63	1335	1629	190

It would be seen from above that the excess manpower was mainly deployed in OCP and GM unit. The overall excess of 169 persons in 2001-02 was reduced to 72 in 2004-05. The excess manpower was mainly in daily rated non-excavation category on which a sum of Rs.4.80 crore was paid as wages during 2001-02 to 2005-06. Apart from surplus manpower availability, the deployment of the workforce was not rationalised.

The Management stated (October 2006) that in view of the production plan of Rajrappa OCP, it was premature to declare the surplus manpower. Furthermore, it was not possible to adjust the manpower against frequently fluctuating output.

The Management's reply was not acceptable in view of the fact that actual departmental production was far below the target and remained static. Besides, the bulk of surplus manpower was in the daily-rated non-excavation category. Under such circumstances, the Management should conduct a detailed study for rationalisation of the workforce.

1.4.4.2 Payment of overtime allowance

Though the average annual production of 1.42 MMT for the five years between 2001-02 and 2005-06 fell consistently below the target of three MMT, overtime (OT) was being paid regularly (Rs 3.76 crore per annum on average). For the five years 2001-02 to 2005-06 actual payment of OT allowance per MT of production remained higher than the budgeted allotment. In 2004-05, overtime payment was made at the rate of Rs.20.76 per MT. This shot up to Rs 46.67 per MT in 2005-06 although the production fell to less than 50 *per cent* of 2004-05. Thus, instead of reducing the burden of OT corresponding to the fall in production, the total amount of OT payment had increased by Rs.39 lakh. Payment also exceeded the OT allowance budget by 18 *per cent* despite fall in production.

It was further noticed in Audit that out of 144 daily-rated workers declared surplus in 2005-06, 143 were in the non-excavation category. The project Management failed to properly utilise this surplus workforce and as a result OT payment for working on Sundays and Holidays could not be reduced. Further, OT hours on Sundays were much higher as compared to normal working hours during 2005-06. For the project as a whole,

details of coal produced, OB removed and OT Allowance paid (for MR[▲] and DR[▼]) since 2001-02 were as under:

Table-8

Year	Coal production MMT	OB removal in cubic metres	Category	OT hours		OT payment (Rs. in lakh)		OT rate (Rs./MT
				Normal	Sunday	Normal	Sunday	
2001-02	1.47	6.32	MR	47923	13007	38.96	41.22	27.43
			DR	178303	62904	134.85	188.24	
2002-03	1.30	5.98	MR	38637	12291	27.39	41.38	25.29
			DR	88102	59557	71.09	189.02	
2003-04	1.407	58.18	MR	19654	12117	14.39	43.12	20.92
			DR	746 97	54076	55.92	180.85	
2004-05	1.507	52.80	MR	14838	11970	11.69	44.64	20.76
			DR	68867	56537	57.26	199.32	
2005-06	0.72	32.19	MR	18257	11757	15.46	51.52	46.67
			DR	39062	55826	38.93	230.11	
Total						465.94	1209.42	

From the above table it would be observed that while production in 2005-06 was less than 50 *per cent* as compared to 2004-05, OT hours fell by 18 *per cent* only.

The Management stated (October 2006) that the OT Budget was being prepared with reference to the production programme. Idle operators, if any, would be deployed for gainful utilisation. The Management's reply was not acceptable in view of the fact that though the OT budget was fixed based on available surplus fund and budgeted production target, payment could be regulated based on the actual production, the previous rates and not on the budgeted amount only.

Recommendations

- Surplus manpower should be transferred to needy areas so that payment of idle salary and wages could be reduced.
- OT norms should be fixed for operational and support staff separately with reference to linkage with production. To minimize the OT, the idle operators should be gainfully utilized for production in the section where there was acute shortage like Section II.

[▲] ***MR=Monthly Rated workers***

[▼] ***DR= Daily Rated workers***

1.4.4.3 Output per Man Shift (OMS)

Productivity of Rajrappa OCP fell far below the projected OMS of eight MT. OMS remained almost half its DPR projection during 2000-01 to 2004-05 and fell to almost a quarter to 2.56 MT in 2005-06. Continuous shortfall in production to 50 *per cent* of the target and excess manpower were the prime reasons for the decline in OMS.

1.4.5 Contractual transportation of coal

Utilisation of a mine capacity is an important factor affecting the production and profitability of mining operation. As per DPR coal was to be produced and transported by departmental means to the Rajrappa Washery. Considering the load factor[♣] of opencast mine, transportation distance and actual population of HEMM available in the project, CMPDIL assessed the digging (excavation) capacity and hauling (transport) capacity of the project for the year. The lower of the above two becomes the mine capacity of the project. The table below indicates the departmental capacity, actual production, contractual production and payments made to the contractors since 2001-02:

Table-9

Year	Capacity of departmental Production (in MMT)	Actual departmental production of coal (in MMT)	Contractual production of coal (in MMT)	Total payment made to private contractor (Rs. in crore)
2001-02	1.75	1.08	0.40	1.57
2002-03	1.95	0.89	0.45	1.56
2003-04	1.62	0.72	0.68	1.32
2004-05	1.98	0.72	0.79	2.03
2005-06	1.81	0.63	0.10	0.25

It would be observed from the table that in spite of adequate departmental capacity for production private contractors were engaged for coal production spending Rs.6.73 crore during 2001-02 to 2005-06. It was mainly the absence of matching equipment and not shortage of departmental capacity that necessitated contractual production of coal. In June 2006, the contractors refused to work at the quarry sections as their equipment were suffering heavy damage due to steep gradients and poor condition of the haul roads from coalfaces. As the Management failed to improve utilisation of departmental capacity to cover the production deficit, the total coal production drastically fell in 2005-06 leading to financial loss for the OCP.

The Management accepted (October 2006) the audit observations and stated that because of various problems besetting the project, the actual availability and utilisation of equipment remained low. In order to compensate for the loss in production arising out of the low availability and utilisation of equipment, contractors were engaged for transportation of coal.

Actual volume of OB material extracted during each operation is less than the bucket capacity of extraction equipment due to volumetric expansion of OB following blasting. While calculating the digging capacity of a mine this constraint is factored in as the 'load factor'. It depends, inter alia, on the type of material extracted.

Conclusion

From the audit review, it was clear that due to improper planning, lack of managerial control, heavy downtime of principal machinery, land problems, etc. the Project could not achieve the production as per the target. Audit also noticed that the very purpose of heavy investment on procurement of equipment as a replacement project under the World Bank sponsored CSRP was defeated. Coal production and overburden removal were on a declining trend. The problem areas as identified by Audit needed urgent attention of the Management.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

CHAPTER II

Neyveli Lignite Corporation Limited

Performance of Thermal Power Stations

Highlights

The Plant Availability Factor achieved was consistently higher than 75 *per cent*, the norm fixed by the CERC for recovering capacity charges. However, the Corporation declared lower availability during 2004-05 and 2005-06 because of the anticipated shortfall in lignite production. Due to this, it could not realise the capacity charges of Rs.16.59 crore in TPS II.

(Para 2.6.1.4)

The actual generation fell short of potential generation by 7623 million units during 2001-02 to 2005-06.

(Para 2.6.2.1)

Forced outages caused a loss of generation of 2520 million units during 2001-02 to 2005-06.

(Para2.6.3.2)

The Corporation suffered loss of generation of 3141 million units due to non-availability of lignite.

(Para 2.6.4.1)

The Corporation incurred additional expenditure of Rs.32.87 crore on transportation of lignite from Mine I and Mine IA to meet the lignite shortage in TPS II.

(Para 2.6.5.1)

The Corporation incurred Operation and Maintenance charges amounting to Rs.77.29 crore in excess of CERC norms during 2001-02 to 2005-06.

(Paras 2.6.9.1 and 2.6.9.2)

Gist of recommendations

- The Corporation should review the hours allotted for planned maintenance and revise its targets for generation based on the experience over the years.
- The Corporation should make further efforts to minimise forced outages due to controllable causes.
- The Corporation should review the consumption of lignite considering the actual boiler efficiency achieved and take appropriate measures for controlling consumption.
- The Corporation should take adequate steps to control the Operating and Maintenance expenses and maintain it within the CERC norms.

2.1 Introduction

Neyveli Lignite Corporation Limited (Corporation) was incorporated in November 1956. The Corporation is an integrated power generating facility consisting of three lignite mines viz. Mine I, Mine IA and Mine II and three Thermal Power Stations (TPS) viz., TPS I (600 MW)♣, TPS I Expansion (420 MW)♦ and TPS II (1470 MW)♥. Power generated from TPS I including Expansion is entirely supplied to Tamil Nadu Electricity Board (TNEB). Power from TPS II is supplied to the Southern Electricity Boards (SEBs).

2.2 Audit objectives

A Performance audit of TPS I and TPS II was carried out with a view to critically evaluate capacity utilisation and cost of generation and to ascertain that:

(i) there was no underutilisation of capacity of generating units due to forced outages or lignite shortage; and

(ii) the Corporation was able to control the cost of generation by keeping the Gross Station Heat Rate (GHR) and the Operation and Maintenance (O&M) expenses within the norms fixed by the Central Electricity Regulatory Commission (CERC).

2.3 Scope of Audit

The audit covered the period 2001-02 to 2005-06. While TPS I and TPS II were studied, TPS I Expansion was not covered as its commercial operations commenced only in 2003-04. A comprehensive appraisal on the working of the Corporation was initially attempted during October 2003 to March 2004 and the report on the Thermal Power Stations was updated as a Performance audit during July 2006 to September 2006.

2.4 Audit criteria

Audit of the operation of the power stations was conducted with reference to the norms/guidelines laid down by CERC and the Central Electricity Authority (CEA). The annual maintenance and periodical overhaul of the generating plant and equipment were reviewed with reference to the CEA guidelines. GHR and operation and maintenance expenditure were compared with norms fixed by CERC. Generation of power was compared with the targets fixed by the Corporation in its Annual Action Plan.

2.5 Audit methodology and acknowledgement

The audit included examination of the agenda and minutes of meetings of Board of Directors, Annual Action Plan, data maintained at various production units and costing records. Discussions were also held with the unit heads as well as other field personnel at various levels.

Audit thankfully acknowledges the co-operation and assistance extended at different levels of the organisation at various stages of this audit.

♣ ***Six units of 50 MW and three units of 100 MW each commissioned between May 1962 and February 1970.***

♦ ***Two units of 210 MW each commissioned during 2003-04.***

♥ ***Three units of 210 MW each in Stage I and four units of 210 MW each in Stage II commissioned between March 1986 and January 1993.***

2.6 Audit findings

2.6.1 Capacity utilisation

2.6.1.1 Table 1 details the generation of power in hours and million units (MUs) and the Plant Availability Factor (PAF) for the years from 2001-02 to 2005-06.

Table 1

Generation of power and plant availability

Particulars	Unit	2001-02	2002-03	2003-04	2004-05	2005-06
TPS I						
Planned Generation	Hours	61596	62552	62510	63036	63036
Actual Generation	Hours	71584	73893	72407	71106	71591
Planned PAF	*per cent*	78.13	79.34	79.07	79.95	79.95
Actual PAF	*per cent*	90.80	93.73	91.59	90.19	90.81
Planned Generation	MU	3680	3680	3680	3680	3784
Actual Generation	MU	4182	4379	4400	4259	3990
TPS II Stage I						
Planned Generation	Hours	21581	21688	21569	21559	21370
Actual Generation	Hours	23346	24083	20946	20594	20702
Planned PAF	*per cent*	82.12	82.53	81.85	82.04	81.32
Actual PAF	*per cent*	88.84	91.64	79.48	78.36	78.77
Planned Generation	MU	3864	3864	3864	3864	3974
Actual Generation	MU	4524	4605	4110	3948	3856
TPS II Stage II						
Planned Generation	Hours	28803	28880	28845	28860	28385
Actual Generation	Hours	30045	30312	30048	28024	29056
Planned PAF	*per cent*	82.20	82.42	82.10	82.34	81.01
Actual PAF	*per cent*	85.75	86.51	85.52	79.98	82.92
Planned Generation	MU	5151	5151	5151	5151	5298
Actual Generation	MU	5746	5898	5895	5300	5318

In TPS I, actual generation of power (both in hours and MUs) and PAF exceeded the planned levels in all five years. In TPS II Stage I, the units worked fewer hours than planned during the years 2003-04 to 2005-06 but generation in MUs was more than planned in 2003-04 and 2004-05. In TPS II Stage II, the units worked more hours than planned in all the years except 2004-05 and the generation in MUs exceeded the planned level in all five years.

2.6.1.2 Hours planned for annual maintenance and actual utilisation in TPS I and TPS II Stage I and II are given below:

Table 2

Hours provided and utilised for planned maintenance

Unit		2001-02	2002-03	2003-04	2004-05	2005-06
TPS I	Planned hours	9360	9000	8640	7920	7920
	Actual utilised hours	3904	3982	5880	4553	5208
TPS II	Planned hours	2256	2088	3528	1920	1560
Stage I	Actual utilised hours	1427	911	4019	1679	1149
TPS II	Planned hours	2976	3648	2208	3456	3744
Stage II	Actual utilised hours	2368	3348	1942	2708	2861

It can be seen from the table that the hours provided for the planned maintenance were not utilised to the full extent in any of the years except during 2003-04 in TPS II-Stage I.

2.6.1.3 The Management stated (September 2006) that the audit findings in respect of TPS I were based on targets communicated to CEA and SEBs. These targets had a safety margin to ensure that annual generation planning and grid management did not suffer. The norms adopted for planned maintenance for internal purposes were of lower duration. In respect of TPS II, a conservative approach was maintained while formulating the Annual Action Plan, which was communicated to external agencies and the maximum duration that would be required for inspection, rectification and replacement of components of the generator, boiler and turbine and auxiliaries was adopted.

They added that reduction in planned maintenance hours was only due to completion of maintenance works in less than the anticipated time without any compromise on the health of the unit and this could not be construed as being against the concept of preventive maintenance.

2.6.1.4 The generation by TPS II came under the Availability Based Tariff (ABT) system introduced by CERC with effect from January 2003. The ABT system in power stations contemplates planning the generation and drawal of power through a process of scheduling. The Generator declares to the Regional Load Despatch Centre (RLDC) the energy that can be exported to the grid. Based on the availability declared by the Generator, the Electricity Boards give their requirement to the RLDC. Taking into consideration the declared availability and the requirement by Electricity Boards, the RLDC prepares a generation and drawal schedule. The 'declared availability' by the generator forms the basis for payment of capacity charges (fixed cost) and the 'scheduled generation' prepared by the RLDC forms the basis for payment of energy charges (variable cost). Any deviation from the schedule in the actual generation or drawal of power is liable to Unscheduled Interchange charge (UI) payable / receivable depending upon who has deviated from the schedule. According to the operational parameters of CERC with effect from April 2004, recovery of full capacity charges depended upon declaration of availability equal to 75 *per cent* of its installed capacity. However, in spite of higher PAF in TPS II, the declared capacity ranged from 71.29 *per cent* to 72.75 *per cent* during 2004-05 and 2005-06 and was less than the CERC norms of 75 *per cent.* So the Corporation could not realise capacity charges amounting to Rs.16.59 crore. While accepting the under recovery, the Management stated (November 2006) that less capacity was because of the anticipated lignite shortage since advancement of Mine II could not be carried out due to non-availability of land.

Recommendation

- The Corporation needed to review the hours allotted for planned maintenance based on its experience over the years and provide for them realistically.

2.6.2 Shortfall in generation due to low load operations

2.6.2.1 Although both the thermal power stations were in service for more hours than planned, the actual generation in TPS I fell short of potential generation[♣] by 2821 MU, in TPS II Stage I by 1987 MU and in TPS II Stage II by 2815 MU during the period under review (**Annexure-1**). This was due to the low load operations by the units. The Management stated (September 2006) that due to various internal factors like sudden breakdown of critical equipment, poor quality of fuel and external factors such as low system demand, partial load loss was inevitable. However, it was observed in Audit that the primary reasons for partial load loss were forced outages and insufficient availability of lignite.

2.6.3 Shortfall in generation due to forced outages

2.6.3.1 Units of the thermal power stations were shut down due to forced outages leading to underutilisation of capacity. Shutdown of units resulting in stoppage of generation due to reasons other than planned maintenance is called "forced outage". The hours lost in TPS I due to forced outages that were controllable ranged from 1065 to 3287 hours, in TPS II Stage I from 516 to 1286 hours and in TPS II Stage II from 758 to 2389 hours during the five years ending March 2006 (**Annexure-2**).

2.6.3.2 Some of the causes of forced outages viz. economiser puncture, water wall puncture, electrical/mechanical faults, etc. occurred repeatedly. Repetition of the causes over the years indicate that these faults were not attended to properly during the planned maintenance. These outages caused loss of generation of 485 MU valued at Rs.88.83 crore in TPS I, 857 MU valued at Rs.104.65 crore in TPS II Stage I and 1178 MU valued at Rs.206.87 crore in TPS II Stage II during the five year period ending March 2006. The forced outages due to these reasons reflected a declining trend during the period of audit but began to increase from 2004-05 in TPS I and from 2005-06 in TPS II.

2.6.3.3 The Management stated (September 2006) that in TPS I forced outages like tube punctures, etc. could not be totally avoided since power plants run on different loads corresponding to demand and hence are subjected to variations in temperature and pressure. Variations in fuel quality, moisture and ash content also cause variation in furnace conditions. As regards TPS II, owing to fluctuating load, the units were subjected to stress leading to occurrence of forced outages. The mined lignite had some aberrations in quality and was contaminated with ash causing erosion of boiler tubes. They added (November 2006) that the nature of fuel and fluctuations in demand were taken into account at the design stage and it was not possible to provide for all variations that might occur during actual operations of the plant.

It was, however, observed that forced outages occurred repeatedly due to the same causes over several years.

[♣]***Potential generation is the power that can be generated at full capacity for the actual hours the plants were operated***

Recommendation

- The Corporation needed to take appropriate measures to minimise occurrence of the forced outages due to repeated causes that are controllable.

2.6.4 Shortfall in generation due to lignite shortage

2.6.4.1 The installed capacity of Mine II was 10.5 MMTPA[▼]. The lignite requirement of generation units of TPS II for the planned hours of operations is given below:

Year	TPS II Stage I (MMT*)	TPS II Stage II (MMT)	Total (MMT)
2001-02	4.287	5.719	10.006
2002-03	4.312	5.749	10.061
2003-04	4.312	5.749	10.061
2004-05	4.312	5.749	10.061
2005-06	4.356	5.807	10.163

** MMT – Million metric tonnes*

Audit observed a shortfall in generation on a number of occasions due to non-availability of lignite and the consequent loss of generation of 3141 MU during the five year period ended March 2006 (**Annexure 3**). Two factors viz., inadequate capacity of Mine II and shortfall in overburden removal mainly contributed to the shortage of lignite extraction in Mine II. These are briefly discussed in the following paragraphs.

2.6.5 **Inadequate capacity of Mine II**

2.6.5.1 The total requirement of lignite in TPS II was 12.775 MMTPA for operation at 100 *per cent* plant load factor (PLF), which was to be met from Mine II. As the capacity of Mine II was only 10.5 MMTPA, it was unable to meet the lignite requirements of TPS II for operating beyond 74 *per cent* PLF (**Annexure-4**). The actual PLF and the lignite consumption in TPS II Stage I and II and the production of lignite by Mine II are given below:

Year	Actual PLF (*per cent*)	Lignite consumption (in MMT)	Lignite production by Mine II (in MMT)
2001-02	79.8	11.29	10.71
2002-03	81.6	11.44	10.60
2003-04	77.5	10.95	8.71
2004-05	71.8	9.94	7.83
2005-06	71.2	10.00	6.43

Though the lignite requirement of TPS II could not be met by Mine II in any of the years during 2001-02 to 2005-06, the shortfall drastically increased since 2003-04 onwards due to difficulties in land acquisition. The Corporation could not acquire any land since 2000 mainly due to delays in acquisition procedures, displaced persons approaching the courts, etc. The shortfall was met by road transportation of lignite from Mine I and Mine IA

▼ Million metric tonnes per annum

involving an expenditure of Rs.32.87 crore. The Management was of the view (November 2006) that this was a temporary phenomenon and lignite transportation compulsions would not arise once the teething problems in Mine II were resolved.

2.6.5.2 Mine II was originally designed based on 68.5 *per cent* PLF for thermal power stations. With the subsequent increase in performance levels of TPS-II, the lignite from Mine-II was found to be insufficient. Given that the cumulative performance of the mines had not exceeded 85 *per cent* of the mine capacity, the design of Mine II should have provided for such capacity as could meet the normative performance levels of TPS II. The Management stated (July 2004) that steps had been taken to commission an additional system in Mine II to augment lignite production. The augmentation work was still in progress (September 2006).

2.6.6 Shortfall in Over Burden (OB) removal[♣]

2.6.6.1 The shortage of lignite from Mine II was also due to shortfall in OB removal during 2002-03 leading to less lignite exposure. The shortfall in removal of OB was due to less working hours of Bucket Wheel Excavators (BWE) No 1420 and 1421 in the surface bench due to frequent breakdowns caused by dislocation of overhaul schedule of these machineries. The Corporation accepted (September 2006) the point made by Audit. It further stated during discussion (November 2006) that in addition to the shortfall in OB removal by the above BWEs, Mine II had entered the deeper lignite zone during the period under review and the non-availability of MAN BWEs for OB removal resulted in less lignite exposure and less production of lignite during 2003-04 and 2004-05.

2.6.7 Cost of generation

2.6.7.1 Cost of lignite and Operation and Maintenance (O&M) expenses constitute the main elements of the cost of power. Therefore, controlling the consumption of lignite and O&M charges would reduce the cost of power considerably.

2.6.8 Controlling consumption of lignite

2.6.8.1 GHR, measured in kilo calories (kcal), is the input heat energy required to generate one kwh of electricity. CERC has prescribed norms for GHR with effect from April 2004. Three factors viz. the quantity of lignite (weight in tonnes), the quality of lignite (calorific value) and the boiler efficiency determine the GHR.

2.6.8.2 Quantity of lignite

The quantity of lignite consumed by both the TPS did not tally with the quantity of lignite transferred from the Mines (**Annexure-5**). The difference in TPS I during 2001-02 to 2005-06 ranged from 0.435 MMT to 0.635 MMT. In TPS II Stage I and II it ranged from 0.319 MMT to 0.363 MMT and 0.395 MMT to 0.455 MMT respectively during 2001-02 to 2003-04. The Management stated (July 2004) that lignite was accounted on volumetric basis in Mine I, while in TPS I the consumption was accounted for taking a derived[♥] figure using the GHR norms fixed by CERC. The difference was attributed to the loss of moisture during storage. However, no norms for such variations have been fixed.

[♣] ***The under performance of Bucket Wheel Excavators (BWE) and the consequent shortfall in lignite production having effect on generation was commented upon in the Performance audit Report on Bucket Wheel Excavators printed in Report No 8 of 2006 of Comptroller and Auditor General of India***

[♥] ***Derived lignite consumption = GHR as per CERC norms/GCV of lignite adopted by CERC x units produced***

2.6.8.3 Quality of lignite

Gross Calorific Value (GCV) of lignite adopted by TPS I to arrive at GHR was 2756 kcal/kg and 2754 kcal/kg during 2004-05 and 2005-06 respectively. Another consumer of lignite from Mine IA, STCMS, stated that the GCV of lignite supplied from Mine IA was 2946 kcal/kg. As Mine I and Mine IA are in the same location, the Management could not explain the difference. Similarly, the GCV of lignite stated by TPS II is 2662 kcal/kg and 2630 kcal/kg for the years 2004-05 and 2005-06 respectively whereas the Mine II laboratory reported them as 2794 and 2942 kcal/kg.

2.6.8.4 Boiler efficiency

The GHR of TPS I was fixed by CERC at 3900 kcal/kwh with effect from April 2004 giving allowances for deterioration in the life of the station, unit size and boiler efficiency. The actual efficiency of boilers ranged from 84.39 *per cent* to 88.08 *per cent* during 2004-05 and 2005-06 as against the boiler efficiency of 67.6 *per cent* adopted by the CERC for fixing the GHR. Taking into account the calorific value of lignite adopted by the Corporation and the average efficiency of the boilers, the actual quantity of lignite consumed (the Management adopted the quantity transferred from Mine I as consumption) exceeded the required quantity of lignite by 1.37 MMT during 2004-05 and 1.27 MMT during 2005-06 as given below.

Year	**GCV of Lignite adopted by TPS I (kcal)**	**Lignite required kg/kwh @**	**Gross generation (MU)**	**Required lignite (MT) (3x4)**	**Actual lignite consumption (MT)**	**Difference (MT)**
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2004-05	2756	1.112	4259.00	47,36,008	61,03,319	13,67,311
2005-06	2754	1.118	3990.00	4460820	5731242	1270422

@ Lignite required per kwh considering average boiler efficiency at 86.06 *per cent* (2004-05) and 85.66 *per cent* (2005-06) and GHR at 3900 kcal/kwh

2.6.8.5 CERC fixed GHR at 2850 kcal/kwh for TPS II with effect from April 2004. Boiler efficiency of the generating units of TPS II Stage I was not available. Boiler efficiency of TPS II Stage II ranged from 69.86 *per cent* to 75.96 *per cent* during 2004-05 and 2005-06 and the Corporation could not achieve the boiler efficiency of 77 *per cent* adopted by CERC for fixing the GHR during the above two years. Taking into account the calorific value of lignite adopted by the Management and the average efficiency of the boilers as achieved, the quantity of lignite required for TPS II Stage II for the actual gross generation of power was 5.99 MMT and 6.06 MMT during 2004-05 and 2005-06 respectively while the actual quantity of lignite consumed was 5.67 MMT and 5.78 MMT indicating an inconsistency as given below:

Year	GCV of lignite adopted by TPS II (kcal)	Lignite required kg/kwh	Gross generation (MU)	Required lignite (MT) (2x3)	Actual lignite consumption (MT)	Difference (MT)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2004-05	2662	1.131	5300.34	5994685	5672699	-321986
2005-06	2630	1.140	5318.16	6062702	5789266	-273436

Average boiler efficiency at the rate of 72.91 *per cent* (2004-05) and 73.18 *per cent* (2005-06) at GHR of 2850 kcal/kwh

2.6.8.6 The GHR of TPS II was 2930 kcal, 2939 kcal and 2930 kcal during 2001-02 to 2003-04 respectively. However, after introduction of norms for GHR by CERC with effect from April 2004, GHR was 2864 kcal and 2871 kcal during 2004-05 and 2005-06 nearer to the CERC norms of 2850 kcal. The factors contributing to this improvement in GHR were not on record.

2.6.8.7 In view of the above inconsistencies in the quantity of lignite consumed, its quality and the GHR, the factors contributing to the increased/reduced consumption of lignite were not ascertainable. The Management did not agree (November 2006) with the consumption figures arrived at by Audit based on the actual boiler efficiency. Boiler efficiency is one of the critical parameters in fixing the norms for the GHR. CERC had adopted a norm of 67.6 *per cent* for boiler efficiency while calculating the GHR for TPS I and 77 *per cent* for TPS II. As such, the consumption worked out by the Management did not depict the advantage or otherwise of higher or lower boiler efficiency.

Recommendations

- The Corporation should fix norms for loss of lignite due to moisture.
- The Corporation should review the consumption of lignite considering the actual boiler efficiency achieved and take appropriate measures for controlling consumption.

2.6.9 Control over Operation and Maintenance expenses

2.6.9.1 According to the Bulk Power Supply Agreement (BPSA) in respect of TPS-I entered into with TNEB for the period 1997-98 to 2001-02, the O&M expenses for 2001-02 were Rs.75.61 crore. This continued in 2002-03 and 2003-04. CERC prescribed (March 2004) O&M expenses for tariff purposes for 2004-05 at Rs.0.152 crore per MW amounting to Rs.91.20 crore and at Rs.0.1581 crore per MW for 2005-06 amounting to Rs.94.86 crore. The actual O&M expenses incurred and norms as per BPSA/CERC are given in Table 1 of **Annexure-6**. It can be seen that the Corporation was not able to keep the actual O&M expenditure within the norms during 2001-02 to 2005-06 and the excess O&M expenses that could not be recovered from TNEB amounted to Rs.58.45 crore.

2.6.9.2 The O&M expenses for the period from 2001-02 to 2003-04 in respect of TPS II were yet to be determined by CERC. According to CERC notification of March 2004, the O&M expenses allowable for tariff purposes for TPS-II were Rs.10.40 lakh per MW in 2004-05 and Rs.10.82 lakh per MW for 2005-06. The Corporation had incurred Rs.6.89

crore and Rs.11.95 crore towards O&M expenses in excess of the CERC norms in TPS II Stage I and Stage II respectively (Table 2 of **Annexure-6**), which could not be recovered from SEBs.

2.6.9.3 The Management stated (September 2006) that the reasons for excess O&M expenses in TPS I were increase in labour rates, general charges including insurance premium and common charges. In respect of TPS II, price escalation of spare parts and escalation of payment to contractors contributed to the excess O&M expenses. The Management further stated that an objection was put forth to CERC before finalisation of tariff but it was in vain. The Management contended (November 2006) that during the years 2002-03 and 2003-04, full capacity charges beyond the normative generation in TPS I were recovered by way of incentive and that there was no significant loss. The reply is not acceptable as the incentive earned is not adjustable against the O&M expenses and as such the expenses amounting to Rs.77.29 crore incurred in excess of the norms need immediate attention.

Recommendation

- The Corporation should initiate action to contain the O&M expenses within the norms.

2.7 Conclusion

Power plants operated for more hours than planned. Hours provided for annual maintenance were not utilised to the full extent and surplus hours were available for generation. Despite higher availability of plants the Corporation did not revise the generation targets upward. Higher availability of hours did not translate into higher generation. The Lignite production capacity of Mine II was insufficient to meet the requirements of TPS II. The O&M expenses were in excess of the norms.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

MINISTRY OF DEFENCE

CHAPTER III

Bharat Earth Movers Limited

Performance of Engine Division

Highlights

Despite availability of in-house capacity, Bharat Earth Movers Limited (Company) resorted to manufacture of equipment with engines of other make.

(Para 3.7.1.1)

The Engine Division (Division) could utilise only a maximum of 42 *per cent* of installed capacity for captive requirements indicating that there had been an unrealistic forecast of the demand for engines at the project.

(Para 3.7.1.1)

Though the annual production targets ranged between 15 and 57 *per cent* of the installed capacity, the Division could not achieve the target in 2003-04 and 2005-06 when the shortfall was 23 and 27 *per cent* respectively.

(Para 3.7.1.1)

The Company could not recover even the material cost in 9 out of 20 models of engines produced during 2005-06. The excess cost worked out to Rs.2.09 crore.

(Para 3.7.2.2)

The Division placed purchase orders based on single tender. Such orders accounted for between 30 and 59 *per cent* of the total value of purchase orders placed during the period of review.

(Para 3.7.3.3)

Diversification efforts made to manufacture and sell the Company's engines for use in Diesel Generator sets were not successful resulting in loss of Rs.2.49 crore; besides, the Company was left holding an inventory of finished stock of Rs.3.14 crore.

(Para 3.7.4.1)

Another diversification effort made to use the Company's engines in compressor application was also not successful.

(Para 3.7.4.2)

Gist of Recommendations

- The Division should increase the production of engines by planning use of more and more Company's engines for captive consumption, so as to achieve economies of scale.

- The Division should explore the possibility of supply of the Company's engines to new applications and improve the capacity utilisation of engine plant.
- Development of alternative supply sources should be expedited so as to obtain competitive prices in procuring raw materials and components.
- The Company should evolve clear guidelines for dealing with private customers so as to safeguard the interests of the Company.

3.1. Introduction

In order to meet the requirement of engines for the production of Earth Moving (EM) equipment, the Government had accorded approval in 1988 for the establishment of facilities for the manufacture of engines at the Mysore Complex of Bharat Earth Movers Limited (Company). The project was conceived with technical collaboration of Komatsu Limited, Japan. The first phase of the project was commissioned in April 1991 and second phase (with establishment of Flexible Manufacture System) in March 1998. The gross block (Fixed Assets) of the project as on 31 March 2006 stood at Rs.72.44 crore and the net block at Rs.16.81 crore. The project envisaged manufacture of 2400 engines in the sixth year of commencement of production.

3.2. Organisation

The Engine Division of the Company is headed by a Chief General Manager, who reports to Director (Production). The General Managers and other sub-ordinate officers assist them.

3.3. Main objectives of the Division

According to the Project Report (1983), the Engine Division was set up to satisfy the demand for captive consumption and to overcome customers' dissatisfaction with engines being used in the Company's equipment due to:

(i) Poor engine quality resulting in high down time of the Company's equipment;

(ii) Poor performance, reliability and life of engines;

(iii) Non-availability of engine spare parts in time;

(iv) Poor after sales service of engines;

(v) Diversity in product line, such as diesel engine sets, compressors etc.

3.4. Scope of Audit

The Performance audit of Engine Division of the Company covered the period from 2000-01 to 2005-06.

3.5. Audit objective

The Audit objectives were to ascertain the extent to which the envisaged objectives of the Engine Division were achieved.

3.6. Audit methodology and acknowledgement

In preparing this report, Audit followed mixed audit methodology viz. audit requisitions, questionnaire, audit enquiries, discussion with the Division heads and other officers and analysed Board agenda and minutes, project report for setting up of the Division, perspective plan and annual production plans, budgets, manuals, cost audit reports and

customers' information and competitor's information as available with the Company/Division. Entry and exit conference were also held with the Management. Audit acknowledges the cooperation and assistance extended by all the levels of Management at various stages for completion of the Performance audit.

3.7. Audit findings

3.7.1 Capacity utilisation and production performance

The original project report had prescribed the production capacity of the plant as 2400 engines (4 bore sizes) per year with man power of 1500 and with the plant working in three shifts. The manpower strength of the Division as on 31 March 2006 stood at 263 (101 officers, 88 direct employees and 74 indirect employees). The Division could not achieve the envisaged capacity. The average engine production per year during the period 2000-01 to 2005-06 stood at only 356 engines. Reasons for the underutilisation of capacity and related issues are detailed below.

3.7.1.1 Production performance

(a) According to the project report, the Engine Division was expected to manufacture 2400 engines of varying bore size category per year. Actual production against the envisaged capacity was as follows:

(In nos.)

Bore size in mm	**Envisaged no. of engines as per project report**	**Actual no. of engines manufactured per year**					
		2000-01	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**
105	475	67	85	55	64	214	279
125	585	14	42	37	96	80	80
140	135	36	37	26	41	50	66
170	1150	98	106	99	130	137	200
170-V	55	-	-	-	-	-	-
Total:	2400	215	270	217	331	481	625

However, since the machining facility for cylinder blocks was not enhanced beyond 1500, the installed capacity has been adopted as 1500 engines per year. Percentage of utilisation against the installed capacity, targets of production and actual production of engines in the Division during 2000-01 to 2005-06 were as follows:

(in Nos.)

Year	Installed capacity	Production targets	Actual production	Percentage of utilisation		
				Target against installed capacity	Actual production against installed capacity	Actual production against target
2000-01	1500	229	215	15	14	94
2001-02	1500	275	270	18	18	98
2002-03	1500	223	217	15	14	97
2003-04	1500	429	331	29	22	77
2004-05	1500	509	481	34	32	94
2005-06	1500	859	625	57	42	73

As could be seen from the above, from 2003-04 onwards there was some improvement in the number of engines manufactured. In all the years even though the targets fixed were very low compared to the installed capacity, the Division could not achieve the targets.

In terms of installed capacity of the Engine Division, the utilisation ranged from 14 *per cent* in 2000-01 to 42 *per cent* in 2005-06. The Management attributed the underutilisation to low demand of engines for captive requirement as compared to the projections made in the Project Report. While establishing the manufacturing facilities (including 2nd phase), projection of the year-wise captive requirement of engines varied from 1211 in 1993-94 to 2650 in 1997-98. As against this projection, the actual demand was very low. This suggested that the demand projections in the project report had been unduly inflated.

The Management stated (November 2006) that based on the existing facilities, they had themselves re-assessed the capacity of the Division and determined its installed capacity as 1100 equivalent engines of 140 mm bore size. The engines manufactured were presently only for captive consumption in Earth Moving (EM) equipment and hence full production level was not planned till date. Further, it was stated that as certain EM equipment viz. dumpers were originally engineered with Cummins engines, the re-engineering of the same with the Company's engine took some time and production could not be achieved to the level of available capacity. During 2006-07, the Company proposed to manufacture 1000 engines.

The reply is not tenable since the revised capacity of 1100 engines determined in October 2006, was yet to be approved by Board/Administrative Ministry. The project report as approved by the Government was for the capacity to manufacture 2400 engines. The cost audit report as accepted by the Board of Directors also indicated the installed capacity of the Engine Division as 2400 engines.

(b) The Company did not utilise its engines in all its equipment manufacture resulting in under utilisation of the manufacturing capacity of engines. The Company had been purchasing Cummins engines and utilising the same for manufacture of equipment. Details of engines manufactured and utilised in EM equipment were as follows:

Year	Equipment manufactured (KGF and Mysore) (Nos.)	Equipment fitted with Cummins and other engines (Nos.)	Percentage of equipment fitted with Cummins and other engines	Equipment fitted with the Company's engines (Nos.)	Percentage of equipment fitted with the Company's engines
2000-01	652	454	70	198	30
2001-02	838	633	76	205	24
2002-03	1119	955	85	164	15
2003-04	1610	1376	85	234	15
2004-05	851	418	49	433	51
2005-06	995	581	58	414	42

Except in 2004-05 the number of equipment fitted with the Company's engine was less than 50 *per cent* of the total number of equipment manufactured. In spite of the availability of capacity in the Engine Division, the Company did not use its engines in all its equipment manufactured. An audit analysis in this regard revealed that fitting of the Company's engines in the equipment supplied to the major customers viz. Coal India Limited and its subsidiaries ranged between 15 and 45 *per cent* only. Details were as below:

Year	Total no. of equipment ordered during the year by CIL and its subsidiaries	Equipment fitted with the Company's engines (Nos.)	Percentage of equipment fitted with the Company's engines	Equipment fitted with Cummins engines (Nos.)	Percentage of equipment fitted with Cummins engines
2000-01	166	75	45	91	55
2001-02	81	12	15	69	85
2002-03	230	92	40	138	60
2003-04	154	46	30	108	70
2004-05	235	97	41	138	59
2005-06	503	186	37	317	63

The Management stated (November 2006) that the customer had the discretion to specify the engines to be fitted into EM equipment. Further, the engines manufactured by Engines Division were not compatible for use in some models of EM equipment manufactured and that if Engine Division started production of engines of required range, utilisation would improve. However, feedback from Coal India Limited and its subsidiaries revealed that it was the Company which was offering a competitor brand viz. Cummins engines as an alternative in preference to their own product thereby defeating the aim of establishment of Engine Division to cater to the captive consumption for its equipment.

Further, as could be seen from the table below, the expenditure on warranty showed a decreasing trend even though the number of engines sold had gone up, which suggested qualitatively better performance of engines manufactured by the Company and used in their equipment.

The warranty expenditure incurred by the Division was as follows:

Year	Engines sold (units)	Cost of warranty (Rs. in crore)	Cost of production (Rs. in crore)	Percentage of total warranty to cost of production.
2001-02	270	1.49	33.34	4.48
2002-03	217	1.11	31.32	3.55
2003-04	272	0.31	33.01	0.92
2004-05	470	0.31	42.21	0.73
2005-06	622	0.47	48.60	0.98

In addition, the customers' feed back on the engine performance analysis assessed through customer satisfaction survey had rated the Company's engines between seven and nine on a rating scale of one to ten during 2003-04 and 2004-05. From this, it could be concluded that the Company's engines were of a quality acceptable to users. Accordingly, the Management should have modified/upgraded upon their engines to suit the equipment being manufactured and avoided underutilisation of available capacity.

Recommendations

- The Division should increase the production of engines by planning use of more and more Company's engines for captive consumption (instead of using purchased engines) so as to achieve economies of scale.
- The Division should explore supply of the Company's engines to new applications to improve the capacity utilisation of engine plant.
- The Division should follow up with customers for replacement of existing engines with the Company's engines at the time of re-powering of earth moving equipment at site.

3.7.1.2 Machine utilisation

25 high cost machines were being used in the manufacture of engines. Besides assembly and testing facilities, the machine groups/operations involved were (1) Camshaft Line operations (2) Connecting Rod Line operations (3) Flywheel Housing Line operations (4) Cylinder Head Line Operations (5) Cylinder Block Line operations. The machine utilisation for the last five years period was as follows:

Year	Planned hours	Utilised hours	Percentage utilisation	Shortfall	Percentage of shortfall
2001-02	87243	68273	78.26	18970	21.74
2002-03	102060	76885	75.33	25175	24.67
2003-04	94299	77197	81.86	17103	18.14
2004-05	83046	66966	80.64	16080	19.36
2005-06	87011	75408	86.66	11603	13.34

The Division worked on single shift and the planned hours were not in line with the installed capacity. The reasons advanced by the Management for the unutilised planned hours were:

Year	No operator (hours)	Breakdown (hours)	Other reasons (hours)	Total unutilised hours
2001-02	6066	4403	8501	18970
2002-03	6268	7030	11877	25175
2003-04	5036	5072	6695	17103
2004-05	4005	5372	6703	16080
2005-06	3883	5482	2238	11603

The hours lost due to 'breakdown' could have been controlled by taking timely action.

The Management stated (November 2006) that since production had not reached the envisaged capacity, utilisation was low and manpower strength was restricted to current level of production.

Reply is not tenable as the planned machine hours utilisation needed close monitoring to ensure that there was no over absorption of cost due to unutilised planned hours.

3.7.1.3 Labour utilisation

As against 1500 employees proposed at the project report stage, only 263 were on rolls (31 March 2006). The labour and labour overhead was allocated based on the horsepower of engines, as job card system was not in place till October 2004. Effective labour utilisation could not be audited in the absence of job cards for earlier years.

The Management stated (November 2006) that due to low volumes of production, the job cards were not introduced till October 2004. Reply is not acceptable since labour charges would not be allocated properly in the absence of job cards.

3.7.2 Cost method and profitability

3.7.2.1 Batch costing system was in vogue. From the financial year 2001-02 onwards, the cost audit of the Engine Division was being conducted by a Cost Auditor as required under section 233(B) of the Companies Act, 1956. The observations by the Cost Auditor also pointed towards underutilisation of the capacity.

3.7.2.2 The financial results of the Engine Division for the last four years were as below:

(Rs. in crore)

	2002-03	2003-04	2004-05	2005-06
Total income	24.40	31.58	43.58	46.56
Total expenditure	40.37	47.54	52.97	50.97
Profit(+)/loss (-) for the year	(-)15.97	(-)15.96	(-)9.39	(-)4.41

As could be seen from the financial results the Division incurred loss every year. The loss of the Division during the year 2002-03 was Rs.15.97 crore but came down to Rs.4.40 crore in the year 2005-06. The progressive improvement in the financial results could be attributed to increase in the volume of production (217 nos. in 2002-03 to 625 nos. in 2005-06).

The manufacturing cost was higher mainly due to high cost of raw materials and components, underutilisation of installed capacity and low volume of production for captive consumption.

The Management accepted that there was financial loss. The Management, however, claimed that the presence of Engine Division had deterred the competitors from escalating the prices for engines sold by them to the Company in spite of increase in the input cost during this period. This was indicative of a skewed management approach.

The Management further stated (November 2006) that the profitability indicated was based on the transfer price adopted by the Company. The transfer price for the engines produced by the Division was fixed based on prices of comparable models of engines available in the market at that time and pro-rata on Horse Power basis wherever prices were not available and the same was retained since 2000-01. Barring a few equipment like BE 220 where the competition was very severe, majority of the EM equipment were showing positive trend and the Company was able to recover full material cost and labour.

Reply of the Management is not acceptable as transfer price was pegged below material cost in most of the engines produced. As a result the Engine Division could not recover even direct material cost in many models resulting in loss of Rs.2.09 crore. **(Annexure-7)**

3.7.2.3 Even though the Engine Division achieved import substitution by indigenising certain portion of material and components, the material cost could not be brought down significantly as the Division was unable to achieve economies comparable to those of the multinational companies. The Company was not in a position to secure the most economic prices since the quantity of raw material procured was low and production was not commensurate with installed capacity. There was competitive Research and Development (R&D) in EM equipment and the related business being complex needed heavy investments.

The Secretary (DP & S) had informed Audit Board (November 1999) that it had been decided to start a dialogue with leading multinational companies for a strategic alliance in an effort to hive-off engine plant in due course of time. There has been no progress in this direction and the Division continued to incur losses.

The Management stated (November 2006) that even though the representative of the original collaborator of the plant Komatsu inspected the plant there was no positive response.

3.7.3 Cost reduction measures

The Division stated that efforts were being made for reducing the material cost of all the engines either by indigenising imported items or by value engineering. The cost reduction measures taken by the Company like offloading/subcontracting, indigenisation, development of alternate sources, etc. are discussed below.

3.7.3.1 Offloading/subcontracting

The effort of the Company to offload conventional process for cost saving activities related to turning, milling, drilling, boring, tapping, grinding and keyway slotting, etc. The offloading was taken up to reduce the cost of production.

(Rs. in crore)

Year	Total purchases made by Engine Division	Value of offloading orders	Percentage of value of offloading to total purchases
2000-01	20.20	0.74	3.7
2001-02	33.44	1.36	4.1
2002-03	23.95	0.67	2.8
2003-04	27.64	1.34	4.8
2004-05	44.18	1.66	3.8
2005-06	44.66	3.30	7.4

However, it was seen that offloading was less than 10 *per cent* of the total purchases made during the last six years and such outsourcing had also resulted in non-utilisation of available capacity.

The Management stated (November 2006) that as per the original project report the plant was established to manufacture only seven critical components in-house and remaining components were to be procured through offloading. Accordingly the offloading activities were resorted to based on production requirements.

The reply was not tenable since man/machine hours available were not being fully utilised which had a cost implication. In the absence of a clearly articulated policy regarding the work to be offloaded and the targetted cost reduction, such unplanned offloading might result in creating more idle capacity.

3.7.3.2 Indigenisation

The Division had a continuous programme of indigenisation in order to reduce the cost of production/imports. As per the project report prepared at the time of establishment of Engine Division it was stated that 85 *per cent* of the materials/parts would be indigenised from the sixth year of production. The Division claimed to achieve indigenisation levels between 95 and 98 *per cent* as at the end of 2005-06. The year wise achievement of indigenisation and the amount of savings achieved per engine were as below:

(Savings per engine: Rs. in lakh)

Year/ Model	2002-03		2003-04		2004-05		2005-06	
	Per-centage of indige-nisation	Savings per engine	Per-centage of indige-nisation	Savings per engine	Per-centage of indige-nisation	Savings per engine	Per-centage of indige-nisation	Savings per engine
140 series	73.0	--	82.2	2.36	72.3	1.15	96.5	0.04
105 series	74.4	0.46	78.8	1.61	87.2	0.65	98.2	0.20
125 series	72.9	2.06	78.3	--	83.8	0.09	97.8	0.51
170 series	87.1	0.37	92.8	0.20	92.5	0.04	95.4	0.65

The Division had achieved indigenisation ranging from 72.9 *per cent* (2002-03) to 98.2 *per cent* (2005-06).

The Management stated (November 2006) that it had achieved reduction in material cost ranging from 9.38 to 39.40 *per cent*.

The Management would have to further improve upon the reduction in material cost in all the models of engines manufactured, in order to keep pace with the competition.

3.7.3.3 Development of alternate sources

The dependence on single source suppliers for raw materials and components by the Division was high. An audit analysis revealed the following in respect of value of purchases made on single tender basis during the years 2000-01 to 2005-06.

(Rs. in crore)

Year	Total purchases made by Engine Division	Value of purchase made on single tender basis	Percentage of single tender purchases to total purchase
2000-01	20.20	6.20	30.7
2001-02	33.44	10.06	30.1
2002-03	23.95	7.40	31.0
2003-04	27.64	11.95	43.2
2004-05	44.18	18.81	42.6
2005-06	44.66	26.45	59.2

Percentage of purchases made on single tender basis ranged between 30.1 and 59.2 *per cent*. The procurement of materials and components on single tender basis resulted in denial of the benefits of competitive pricing with resultant higher cost.

The Division started developing alternate sources by incurring development cost. The following table gives the details of development charges incurred by the Division during the years 2001-02 to 2005-06.

(Rs. in crore)

Year	No. of development orders placed	Development charges paid
2001-02	16	0.10
2002-03	18	0.11
2003-04	32	0.21
2004-05	48	0.46
2005-06	51	1.75

The Division had made efforts for developing alternate sources in recent years but the benefits of cost effectiveness were yet to be achieved.

The Management stated (November 2006) that because of low volume of components the vendors were reluctant to develop the components according to the Company's standards. Hence the dependence on single source became inevitable. Further it was stated that the benefits of development cost presently being incurred would be reaped in the future by competitive prices from the alternative sources.

The reply of the Management is not acceptable. As envisaged in DPR the target number of engines to be manufactured was 2400 and as the production of engines had shown an increasing trend from 2003-04 onwards the Company should have taken action for development of alternate sources.

Recommendation

- Development of alternative source of supply should be enhanced to get a competitive price in procuring raw materials and components.

3.7.4 Diversification activity

In order to optimise the capacity utilisation and also to normalise the cost of production the Division intended to extend the application of the Company's engines to other products and also to sell them independently as separate aggregate. Accordingly the Division took up the manufacture of engines for diesel generator set applications and K-300 engines for compressor applications to private customers as discussed below.

3.7.4.1 Manufacture of diesel engines for Diesel Generator Sets

As a part of production programme for the year 1998-99, anticipating demand for Gensets, the Company proposed to manufacture 24 Diesel Generator (DG) sets and accordingly procured raw materials required for the purpose. However, the Company could manufacture (1999-2000) only two numbers each of 548 KVA and 358 KVA DG sets at a total cost of Rs.65.57 lakh and Rs.38.82 lakh respectively and finally sell (2000-04) three DG sets (two numbers of 548 KVA and one 358 KVA) for a total value of Rs.46.29 lakh. On account of the Company's inability to market DG sets, the programmed manufacture of 24 DG sets could not be continued and the unsold DG sets (one number) alongwith the raw materials procured for the purpose had to be devalued (2000-03) based on prevailing market prices resulting in a loss of Rs.1.69 crore. Subsequent efforts made by the Company through value engineering and indigenisation did not yield the desired results and thus the Company's plan to enter DG sets market could did not materialise (November 2006).

The Company's subsequent effort made in March 2003 to enter into the marketing of DG sets through an agreement with a private firm M/s Jeevan Diesel & Electricals Limited, Bangalore (JDEL) was also not successful and the Company had to incur a loss of Rs.2.49 crore besides huge accumulation of unsold stock valued at Rs.3.14 crore lying with the Division as on 31 March 2006 (after devaluation) on account of non-lifting of diesel engines by JDEL. It was observed in Audit that the Company had taken up (2003-04) the manufacture of 59 diesel engines at a cost of Rs.6.39 crore even before the receipt of any order as required under the terms of the agreement and financial commitment by the firm. Finally, JDEL lifted only three diesel engines (value Rs.1.6 crore) and paid only 20 *per cent* of the sale value. JDEL insisted for conversion of the purchased engines to different ranges and the balance payment of 80 *per cent* had not been received so far (November 2006) pending conversion as required by them.

The Management stated (November 2006) that with a view to finding out suitable distributors who could market engines for DG sets an agreement was entered into with JDEL, for marketing DG engines based on indications given by them, but the same could not materialise as envisaged and JDEL were reluctant to adhere to the agreement. Efforts were being made to persuade JDEL to lift the engines. In case of failure by JDEL to lift,

it was proposed that the engines would be rebuilt for use in other equipment. It was claimed that the development of DG engines may be viewed as a marketing strategy and that the expenditure was product development (R&D) expenditure in anticipation of sales and not wasteful expenditure against the sale contract dishonoured by the party. Further the manufacture of DG engines had been taken up to use the existing capacity and to reduce the financial loss.

However, the fact remains that the manufacture of DG engines on a large scale without any firm commitment from JDEL and continuance of manufacturing without ensuring the delivery/receipt of DG engines by the customer on a regular basis had resulted in an avoidable loss of Rs.2.49 crore besides accumulation of non-moving finished stock valued at Rs.3.14 crore.

3.7.4.2 Manufacture of K-300 engines for use in compressors

The Division took up the manufacture of a prototype diesel engine (K-300) for use in compressor applications at a cost of Rs.13.40 lakh. The engine was sent (May 2004) to Kirloskar Pneumatic Company Limited, Pune (KPCL) for testing on compressor application and the test was successful. In August 2004, the Division took up manufacture of 10 engines for marketing at a cost of Rs.1.1 crore.

The Division delivered one more engine in September 2004 on request by the customer i.e. KPCL without finalizing the commercial terms with the firm. The customer intimated (September 2004) the purchase price of Rs.4.75 lakh at which it was interested in buying the engines along with the terms of delivery as ex-works Pune, with 90 days credit and warranty period of three years or 6500 hours from the date of commissioning. There was no settlement of the commercial terms with the customer. The material cost of the Company's engines itself was Rs.7.34 lakh as against the indicative price of Rs.4.75 lakh. In December 2005, the matter of price was again discussed with the customer and the customer finally agreed to pay Rs.7.5 lakh as a special proto price for the first proto type engine accepted by them.

However, the customer subsequently informed that the market for K-300 compressor had collapsed and there was no demand for this range of compressors. Thus the diversification effort of the Division in marketing engines for compressor application had failed. Manufacturing of products without determining the commercial terms, proper market feed back regarding cost of production and market price led to failure of diversification efforts and blocking of Rs.1.10 crore.

The Management stated (November 2006) that while entering into a new area it may not be always possible to follow a strict pricing policy and market could be penetrated only by taking certain business risks. However, all the K-300 engines had since been converted and used in Earth Moving equipment.

Recommendation

- The Company should evolve clear guidelines for dealing with private customers, particularly in diversification activity, so as to properly regulate such transactions while safeguarding the interest of the Company.

3.7.5 Sale of spares and after sales service

The Company had been earning income from sale of spares. The loss in manufacturing engines at higher cost was expected to be compensated by marketing of spares. The

income earned by the Division through sale of spares during the years 2000-01 to 2005-06 was as follows.

(Rs. in crore)

Particulars	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Income from spares (Company bought and manufactured)	424.27	412.22	406.65	430.12	533.41	531.51
Income from spares (Engine Division)	6.66	12.65	12.89	9.39	15.67	19.53
Percentage	1.57	3.07	3.17	2.18	2.93	3.67

The Engine Division continued to incur losses in all the years and it could not cover the losses incurred in the sale of engines through the margin in the sale of spares.

The Management stated (November 2006) that the Company was able to generate additional revenue by way of sale of engine spares.

Clearly, the Company has to make special efforts to bring down the cost of manufacture of engines and increase the volume of sale of spares to restrict its losses.

3.8 Conclusion

The installed capacity was created mainly for the captive consumption of engines for in-house production. However, the Company resorted to procuring engines from outside sources and the Division could utilise only upto a maximum of 26 *per cent* of its installed capacity for captive consumption. Economies of scale could not be achieved as the volume of production was low. Efforts to diversify the product-mix did not bear fruit as the Company did not proceed in a regulated manner. The Division had achieved indigenisation of 95.4 *per cent* to 98.2 *per cent* of the parts/materials imported as on 31 March 2006. The Company has to reduce further the material cost of all the models of engines manufactured in order to acquire a price edge over its competitors. Capacity utilisation too needed substantial improvement.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

CHAPTER IV

Hindustan Aeronautics Limited

Outsourcing activities

Highlights

Determination of available in-house capacity, which was vital for deciding quantum of outsourcing, was not realistic and uniform among divisions.

(Para 4.7.1.1)

In-house capacity was not properly utilised before resorting to outsourcing. In spite of increase in the volume of outsourcing there was increase in capital investment in certain divisions and also in manpower.

(Paras 4.7.1 2 and 4.7.2)

The method adopted for working out savings from outsourcing was not uniform.

(Para 4.7.3)

The vendors list was not updated regularly; mandatory documents during registration process were not obtained and orders were placed on unregistered vendors.

(Para 4.7.4.1)

Developed vendors were not nurtured by placing continuous orders. There was dependence on limited sources, orders were placed in excess of the capacity of the vendors. Alternative sources were not developed.

(Para 4.7.4.2)

Repeat orders were being placed on selected vendors in spite of poor performance. The performance of the vendors was not being rated annually as prescribed in the procedure.

(Para 4.7.5)

The policy on outsourcing was not properly defined and the programme objectives were not in line with the policy objectives. A systematic database of the items to be outsourced had not been developed.

(Para 4.7.6.1)

It was noticed that orders were split, repeat orders were placed without entering into any Long Term Agreement (LTA) with vendors and adequate security was not taken for the raw material issued. There were also lacunae in the system of physical verification and reconciliation of material lying with vendors.

(Paras 4.7.6.2 and 4.7.6.3)

Gist of recommendations

- The method of determination of in-house capacity should be recast after taking into account latest technology developments/Computerised Numerically Controlled (CNC) machines.
- Utilisation of in-house capacity should be optimised before resorting to outsourcing and additional investment in manpower and capital should be preceded by exploration of all outsourcing options and the process should be documented.
- The method of working out savings from outsourcing should be formulated/standardised and communicated to the divisions.
- The vendors list should be updated and mandatory documents required for registration of vendors should be obtained. Process of registration of vendors should be streamlined.

- A wider vendor base should be developed to avoid dependence on limited sources. Developed vendors need to be nurtured by placing continuous orders. Import of indigenously established items should be avoided.
- Rating of the vendors should be made based on their performance and incorporated in a databank of vendors to be utilised during subsequent contracts.
- The policy should be revised to specify the target parameters for outsourcing and the period by which the target should be achieved. Guidelines regarding selection of activities to be outsourced should be formulated and communicated to the divisions for uniform implementation.
- The system for placement of purchase orders, issue, receipt and accountal of material to vendors needs to be streamlined.

The Management generally agreed (November 2006) with the above recommendations.

4.1 Introduction

Outsourcing refers to the delegation of non-core operations of a business to an external entity specialising in the management of that operation. The decision to outsource is often made by a business in the interest of lowering costs and redirecting its resources towards its core competencies. Hindustan Aeronautics Limited (the Company) has been outsourcing components, tools and assemblies since 1980. However, a major thrust to outsourcing was given from 2002-03 by formulating (April 2002/March 2003) the procedures and systems for outsourcing. The Company had outsourced works amounting to Rs.625.61 crore during 2002-03 to 2005-06 which worked out to 3.72 *per cent* of the turnover of Rs.16795 crore.

4.2 Scope of Audit

A Performance audit was taken up to review the outsourcing activities in the Company during the period 2002-03 to 2005-06. Out of 16 production divisions, nine divisions, viz. Aircraft, Helicopter, Engine and Foundry & Forge Divisions at Bangalore, Aircraft Division Nasik, Avionics Division Hyderabad, Koraput Division, Lucknow Division and the Corporate Office, Bangalore were selected based on their volume of outsourcing activities and geographical locations.

4.3 Audit criteria

The following criteria were adopted for assessing the performance of outsourcing activities:

(i) Policies and guidelines issued by the Company;

(ii) Annual production plans and achievements there against;

(iii) Quality inspection procedures and monitoring mechanism;

(iv) Contracts entered with vendors for outsourcing.

4.4. Audit objectives

(i) To examine whether the policy and programme objectives were well defined and adequate;

(ii) To examine the procedure for selection of vendors and vendor rating;

(iii) To examine whether outsourcing was resorted to after properly utilising in-house capacity;

(iv) To examine whether the increased activities of the Company were met through outsourcing without increasing the manpower and capital investments;

(v) To examine whether outsourcing resulted in any cost benefit;

(vi) To examine whether the outsourcing targets were achieved.

4.5 Outsourcing by the Company

The main objectives of outsourcing by the Company were:

(i) To meet the increased activities without increasing the man-power;

(ii) To outsource a large number of medium and low-tech components/activities after ensuring full utilisation of available infrastructure, thus limiting the investment in infrastructure and man power;

(iii) Cost Reduction.

The outsourcing policy of the Company was:

(i) to outsource components and major assemblies to industries in private/public sector, having necessary infrastructure and capability and to extend all assistance to such industries to absorb the technologies and quality standards required in the aeronautical industry;

(ii) to progressively increase the content of outsourcing to 25 *per cent* of the turnover;

(iii) to supply material to the vendors in view of non-availability of raw-material easily or of specified quality; the vendor would be required to provide an indemnity bond and take insurance for the material.

4.6 Audit methodology and acknowledgement

Data collection and evidence gathering were based on the review of records at the Corporate Office and the divisions selected for Performance audit, using sampling techniques, meetings/discussions with the Management and issue of audit requisitions/audit enquiries. Entry and exit conference were also held with the Management. Audit acknowledges the cooperation and assistance extended by all the levels of management at various stages for completion of the Performance audit.

4.7 Audit findings

4.7.1 Capacity determination and utilisation

4.7.1.1 Capacity assessment/determination

The Company considered the excess workload over the available capacity in terms of the Standard Man Hours (SMH) as the deficit capacity and the same was planned for outsourcing. A Committee was constituted (December 2003) to formulate the basic principles, assumptions and methodology for working out the Man Hour Rate (MHR) for various types of jobs outsourced by all the divisions in the Bangalore Complex. The report of the Committee indicated the rates for milling, drilling, grinding, etc. for both conventional and Computer Numerically Controlled (CNC) machines and recommended

that part-wise SMH should be determined and database created for use as a ready reference. The following deficiencies were noticed in calculating the in-house capacity:

(i) The part-wise SMH and database had not been determined and maintained so far as recommended by the Committee. Part-wise SMH indicated in the Engineering Data Master (EDM) based on Rationalised Elemental Time Standards (RETS) prepared in 1960s on conventional machines were not revised keeping in view the large number of CNC machines in operation. Due to these deficiencies in the calculation of available in-house capacity, actual output in terms of SMH in the Engine Division exceeded the assessed capacity by 3.68 lakh hours in 2002-03, 2.81 lakh hours in 2003-04 and 0.10 lakh hours during 2004-05. The Engine Division stated that the RETS was developed and released by the Corporate Office many decades ago and the revision of RETS was being referred to Corporate Office.

(ii) While working out the available capacity, machine capacity was not considered although norms were fixed for high value machines and CNC machines. This indicated that the divisions under assessed their in-house capacity.

(iii) As per the Corporate Office guidelines for calculating capacity per direct labour per year (DL/PY) from 2000-01 onwards, the available capacity per SMH/DL/PY was considered to be 2250 hours.

The Engine Division had considered the available capacity at 1800 hours per SMH/DL/PY during 2002-03 to 2003-04 against the norms of 2250 hours and the Nasik Division assessed the capacity of five shops by adopting 140 to 150 SMH/DL per month against the Corporate Office norms of 187.5 SMH/DL/PM which resulted in understatement of in-house capacity and consequent higher outsourcing.

Recommendation

- The method of determination of in-house capacity should be recast after taking into account latest technological developments and CNC machines.

The Management noted (November 2006) the need for a common guideline for determining the available capacity and agreed to issue suitable guidelines for determination of in-house capacity to ensure uniformity in practice.

4.7.1.2 Utilisation of in-house capacity

Underutilisation of in-house capacity in terms of SMH and simultaneous outsourcing of works were noticed in the following cases:

(i) In the Engine Division, against the in-house tooling capacity of 74880, 60480 and 86625 hours, capacity planned for in-house manufacturing was only 63350, 54900 and 85979 hours during the year 2002-03 to 2004-05. In spite of available capacity, outsourcing was resorted to which was avoidable.

(ii) The Aircraft Division had resorted to outsourcing in respect of tooling during 2002-03 to 2005-06 though in-house capacity of 4.15 lakh hours was available. This resulted in extra expenditure of Rs.16.60 crore considering an average MHR of Rs.400 per hour.

(iii) The Foundry and Forge Division had planned outsourcing of 50000 hours during 2004-05 for rough machining of castings and forgings in respect of Advanced

Light Helicopter (ALH) and Light Combat Aircraft (LCA) projects though the Division had 53156 unutilised machine hours. Considering the composite rate of Rs.72 per hour, the outsourcing cost of Rs.36 lakh was avoidable.

The Management stated (November 2006) that outsourcing was resorted to despite availability of machine capacity due to non-availability of right operators.

Recommendation

- Measures to ensure optimum utilisation of the in-house capacity should be put in place. Utilisation of in-house capacity should be ensured before resorting to outsourcing.

  The Management agreed (November 2006) with the recommendation and stated that the available capacity would be kept in mind.

4.7.2 Manpower and capital investment

The objective of the Company was to meet customer expectations through outsourcing without resorting to increase in manpower thereby limiting the investment in manpower and infrastructure. However, the following deficiencies were noticed in this regard:

(i) The Aircraft Division recruited 283 labour during 2002-03 to 2005-06 apart from employing contract labour.

(ii) The strength of direct labour in the Helicopter Division was increased from 705 in 2003-04 to 847 in 2005-06.

(iii) Manpower of the Engine Division came down from 1710 in 2002-03 to 1543 in 2005-06. There was reduction in manpower of 167 due to natural causes. However, contract labour continued to be employed during 2002-03 to 2005-06.

(iv) Capital investment on major projects being implemented by the Company namely, LCA, Intermediate Jet Trainer (IJT), etc. were funded by the customers. In spite of this, additions to plant and machinery by 188.72 *per cent* were made from 2003-04 to 2005-06. At the same time outsourcing activities also increased from Rs.63 crore in 2002-03 to Rs.282 crore in 2005-06.

Thus, in spite of increase in the volume of outsourcing there was increase in capital investment and also in manpower.

The Management stated (November 2006) that increase in manpower had no direct bearing on increase in outsourcing and that instructions would be issued to examine and assess whether a job could be outsourced instead of acquiring new facility at the time of projecting the capital facility requirements.

Recommendation

- Additional investment in manpower and capital should be preceded by exploration of outsourcing options and the process should be documented.

4.7.3 Cost benefit analysis

The method for calculation of savings out of outsourcing was not indicated in the procedure for uniform adoption by the divisions. The savings should be the difference between the actual in-house cost and the actual cost of outsourcing. The following deficiencies were noticed during audit in this regard:

(i) The Engine Division had not worked out the actual conversion cost for sub-contracted items. Instead, savings were worked out by adopting a uniform Man Hour Rate (MHR) of Rs.200. The shop-wise MHR was not worked out for comparing the in-house cost and cost of outsourcing. Hence, working out of saving was not realistic. In addition, sample check of 62 purchase orders revealed that in-house cost estimated was lower than outsourcing cost involving extra expenditure of Rs.35.76 lakh. In respect of 36 items, in-house cost was not estimated at all before finalising the purchase orders.

(ii) In the Aircraft and Lucknow Divisions the savings due to outsourcing were worked out as the difference between the value of purchase orders placed during the year and the MHR of the division which did not indicate the correct position. Engine Division stated that there was no system prevailing to work out machine-wise/shop-wise MHR and no specific guidelines existed to work out the savings. Hence composite MHR was considered for arriving at the savings. Further, it was stated that implementation of Enterprise Resource Planning (ERP) would improve the system.

The method adopted for working out savings from outsourcing was not uniform. In the absence of a standard method of working out the benefits of outsourcing, it was not possible to categorically conclude that outsourcing activities had resulted in cost reduction.

Recommendation

- The method for working out savings from outsourcing should be clearly formulated and standardised and communicated to the divisions.

The Management noted (November 2006) the need for uniformity in the method of working out the savings and agreed to issue suitable guidelines to adopt a uniform practice for the purpose.

4.7.4 Registration and selection of vendors

4.7.4.1 Registration of vendors

As per the extant procedure, the applications of vendors received by the division for registration were to be evaluated by a committee and the committee was required to visit the vendors' works for assessment of technical and financial capabilities before their selection. The divisions were expected to maintain a directory of approved vendors category-wise and also exchange the same with other divisions. However, the following deficiencies were noticed in this regard:

(i) The Engine Division had not updated the vendor directory, finalised in the year 2002-03 based on the performance of the vendors. It had been updated upto 2004-05 in the Aircraft and Helicopter Divisions.

(ii) Sample check of nine major vendors of the Engine Division revealed that documents like income tax returns, income tax and sales tax clearance certificates for three years, financial statements, details of experience, certificate of incorporation, etc. required to be produced by the vendors were not obtained while registering these vendors. It was also noticed that purchase orders were placed on 13 vendors who were not registered at all.

(iii) The Koraput Division received eight applications in 2002-03 and nine applications in 2003-04 for registration of vendors for tooling. The officials of the Division had not visited the premises of the vendors so far (August 2006) to finalise the registration.

Recommendations

- The vendor list should be updated and mandatory documents required for registration of vendor should be obtained. The process of registration of vendors should be streamlined.

  The Management stated (November 2006) that capacity and credentials of the vendors were considered before placing orders though registration was not carried out and agreed to issue instructions for regular updation of the directory of vendors.

4.7.4.2 Selection of vendors

The procedures for subcontracting provided for selection of 5 to 10 vendors for each category of tools/components to ensure availability of good vendor base and as per the policy the capacity and infrastructure of the vendor were to be assessed before placing order. Further, the guidelines (May 1999) on indigenisation of imported material emphasized that having developed indigenous sources, efforts should be made to sustain and ensure growth of these sources. However, the following deficiencies were noticed in the selection of vendors.

(i) Against 112 vendors available in the Engine Division, a limited group of 27 vendors supplied 1051 items in 2003-04, 343 items in 2004-05 and 998 items in 2005-06.

(ii) During 2002-06, 3213 purchase orders valued at Rs.43.18 crore were placed by Aircraft Division on 331 vendors.

(iii) The Helicopter Division placed orders valued at Rs six crore only on one firm during past 10 years (1996 to 2006) in respect of certain long cycle items like input housing and mast beaming under ALH project. However, no effort was made to develop an alternative source.

(iv) The Foundry and Forge Division was dependent on only one vendor although alternative sources were available for polishing stator blades thereby denying itself the benefit of competitive bidding.

(v) Sample check of two projects in the Engine Division, revealed that the Division had incurred extra expenditure of Rs.1.04 crore on import of 25 items for which indigenous sources had been developed. The reply that import was resorted to at the instance of customer and that the differential cost between the Company fabricated item and the imported item was reimbursed by the customer was not proper.

(vi) The Helicopter Division developed (December 2002/January 2004) two indigenous sources for machining and fabrication of pitch horn required for the ALH project. In December 2004, the Division placed order for 40 pitch horns on a foreign firm and the balance requirement of 52 pitch horns was ordered on

indigenous firms. Placement of order on the foreign firm in spite of the availability of indigenous sources resulted in extra expenditure of Rs.17.62 lakh.

(vii) The capacity available and agreed was not indicated in the vendor directory for reference while placing orders. During the period January 2005 to January 2006, the Helicopter Division placed 150 purchase orders valued at Rs.9.55 crore on four vendors though the actual SMH available with these vendors were valued at Rs.4.78 crore thereby resulting in placement of excess orders valued at Rs.4.77 crore. The vendors had not executed orders valued at Rs 3.97 crore so far.

Recommendations

- A wider vendor base should be developed to avoid dependence on limited sources. Developed vendors need to be nurtured by placing continuous orders. Import of indigenously established items should be avoided.

  The Management stated (November 2006) that guidelines would be issued to nurture vendors for items involving high development cost.

4.7.5 Performance of vendors and control over product quality

According to the monitoring procedure the divisions were required to continuously monitor the performance of each party in respect of quality, delivery, price, etc. and corrective action/termination was to be advised wherever required. Persistent failure in timely delivery/quality compliance would entail cancellation of registration. The registered vendors were required to be evaluated by the Performance Evaluation Committee and rated at least once in a year. However, the following deficiencies were noticed in this regard:

Sample check of data of five major vendors in the Engine Division showed shortfall/delay in supply of 104 items against 117 items during the period July 2000 to January 2006. Similarly in the Aircraft Division, there was delay of 90 to 1852 days in supply of 1169 orders during 2003-04 to 2005-06. However, subsequent orders continued to be placed on them despite their poor performance.

In the Engine Division, on a review of the performance of Prathiba Industries, it was noticed that out of 3027 items outsourced by the Division during 2003-04 to 2005-06, purchase orders for as many as 688 items were placed on the vendor. However, only 29 *per cent* were supplied in 2003-04, 41 *per cent* in 2004-05 and 2 *per cent* in 2005-06.

Out of 2479 items outsourced during 2003-04 to 2005-06 by the Engine Division, 633 items were rejected and the percentage of rejection was *26 per cent*. On an analysis of the supplies made by the vendors, high rejections of almost 100 *per cent* were noticed in 34 cases as the raw material used by the vendor was not as per the required specifications.

The Management stated (November 2006) that vendor rating would be reinforced on an annual basis. In the specific cases noted by audit, the supplied items were rejected as the raw material used by the subcontractor was not as per the specifications. In case of material issued by the Company, a quality control on usage was maintained.

The reply was not acceptable as quality control should be exercised not only on the raw material issued by the Company but also on the raw material used by the vendor to ensure product quality and timely supplies.

Recommendations

- The divisions need to ensure that the raw material used by the vendor meets the required specifications. Corrective action should be taken to reduce the rejections. Performance of the vendors should be rated based on past performance and databank of good vendors should be maintained.

4.7.6 Implementation, monitoring and evaluation

4.7.6.1 Achievement of targets

According to the Chairman's statement in the Annual Report of the Company for the year 2001-02, outsourcing target was based on turnover and as per the outsourcing policy, outsourced turnover of 25 *per cent* was to be achieved progressively. However, the roadmap for achieving the target was not defined in the policy. In the absence of specific instructions, workload in SMH was considered as the parameter for outsourcing in all the divisions. Further, the policy was silent about the period by which 25 *per cent* of total turnover was to be progressively achieved.

The percentage of outsourcing to turnover during 2002-03 to 2005-06 was only 2.01, 2.6, 4.01 and 5.28 *per cent* respectively as indicated below:

Year	Turnover Rs. in crore	Target to be achieved (25 *per cent*) Rs. in crore	Actual outsourcing/ achievement Rs. in crore	Percentage of achievement to turnover
2002-03	3120.42	780.10	62.87	2.01
2003-04	3799.78	949.94	98.70	2.6
2004-05	4533.79	1133.45	181.90	4.01
2005-06	5341.50	1335.37	282.14	5.28
Total	16795.49		625.61	

Considering the workload in terms of SMH, outsourcing achieved was 16.6, 21.9 and 26 *per cent* during the years 2002-03 to 2004-05 respectively as under:

(SMH in lakh)

Year	Total workload in SMH	In-house output in SMH	Workload outsourced in SMH	Percentage of outsourcing to total workload
2002-03	277.39	231.48	45.91	16.6
2003-04	316.28	246.98	69.30	21.9
2004-05	350.30	259.05	91.25	26
2005-06	To be furnished		131.80	

The actual outsourcing planned was less than 25 *per cent* of the workload during 2002-03 to 2004-05 in the Engine and Lucknow Divisions and in 2002-03 to 2003-04 in the Aircraft and Hyderabad Divisions. The Engine Division and the Aircraft Division could not achieve planned outsourcing during 2002-03 to 2004-05 and 2002-03 to 2003-04 respectively. The Helicopter Division exceeded the outsourcing targets in all the years. The following points were noticed:

(i) Outsourcing was to be resorted to in case of non-core operations like medium and low-tech items/activities. However, items had not been identified and documented as low-tech, medium-tech or high-tech and there was no such database in the Company. Full responsibility for identification and execution had been left to the discretion of the divisions.

(ii) The value of actual outsourcing achieved was based on the value of purchase orders issued as stated by the Company. But this was not correct as supplies were received in subsequent years also. In the Aircraft Division, the value of outsourced work completed during 2004-05 to 2005-06 was only Rs.22.45 crore against the order value of Rs.28.75 crore during those years.

Thus, there was shortfall in the achievement of outsourcing targets in terms of turnover at all the divisions and in the Company as a whole. The policy was not properly defined and the programme objectives were not in line with the policy objectives. Although the outsourcing policy was framed in 2002-03, a systematic identification of the items to be outsourced had not been made.

Recommendations

- Efforts are to be made for fixing realistic targets as per outsourcing policy. The policy should be refined to specify the period by which the target was to be achieved and guidelines regarding selection of activities to be outsourced should be formulated and communicated to the divisions for uniform implementation.

4.7.6.2 Placement of purchase orders

According to the procedure for placement of purchase orders, a Long Term Agreement (LTA) would be entered into after approval of the initial order and repeat orders would be placed on the basis of the LTA. The following deficiencies were noticed in the placement of orders:

(i) The Aircraft Division placed 774 repeat orders valued at Rs.6.42 crore for same items on 55 vendors during 2002-03 to 2005-06. However, long term agreements were not entered into to avail of quantity discounts.

(ii) Data analysis of 1295 purchase orders in the Engine Division for the period 2002-03 to 2005-06 indicated delay in conversion of Material Purchase Request (MPR) to purchase orders from 91 to 360 days in respect of 428 purchase orders. Similarly out of 3123 purchase orders analysed in the Aircraft Division for the period 2002-03 to 2005-06, delay beyond 91 days in conversion of MPRs to purchase orders was noticed in 1228 cases.

(iii) As per the delegation of powers, General Managers/Executive Directors were authorized to approve placement of orders upto Rs.10 lakh in each case. Splitting up of orders was noticed in the Helicopter Division in 112 cases valued at Rs.10.78 crore. Orders worth Rs.4.79 crore and Rs.2.64 crore were placed on two vendors during 2001-02 to 2005-06, none of these orders being for more than Rs.10 lakh. The orders were split up and placed on the same day or within the same month.

(iv) Sample check of 20 rate contracts valued at Rs.six crore entered into by the Helicopter Division during 2003-04 revealed that 12 contracts valued at Rs.4.44 crore were being renewed every year since 1998-99 without any kind of review of the terms and conditions of the contracts.

Recommendations

- The system of placement of purchase orders needs to be streamlined to avoid delays in conversion of MPRs to purchase orders, splitting of orders to circumvent delegation of power and periodic review of contracted terms and conditions.

The Management agreed with the recommendations.

4.7.6.3 Issue and accountal of raw material

As per the procedure for sub-contracting, raw material was to be supplied to the vendors against furnishing indemnity bond, bank guarantee and comprehensive insurance policy covering the cost of material. The value of raw material lying with the vendors as at the end of each of the last four years ended on 31 March 2006 was as indicated below:

(Rs. in crore)

Year ended	Value of inventory lying with vendors
31 March 2003	6.65
31 March 2004	9.22
31 March 2005	11.46
31 March 2006	68.16

The following deficiencies in issue, receipt and accountal of raw material were noticed:

Deficiencies in obtaining security

(i) In many cases, purchase orders issued did not indicate the cost of raw material to be issued to the vendors or the value was indicated as Re.one. It was stated that wherever the raw material purchase details were not available, the raw material value was indicated as Re.one. Due to this, security by way of bank guarantee/indemnity bond against raw material issued was not obtained or was inadequate. On a sample check of 5907 items ordered by the Engine Division during 2000-2001 to 2005-06, it was observed that 2396 items did not indicate raw material cost and indemnity bonds against raw material issued were not obtained from the vendors.

(ii) Cost of material to be issued to the vendors was not indicated in the purchase orders to facilitate issue of indemnity bond. Bank guarantee obtained was for maximum amount of Rs.40000 though the material lying with certain vendors ranged between Rs.11 lakh to Rs.44 lakh under the Lucknow Division.

(iii) A review of raw material issued and bank guarantee obtained by the Aircraft Division in respect of nine vendors revealed that during the period 2002-03 to 2005-06, the bank guarantee obtained was not revised leaving raw material valued at Rs.6.97 crore uncovered.

(iv) Bank guarantee had not been obtained from any vendor in the Foundry and Forge Division. Review of raw material issued to 15 vendors in the Helicopter Division for fabrication of titanium materials revealed that the security obtained by way of indemnity bond and insurance was much below the value of material lying with vendors in seven cases.

(v) The Engine and the Koraput Division had not ensured obtaining of comprehensive insurance policy by the vendors against the material issued.

Other deficiencies

(i) Premises of vendors were required to be visited by the Company officials to verify the quality of storage and material lying with vendors. No documentary evidence was available in the Engine Division for such visits; which was confirmed by the Management (June/August 2006).

(ii) Age-wise/year-wise/vendor-wise data regarding raw material lying with vendors were not maintained for follow-up and monitoring. On verification (sample of five major vendors) of raw material held as on 31 March 2006 in the Engine Division, it was observed that the value of raw material held which amounted to Rs.30.35 lakh was not confirmed or reconciled. Similarly, in the Helicopter Division, the material lying with vendors was not being confirmed by the vendors or reconciled with the books of the Division.

(iii) On inspection of the material supplied by vendor, the same was accepted, rejected or sent for rework. The cost of rejected material was to be recovered at the prevailing market rate from the customer. However, raw material cost was not recovered till date.

(iv) Review of 173 purchase orders of the Aircraft Division revealed that raw material was issued after the scheduled date of delivery of the finished material and the delay noticed was upto 1005 days. Sample check of 500 purchase orders under the Helicopter Division revealed delays of four to nine months in issue of material in respect of 497 purchase orders. Delay in issue of material ranging from 3 to 15 months from the date of purchase orders was noticed in the Lucknow Division resulting in delay in completion of supplies by vendors.

(v) Material lying with vendors was to be insured by the vendors. It was, however, noticed that the total inventory held by the Company including material lying with vendors were being insured by the Company also. This resulted in avoidable payment of insurance premia.

The Management stated (November 2006) that the instructions regarding bank guarantee, indemnity and insurance would be reinforced and the procedure and periodicity of verification of materials at vendors works would be enforced.

Recommendation

- The system of issue, receipt and accountal of raw material to vendors needed streamlining.

4.7.6.4 .Quality inspection procedures

Hindustan Quality Instructions (HQI) were issued (August 2003) to emphasize the responsibility of the supplier/vendor in respect of quality system, design/drawing/document control, raw material procurement, manufacturing process, inspection and quality control, packing, route card, etc. These instructions were applicable for components offloaded for one or more machining operations and complete machining to get finished component. On a review of the inspection procedures and its compliance, it was observed that:

(i) As per HQI (Clause 6.1 and 9.1) vendors were responsible for proper traceability and storage of material supplied by the Company. However, the system of traceability and storage facility of the vendor were not ensured.

(ii) HQI prescribes (Clause 7.1) Pilot Batch Inspection Report (PBIR) along with the finished material supplied by the vendor which was not furnished by the vendors.

(iii) The vendors were also required (Clause 8.1.2.2) to furnish Detail Inspection Report (DIR) for the finished material supplied. However, it was observed that the DIR furnished by very few vendors was also not as per the prescribed format.

(iv) The HQI also prescribes (Clause 8.1.2.4) format for Certificate of Conformity, which was required to be signed by supplier organisation's authorised quality control representative. The same was not obtained alongwith the material supplied by the vendors.

(v) The supplier organisation was required (Clause 8.1.5) to carry out internal audits at a pre-defined frequency. The findings of the internal audit were to be shown for reference to the division at the time of audit. This was not complied with by the vendor/division.

(vi) The quality level of some of the major vendors as assessed by the outsourcing department of the Engine Division was between 35.85 *per cent* and 50 *per cent* during 2004-05 which indicated low quality assurance/achievement.

The Management agreed (November 2006) that the procedure to be followed by the vendors for maintaining the quality of the finished components would be enforced.

4.7.6.5 Reporting and monitoring mechanism

The broad guidelines on outsourcing were issued by the Corporate Office and it was the responsibility of the divisions to decide on outsourcing, implementation, execution and monitoring. The monthly reports on outsourcing from the divisions were to be collected and presented to the Management which were to be reviewed quarterly during the meetings of the Managing Director and the General Managers at the Corporate Office.

It was noticed that outsourcing was not being properly monitored at the Corporate Office. It was also noticed that the Board of Directors of the Company were not apprised about the achievement on outsourcing activity on a regular basis. Further it was noticed that the Hyderabad, Koraput and Lucknow Divisions reported value of bought out items like purchase of silver, special tools, etc. as outsourcing in order to meet the committed target of outsourcing and Lucknow Division included value of orders placed on sister division as outsourcing.

The Management stated (November 2006) that a dedicated outsourcing department at the corporate level was not considered necessary as the same was proposed to be done at divisional level.

However, since instructions were issued by the Corporate Office and targets for outsourcing were fixed at the corporate level and approved by the administrative Ministry, evaluation of achievement of outsourcing targets and implementation of the procedure could only be effectively monitored at corporate level.

4.7.7 Conclusions

The Company had achieved some success in outsourcing in the years 2004-05 and 2005-06, after coming out with detailed procedures and systems for outsourcing in March 2003. The outsourcing policy was, however, not properly defined regarding offloading of non-core operations. The vendors' list was not updated regularly and mandatory documents required during registration process were not obtained. Developed subcontractors were not nurtured by placing continuous orders. Determination of available in-house capacity for deciding the quantum of outsourcing was not realistic nor uniform among the divisions. The method adopted for working out saving from outsourcing was not uniform. Adequate security for the raw material was not received and there was delay in issue/excess issue of raw material. Repeat orders were being placed on selected vendors despite poor performance.

The Company agreed with most of the audit recommendations to streamline and improve outsourcing operations.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

MINISTRY OF MINES

CHAPTER V

National Aluminium Company Limited

Acquisition and operation of Rolled Products Unit (RPU)

Highlights

While acquiring (March 2000) International Aluminium Products Limited, a 100 *per cent* Export Oriented Unit (EOU) to manufacture rolled products promoted by Mukund Limited, National Aluminium Company Limited (Company) did not adequately consider the problems consequent on takeover of a partially completed unit with imported equipment lying in prolonged storage.

(Paras 5.2.1 and 5.2.2)

The Company entered the rolled product segment through acquisition route but its performance in the downstream segment was not up to the mark.

(Para 5.2.3)

With the installation of four Rolled Products Unit (RPU) casters (52000 MT) in addition to the existing two Smelter Casters (26000 MT), there was a surplus capacity build-up of casting to the extent of 56000 MT.

(Para 5.2.3)

The DPE guidelines framed by the Government of India (GOI) stated that any project with cost exceeding Rs.300 crore required prior approval of the GOI. Though the project cost exceeded Rs.300 crore, prior approval of the GOI was not obtained.

(Para 5.3.1)

The Company's failure to fully commission the plant in time and absence of a competitive marketing strategy for rolled products led to low capacity utilisation.

(Para 5.4)

The inability of the RPU to export would call for payment of duty of Rs.78.35 crore because of the EOU status of RPU. In the absence of any significant export order in hand coupled with technically deficient and incomplete equipment, the Company was unlikely to fulfil its export commitment

(Paras 5.5.3 and 5.5.4)

As the Company failed to generate any significant sales volume, Rs.361.74 crore invested (September 2006) towards acquiring and commissioning of the unit remained unproductive.

(Paras 5.5.2, 5.5.3 and 5.6)

Recommendations

- Acquisition and diversification of product lines should be consistent with the long term corporate policy of the Company.
- Resource planning, mobilisation and support of foreign technical experts have to be planned well in advance. Necessary contractual and other formalities should be completed in advance to facilitate prompt commissioning.
- The project cost needs to be correctly estimated beforehand taking into consideration future eventualities like exchange variation, escalation and other contingencies to avoid slippage in implementation schedule and project cost.
- A marketing plan for various categories of rolled products including pricing, promotional campaign and advertising support needs to be put in place at the earliest. Target markets for export possibilities need to be identified and prioritised for export of rolled products.

5.1 Introduction

5.1.1 The National Aluminium Company Limited (Company) was incorporated in January 1981 to set up an integrated Aluminium project backed by captive mines and captive power plant. The original capacities of the Bauxite mine, the Alumina Plant, the Smelter Plant and the Captive Power Plant (CPP) were expanded between 1999 and 2004. The Company installed two casters of 13000 MT capacity each in Smelter plant for producing cast strips in 1999 and 2001 respectively. The Company's turnover and profit after tax (PAT) during 2005-06 were Rs.5287.36 crore and Rs.1562.20 crore respectively.

The Company acquired (March 2000) International Aluminium Products Ltd (IAPL). IAPL had been promoted by Mukund Limited, Mumbai as a 100 *per cent* Export Oriented Unit (EOU) at Angul in Orissa to manufacture 50000 MT of Cold Rolled Aluminium Coils and Sheets per annum. The total cost of the project estimated at Rs.228.50 crore was proposed to be financed by equity share capital of Rs.118.56 crore (promoters Rs.53.72 crore, others Rs.64.84 crore) and buyers credit of Rs.109.94 crore from EFIBANCA, Italy. Consequent upon amalgamation of IAPL with the Company, IAPL was renamed the Rolled Products Unit (RPU) and the EOU status was retained.

The major plant and machinery required for the RPU were four melting furnaces, four holding furnaces, four continuous thin strip casters, one Cold Rolling Mill (CRM) and three Annealing Furnaces capable of producing sheets with minimum thickness of 0.12 mm and maximum width of 1650 mm. The entire technology of strip caster and CRM was to be supplied by FATA HUNTER on a turnkey basis.

5.*1.2 Scope of Audit*

The Performance audit covered the acquisition of the RPU, its commissioning and operation alongwith marketing of rolled products during the period from 2000-01 to 2005-06.

5.1.3 Audit objective

The audit objective was to examine whether:

(i) The acquisition of RPU was in line with the long term Corporate Policy of the Company;

(ii) The RPU could be commissioned in time at the estimated appraised cost;

(iii) The RPU could be operated efficiently to maximise production of value added products;

(iv) Proper marketing strategy was formulated and followed for marketing value added products.

5.1.4 Audit criteria

Performance of the RPU was assessed broadly with reference to the following parameters for evaluation of activities connected with the acquisition and operation of the RPU.

- Identification of downstream products as reflected in the Corporate Plan/Annual MOU.
- Commission schedule and cost as assessed at the time of acquisition and its subsequent revision.
- Installed Capacity in the Draft Project Report and as per Annual Memorandum of Understanding.
- Capacity Utilisation of existing downstream products.
- Export obligation commitment.

5.1.5 Audit methodology and acknowledgement

The draft Performance audit report was prepared based on discussion and interaction with the Management and scrutiny of documents such as Board Agenda and Minutes, Annual Reports, Project Appraisal and the exit conference (8 September 2006) and issued to the Management on 15 September 2006.

Audit acknowledges the cooperation and assistance extended by the Company at various stages of the Performance audit.

5.2 Acquisition

5.2.1 Take-over decision

IAPL project started in 1995 and was scheduled to be completed by December 1999 at an estimated cost of Rs.228.50 crore. The project's requirement of liquid metals upto 30000 MTPA[♠], electrical power upto 14 MW and 180 cubic metre of water per hour were to be supplied by the Company as per the agreement executed in April, 1995. The Company also had an option to participate in the equity of IAPL to the extent of 26 *per cent*.

The Board of Directors of the Company initially approved (November 1995) subscription to 11 *per cent* equity involving Rs.13.04 crore and subsequently increased (December 1996) this to 26 *per cent* involving Rs.30.82 crore. The decision of the Company regarding acquisition of 26 *per cent* share in the equity capital of IAPL was approved by the Ministry in January 1998. Mukund Limited approached the Company in May 1998 with a request for stronger and greater involvement in IAPL with expanded management role and participation in it as they would prefer to concentrate on their core business of steel. The Company's internal committee constituted to consider various aspects of the

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♠ ***Metric Tonnes per annum***

acquisition recommended (January 1999) 100 *per cent* takeover of IAPL. Based on the recommendation, the Company engaged MECON Limited (i) to validate the data given by Mukund Limited and IAPL to the committee constituted by the Company; (ii) to make an independent and realistic appraisal of the project; and (iii) to give a firm recommendation on the economic viability of the project after considering all relevant factors.

Based on the recommendations of MECON Limited, the Board gave its in principle approval for taking over IAPL in April 1999. Thereafter, M/s A.F. Ferguson was appointed for review of financial statements of IAPL and assessment of completion cost of the project. M/s A.F. Ferguson assessed (June 1999) the completion cost of the project at Rs.284.62 crore assuming a completion period of 12 months. The Board of directors approved the acquisition in April, 1999 and the project was formally taken over in March 2000 without seeking approval of the Government of India (GOI). The Management stated (October 2006) that as the Board of Directors had already accorded its approval in principle and the amount arrived at by M/s A.F. Ferguson was within the powers of the Board to sanction, approval of the GOI was not necessary at that point of time. However, the fact that the completion cost of the project had increased considerably due to takeover in March 2000 and had exceeded the limit of Rs. 300 crore necessitating approval from the GOI. This aspect was overlooked by the Company. (refer to para 5.3.1).

5.2.2 Status of the project at the time of takeover

The whole package of imported equipment for the project comprising casters, rolling mill and furnaces received in 1996-97 were either stored on site or in warehouse at Kolkata in packed condition. Major civil works of flooring and concreting for equipment foundation were pending. The construction work at site which had started in 1995 had stopped since November 1998 due to financial constraints faced by IAPL. The performance guarantee tests of major equipment could not be conducted by the Company since warranties of major equipment had expired prior to takeover. While ascertaining the project cost and completion schedule the Company had not taken into account the fact that Mukund Limited had made payments to suppliers and civil contractors without ensuring completion of their work. The fact that all civil, mechanical and electrical contracts were awarded to a single contractor by the erstwhile management was not given due cognizance by the Company. The contractors did not complete their job after takeover by the Company and they were dealt with as per terms of the contract between the Company and IAPL, executed at the time of takeover. The renegotiation of civil, mechanical and electrical contracts caused delay of around one year in execution of various works after takeover.

5.2.3 Performance in downstream metal segment

At the time of acquisition of partially completed RPU in March 2000, the Company's performance in the downstream segment was low (ranging from 4.81 *per cent* to 55.74 *per cent* of installed capacity) as indicated below:

Statement showing capacity utilisation of downstream products

Product	Installed capacity (MT)	Capacity Utilisation (1994-95 to 1999-2000) percentage	Capacity utilisation (2000-01 to 2005-06) percentage
Billet	30000	19.46 to 41.50	18.15 to 56.48
Wire rod	100000	36.34 to 55.74	32.79 to 67.32
Strip coil	13000/26000	4.81 (1999-2000)	13.93 to 25.01

It could not fully utilise its existing billet, wire rod and strip casting production capacities. Other primary producers in the private sector, however, made full utilisation of their downstream facilities. During 2003-04 to 2005-06 sales of downstream products (billets, wire rods and strip coils) in the metal segment constituted 22 *per cent* to 27 *per cent* of the total metal (Aluminium) sales. The Company had two Smelter Casters of 13000 MT capacity each of its own. In addition it acquired four RPU casters (13000 MT each) from IAPL which were finally installed in 2005. Thus, the total casting capacity with the Company became 78000 MT per annum. The planned annual production (2007-12) was 20000 MT per annum for rolled products and 2000 MT per annum for strip castings. This meant that the Company had an excess casting capacity of 56000 MT per annum. Considering that, the Company had spent more than Rs.63 crore in acquiring its own casters (one in 1998 and the other in 2001), acquisition of the additional capacity of 56000 MT per annum had clearly involved unfruitful expenditure in excess of Rs.100 crore for the Company. The expenditure actually incurred by the Company in acquiring the four casters could not be ascertained in audit.

The Management stated (October 2006) that the Company was new to the downstream segment and as such would take some time to stabilise and improve capacity utilisation. However, no significant improvement was discernible in the level of production of existing strip coil (downstream segment) even after eight years of commissioning of the production facility.

5.2.4 Downstream augmentation policy

The Company's broad strategy as defined in the Corporate Plan (1995-2005) was to first consolidate the Company's operations by capacity utilisation, maximising operational efficiency and then go for expansion and diversification. Such diversification in the metal sector included strip casting facility and equity participation in IAPL at Angul for making rolled products. In the Corporate Plan for 2007-12 prepared by the Company, substantial increases in upstream production (alumina and aluminium) were planned without any corresponding growth in downstream facilities for rolled products. Though the Management stated (October 2006) that the acquisition of IAPL was decided on stand alone basis considering all pros and cons, the acquisition did not appear to be exactly in line with the long term corporate policy of the Company.

5.3 Commissioning

5.3.1 Increase in project cost and approval of the GOI

Based on the anticipated completion of the project by March 2000 i.e. within 12 months of take over (April 1999) M/s A.F. Ferguson estimated (June 1999) the project cost at Rs.284.62 crore[♣]. The Company did not consider the fact that with the acquisition

[♣]*Excluding Rs.7.15 crore of leased assets*

actually taking place in March, 2000 the project completion schedule would be extended by at least another 12 months with concomitant increase in project cost. The increase in project cost, largely on account of period cost[▼] and exchange variation was Rs.22.16 crore. This increase took the project cost beyond Rs.300 crore in March 2000, *i.e.*, at the time of takeover. The DPE guidelines stated that any project with cost exceeding Rs.300 crore required prior approval of the GOI. But in this case, prior approval of the GOI was not obtained. The project cost estimated by M/s A.F.Ferguson at Rs.284.62 crore increased to Rs.326.33 crore in October 2000 and was forwarded to the Ministry for approval in November 2000. Proposal for further revised project cost of Rs.355.81 crore at May 2001 price level, was forwarded to the Public Investment Board in July 2001 and approval of the Ministry for Rs.330.81 crore eliminating the cost of balancing equipment and civil works amounting to Rs.25 crore was obtained in March 2002. The final cost estimate of the Project which shot up to Rs.398.36 crore due to delays in execution was approved by the Ministry in January 2005 (**Annexure-8**).

5.3.2 Delay in arranging mode of payment and finalising work programme

The major equipment of the project included one cold rolling mill and four casters supplied by FATA HUNTER (FATA) of Italy. In terms of the original agreement between FATA and IAPL, 85 *per cent* of the price was to be paid by drawing a loan from an Italian financial institution, EFIBANCA which was granted in January 1995. At the time of takeover of IAPL by the Company in March 2000, a portion of the loan remained undisbursed. The cost of services on erection, supervision and commissioning payable to FATA experts was to be met from this undisbursed amount. To contain the project cost, the Company decided (July 2000) to suspend drawal of the undisbursed amount of the loan. Suspension of the loan agreement by IAPL implied that the contractual obligation of FATA would also be suspended unless alternative terms of payment acceptable to both the parties were arranged. The Company realised the necessity of arranging alternative mode of payment only at the end of October 2000 and amended the contract in February 2001 with modification in man-month rate and mode of payment. The supervision activities by FATA required a program encompassing erection, startup and commissioning to be communicated to them to plan the arrival of foreign experts. Though FATA had requested in January 2000 for the programme, the Company provided it only in September 2001 after finalising the mode of payment. Without the work programme, arrival of technical experts of FATA and their subcontractors could not be properly scheduled. It caused increase in man-months and 98.81 man months were consumed toward technical services against 50 man-months provided in the agreement with FATA. The cost, therefore, increased from Rs.3.95 crore in 2001-02 to Rs.9.27 crore at the end of 2005-06 resulting in additional expenditure of Rs.5.32 crore. The availment of the undisbursed portion of the loan could have avoided disruption in the completion schedule by ensuring availability of foreign experts.

The Management stated (October 2006) that without obtaining approval from Public Investment Board, incurring further expenditure was not feasible. The above contention was not tenable as expenditure was being incurred since takeover and Rs.293.30 crore was spent by the Company till March 2001. Thus, it was not a fact that expenditure was not being incurred pending Public Investment Board's approval.

[▼] ***Finance charges, pre-operating expenses***

5.3.3 Delayed commissioning of equipment

The technology and the process of manufacture of aluminium alloy strip/sheet through continuous thin strip casting route involved the stages of melting and alloying of hot metal, refining and continuous thin strip casting, cold rolling, annealing, slitting and cut-to-length line. The Company prepared a bar chart detailing completion schedule for all equipment to obtain approval for Revised Cost Estimates-I. Although there was slippage in execution of the project the Company had not revised the scheduling of various activities in consonance with the revised phasing of expenditure for proper monitoring and early completion of the project. Considering the schedule for commissioning of major equipment as per Project Appraisal Report prepared by MECON Limited there were delays of 15 to 56 months in actual commissioning as depicted in **Annexure-9.**

The Company commissioned only Cold rolling Mill (CRM) and Roll Grinding Machine (RGM) in March/April 2002. The commissioning of CRM was dependent upon the installation of RGM. Delay in completion of civil works and deterioration of components due to prolonged storage necessitated replacement and delayed the installation of RGM with consequent delay in commissioning of CRM till March 2002. The Annealing Furnaces II and III, Casters III and IV, Melting and Holding Furnace IV and the Slitting and Cut-to-length lines were commissioned by engineers of the Company as foreign experts were not available (six to nine years after supply of the equipment). Thus, as discussed in the preceding paras (para 5.3.1 to 5.3.2) the Company's inaccurate estimation necessitating repeated revision of project cost; consequent fund constraints; renegotiation of civil, electrical and mechanical contracts after take over and failure to finalise in time the mode of payment and work programme of technical experts had increased the project cost and held up the erection and commissioning of equipment. The project with an initially appraised cost of Rs.284.62 crore and scheduled completion by March 2001 was thus actually commissioned by December 2005. However, the precisioning equipment were commissioned in May 2006. The total cost incurred till September 2006 was Rs.361.74 crore.

5.4 Capacity utilisation

The RPU (45,000 MT of rolled products and 5000 MT of cast strips) was acquired as a 100 per cent EOU in March 2000. As per the production process (refer to para 5.3.3) CRM was to be fed by strips generated from four strip casters. While the CRM was commissioned in March 2002, the strip casters were commissioned in phases between January 2005 and November 2005. Hence, the CRM was fed by cast strips sourced from the two existing smelter casters. The products, however, were not marketable as commissioning of annealing furnace and other facilities was held up due to deletion of Rs.25 crore from the revised cost (refer to Para 5.3.1) which resulted in commercial utilisation of CRM only from November 2002 i.e. eight months after its commissioning.

Though the production plan envisaged in the M/s A.F. Ferguson Report indicated capacity utilisation of 20 *per cent* in the first year and 75 *per cent* in the third year, the capacity utilisation of CRM during 2003-04, 2004-05 and 2005-06 was 5.91 *per cent*, 1.90 *per cent* and 11.20 *per cent* respectively. The production of rolled products during 2003-04 to 2005-06 varied between 858 MT and 5040 MT. The Company attributed low capacity utilisation of the CRM to technical deficiency of equipment stored since 1996-97, obsolescence of some of the components and lack of orders. Audit observed that the Company had not prepared any production plan based on operational constraints for

optimum capacity utilisation. Instead it contended (October 2006) that interim production between June 2002 and November 2005 should not be considered for capacity utilisation. The above contention was not acceptable in view of the fact that the Company had declared commencement of commercial production from June 2002. In fact, absence of competitive marketing strategy for rolled products coupled with lack of concerted efforts by the marketing and production departments were also responsible for low capacity utilisation. The Company while admitting this further stated (October 2006) that co-ordination meeting between the production and the marketing departments were being held to sort out problems.

5.5 Marketing

5.5.1 Manufacturers in India

Hindalco, the leader in the domestic market in Value Added Product Segment (rolled products, extrusions and foils) achieved more than 95 *per cent* capacity utilisation (rolled products) during 2003-04 to 2005-06. Its existing rolled product capacity is 200000 MT. Value Added Products (VAP) accounted for 47.3 *per cent* and 49.4 *per cent* of aggregate metal sales of Hindalco during 2004-05 and 2005-06 respectively. Installed capacity of the Company in respect of aluminium and rolled products was 345000 MT and 45000 MT respectively. During 2005-06 the Company produced 5040 MT of rolled products representing only 1.40 *per cent* of metal production. In terms of turnover (2005-06) rolled products represented only 1.41 *per cent* of total aluminium sales.

5.5.2 Limited marketing efforts

The study and analysis of global demand-supply scenario was conducted by M/s A.F. Ferguson & Company in 2001. No further market survey was carried out by the Company. This coupled with only a passing reference to marketing strategy for rolled products in its Marketing Guidelines (July 2005) indicates the low priority accorded to marketing of rolled products.

Since launching of rolled products in the domestic market, the Company restricted itself to marketing of products which required lower market development efforts. However, the quantum of sales made by the Company over the last 3-4 years indicated that the marketing efforts were inadequate and failed to significantly increase the sales volume.

Cold Rolling Mill (figures in MT)		
Year	**Production**	**Sales**
2003-04	2660	2738
2004-05	858	777
2005-06	5040	4163

The Management stated (October 2006) that RPU being an EOU the thrust was not on domestic sales of rolled products and increase in share of the domestic market. Domestic sale was limited and depended on permission from competent authority. This is negated by the Company's long term plan which envisaged 50 *per cent* sales in the domestic market. Further, it was observed that the export order obtained for 36 MT only (July 2006) and the deemed export (130 MT in July 2006) made were not for products requiring high level of precision. Such orders procured after expiry of Domestic Tariff Area (DTA) permission indicated that efforts for export were made only under

compelling circumstances. The Company further stated (October 2006) that export of rolled products commenced at the appropriate time and without commissioning the precisioning line, entry into export markets with whole range of products was not possible. The fact remained that despite commissioning of precisioning equipment, the Company had not prepared any comprehensive work plan for export of rolled products on a commercial scale and marketed only a single variety of alloy till September 2006.

5.5.3 Duty liability and export obligation

The Company obtained permission for sale in the Domestic Tariff Area (DTA) and products were sold in the domestic market since launching the product commercially in November 2002. It has availed of duty exemption of Rs.66.02 crore for importing of capital goods against sales of Rs.99.11 crore (upto June 2006) in domestic market. The Company therefore, has to fulfil the obligation of selling in export markets twice the amount sold in the domestic market. As indigenous materials were also procured without payment of excise duty of Rs.12.33 crore, the total duty liability is Rs.78.35 crore. The DTA permission expired in May 2006.

The Company stated (August 2006) that after some of the important online equipment at RPU, which enhanced the quality of the product, had been taken into operation recently, physical export activities had been initiated. It was observed that the Company secured the first export order only in July, 2006 i.e. after the DTA sale permission expired in May 2006. The Company stated (October 2006) that export of rolled products was initiated at appropriate time and was in no way related to expiry of permission. It was noticed in audit that there were neither any existence of specific strategy/plan for export prior to expiry of permission for DTA sale nor any significant export order for the Company to generate adequate revenue to offset the duty liability of Rs.78.35 crore and to meet the export obligation of Rs.198.22 crore.

5.5.4 Marketing practice

The Company had been exporting primary aluminium products (alumina and aluminium) through the process of tendering and also on 'one to one basis'. In line with that, the Company envisaged that for rolled products export they would go for tendering at the initial stage followed by sales on 'one to one basis', if required. Sale of rolled products in the domestic market was being done by directly contacting the prospective customers through regional sales offices without any distributors' network. As the Company is a new entrant in the rolled product segment dominated by well-established producers like Hindalco and Balco, the existing marketing structure may not be adequate for enabling better utilisation of capacity built through acquisition of IAPL. This was also reflected in the Corporate Plan (2007-12) envisaging capacity utilisation of 40 *per cent* of the RPU in the 12th year of acquisition. The Management stated (October 2006) that all efforts would be made to achieve a respectable capacity utilisation in line with their competitors.

5.6 Conclusion

The RPU was acquired in March 2000 as a 100 *per cent* EOU, not fully consistent with the long term Corporate Policy of the Company and products were launched in the domestic market in November 2002. Commissioning of all equipment took more than five years resulting in time and cost over run. The Company was allowed to sell in the DTA pending stabilisation of the products for overseas market. Till March 2006, the Company could not export any rolled product and the permission for sale in domestic

market expired in May 2006. The inability to export would call for payment of duty of Rs.78.35 crore because of the EOU status of RPU. In the absence of any significant export order in hand and with equipment that are not technically very sound, the Company was unlikely to fulfil its export commitment. As the Company failed to generate any significant sales volume, the amount of Rs.361.74 crore invested (till September 2006) on acquisition and commissioning of the unit remained unproductive.

Going by the Company's production plan (2007-12), non-stabilisation of product quality over a period of around four years (refer to Paras 5.4), lack of market competitiveness due to its belated entry into the market dominated by the established private players (refer to Para 5.5.1) and its performance in other downstream products (refer to para 5.2.3), there seems to be little possibility for extensive utilisation of RPU in future.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

MINISTRY OF PETROLEUM AND NATURAL GAS

CHAPTER VI

Indian Oil Corporation Limited

Solvent Dewaxing Unit of Digboi Refinery and Microcrystalline Wax Plant of Haldia Refinery

Highlights

The Company was aware that Microcrystalline Wax Plant (MCW) could not be produced by processing Heavy Waxy Distillates (HWD) of Digboi Refinery. Despite that, the Company decided to construct the processing facilities of HWD (42000 MT per annum) for production of MCW (11000 MT per annum) in Solvent Dewaxing Unit (SDU).

(Para 6.6.1.1)

Prior to designing of SDU, the process licensor reported that HWD in its existing state could not be economically processed. Despite this, the Company finalised the agreement with the process licensor for processing of HWD in SDU.

(Para 6.6.1.5)

The technical credentials of the process licensor in the field of wax deoiling technology was not proven at the time of selection of process licensor for SDU.

(Para 6.6.1.4)

The operation of SDU for production of wax required a continuous supply of high wax crude (HWC) from Oil India Limited (OIL) to Digboi Refinery. However, there was no agreement with OIL for supply of HWC to the refinery on sustainable basis. No firm commitment was also obtained in this respect.

(Para 6.6.1.2)

The SDU had to be shut down during initial start-up due to design deficiencies. The Company incurred Rs.6.86 crore towards corrective actions, which could not be recovered from the process licensor.

(Paras 6.6.1.6, 6.6.1.7 and 6.6.1.9)

The guarantee period of the performance (product quality) of SDU expired and no performance test was conducted.

(Para 6.6.1.8)

Inability of SDU to process Pressable Waxy Distillates (PWD) for production of paraffin wax resulted in diversion of PWD to other units for the production of low value products due to which the Company suffered loss of revenue of Rs.8.33 crore.

(Para 6.6.1.11)

The SDU could not produce guaranteed quality or quantity of paraffin wax on sustainable basis. The operating efficiency of SDU was less than the designed.

(Paras 6.6.1.10, 6.6.1.11 and 6.6.1.12)

The SDU could be operated for only 16 days from the date of commissioning for processing of HWD since the filters were clogged during HWD runs. The wax produced from the processing was high melting point paraffin wax which had no market.

(Para 6.6.1.13)

Inability of SDU to reduce oil content of paraffin wax resulted in continued operation of old wax refining unit for which the Company incurred additional expenditure of Rs.9.01 crore.

(Para 6.6.1.14)

The solvent loss in SDU was in excess of norms due to which the Company incurred extra expenditure of Rs.3.81 crore.

(Para 6.6.1.15)

The limiting factor for availability of input for MCW was not considered for fixation of capacity of MCW plant of Haldia Refinery resulting in oversizing of the plant with an additional capital investment of Rs.five crore.

(Para 6.6.2.1)

The capacity utilisation of MCW plant was only 1.8 *per cent* to 6.1 *per cent*. The Bright Neutral slack wax not processed for production of MCW was diverted for production of low value products.

(Para 6.6.2.2)

Recommendations

- The supply of High Wax Crude to Digboi Refinery on sustainable basis may be pursued with OIL and necessary agreement entered into. The issue needed to be pursued through the Ministry, if required.
- For fixation of production capacity of any product, the availability of input for the same should be assessed on realistic basis considering the production capacity of any other joint product simultaneously being produced while generating such input.
- In case of selection of a process licensor who acquired the process know-how from the original owner of that process knowhow, the technical credentials of the transferee process licensor should be taken into account before finalisation of its offer.
- In case the basic premises (on which the project report is prepared and approved), undergo any change prior to or in the course of finalisation of agreement with process licensor and finalisation of the design of the unit/plant, the Company should consider such change before finalisation.
- In view of non-stabilization of product quality in SDU, necessary action may be taken to extend the guarantee period of performance (product quality) of SDU and

the performance test of the unit conducted in association with the process licensor (UOP).

- Steps may be taken to improve the oil content of paraffin wax upto the guaranteed level (0.2 *per cent*) on sustainable basis. Steps may be taken to meet the desired pour point (18 ^{0}C) of dewaxed oil (PWD) on sustainable basis.
- In view of available domestic demand, the Company should explore the market of MCW and Type-I Paraffin wax and maximise the production of MCW at Haldia plant and Type-I Paraffin wax at Digboi Refinery to increase its revenue.

6.1 Introduction

6.1.1 Digboi Refinery of Indian Oil Corporation Limited has crude oil processing capacity of 0.50 Million Metric Tonnes Per Annum (MMTPA). Three types of intermediate products with wax content i.e., Presseable Waxy Distillates (PWD), Heavy Waxy Distillates (HWD) and Vacuum Residue (VR) are produced by the refinery. While PWD was processed to produce paraffin wax, HWD and VR were diverted to other units of the refinery for production of fuel oils. PWD was processed in the wax production units♣ set up in refinery in 1928 consisting of wax extraction unit and wax refining unit. The wax production units were outdated, highly labour intensive and in a poor physical state. They could not achieve their production capacity on a sustainable basis. With the crude processing capacity of the refinery increased to 0.65 MMTPA in June 1996, the Refinery decided to install a new Solvent Dewaxing/Deoiling Unit (SDU) to produce 49000 Metric Tonnes Per Annum (MTPA) paraffin wax from PWD and 11000 MTPA Microcrystalline Wax (MCW) from HWD. Thus, HWD hitherto diverted to produce low value fuel oil, would be utilised for the production of MCW, a very high value product. The Board of Directors of the Company approved (February 1999) the project at a cost of Rs.419 crore. The SDU scheduled to be commissioned by November 2002 was actually commissioned in May 2003 at a cost of Rs.423.42 crore.

6.1.2 Haldia Refinery is the only refinery of the Company producing Lube Oil Base Stocks (LOBS). While producing Bright Neutral (BN) LOBS in the refinery, BN Slack wax was produced as a by-product. Part of BN slack wax was marketed to small-scale manufacturers and the balance was disposed of as fuel oil. It was envisaged that there was potential for production of MCW by processing BN slack wax. The Company, therefore, decided to install facilities for production of 15000 MTPA MCW at Haldia Refinery. The MCW project was approved in April 1996 at an estimated capital cost of Rs.35 crore. The MCW plant scheduled to be commissioned by April 1999 was eventually commissioned in August 2001 at a cost of Rs.38.27 crore after a delay of 28 months.

6.2 Scope of Audit

The Performance audit reviewed the planning process of the projects, implementation of the projects and operation of the plants from inception upto the year 2005-06.

6.3 Audit objectives

The audit was conducted to assess whether:

♣ ***Capacity of 33,000 MT per annum of paraffin wax***

(i) The planning for setting up the SDU at Digboi Refinery and the MCW plant at Haldia Refinery was based on sound premises;

(ii) The projects were implemented efficiently, economically and effectively;

(iii) The plants could be operated economically, efficiently and effectively;

(iv) Appropriate marketing strategies for paraffin wax and MCW were framed;

(v) The overall pollution load of Digboi Refinery was reduced after commissioning of SDU.

6.4 Audit methodology and acknowledgement

Based on initial study, discussion papers containing preliminary observations of audit were issued to the Company in July 2006. Further detailed study at field level was conducted in August 2006. Finally, an exit conference was held on 7 September 2006.

Audit acknowledges the co-operation and assistance extended by all the levels of Management at various stages for timely completion of the Performance audit.

6.5 Audit criteria

Performance of the units was assessed broadly with reference to parameters mutually agreed to with the Management in the entry conference held in April 2006.

6.6 Audit findings

6.6.1 SDU at Digboi Refinery

6.6.1.1 Feasibility of production of Microcrystalline Wax by processing Heavy Waxy Distillates in SDU

Digboi Refinery processes waxy crude oil of Assam fields. With a view to maximising wax production from such crude oil, the Company explored the feasibility of processing HWD and upgradation of VR of Digboi Refinery for production of wax. Indian Institute of Petroleum (IIP), Dehradun, was entrusted with the studies for the above purpose. The summary of findings of the reports of IIP of February 1984, January 1985 and November 1993 stated that the HWD of Digboi Refinery was difficult to deoil and process for production of wax owing to mixed nature of waxes present therein. The deoiled wax derived from HWD did not match the characteristics of paraffin wax or MCW. This wax was classified as higher melting point paraffin wax or semi-MCW with properties intermediate between paraffin wax and MCW. There was uncertainty of ready market of the waxes so derived from HWD. The deoiled wax derived from upgraded VR was of MCW type.

Thus, the study of IIP established that HWD was a tougher stock for dewaxing and deoiling. The studies carried out by the Company also confirmed this fact. At the time of initial proposal (1990) for increasing wax production at Digboi Refinery, it was envisaged that high melting point paraffin wax could be produced by processing HWD and there was potential for production of MCW by processing upgraded VR. The Company's efforts to upgrade the VR of Digboi Refinery for production of MCW did not lead to any fruitful result.

The Company was thus aware of the fact that it was difficult to process HWD of Digboi Refinery and that in any case MCW could not be produced from HWD. Despite this, the

Company went ahead with its decision to set up processing facilities of HWD for production of MCW in SDU. The Management had also accepted (August/November 2006) the fact that MCW could not be produced from HWD. Thus, the Company's decision to install facilities in the SDU for producing MCW from Heavy Waxy Distillates was flawed at the very outset.

6.6.1.2 Availability of high wax crude at Digboi Refinery

Digboi Refinery processes high wax crude supplied by OIL from its two oil fields of Assam viz., Duliajan and Digboi. High wax crude is the ideal feed for successful operation of SDU of Digboi Refinery for production of wax. Audit scrutiny, however, revealed that there was no agreement with OIL for the supply of high wax crude to the refinery on a sustainable basis. OIL had been supplying high wax crude from these oil fields directly to Digboi Refinery. However, OIL is presently processing a proposal to bring crude oil from its different oil fields to newly constructed/modified tank farms for mixing and dehydration. The dehydrated mixed crude would then be supplied to the refineries of Assam (Digboi, Guwahati, etc.). In the absence of any agreement with OIL to supply high wax crude to the refinery, Digboi Refinery may not get segregated high wax crude from OIL which would adversely affect the operation of SDU of Digboi Refinery and wax production. Since there is no wax plant in the other refineries of Assam, it will be a national wastage if high value wax is not extracted from such high wax crude oil sourced from OIL.

The Management stated (November 2006) that the matter regarding supply of high wax crude by OIL to Digboi Refinery was being pursued.

6.6.1.3 Consideration of feed for SDU

In the approved project report of SDU of Digboi Refinery, Pressable Waxy Distillates and Heavy Waxy Distillates feed stocks were considered for production of paraffin wax and MCW respectively. However, the Notice Inviting Tender (NIT), issued (July 1997) for selection of process licensor of SDU, indicated that SDU should have flexibility to process the upgraded Vacuum Residue along with Heavy Waxy Distillates mode of operation for production of MCW without any increase in overall feedstock processing capacity of SDU.

The Management stated (November 2006) that processing of upgraded VR was considered in NIT with an objective to maximise sales realisation by producing premium grade MCW. It was, however, not considered during final evaluation of bids of the process licensors.

The reply was not tenable. The above action clearly indicates that the Management was not at all sure of producing MCW from Heavy Waxy Distillates. So they had attempted to keep open the option of using Vacuum Residue as feedstock.

6.6.1.4 Selection of process licensor for SDU

The Company issued (July 1997) NIT for selection of process licensor for SDU to the three vendors. The offers of UOP (owner of Methyl Iso Butyl Ketone wax deoiling technologies of UNOCAL, USA) and Bechtel Corporation, USA were technically acceptable. Both these vendors were to furnish reference of at least one operating unit under their licence similar to the proposed SDU of Digboi Refinery, which was running satisfactorily. UOP referred to five other units [including revamping of Methyl Iso Butyl

Ketone deoiling unit of erstwhile Madras Refinery Limited (MRL), (presently Chennai Petroleum Corporation Limited)]. Bechtel also referred to 14 other units. The representative of the Company visited (July 1998) the Methyl Iso Butyl Ketone (MIBK) deoiling unit of MRL to study and examine the status of the revamped unit and observed that the unit faced serious problems regarding quality of finished products after its revamp and the yields of the products were also very poor. Assistance from UOP to overcome the problem was sought but adequate technology support could not be obtained.

The offer of UOP was the lowest. The job relating to supply of knowhow, process package and other services for SDU at Digboi refinery was awarded to UOP in June 1999 at a total cost of Rs.15.85 crore.

It was observed that UOP bought the MIBK wax deoiling technology of UNOCAL, USA in 1995. In fact, the MIBK wax deoiling units referred to by UOP were licensed by UNOCAL prior to 1995. The only job relating to MIBK wax deoiling unit done by UOP, after the technology transfer from UNOCAL (1995), was the revamping of MRL's unit which was not performing satisfactorily. The technical credentials of UOP in the field of MIBK wax deoiling technology therefore, appear not to have been proven at the time of its selection as process licensor. The Management stated (November 2006) that on the basis of performance of the reference unit (the wax plant of Taiwan Wax Company Limited, Taiwan) it could be concluded that the technical credentials of UOP was proven. This was not acceptable in view of the fact that the wax plant of Taiwan was licensed by UNOCAL in 1988 and hence the performance of this plant could not be construed to prove the technical credentials of UOP in the field of MIBK wax deoiling technology. The Management's contention that during purchase of technology, UOP ensured the availability of UNOCAL's experts on the technology was not borne out by subsequent events since UOP could not provide adequate technology support to overcome the problem of the wax deoiling unit of MRL.

6.6.1.5 Finalisation of design of SDU

The meeting to finalise the basis of the design of the SDU was held between the Company and UOP in April 1999 where the characteristics of feeds (PWD and HWD) and their impact on processing in SDU were discussed. UOP indicated that the HWD feed samples provided in 1997 did not match the characteristics of HWD incorporated in NIT and requested for fresh samples. It was decided that in case the fresh samples did not meet the NIT specification, UOP would redistill them to match the NIT level and confirm the filterability of HWD. The Company, to ensure feed supply as per the NIT specifications, would then carry out modifications in the upstream unit. The fresh samples were provided in May 1999. UOP indicated (July 1999) that both the HWD samples of 1997 and 1999 were essentially the same and differed from the NIT proposal. The samples were analysed by UOP to conduct laboratory deoiling studies for the purpose of verification of wax yields, determination of optimum processing conditions and wax filtration rates. On such studies, UOP reported (July 1999) that the samples contained heavy materials which were difficult to filter. UOP further stated that the feed available could be economically processed in SDU subject to its redistillation for removal of heavy materials. The Company, however, finalised (September 1999) the agreement and design basis of SDU with UOP for processing of HWD (42000 MTPA) to produce

MCW (11516 MTPA) without taking any action to redistill the HWD for removal of heavy materials to make it processable in SDU.

The Management stated (August 2006) that during HWD runs in SDU it was established that HWD alone could not be processed and as such no action was taken for the modification of upstream unit. The Management's reply confirmed that it was aware at the outset that MCW could not be produced from HWD.

6.6.1.6 Delay in commissioning of SDU

The SDU project was scheduled to be commissioned within 45 months from the date of approval i.e., by November 2002. The SDU was mechanically completed in March 2002 without setting up of certain utilities♥. After availability of utilities, the start-up activities of the unit were taken up and PWD feed cut-in was done in August 2002. However, the unit had to be shut down due to operational constraints arising out of design deficiencies. UOP recommended (August 2002) not to operate the unit till correction of the problems and subsequently furnished (October 2002 and November 2002) revised process schemes for modification of the unit. The Company decided to carry out the modification in two phases (I and II). It was also decided to commission the unit after phase I modification and to carry out phase-II modification later on. The phase I modification was completed in April 2003 at a cost of Rs.1.99 crore and the SDU was commissioned in May 2003. Thus, the delay of six months for commissioning of the unit was attributable to the design deficiencies of the unit identified at the time of initial start-up.

6.6.1.7 Recovery of cost of modification work from process licensor

The modification job for rectification of SDU, after mechanical completion, was necessitated primarily due to deficient design for which UOP was responsible. The cost of such rectification work should therefore, have been recovered from UOP. As per article 7 (a) of the guarantee agreement (September 1999) with UOP, if the unit failed to meet product guarantee during any product test prior to final product test and if such failure was due to the fault of UOP, then UOP will recommend changes to the unit which it considered necessary to enable the unit to meet the product guarantee. The costs of such changes were to be borne by UOP. As the modification work was carried out prior to any performance test of SDU, modification cost was not recoverable from UOP as per the above clause of the agreement. The Company, however, lodged claim with UOP in June 2005 for Rs.1.99 crore towards recovery of cost incurred for phase I modification work. The claim remained unsettled (October 2006).

6.6.1.8 Expiry of guarantee period of process licensor

The SDU was commissioned in May 2003 after phase I modification. As per article 5 (g) of the guarantee agreement with UOP, the performance/product guarantee would apply only if SDU was constructed and operated and the corresponding performance test runs were completed by end of December 2004. As per article 7 (c) of the agreement, if SDU failed to meet product guarantee during the final performance test due to fault on the part of UOP, the Company would be entitled for price discount subject to the maximum amount equivalent to 50 *per cent* of royalty payable to UOP. No performance test of SDU was conducted (August 2006). Thus, the Company was not in a position to establish its claim for price discount before UOP towards under performance (para 6.6.1.11 and para

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♥ *Nitrogen plant, CPP alongwith HRSG (20MW) and centrifugal air compressor*

6.6.1.12) of SDU. Besides, UOP had no further liability towards performance guarantee since no performance test run was conducted within the agreed time limit (December 2004). The Company, however, withheld 50 *per cent* of royalty payable for not conducting successful performance test run of SDU (October 2006).

The Management stated (November 2006) that the performance test run of SDU was scheduled to be conducted in November–December 2006 in the presence of UOP personnel and the matter of extension of guarantee agreement had been taken up with UOP.

6.6.1.9 Phase II modification work of SDU

Phase II modification work of SDU was carried out in March/April 2006 at a cost of Rs.4.87 crore and after the modification work the unit started operating from 21 April 2006. The cost of such modification could not be recovered from UOP (October 2006).

6.6.1.10 Processing of PWD and HWD in SDU

6.6.1.11 Capacity utilisation for processing of PWD in SDU

As per the guarantee agreement with UOP, the SDU was to operate for 6335 hours per annum to process 168000 MT of PWD♠ for production of 46990 MT of paraffin wax with oil content of 0.2 *per cent* by weight. It was observed that during the period from 2003-04 to 2005-06, the capacity utilisation of SDU was low due to inability of the unit to process feedstock. It was also observed that the actual paraffin wax production in SDU ranged between 22361 MTPA and 40867 MTPA during the above period. The PWD not processed in SDU was diverted to other secondary processing unit (delayed coking unit) for production of low value products♣ and as a result, the Company suffered loss of revenue to the extent of Rs.8.33 crore♥ during the period from 2003-04 to 2005-06.

6.6.1.12 Operating efficiency of SDU for processing of PWD

The actual average PWD processed in SDU per operating day for the last three years ended 2005-06 was as follows:-

Year	PWD processed (MT)	Actual operating days for processing of PWD	Average PWD processed per day (MT)	Guaranteed processing capacity per operating day (MT)	*Per cent* of actual processing to guaranteed capacity.
(1)	(2)	(3)	(4)=(2)/(3)	(5)	(6)=(4)/(5)X100
2003-04	77324	248	311.79	636.50	49.00
2004-05	141150	345	409.13	636.50	64.28
2005-06	149478	328	455.73	636.50	71.60

It was, thus, observed that the operating efficiency of SDU had been improving over the last two years but was still far below the design capacity (636.50 tonne per day).

♠ *636.5 tonne per operating day of 24 hours*

♣ *Fuel gas, kerosene, diesel oil, coke, etc.*

♥ *Difference in value of paraffin wax and low value products*

As per design basis of SDU, guaranteed oil content should be 0.2 *per cent* and the pour point♠ value of dewaxed oil should be 18^0. Higher oil content in paraffin wax indicated the impurity of wax whereas higher pour point of dewaxed oil signified presence of wax in dewaxed oil beyond the permissible limit resulting in lower yield of paraffin wax. Analysis of all the laboratory test reports relating to oil content of paraffin wax and pour point of dewaxed oil for the period from 2003-04 to 2005-06 revealed that SDU failed to meet the guaranteed oil content of paraffin wax and pour point of dewaxed oil exceeded the desired value of 18^0.

The Management stated (August 2006) that performances of SDU towards capacity utilisation, operating efficiency, oil content and pour point in respect of PWD operation had improved after phase II modification (March–April 2006).

However, it was observed that although the capacity utilisation of SDU (for PWD operation) improved after phase II modification, the operating efficiency (560 MT per day) was less than the guaranteed quantity (636.5 MT per day). Further, SDU could neither meet the guaranteed oil content of paraffin wax nor the desired pour point of dewaxed oil on sustainable basis even during post phase II modification period (April 2006 to July 2006).

The Management stated (November 2006) that continuous efforts were being made to further fine tune the operation of SDU to meet the guaranteed oil content of paraffin wax and other designed parameters.

6.6.1.13 Processing of HWD in SDU

As per guarantee agreement with UOP, the SDU was to operate for 1665 hours per annum to process 42000 MTPA of HWD (605.4 MT per day) for production of 11516 MTPA of MCW. However, SDU could be operated for five days in 2003-04 and 11 days in 2004-05 only for processing 1402 MT and 2467 MT of HWD respectively and 717 MT of finished wax was produced. Laboratory test and analysis of this wax showed that it was of the nature of high melting point paraffin wax and could not be categorised as MCW. There was no market for such wax and it was lying unsold (August 2006).

The Management stated (August 2006) that processing of HWD in SDU was difficult as it clogged the filtrate tubes of primary rotary filters during processing and it was decided to experiment the processing of HWD mixed with PWD (at 10:90 ratio) in SDU for production of paraffin wax. It was also confirmed by the Management that MCW could not be produced by processing HWD.

It is worth mentioning that the Company was aware of this fact even before setting up the SDU. It had been established during various studies by IIP on the feasibility of processing of HWD for production of wax that HWD of Digboi Refinery was difficult to deoil and filter and high melting point Paraffin wax would be produced which did not have any market (para 6.6.1.1). UOP also, before entering into agreement for designing of SDU, indicated that HWD in its present form was difficult to be processed in SDU (para 6.6.1.5).

While accepting the above facts the Management stated (November 2006) that the wax produced from HWD was being disposed of as Paraffin Wax Type II, which had a ready

♠ ***Lowest temperature at which an oil will pour or flow under certain prescribed conditions***

market. The Management's contention on availability of ready market of the above was not acceptable since the product was lying unsold for last three years.

6.6.1.14 Operation of old dewaxing/deoiling units of Digboi Refinery

As per approved project report of SDU, old dewaxing units consisting of paraffin shed and sweating stoves were to be closed down with the commissioning of SDU. While the paraffin shed was closed down from August 2003, the operation of sweating stoves continued upto May 2006 to reduce the excess oil content of paraffin wax produced in SDU. The sweating stoves were out of operation from June 2006 due to improvement in oil content of paraffin wax produced in SDU after phase II modification. Inability of SDU to reduce oil content of paraffin wax had resulted in continuation of operation of sweating stoves for which the Company incurred additional expenditure of Rs.9.01 crore during the period from 2003-04 (w.e.f. August 2003) to 2005-06.

While confirming the above facts the Management stated (November 2006) that operation of sweating stoves was continued for processing off-specification wax generated in SDU as otherwise such wax would have to be downgraded to lower value products. The operation of sweating stoves would not have been required if the SDU could have produced Paraffin Wax with desired oil content.

6.6.1.15 Abnormal Solvent loss in SDU

Methyl Iso Butyl Ketone (MIBK) is used as solvent in SDU. As per agreed offer of process licensor (UOP), the normal loss of solvent should be one Kg per hour of operation of SDU. It was observed that the actual solvent loss was in excess of norms for which the Company incurred extra expenditure of Rs.3.81 crore during the period from 2003-04 to 2005-06. It was also observed that even after phase II modification, the actual solvent loss (47 MT) was in excess of norms (1.91 MT)♣ during the period from May 2006 to July 2006.

While accepting the fact of abnormal loss of solvent, the Management stated (November 2006) that for better monitoring of loss, technical audit norm of 1.12 Kg per MT of feed stock processed had been established.

6.6.1.16 Marketing of Paraffin Wax of Digboi Refinery

Digboi Refinery produced Type I and Type II paraffin wax. Type II constituted the majority of wax production. The market price of Type I paraffin wax (oil content of 0.50 *per cent* by weight) was more than that of Type II due to its superior quality. Other than the above grades, the refinery produced match wax (Type III paraffin wax). It was observed that during the period from 2003-04 to 2005-06, the production (295 MTPA to 380 MTPA) and sales (255 MTPA to 383 MTPA) of Type I paraffin wax were very low compared to the estimated domestic demand (24390 MTPA). The production and sales of Type II paraffin wax were 23508 MTPA to 37986 MTPA and 22551 MTPA to 38476 MTPA respectively during the period from 2003-04 to 2005-06 compared to the estimated domestic demand of 130025 MTPA.

The Management stated (August 2006) that Type I paraffin wax was produced based on order. While domestic demand of Type I paraffin wax was assessed at 24390 MTPA,

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♣ ***Calculated at the norms of one Kg per hour of operation***

there had been orders for only around 300-400 MT per year indicating lack of adequate marketing efforts.

6.6.2 MCW plant at Haldia Refinery

6.6.2.1 Capacity fixation of MCW plant of Haldia Refinery

Bright Neutral (BN) Slack wax was the input for production of MCW at Haldia Refinery. BN Slack wax is a byproduct of Bright Natural Lube Oil Base Stock (BN LOBS) which is produced at Haldia Refinery. The generation of BN slack wax and production of MCW was, thus, entirely dependent on the capability of Haldia Refinery to produce BN LOBS. Considering the production capacity of BN LOBS (48000 MTPA) of Haldia Refinery, only 16000 MTPA of BN slack wax could be produced and 9456 MTPA of MCW could be generated by processing the BN slack wax. The production capacity of MCW plant of Haldia Refinery was, however, fixed at 15000 MTPA resulting in excess capacity fixation of 5544 MTPA because of which the Company had to make an additional investment of Rs.five crore.

The Management stated (August and November 2006) that 48000 MTPA BN LOBS production was considered keeping in view of the fact that more BN LOBS could be produced at the cost of other grades depending upon market demand and hence, the 15000 MTPA unit was not oversized. The Management also contended that under common design practice, they had to plan 25 *per cent* cushion to be built into the system.

The above contention of the Management is not tenable in view of the fact that the production capacity of BN LOBS was fixed at 48000 MTPA considering the market requirements of LOBS quality of all grades and operating conditions of the units of Lube oil block of Haldia Refinery. Further, planning for 25 *per cent* cushion into the system did not seem to be justified when the availability of input (BN slack wax) was the limiting factor.

6.6.2.2 Capacity utilisation of MCW plant at Haldia Refinery

The MCW plant at Haldia Refinery was commissioned in August 2001. The capacity of the plant was 15000 MTPA. It was observed that only 7.8 *per cent* to 27 *per cent* of available BN Slack wax could be processed for production of MCW and the refinery could utilise only 1.8 *per cent* (271 MTPA) to 6.1 *per cent* (915 MTPA) of the capacity of MCW plant during the period from 2001-02 to 2005-06. The plant also could not achieve its breakeven level of production (900 MTPA) except during 2003-04. The quantum of BN slack wax that was not processed in MCW plant was diverted to other secondary processing unit of the refinery for production of low value products resulting in a loss of an opportunity to earn Rs.25.06 crore (difference in value of MCW and low value products) during the period 2001-02 to 2005-06. The major end uses of MCW are in the manufacture of petroleum jelly for pharmaceuticals, cosmetics, tyre industries, polymer extrusion, etc. MCW produced at Haldia Refinery was suitable for use in the manufacture of petroleum jelly for pharmaceuticals and cosmetics applications. It was not found to be acceptable by tyre manufacturers as the product did not conform to the required quality parameter (carbon chain distribution). Tyre industry offered good potential and more or less stable demand during the whole year. The Company could not tap the market of MCW for pharmaceuticals and cosmetics, which resulted in low capacity utilisation of MCW plant. It was observed that in the project report of MCW

plant the quality specification of MCW required for tyre industries was not considered while finalising the quality parameters of MCW to be produced by Haldia plant.

The Management stated (August 2006) that carbon number change of MCW (quality parameter for tyre industry) would require separate process schemes and change in various upstream process plants. The Management further stated (November 2006) that the demand of MCW did not reach the level projected (15000 MTPA) and non-availability of MCW feed (BN slack wax) had resulted in idling of MCW plant. The Management added that market seeding and tie up with various customers was not possible due to unsustainable production of MCW. It was, however, clear that there was adequate domestic demand for MCW but the Company could not make use of it. Substantial portion of the available feed (BN slack wax) remained unprocessed for production of MCW and had to be diverted for production of low value products. The Management, however, stated (November 2006) that efforts were being made to produce MCW according to demand and this would help tie-up the MCW market and realise maximum margins.

6.6.3 Conclusion

There were lapses in the planning process itself. Despite the fact that Microcrystalline wax could not be produced by processing Heavy Waxy Distillates available at Digboi Refinery, the Company decided to construct processing facilities of HWD for production of MCW in the SDU at Digboi Refinery. The difficulty of processing HWD, reported by UOP before designing of SDU, was not even considered prior to finalisation of the SDU design. Similarly, while planning for MCW production capacity at Haldia Refinery, the limiting factor of production of BN Slack wax (feedstock for MCW) was not considered. Such inadequately planned investment decisions resulted in oversizing of the SDU at Digboi Refinery and the MCW plant at Haldia Refinery alongwith their allied facilities.

The fact that technical credentials of UOP (process licensor for SDU) were not proven in the field of wax deoiling technology, was not given due consideration at the time of selection of the process licensor. This had a cascading effect on the operating efficiency of SDU and the quality of the product.

Marketing efforts of the Company were lagging as production and sales of MCW and Paraffin wax (Type I) were far less than the domestic demand resulting in underutilisation of the plants.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

CHAPTER VII

Oil and Natural Gas Corporation Limited

Performance of offshore rigs in shallow water areas

Highlights

The Company closed a proposal to acquire new rigs without carrying out any cost benefit analysis vis-à-vis charter hiring and lost an opportunity of saving Rs. 436 crore.

(Para 7.7.2.1)

Offers of certain bidders for hiring rigs on nomination basis were not initially accepted but the same rigs were subsequently hired at higher rates to meet the requirement leading to avoidable expenditure of Rs.357.05 crore.

(Para 7.7.2.2(d))

Liquidated damages of Rs.88.74 crore had been demanded by the Director General Hydrocarbons towards shortfalls/delays in the Minimum Work Programme during the period from 2002-03 to 2005-06 and extension sought in respect of five blocks under New Exploration Licensing Policy I to III.

(Para 7.7.3.1)

The Company was losing annually at least one rig year due to idling of rigs caused by the factors which were controllable viz., delay in material, logistic support and unplanned repairs. The Company had to bear an avoidable expenditure of Rs.151.47 crore due to these reasons during the period 2002-03 to 2005-06.

(Para 7.7.3.4)

The Company continued to deploy costlier jack up rigs for 79 work over jobs during the review period despite instructions for using modular rigs for work over jobs and, thus, incurred an avoidable expenditure of Rs.109.81 crore during 2002-03.

(Para 7.7.3.7(a))

The Company had not taken any action to formulate a dry dock policy for upkeep and maintenance of owned jack up rigs leading to poor maintenance, high dry dock cost and loss of rig days.

(Para 7.7.4.1)

An expenditure of Rs.77.05 crore incurred during March to November 2003 on upgradation and dry dock of a rig became unfruitful due to improper planning as the benefits of upgradation and dry dock could not be availed of.

(Para 7.7.4.3)

Four major exploratory and production projects with drilling of 183 wells were started during the period 2002-03 to 2005-06 without obtaining mandatory environmental clearance from the Government of India, Ministry of Environment and Forests.

(Para 7.7.5.3)

Weak monitoring and internal control system led to deficiencies in planning, charter hiring, deployment and dry dock repairs of rigs.

(Para 7.7.6)

Gist of Recommendations

- The Company should plan appropriate number of exploratory wells every year to achieve the target of reserve accretion.
- In view of shortage of rigs and increasing charter hiring rates in the market, the Company may reconsider its proposal of acquisition of new rigs after carrying out detailed cost benefit analysis vis-à-vis charter hiring rigs.
- The Drilling Services should initiate tenders taking into account the requirement of rigs including rigs to be dehired during the period. The date for floating tenders for the required number should be firmed up after all the necessary clarifications, updates are obtained.
- The Company should review the prevailing market rates before accepting or rejecting offers for hiring of rigs on nomination or limited tender basis.
- To reduce rig idle time, the Company needs to review and put in place a system for timely requisition, issue and dispatch of materials, spares, tools, water, fuel, logistics, etc. Besides, the Company should keep locations ready before rig movement takes place.
- The Company may also explore the possibility of charter hiring rigs on 'job rate' basis instead of 'day rate' as done by some of the private players.
- The Company should hire modular rigs exclusively for work over operations instead of using costlier jack up rigs.
- The Company should expedite a dry dock policy for jack up rigs laying down periodicity and due procedure for their dry dock and major repairs.
- Environmental clearance should be obtained from the Government of India before commencement of any project costing Rs.100 crore and above.
- Monitoring and internal control system should be strengthened so that planning, charter hiring, deployment and dry dock repairs in rig operations are executed effectively and health, safety and environmental concerns are addressed properly.

7.1 Introduction

Exploration of hydrocarbon reserves in the blocks awarded by the Directorate General of Hydrocarbon (DGH) and development of proved reserves for production by drilling exploratory and development wells are the two main activities of Oil and Natural Gas Corporation Limited (Company). The Company prepares a Five Year Plan (FYP) duly envisaging the exploration as well as production activities in the ensuing five year period. The approved FYP includes physical targets set for production and reserve accretion to be achieved through production and exploration activities. The Company enters into an annual Memorandum of Understanding (MOU) with the Ministry of Petroleum and Natural Gas (Ministry), Government of India (GOI), to achieve the overall targets of production and reserve accretion depicted in the FYP. The process of planning for deployment of rigs is shown in **Annexure-10.**

The Company owned a fleet of nine offshore rigs for shallow water, which included seven independent cantilever type jack up rigs, one slot type jack up rig and one floater rig. The additional requirement of offshore rigs was met through charter hiring. Rigs were generally hired on long term basis for a period of two to three years through International Competitive Bids (ICB) as per procedure prescribed by the Material Management Manual. Rigs were deployed at various locations and platforms for exploratory and development drilling and work-over and side-tracking jobs to meet the annual targets for reserve accretion as well as production.

To ensure seaworthiness and availability and to enhance operational efficiency and meet the classification and statutory requirements, rigs were sent for dry dock, major repairs and upgradation of electrical, mechanical and communication equipment. Except rig "Sagar Samrat" (33 years old), all the owned rigs were commissioned between 1981 and 1990. All these rigs are registered with Flag State Administration (*i.e.*, Directorate General of Shipping, Government of India). The Flag State Administration delegates to the Classification Societies, *viz.,* American Bureau of Shipping and Indian Register of Shipping the task of verification of compliance with the International Maritime Organisation (IMO) conventions. As per IMO guidelines, the floater rigs have to undergo major dry dock after every two and half years, the procedure for which has been prescribed in the Office Procedure Manual of the Company.

IMO adopted (1993) the International Safety Management (ISM) Code for safe management and operation of ships and for prevention of pollution to ensure safety, avoid damage to the marine environment, etc. The Company has accordingly formulated its own Corporate Health, Safety and Environment (HSE) Policy in January 2004 to comply with all applicable codes and requirements in this regard.

7.2 Scope of Audit

Audit covered the performance of rigs deployed in Mumbai Region (MR) and Southern Region (SR) in shallow water areas with water depth upto 400 metres for the period 2002-03 to 2005-06. It included nine shallow water rigs owned by the Company and 20 rigs hired and deployed in different years. The documents relating to planning, tenders, contracts, utilisation, dry dock repairs, health, safety and environmental aspects were examined.

7.3 Audit objectives

The Performance audit of offshore rigs in shallow water areas of the Company was conducted with the following objectives:

(i) To examine whether rig deployment plan was prepared based on targets set in long-term corporate plan and MOU entered with the GOI, and inputs provided by different Asset and Basin Managers;

(ii) To examine whether requisite number of rigs were hired in time at the most economical rate by following the tender procedure to safeguard the Company's interests;

(iii) To verify whether rigs were deployed as per the rig deployment plan to avoid any deviation, delay or idling;

(iv) To examine whether owned rigs were maintained and repaired (dry-docked) as per maintenance plan and statutory and actual requirements and upgraded with latest viable equipment;

(v) To assess if the Company provided safe and healthy working conditions to employees involved in drilling and took suitable measures to ensure that environment is not adversely affected;

(vi) To verify whether monitoring and internal control system in all the above areas was adequate and effective.

7.4 Audit criteria

The following criteria were used for the Performance audit:

(i) Planning: standardisation and documentation of planning procedure, timely collection of requisite inputs for planning, implementation of Service Level Agreements (SLAs);

(ii) Charter hiring: floating tenders as per requirement and schedule of deployment, carrying out market survey, compliance of Materials Management Manual and CVC guidelines, consistency in bid evaluation and contract provisions;

(iii) Deployment of rigs: drilling targets, rig deployment plan, suitability of rigs, cycle speed of rigs, idle time norms;

(iv) Dry dock repairs and upgradation: dry dock policy, completion of tender procedure as per schedule, maintenance as per Original Equipment Manufacturer (OEM) recommendations, improvement in performance after upgradation;

(v) Safety, health and environment: compliance of statutory requirements and international norms;

(vi) Monitoring and internal control: existence and efficacy of monitoring mechanism and controls.

7.5 Audit methodology

Audit reviewed the management process of planning, hiring, deploying (utilising) and maintenance of rigs for achievement of targets for reserve accretion and production. Entry Conference was organized in April 2006 with the functional Directors of the Company where the audit objectives, scope and methodology were explained. Examination of rig deployment plans, 10th Five Year Plan, Corporate Annual Plans, MOUs and Annual Performance Reports of the Company, procedure of charter hiring of rigs, scrutiny of tenders, etc. was carried out. Audit results were discussed with the Management in the Exit Conference in September 2006. The report was also issued to the Company in September 2006.

7.6 Acknowledgement

Audit is thankful for the cooperation extended by the Management in providing information, records, clarifications from time to time and for arranging discussions with the concerned officers of the Company as and when the need was felt. Their cooperation facilitated completion of the review within the given time frame.

7.7 Audit findings

7.7.1 Rig deployment planning

7.7.1.1 Inadequate planning for exploratory drilling

The Five Year Plan (FYP) and the Annual Plan specify the annual targets for the number of wells, their depth and reserve accretion to be achieved in exploratory drilling. In order to achieve the reserve accretion target, the Company needed to work out every year the number of exploratory wells and target depth to be drilled for which Acquisition, Processing and Interpretation (API) of survey data is to be completed and prospective locations released in time.

Audit noted that the Company had not planned sufficient number of exploratory wells during the review period despite failing to achieve annual Revised Estimated (RE) targets of reserve accretion in the first four years ended 2005-06 of the 10th FYP period. Audit scrutiny revealed that, instead of planning for more exploratory drilling, the Company planned less exploratory wells every year in Mumbai Region as compared to previous years. The number of exploratory wells planned in the region was 26 in 2002-03, 24 in 2003-04, 22 in 2004-05 and 18 in 2005-06. The table below indicates the RE targets of reserve accretion in the 10th FYP and actual achievement.

Table-1

Accretion to hydrocarbon reserves - Initial in Place (IIP)

(In Million Metric Tonne Oil Equivalent (MMTOE)

Particulars	Total	2002-03	2003-04	2004-05	2005-06
10th FYP Target (for five years)	368.69				
Annual Plan Target*	310.5	65.30	78.70	78.00	88.50
Actual	194.65	59.11	29.76	56.17	49.61
Achievement (*per cent*) of Annual Target	63	91	38	72	56

*RE target for Mumbai Region and BE target for Southern Region.

During the first four years of the 10th FYP period, only 53 *per cent* of reserve accretion target could be achieved. To achieve the 10th FYP target of 368.69 MMTOE, the Company has to achieve the remaining reserve accretion target of 174.04 (368.69 less 194.65) MMTOE in one year (*i.e.,* 2006-07). In this background the achievement of overall target of reserve accretion for the 10th FYP period would appear to be doubtful.

The Management stated (December 2006) that the Drilling Services always planned the well requirement envisaged by Basin and also based on input available with the Company. These plans were approved and signed by the Basin Manager.

The reply of the Management was not tenable since in all the rig deployment plans pertaining to the period covered by audit, most of the locations were tentative and were not firmed up by the Basin. Even though the targets fixed for reserve accretion increased from 65.30 MMT in 2002-03 to 88.50 MMT in 2005-06, the number of exploratory wells planned by ONGC decreased from 26 in 2002-03 to 18 in 2005-06.

Recommendation

- The Company should plan appropriate number of exploratory wells every year to achieve the target of reserve accretion.

7.7.1.2 Work-over and side-track operations not included in Corporate Plans

Audit observed that work-over and side-track operations which consume substantial number of rig months and are critical for achieving production targets were not planned in the Corporate Annual Plans. These were provided only in the regional rig deployment plans for development drilling. Though rig months planned during the period for work-over and side-track jobs increased from 41 *per cent* in 2002-03 to 53 *per cent* in 2005-06 of the total rig months planned for development drilling, these were still not part of corporate plans.

The Management stated (December 2006) that this was a policy matter and the concern and suggestion of Audit would be discussed at the appropriate forum.

Recommendation

- The Corporate Plans should include targets for side-tracking and work-over operations along with expected production increase.

7.7.1.3 Incorrect assessment of requirement of rig months and types of rigs

For correct estimation of rig requirement and rig months, requisite parameters need to be spelt out specifically. Audit noted that the requirement of additional rigs for charter hiring was estimated based on average past performance. Rig months for 2004-05 were estimated on the basis of 'cycle speed'[♣] and on the basis of 'number of wells to be drilled' for the other years.

As against the average cycle speed of 858 of owned rigs during previous four years, the cycle speed of 1336 was considered for calculation of rig months for 2004-05. This resulted in incorrect estimation of rig months and short hiring of rigs. Despite the observations of Director (Offshore) in December 2003 the Drilling Services had assumed improved efficiency of owned rigs without analysing their poor past performance.

Selection of rig for development wells (including side-track and work-over operations) depends on factors like pug marks left by the previously deployed rig on the platforms, design of platform, leg penetration, soil characteristics, well spacing, water depth and design of rigs, etc. Audit noted that while finalising the rig deployment plan for the years 2002-03 and 2003-04, the aspect of suitability of rig for platforms (despite having rig suitability chart) was not considered. As a result 26 wells planned to be drilled by 12 rigs during 2002-03 and seven wells to be drilled by four rigs during 2003-04 were found unsuitable for these platforms.

The Management stated (December 2006) that during estimation of rig months, other factors like number of days taken for particular activities during last year, distance between two wells, type of wells were also being considered in addition to cycle speed.

♣ ***Rig release from previous location to rig release from present location after drilling and production testing, makes a cycle. Cycle speed denotes the metreage drilled in a rig month within a cycle. Cycle speed is a measure of the efficiency of a rig.***

Cycle speed of departmental rigs was less as very few development wells were drilled by them.

The Management reply was not acceptable as the audit finding emphasised the lack of clear guidelines as well as inconsistency in estimation of rig month requirement and the basis for determination of rig months. The Management did not reply to the core audit observation in respect of different criteria adopted for estimation of rig months as well as considering higher cycle speed of owned rigs for rig month calculation, which might result in incorrect assessment of rig months and short hiring of number of rigs. The Management also did not reply to the audit observation relating to non-consideration of suitability of rigs to the platforms on which rigs were planned for deployment.

Recommendation

- The Company should firm up the basis for estimation of requirement of rig months of various types of rigs based on past experience and locations to be drilled.

7.7.2 Charter hiring of rigs

7.7.2.1 No cost-benefit analysis carried out for acquisition of new rigs

In January 2002, the Executive Purchase Committee (EPC) directed the Drilling Services to examine the possibility of acquiring rigs to reduce dependency on the hired rigs. The Drilling Services submitted (February 2002) a proposal for purchase of three jack up rigs for approval of the Executive Committee. The Drilling Services briefly discussed the advantages of acquiring rigs as against charter hiring of rigs *viz.* assured availability of rigs, limited exposure to market fluctuations in rig day rates, greater flexibility of deployment of rigs on existing platforms and saving on account of mobilisation and customs duty, etc.

The Executive Committee, in principle, agreed (December 2002) to the proposal for procurement of three cantilever jack up rigs suitable for 350 feet water depth. However, the proposal for acquisition of rigs was closed (April 2004) as the Chairman and Managing Director observed that "utilisation of owned rigs was substandard, the problem was vitiated by indiscipline as well as poor logistics". It was, therefore, agreed to adopt integrated work contract concept for shallow water and to close the case as there was no case for procurement. Audit noted that the proposal was initiated without any specific cost benefit analysis of acquiring new rigs over charter hiring and the acquisition of new rigs was not processed further.

Meanwhile, the rates of charter hired rigs increased and were 74 to 97 *per cent* higher than the ongoing contract rates as of January 2006. Jack up rigs were hired (January 2006) by the Company at an effective day rate of US$ 144,899 which was substantially higher when compared to the average per day cost of US$ 1,11,964 of operation of own rigs. By acquiring three additional rigs, the Company would have saved an amount of Rs.158.68 crore per annum from 2006 onwards and would have recovered the cost of rigs within a period of three years thereafter. Moreover, new rigs with the latest technology, less repair jobs and better efficiency would have increased the available rig time as compared to that of the existing old rigs. Further, the average cost of acquisition had also increased by US$ 33.03 million per rig since April 2004. Thus, even if the Company reconsidered any proposal for acquisition of rigs in future, it would have to spend

additional amount of US$ 99.09 million, i.e., Rs.436 crore (one US$=Rs.44) on acquisition of three rigs.

The Management stated (December 2006) that the day rates of rigs in the international market were stable at the time of closing of the proposal and the demand and supply situation of the rigs was not critical for acquisition of three rigs at the time. During 2005, the demand and supply situation of the rigs became critical. In view of this, the Company decided on 25 March 2006 to acquire four shallow water cantilever jack up rigs and one deep water drill ship for which a case for hiring professional services for technical consultancy had been initiated. The loss as envisaged by Audit could not be predicted due to such unforeseen circumstances.

The reply of the Management was not tenable, as the proposal for acquisition of rigs was closed by the Chairman and Managing Director on the ground that the utilisation of the owned rigs was substandard and the problem was vitiated by indiscipline and poor logistics.

Further, world over the demand for jack up rigs picked up in 2004 (at the time of closing of proposal for purchase of three rigs) following the recession of 2001-02 and 2002-03. During the period from 2002 to 2004, the market rates of 300 feet cantilever jack up rigs also increased gradually. The Management itself, in reply to subsequent paragraph 7.7.2.2(d) of this Report, agreed that rig availability was worsening from year 2001 to 2006. Going by the trend of increasing demand for jack up rigs, there was a good case for the Company to increase its own fleet in 2004 to avoid the high cost of hiring in future.

Recommendation

- In view of the shortage of rigs and increasing charter hiring rates in the market, the Company should improve the standard of performance of owned rigs and reconsider its proposal of acquisition of new rigs after carrying out detailed cost benefit analysis vis-à-vis charter hiring rigs.

7.7.2.2 Deficiencies in tender procedure

After assessing the workload and considering the availability of owned rigs as well as charter hired rigs under existing contract, the Drilling Services determined the number of additional rigs required and placed indent on Material Management Section for hiring the requisite number of rigs for a specific period. On receipt of the indent, Material Management section published Notice Inviting Tender (NIT) and placed firm order on the short listed bidder after following the tender procedure and approval of the competent authority.

a) Non-finalisation of specifications and firm period of deployment of rigs

Audit scrutiny of tender documents revealed that the Drilling Services had not formulated firm requirement at the time of placing indent for hiring of rigs. In two of the six ICB tenders floated for hiring of rigs during the review period, the requirement of rigs was not firmed up at the time of placing the indent and the tender opening dates had to be postponed due to modifications in number and specifications of rigs after issue of NIT. The number of rigs was firmed up only after issue of NIT resulting in delay in finalisation of tenders ranging from 18 to 60 days.

The Management stated (December 2006) that generally indents for firm requirement were being conveyed to MM Section for hiring of rigs. It required nine to ten months to

finalize the tender for charter hired rigs. In case finalization of physical targets were likely to take time, indent indicating the quantity and likely variation was conveyed to MM Section to ensure timely mobilization of critical input like offshore rigs.

The Management's reply was not acceptable as the MM Manual of the Company specifically stipulated that specifications given in the indent were final without allowance of any subsequent revision therein. The change in specification of rigs was, therefore, not as per the Company's own regulations.

The Management's contention that it took nine to ten months to finalise the tender for charter hiring of rigs was also not tenable. The MM Manual allowed the maximum time of 190 days from the date of NIT for finalisation of tender.

b) Delay in finalisation of tenders

As per the Material Management Manual, the maximum time allowed for processing a tender is 190 days (70 days for opening of tender and 120 days from tender opening date to final approval by the EPC). Audit noted that the Material Management section took 224 to 276 days in finalisation of four out of six tenders in Mumbai region during 2002-03 to 2005-06.

Though the Company had standardised Bid Evaluation Criteria (BEC) for all service contracts, the review of tenders revealed that, besides delay in firming up of indent, the opening dates of bids were postponed for seeking clarifications on various issues including applicability of customs duty, status of the firms, technical criteria in the bid document, etc. These delays in finalisation of tender had a cascading effect on the availability and deployment of rigs. During 2002-03 and 2003-04, 19 rig months were, thus, lost leading to deferment of planned drilling of 12 new wells and seven work-over jobs.

The Management stated (December 2006) that the compilation of pre-bid minutes, approval of EPC with reference to the changes to BEC clauses and deliberation with reference to changes to contract clauses was a time consuming process which was not covered in the time period mentioned in Material Management manual.

The period of 190 days stipulated in the Material Management manual included 10 to 15 days for pre-bid conference related activities. Hence, any change in BEC clause emanating from the pre-bid conference was to be completed within the stipulated time. The Company had consumed 34 to 86 days more than the time prescribed for final approval of the tender.

The Management, however, assured that the recommendation of Audit for strict adherence to the time schedule prescribed in MM Manual would be followed as far as possible.

Recommendation

- Strict adherence to the time schedule for processing of tenders as prescribed in the Material Management Manual is called for.

c) Inconsistency in evaluation of bids as per the Bid Evaluation Criteria

As per the Bid Evaluation Criteria (BEC), the bidders were required to categorically confirm the availability of rigs before opening of the price bids failing which the bids were rejected. The bidders were also required to submit, *inter-alia*, audited financial

accounts for the last two years. Audit scrutiny revealed that these two BEC conditions were not applied uniformly and prudently in the following case.

In a tender floated on 6 January 2004, offers of two technically qualified bidders, M/s. Transocean Offshore International Venture Limited for rig 'J T Angel' and M/s. Discovery Hydrocarbons for rig 'Nobel George McLeod' (NGM) were rejected, as the bidders could not confirm the availability of rig on the scheduled date. To meet the shortfall, the tender was reinvited on 24 September 2004 and closed in May 2005. Audit noted that the rig 'J T Angel' was subsequently hired (January 2006) by the Company at an EDR of US$ 156,857 on nomination basis and the rig 'Nobel George McLeod' was hired (January 2006) at an EDR of US$ 100,865.49 in the subsequent tender of 16 September 2005 despite the fact that the bidder had not confirmed the date of the rig availability before opening of the price bids.

Rejection of earlier offers in respect of above two cases due to non-confirmation of the date of mobilisation in the first instance and hiring the same rigs in subsequent tenders at higher rates without obtaining the confirmation resulted in avoidable expenditure of Rs.357.05 crore in 18 months commencing from January 2006.

The Management in reply (December 2006) stated that both the rigs JT Angel and NGM were rejected in earlier tenders due to non-compliance of BEC conditions. However, in respect of tender floated on 16 September 2005, considering the rig shortage and the fact that the Company was not getting a rig of Friede and Goldman (F&GL) design, the price bid of NGM rig was opened though the bidder did not confirm the availability of rig. The Management further stated that rigs' availability was worsening since the year 2001 till 2006.

The reply of the Management was not convincing since it took considerably long time in retendering the requirement in a scenario when the availability of rigs was worsening since 2001.

7.7.2.3 Deficiencies in contracts for charter hiring of rigs

a) Delay in signing of contracts

As per the firm order conditions, the contract is required to be signed within 30 days from the date of firm order. The draft contract was vetted by the Drilling Services, Finance and Legal sections of the region and in some cases by the contractor. Audit noted that the time taken for signing the above mentioned contracts ranged between 113 and 280 days.

Though no case of arbitration or loss of claim due to non-signing of contract was noticed in audit, the Company was placing itself in a vulnerable position in the absence of a formal contract.

The Management stated (December 2006) that after placement of firm order, the draft contract was sent to various Sections for vetting and changes proposed by various Sections were considered and incorporated to safeguard the interests of the Company. As different Sections were located at different places, movement of files and information took time.

The reply was not acceptable since the Material Management manual provided 30 days to complete all the activities required for finalising and signing of a contract.

Recommendation

- The Company should ensure the signing of contract within the stipulated time to safeguard its interest.

b) Inconsistency in contract provisions

(i) In contract of January 2000, the contractor M/s. Jagson International failed to deploy the rig 'Sakhalinskaya.' The EPC directed (October 2001) that firms who failed to perform satisfactorily should be put on hold for two years and accordingly directed the Policy Monitoring Cell to issue suitable instructions. Audit noted that due to non-deployment of rig 'Sakhalinskaya' the Company hired (March 2002) another rig 'CE Thornton', at a higher day rate of US$ 45,000 from RBS Rig Corporation resulting in an additional expenditure of US$ 212,60,330 (Rs.95.67 crore). Audit examination further revealed that no instructions were issued by the Policy Monitoring Cell. On the contrary the offer of M/s Jagson International was considered in November 2002 and order placed against tender OT-1021 in January 2003. The contractor did not offer the rig for inspection before deployment within the stipulated period of 150 days from the date of firm order. The Drilling Services proposed (June 2003) to terminate the contract and put the contractor on holiday. Performance bank guarantee could not be invoked due to a stay order by a court. Thus, placement of order on a defaulting firm, notwithstanding clear instruction, resulted in deferment of planned drilling by six months.

The Management stated (December 2006) that against both the contracts arbitration proceedings were going on. Both the performance bank guarantees were valid upto 20 December 2006 but the performance bank guarantee invocation was on hold as per decision of the Arbitrators. The rates of rig Deep Sea Matdrill operated by M/s. Jagson International were very low compared to the market rate for a Mat rig. Further, there was scarcity of availability of Mat rig.

The reply was not tenable, as the Management had not replied to the audit observation of non-implementation of the EPC's direction of putting the defaulting firms on hold for two years.

(ii) If rig days were lost due to breakdown during the contract period, the contractor was required to deploy the rig at the same rate to make up for the loss of rig time but for a maximum period of 30 days. A contractor, thus, was not liable to extend the contract beyond 30 days if the breakdown was for more than 30 days. Audit noted that the rig 'Deep Sea Matdrill' (DSM) hired in December 2000, went out of cycle after an accident at location BSE-4A during February 2002 and was not available for drilling for 471 days during the period of contract. In a subsequent contract in 2002-03, the same rig was hired at EDR of US$ 21998.56 and the contractor directed to compensate by operating the rig for the lost period of 471 days. The contractor, however, agreed to deploy the rig only for 60 days at the old contract rate of US$ 15,400.07. As the contract condition limited the extension of contract in case of absence of rig due to breakdown to a maximum period of 30 days, the contractor could not be compelled to compensate for the entire period of breakdown. The rig had, therefore, to be deployed for the remaining 411 days at

higher rate of US$ 21,998.56 entailing extra expenditure of US$ 2,711,979.39 (Rs.12.20 crore).

The Management stated (December 2006) that in the previous contract (contract number DY8DF0180 for rig DSM) the period of absence owing to repair of rig could be extended only upto 30 days. In the next tender number OT-1021 when the contractor offered the same rig, not only was the rate brought down, but the contractual provision for this contract (i.e. contract against 1021) was also modified in favour of the Company by keeping provision for extension for full absence period with due acceptance by the contractor.

Recommendations

- The Company needs to take steps to improve the quality of monitoring the implementation of its decisions.
- The contracts for charter hire of shallow water rigs should provide for deployment of rig at the same day rate for the days lost during contractual period.

7.7.2.4. Award of contracts on nomination/limited tender basis at higher rates

a) Contract for hiring of rig 'J T Angel' expired in July 2004. The Company made an offer for continuance of the rig for three other wells. As the contractor agreed to the continuance of the rig only for one well and offered (August 2004) another rig 'FG McClintock' at an EDR of US$ 47,459.30, the case was closed. The composite tender floated during September 2004 for two rigs did not materialise. To avoid any adverse impact on production targets, the Company went in for rigs on nomination basis and hired (April 2005) rig 'FG McClintock' for three years at an EDR of US$ 48,622.09, which entailed an additional cost of Rs.5.94 crore for three years from April 2005 onwards on hiring rig 'FG McClintock' rejected earlier.

The Management stated (December 2006) that both the rigs viz. JT Angel and FG McClintock were at operational day rate (ODR) of US$ 50,000. The mobilisation fee of FG McClintock as per original contract was US$ 2.5 million and that of JT Angel was US$ one million. However, no mobilisation fee was paid for FG McClintock which was hired on nomination basis. In its reply, the Management did not give reasons for rejecting the rig FG McClintock at first instance and hiring the same rig on nomination basis at a higher EDR subsequently.

b) The Company made an offer (April 2004) to M/s. Transocean Offshore International Venture Limited (TOIVL) for deployment of rig 'C E Thornton' on nomination basis in Bengal Offshore block. M/s. TOIVL offered the rig at an EDR of US$ 59,960.82. As the rate quoted by the contractor was considered high vis-à-vis the existing EDR of US$ 45,219.45 of the same rig, the case was closed (April 2004) and a limited tender was floated on 21 July 2004. Against the limited tender, the Company charter hired (November 2004) rig 'Transocean Nordic' from M/s. TOIVL at an EDR of US$ 75,484 for two years. Thus, by not considering the offer of M/s TOIVL for rig 'C E Thornton' and subsequently hiring similar type of rig 'Transocean Nordic' from the same contractor at higher rate, the Company incurred an extra expenditure of Rs.50.99 crore in two years from November 2004 onwards.

The Management replied (December 2006) that the rig CE Thornton was already working with the Company. The environmental condition of West Bengal Project and Western

Offshore were not the same and the rig had to be diverted to West Bengal Project after certain modifications. Hiring of rig Transocean Nordic added rig month availability as diverting CE Thornton to West Bengal Project would have affected this. The reply of the Management was not tenable as the Company rejected the offer of M/s. TOVIL on the specific ground that the rate quoted (US$ 59,960) for FG McClintock was high. But the Company hired another rig from the same contractor at an EDR of US$ 75,484 for two years.

Recommendation

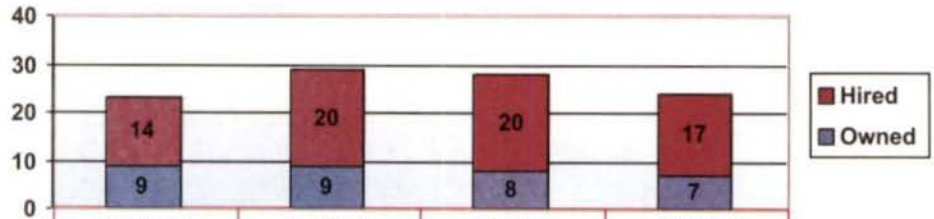
- While accepting or rejecting offers for hiring of rigs on nomination or limited tender basis, the Company needs to carefully consider the prevailing market conditions.

7.7.3 Deployment of rigs

The Company deployed own and hired rigs for drilling operations. The following table shows the number of rigs (both owned and hired), under the Company's operation during the period from 2002-03 to 2005-06.

Table-2

Rig count-charter hired/owned rigs



	2002-03	2003-04	2004-05	2005-06
Hired	14	20	20	17
Owned	9	9	8	7

Audit findings on deployment of owned and charter hired rigs are discussed below:

7.7.3.1 Non-achievement of exploration targets

As production from the existing developed fields of the Company had already reached its peak and started declining, exploration of new reserves and their development became critical. The Company was mandated to drill a minimum number of wells in each phase of each exploration block as committed to the Director General Hydrocarbons (DGH) in production sharing contract at the time of awarding the blocks by the latter under New Exploratory Licensing Policy (NELP). If the wells committed in the Minimum Work Programme were not drilled, DGH had the right to not only impose liquidated damages for extension of time but also direct the Company to surrender blocks under default.

During the review period the Company planned drilling of 110 exploratory wells but actually drilled 77 (70 *per cent*). Against the plan to achieve reserve accretion of 368.69 Million Metric Tonne of Oil Equivalent (MMTOE) Initial in Place (IIP) during the 10th FYP (2002-03 to 2006-07), the Company could achieve only 194.65 MMTOE. Under the NELP-I to III, the Company was nine wells short of drilling targets in five blocks (**Annexure-11**), after completing the jobs relating to Acquisition, Processing and

Interpretation (API) **(Annexure-12)**. As conditional extension of time for completing phased Minimum Work Programme had been granted to the Company, the DGH demanded liquidated damages of Rs.88.74 crore **(Annexure-11)** for the extension of six months in respect of the five blocks. Despite getting extensions in two blocks, the Company had not yet (August 2006) completed the drilling of the number of wells committed in the phased Minimum Work Programme.

Audit noticed that the Company not only planned less number of exploratory wells than required, but also failed to drill the planned number of wells (by 36 *per cent*) which ultimately resulted in underachievement of the reserve accretion target.

The Management in reply (December 2006) stated that the geological and geophysical data was interpreted in house and expert opinion was also taken from foreign consultants for these NELP blocks which occasionally took more time for completion of jobs. Therefore, there was shortfall in drilling of wells. Corrective measures were being taken so that there is no slippage in commitments to the MWP.

7.7.3.2 Development drilling and work-over operations

The Company made efforts to achieve targets of development drilling and side-tracking and work-over of producing wells so as to increase production of oil and gas. Accordingly, the Company planned drilling of 219 development wells and 381 wells for side-tracking/work-over operations during the review period. Against this target, 180 development wells and 306 side-tracked/work-over wells were actually drilled. The Company planned production of 71.336 MMT of oil and 67540 Million Metric Standard Cubic Metres (MMSCM) of gas during 2002-03 to 2005-06 and achieved production of 69.714 MMT of oil (98 *per cent*) and 70,563 MMSCM of gas (104 *per cent*).

7.7.3.3 Poor performance of owned rigs

The efficiency of rigs deployed is determined by two parameters 'cycle speed' and 'commercial speed'. Cycle speed measures overall efficiency of drilling process as it includes drilling time, production testing time as well as rig move time in computing rig months. 'Commercial speed' indicates efficiency of rig in actual drilling and production testing.

A comparison of 'cycle speed' and 'commercial speed' of hired and owned rigs of the Company were as given below:

Table-3

Cycle and commercial speed of owned and hired rigs

(metres/rig month)

Rigs	2002-03		2003-04		2004-05		2005-06	
	Cycle speed	Commercial speed	Cycle speed	Commercial speed	Cycle speed	Commercial speed	Cycle speed	Commercial speed
Owned	753	895	795	875	529	679	615	758
Hired	1259	1529	1204	1471	1222	1476	1210	1403
Difference	506	634	409	596	693	797	595	645
Difference (*per cent*)	67	71	51	68	131	117	97	85

Audit noted that the average commercial speed of charter hired rigs was much higher than that of the owned rigs (68 to 117 *per cent*) despite the latter being younger in average age. Similarly, average cycle speed of charter hired rigs was also higher (51 to 131 *per cent*). The average time taken for drilling exploratory and development wells by owned rigs was 135 and 100 days as against 100 and 57 days by charter hired rigs.

Though no benchmark had been set for the efficiency of owned rigs, it was far below hired rigs that were of the same type. Lower operational efficiency of owned rigs in drilling operations resulted in 69.23 additional rig months in drilling operations.

The Management replied (December 2006) that the main factors for poor performance of owned rigs in comparison to charter hired rigs were non-availability of required input in terms of latest equipment in comparison to hired rigs and non-availability of proper manpower (in terms of category and age profile) for carrying out the desired jobs. Priority was being given to the hired rigs in case of supply of material, services, etc. in comparison to owned rigs which resulted in down time on owned rigs and reduced productivity. Owned rigs were very old that led to more repair/down time of the equipment. Well complications like stuck up, mud loss, etc., were one of the reasons for less productivity. The Management, however, assured that all efforts were being made to improve the productivity of owned rigs. However, as mentioned before, it was observed in Audit that the average age of the owned rigs was less than that of the charter hired rigs.

Recommendation

- The Company should take necessary steps to improve efficiency of owned rigs for improvement in performance.

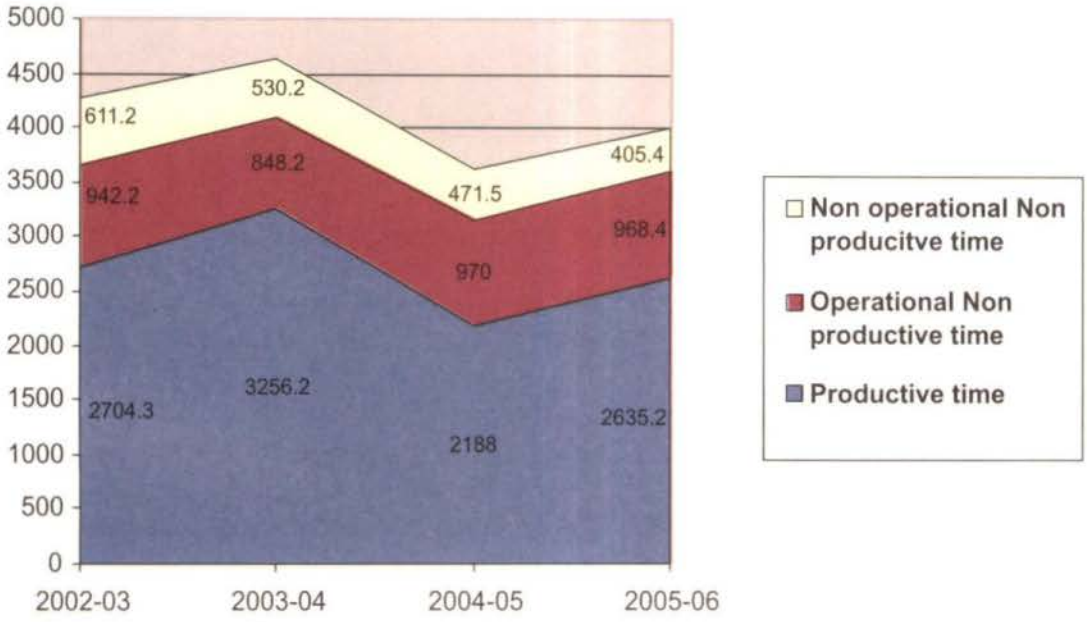
7.7.3.4 Inefficient utilisation of rigs due to high unproductive time

The Company had not set any norm for the productive time of the rigs. The productive and unproductive time of owned and charter hired rigs during the four years ending 31 March 2006 were as given below:

Table-4

Productive and unproductive time of rigs in days of Mumbai Region

Year	Total drilling time	Productive time		Non-productive time			
				Operational (Down hole problems, mud loss, fishing, etc.)		Non-operational	
	Days	Days	*Per cent*	Days	*Per cent*	Days	*Per cent*
2002-03	4257	2704	63.51	942	22.12	611	14.35
2003-04	4634	3256	60.29	848	18.30	530	21.41
2004-05	3630	2188	60.30	970	26.70	471	13.00
2005-06	4009	2635	65.70	969	24.20	405	10.10



Audit examination further revealed that increase in unproductive time was largely due to idling of rigs for operational and non-operational reasons. Operational reasons were mainly down hole problems like stuck up tools and fishing operations for recovery of tools, mud loss, etc. Non-operational reasons were waiting for crew, materials, tools and logistic support, repairs and breakdowns. Total expenditure on idling of rigs charged to Profit and Loss Account by the Company during the period 2002-03 to 2005-06 was Rs.151.47 crore.

In reply, the Management stated (December 2006) that non-productive time was attributable to down hole problems, mud loss, fishing operation etc. Such operational problems were being reduced but could not be ruled out due to environment and formation characteristics. Non–operational, non- productive time were mainly occurring during monsoon and due to lack of logistic supports. The Management, however, assured that all efforts were being made to reduce such non-productive time through better coordination with all concerned.

Recommendation

- The Company should make efforts to increase productive time by reducing controllable idling through better advance planning.

7.7.3.5. High idle time due to delay in supply of material and tools, etc.

During audit examination of IADC reports of rigs, store records, etc., the following cases of controllable idling of more than 12 hours were noticed.

(i) Idling due to material

The Company was required to maintain a buffer stock of 5,000 MT and a minimum stock of 100 to 150 MT of barytes, being an insurance item, in a rig to meet any exigencies. However, delay in awarding tender for procurement of barytes resulted in suspension of rig operations and consequential loss of Rs.37.18 crore to the Company during September

2004 to January 2005. This has been pointed out in the Comptroller and Auditor General of India's Report No.11 of 2007, Union Government (Commercial).

(ii) Idling due to logging tools

The Company entered into a contract with M/s. Shlumberger Asia Services (SASL) for electro logging services. Audit noticed that in order to reduce the cost, the Logging Services reduced the number of logging tools required. Though a separate logging unit was available for each rig, other logging tools required for various types of logs had to be shared between rigs, resulting in non-availability of logging tools in time and consequent rig idling. Though the Management had worked out a saving of Rs. 84 lakh due to tool optimisation, it resulted in additional expenditure of Rs.16.06 crore during 2002-03 to 2005-06 by way of rig shut down.

The Management stated (December 2006) that the tools were hired according to the work plan and requirement of various Assets and Basins. As per records available in logging services during the period 2004-05, a total of 861 hours were waiting time for logging services. Out of this, waiting time of 446 hours was because of logistic problems due to bad weather, last minute decision to carry out particular services, uncertainty of carrying out the services or emergency requirement of any service. The Management, however, assured that all efforts were being made to ensure that rigs do not wait for. want of logging services.

(iii) Idling due to spares

Drilling Tools Yard Stores (DTYS) at Nhava supplied spares, whip stock, directional drilling equipment, etc. to rigs. Store Transfer order for these items were created by DTYS itself on the basis of telephonic demand from the Rig Managers. Items such as whip stock were supplied by contractors (Weatherford, Smith, etc.) as and when required. Audit noted that there were delays on the part of the Rig Managers/DTYS in creating store transfer orders and delivering the tools or equipment to rigs resulting in idling of rigs for want of whip stock, MWD tools, etc. It was observed that 5,580 rig hours were rendered idle during 2002-03 to 2005-06 due to delayed supply of whip stock, MWD tools, directional drilling equipment and other tools.

While accepting the audit observation, the Management assured (December 2006) that all efforts were being made to reduce such down time through proper coordination with logistics, rig managers, DTYs as well as the representatives of the Assets.

(iv) Other reasons

Audit examination revealed that rig 'Ron Tappmeyer' had to wait for 171 hours for RS-2 platform to be ready for drilling. Rig 'Trident-II' had to wait for 70 hours (from 11 April 2005 to 17 April 2005) and Rig 'Randolph Yost' had to wait for 48 hours (from 28 July 2005 to 29 July 2005) for want of programme. Similarly, Rig 'Frontier Ice' waited for anchor handling boat for 230 hours (from 20 August 2005 to 28 August 2005) and Rig 'Ed-holt' waited for 72 hours (from 27 February 2006 to 1 March 2006) for want of towing boat.

The Management did not (December 2006) offer any comments.

Recommendation

- To reduce rig idle time the Company should review and put in place a system for timely requisition, issue and dispatch of materials, spares, tools, water, fuel, and ensure all other logistic support.

7.7.3.6 Idling of rigs due to improper planning

Audit examination revealed that improper planning in deployment of rigs rendered rigs idle in the following case:

During 2004-05, rigs 'Ed-holt', 'Trident -12' and 'N.C. Yester' were deployed on platforms IS-10H, IC-4 and S1-6 without confirming the status of the platforms instead of planned deployment on the wells N-10-7H, IE-5ZH and ED-4-ZH respectively. The rigs remained idle for six, twelve and five days respectively on these unplanned wells due to pending fabrication work on clamp-on platforms resulting in avoidable expenditure of Rs.8.91crore.

The Management stated (December 2006) that rigs were deployed on platform IS-10H, IC-4 and SI-6 as the wells on these platform were priority wells envisaged by the Assets. The reply of the Management was not convincing as the Company could have ensured the readiness of the location through coordination between different wings to avoid idling of the rigs.

Recommendations

- In order to reduce rig idle time, the Company should keep locations ready before rig movement takes place. Only suitable rigs should be deployed.
- The Company may also explore the possibility of charter hiring rigs on 'job rate' basis instead of 'day rate' as done by some of the private players.

7.7.3.7 Deployment of costlier rigs of higher capacity

7.7.3.7 (a)Deployment of costlier jack up rigs for work-over operations

Drilling Services deployed jack up rig for carrying out work-over operations in the existing wells to restore the existing production, reduce gas/oil ratio or for other safety purposes. Worldwide routine work-over job is mostly carried out by modular rigs, which are economical. Well Services, with the intention to reduce the cost of work-over operations, initiated a proposal during October 1999 for hiring of modular rigs for work-over jobs other than side-tracking operations. The proposal materialised after three years and the first modular rig 'Sundowner VI' was hired and deployed during June 2003 at an operating day rate of US$ 27,650 for a period of three years (upto June 2006). EPC during June 2001 directed the region to float tender for hiring of two more modular rigs with an option to increase the number of modular rigs to three after a period of six months.

The EPC instructed (5 March 2004) the region that jack up rigs should not be deployed for taking up work-over operation in future except under compulsion during monsoon period. Well Services, however, hired only one modular rig on 10 September 2004 at an operating day rate of US$ 27,374 with option to hire one more rig within a period of six months. Before hiring of the second modular rig Well Services carried out a cost benefit analysis of modular *vs.* jack up rigs and concluded that the cost of work-over operations by modular rigs even after considering the platform modification, was less than that of

jack up rigs. Despite the low cost and other benefits of modular rig, Well Services continued to deploy only two modular rigs and did not consider hiring of additional ones which were available in the market. Two modular rigs were not sufficient to cater to the projected work-over volume of 89, 95 and 95 jobs (excluding side-track) during 2004-05, 2005-06 and 2006-07 respectively. Drilling Services, in addition to modular rigs and owned jack up rigs, continued to deploy costly charter hired rigs for work-over operations. The Company executed 79 work-over jobs by using charter hired rigs for 43.77 months. Hiring of additional modular rigs during 2002-03 would have resulted in saving of Rs.109.81 crore (after considering platform modification cost of Rs.1.1 crore per platform) on work-over operations by deploying modular rigs in place of hired jack up rigs. The Company has been deploying two of its owned rigs exclusively for work-over operations. By hiring more economical modular rigs, the Company could also have diverted its owned rigs for development/exploratory drilling where the targets were not being met due to less availability of rig months.

The Management stated (December 2006) that two modular rigs were operating in western offshore to carry out work-over and side track jobs. Keeping their performance in view, two more such rigs were hired.

In its reply, the Management only informed that the Company initiated the process for hiring of two additional modular rigs and did not give reasons for non-compliance with the EPC's instruction of March 2004 that jack up rigs should not be deployed for taking up work-over operation. It took three years to take action on the instruction.

Recommendation

- The Company should hire modular rigs exclusively for work-over operations instead of using costlier jack up rigs.

7.7.3.7 (b) Charter hiring of 300 feet jack up rigs

Drilling Services had been hiring jack up rigs both for exploratory as well as development drilling. The indents for all the tenders floated during 2002-03 to 2005-06, were specifically for 300 feet cantilever jack up rigs for exploratory drilling. It was noted that 300 feet slot type jack up rig 'Kedarnath' was hired during 2002 and 2004 and deployed from June 2002 and October 2004 in exploratory area. Audit scrutiny revealed that the rig 'Kedarnath' was deployed on eight exploratory locations all of which were under 250 feet water depth.

The Drilling Services could have hired cantilever rigs of 250 feet water depth capacity in place of rig 'Kedarnath', when the prevailing market rate of the former was in the range of US$ 25,000 to 35,000 per day during June 2002 and US$ 30,000 to 43,000 per day during December 2004 to save Rs.13.22 crore.

The Management stated (December 2006) that due to exploratory leads, some locations having water depth of more than 250 feet might be released by Basin and invitation of another tender might be imprudent and time consuming. However, as all the locations drilled by rig 'Kedarnath' were below 250 feet depth, the Company could have hired rig of lesser capacity and avoided the extra expenditure.

Recommendation

- The Company should plan and assess correctly the depth of the target exploratory wells and hire rigs accordingly for effecting economy in expenditure.

7.7.4 Dry docking, major repairs and upgradation

7.7.4.1 Absence of dry dock policy for jack up rigs

In order to ensure seaworthiness and proper maintenance of the rig as well as to attend classification requirements pointed out by the surveyors in time, a policy for periodic dry dock and major repairs of rigs was necessary.

As per IMO, dry dock of floater rigs is required to be carried out every two and half years so that survey for statutory class requirement can be done simultaneously. Audit noted that floater rigs were dry docked periodically whereas jack up rigs had not been dry docked for long periods as the Company did not have a policy for dry dock for jack up rigs. As per recommendation of the Original Equipment Manufacturer, major overhaul of engines was to be carried out after every 20,000 or 25,000 machine hours (depending upon make of the engine). Top overhaul was to be carried out after every 15,000 machine hours. Audit observed that this recommendation had not been acted upon and overhauls in 13 cases (eight major overhauls, five top overhauls) were overdue as of August 2006 where the due dates had fallen between October 2004 and May 2006 as shown in **Annexure-12**.

Audit examination further revealed the following:

(i) In case of jack up rigs Sagar Ratna and Sagar Uday, no dry dock was carried out since commissioning in 1985 and 1990.

(ii) Substantial increase in the cost of dry dock, ranging from Rs.47.41 crore to Rs.88.80 crore was noticed in case of all the jack up rigs mainly from the year 1998 onwards (**Annexure-13**). A technical committee appointed (December 2000) to identify factors responsible for upward trend in cost of dry docks and repairs of jack up rigs, had attributed the abnormal increase in the cost to major upgradation and extensive over hauling with costly spares, in the absence of scheduled repairs.

(iii) The estimated cost of repairs planned in 2006 for Sagar Kiran (18 years old) was Rs.203.95 crore as compared to Rs.165.75 crore incurred on six dry docks of floater rig Sagar Bhushan (19 years old).

(iv) Various breakdown repairs/replacement carried out frequently in most of the jack up rigs during the period 2002-03 to 2005-06 led to a loss of 326 rig days and idling cost of Rs.12.32 crore (approximately).

No action had been taken yet (August 2006) to formulate a dry dock policy for upkeep and maintenance of owned jack up rigs leading to poor maintenance, high dry dock cost and loss of rig days.

The Management while accepting the necessity of dry dock policy stated (December 2006) that none of the jack up rigs had been de-classified till then and contended that all the maintenance schedules of drilling equipment were being followed as per OEM guidelines. However, major overhaul of drilling equipment was being carried out as a parallel activity along with the dry dock jobs. The Management attributed the substantial

increase in the cost of dry dock to inflation, increase in the cost of upgradation and cost of material.

The reply of the Management was not tenable since Audit pointed out cases where OEM recommendations were not adhered to as well as instances of 'suspension of class' and 'condition of class' due to non-adherence to the classification requirements. In the absence of any dry dock policy, the time schedule for availing the dry dock period for major repairs was also uncertain. A technical committee appointed for the purpose had observed that the abnormal increase in the cost of dry dock was due to absence of scheduled repairs.

Recommendation

- The Company should expedite a dry dock policy for jack up rigs laying down periodicity and due procedure for their dry dock and major repairs.

7.7.4.2 Delay in award of contracts for dry dock

As per Material Management Manual the time allowed from publication of NIT to finalisation of Executive Purchase Committee recommendations was 190 days. Time required from defining the scope of work to actual issuance of notification of award had not been standardised for dry dock. Audit examination of tender documents revealed that there was abnormal delay beyond the permitted days in issuing notification of award after the approval of scope of work had been accorded in case of rig Sagar Samrat (396 days) and Sagar Pragati (473 days). There was further delay in handing over rig to repair yard in case of Sagar Samrat (221 days) and Sagar Bhushan (265 days) as shown in the following Table:

Table-5

Delay in issue of notifications of award and handing over of rigs for dry dock

Rig	Year of dry dock	Date of approval of scope of work	Date of notification of award	Total time taken for notification of award from date of receipt of scope of work (days) 'A'	Delay in finalisation of tender 'A' less 190 days	Actual date of handing over	Time gap between finalisation of scope of work and actual handing over of rig. (days)
Sagar Jyoti	2001	28/3/2000	4/10/2000	190	--	20/1/2001	190+108=298
Sagar Samrat	2003	21/12/2000	31/7/2002	586	396	10/3/2003	586+221=807
Sagar Vijay	2003	30/8/2002	10/1/2003	132	--	5/6/2003	132+145=277
Sagar Bhushan	2003	15/4/2002	2/12/2002	246	56	26/4/2003	246+144=390
Sagar Pragati	2005	4/2/2002	28/11/2003	663	473	15/4/2004	663+137=800
Sagar Vijay	2005	5/11/2004	22/07/2005	259	69	27/11/2005	259+127=386
Sagar Bhushan	2005	25/2/2005	08/11/2005	255	65	Not yet sent	255+265 (upto 31/7/2006)=520

Audit also noted that the large time gap in finalisation of the scope of work and placement of notification of award resulted in non-inclusion of essential repair works in the contract. The deficiencies noticed during the interim period from the stage of preparation of scope of repairs till actual dispatch of the rigs also remained uncovered in the contract. These items were subsequently added by way of change orders, resulting in time overrun.

In December 2006, the Management agreed that the recommendation and suggestion made by Audit would be taken care of in future.

Recommendation

- There should be a clearly laid down tender procedure for contracts of dry dock and major repairs, prescribing the stage-wise time schedule to avoid delay.

7.7.4.3 No benefits from upgradation

(i) During major lay-up or dry dock repairs of the jack up rig Sagar Samrat in March to November 2003, the top drive system was installed at a cost of Rs.9.50 crore with a view to handling well complications efficiently. In the expenditure sanction it was stated that this would also increase the cycle speed of the rig and the same would be upgraded at par with the latest offshore drilling technology available.

Audit noted that the cycle speed of rig Sagar Samrat for the period from December 2003 to March 2004 after upgradation was recorded at 717 metres which declined to 249 metres in 2004-05 i.e., less than the level of performance recorded in pre-upgration period (507 metres in 2001-02 and 496 metres in 2002-03). Further, after upgradation the rig lost 130 days in 2004-05 on account of down hole problems which was proposed to be reduced by introduction of top drive system. Thus, the upgradation of rig Sagar Samrat at a cost of Rs.9.50 crore did not yield the higher performance envisaged.

The Management stated (December 2006) that top drive system was installed at rig Sagar Samrat during dry dock in March to November 2003 for upgradation of the rig for better performance and to take up more difficult wells and avoid operational limitations. But due to complications in the well no meterage could be achieved during 2004-05.

It is evident from the reply that intended objectives could not be achieved and the expenditure incurred on upgradation did not yield the desired results.

(ii) Similarly, an expenditure of Rs.77.05 crore including Rs.43.91 crore on drilling related equipment was incurred (March to November 2003) on dry dock of rig Sagar Samrat. Expenditure sanction envisaged that the rig would be used for another 10 to 12 years. However, the rig was converted (October 2005) into Early Production System based on its age and efficiency analysis.

The Management stated (December 2006) that rig Sagar Samrat was being utilised as EPS to revive production due to major accident that took place at Bombay High North platform. Equipment upgraded or replaced were sent to different locations for their further better utilisation.

The decision to upgrade a 33 year old rig did not give the expected results and as such the upgradation could have been undertaken on a rig having longer and potentially more

efficient residual life. During the post upgradation period of 675 days, the rig was out of operation for 440 days due to down hole problems, waiting on weather, leg repairs, etc.

Thus, due to improper planning, the expenditure of Rs.77.05 crore incurred on upgradation and dry dock proved unfruitful as the benefits of dry dock could not materialise as envisaged.

Recommendation

- Upgradation should be carried out on the rigs after proper review of their residual useful life and performance.

7.7.5 Health, safety and environmental issues

7.7.5.1 Non compliance of surveyor's recommendations for class

In compliance with the requirements of ISM Code, the Company obtains a 'document of compliance' issued by DG Shipping or by accredited societies like IRS and ABS. The certificate, valid for five years, is issued after verification of proper functioning of rigs through periodical surveys. The surveyor also issues short term certificates as extensions within which deficiencies pointed out need to be rectified. The certificates have to be renewed before expiry. Not attending to the deficiencies pointed out by the surveyors might lead to non-renewal of statutory certificates, imposition of 'condition of class♣' or 'suspension of class♠' assigned to the rig. In the absence of class certificate, naval clearance is not given for rig movement.

Audit noted that in some cases the deficiencies pointed out by the surveyors were not attended to, which led to non-renewal of class certificate, short term extension of class certificate and suspension of class. Rig Sagar Uday was continued in operation for 26 days (April 2005) despite non-renewal of class certificate (expired on 31 March 2005) due to non-compliance to ABS observations. The rig did not get naval clearance for movement.

Audit also noted that in case of Sagar Samrat and Sagar Vijay, the certificates were extended on short term basis (as short as two months) due to non-rectification of the outstanding deficiencies. Since the recommendations involved long lead time for procurement of items, the Company could have coordinated procurement of material from OEM and planned availability of berth in shipyard in time for which periodicity of dry dock is fixed. Since each extension of certificate entails two to three visits by class surveyors and expenditure of more than Rs.84,000 per visit, non-compliance of surveyor's recommendations led to not only working in unsafe conditions but also avoidable expenditure of Rs.1.93 crore during 2000-01 to 2005-06 on account of surveyor's visits for nine rigs.

♣ ***When a surveyor identifies defects or damages which affect the ship's class, remedial measures and/or appropriate recommendations/conditions of the class are implemented before ship continues in service. 'Condition of the class' refers to the requirement that specific measures/repairs are to be carried out by the owner within the specified time limit in order to retain the class.***

♠***Class is assigned to ship upon completion of satisfactory surveys and where conditions for maintenance of class are not complied with, class will be suspended/withdrawn or revised to different notations. Thereby the ship may lose its class either temporarily or permanently. In the former case it is referred to as 'suspension of the class' while in the latter it is 'withdrawal of class'. In the case of surveys that are not carried out within the specified time frame, or if the vessel is operated in a manner that is outside the classification designation, the suspension may be automatic.***

The Management stated (December, 2006) that due to operational exigencies, the recommendation might have been deferred but with the approval of competent authority, short-term extension was obtained. The instances of 'suspension of class' and 'condition of class' brought out in the Report did not reflect acceptable practice and, therefore, the reply of the Management that short term extensions were with the approval of competent authority was not acceptable when safety aspects are involved.

Recommendation

- The Company should immediately take up the rectification of deficiencies pointed out by the class surveyors. This would avoid short term extension of the statutory certificates and save rigs from eventualities such as suspension of class assigned to it and thereby fulfil safety provisions.

7.7.5.2 Accidents

'Goal Zero' of corporate environmental management includes zero accidents, lost mandays and fatalities. Audit, however, noted that 72 accidents (Major–11, Minor-55 and Others– six) involving workmen and equipment occurred on rigs during the four years ending 2005-06. The Management in its own investigation reports accepted that these accidents took place due to lack of preventive maintenance of tools and equipment, poor house keeping and lack of safety awareness among workmen.

The Management stated (December 2006) that for reduction in accidents, technical and safety audits were regularly carried out. The reasons of accidents were being analysed and lessons learnt were being circulated to all concerned. However, 'Goal Zero' was yet to be achieved.

7.7.5.3 Completion of drilling without obtaining environmental clearance

The Ministry of Environment and Forests (MoEF), Government of India's notification of 13 June 2002 stipulated that all Exploration and Production (E&P) projects costing more than Rs.100 crore and above required environmental clearance from the GOI before commencement of the projects. For this, public hearing[♣] was also mandatory as per an earlier notification of 10 April 1997. The environmental clearance was granted for five years subject to observance of certain conditions. The organisation was required to send half yearly compliance status reports to the MoEF, GOI.

Audit scrutiny revealed that the Company started or continued the construction work of four major E&P projects (**Annexure-14**) with an aggregate capital cost of Rs.10,672.87 crore without obtaining even the 'consent to establish' from the Maharashtra Pollution Control Board (MPCB) and environmental clearance from the GOI. Out of these, modifications/commissioning of platforms of two projects had been completed in November 2002 and February 2006 at a cost of Rs.581.96 crore without obtaining environmental clearance from the GOI. Under these four projects 183 wells were drilled by March 2006. 'Consent to Establish' by MPCB had been granted in case of two projects (under implementation) only in March 2006 subject to the condition that No Objection Certificates from the State Government and Environmental Clearance from the GOI were to be obtained before taking any steps for development of the projects. Audit noted that environmental clearance was delayed due to the Company not submitting

♣ ***Public Hearing procedure gives opportunity to public to register their suggestions, view, comments and objections about the project.***

completed applications to the GOI in time. The time taken for compliance with various steps to be completed for seeking environmental clearance of the projects is given in **Annexure-15**. Non-compliance of the GOI's notification may attract penal action.

The Management stated (September 2006) that the Company had planned to revise the procedure to reduce the time required for getting environment clearances and that due to procedural steps at the MPCB and the GOI, environmental clearances needed more time.

Recommendation

- Environmental clearance should be obtained before commencement of any project costing Rs.100 crore and above as per the GOI's notification.

7.7.5.4 Use of ozone depleting substances

Section 7 of the Ozone Depleting Substances (Regulation and Control) Rules, 2000 prohibits purchase of Ozone Depleting Substances (ODS) for stocking or for using them for specified activities which include 'servicing of the fire extinguishers and fire extinguishing systems', unless end use declaration is given to the seller of ODS in prescribed format within one year from the commencement of these Rules. Further, as per Section 14 of the said Rules, maintenance of records and filing of report in the prescribed manner is required.

Audit scrutiny revealed that 22,216 kg of Halon-1211 and Halon-1301(ODS) was purchased for Mumbai Region during 2004-05 and 2005-06 for use in servicing of fire extinguishers and fire extinguishing systems, without giving end use declaration to the sellers in the prescribed format. The Company continued to maintain a stock of 7,116 kg of Halon gas of which 4,448 kg was in the owned rigs of the Company. The Company had no plan to replace this substance with ozone friendly agent by January 2010 as mentioned in the Rules and also reported in the in-house Health, Safety and Environment Audit Reports of the owned rigs. Further, the Company neither maintained records in the manner prescribed under the Rules nor submitted reports to the concerned registering authority mentioned therein.

The Management stated (December 2006) that the concerned wings of the Company had been asked to issue policy guidelines in this regard.

Recommendation

- Adherence to environmental protection regulations like Ozone Depleting Substances (Regulation and Control) Rules, 2000 needs to be monitored and ensured.

7.7.5.5 Outstanding recommendations of Technical Audit

Audit noticed that out of 408 audit observations of essential, desirable and vital character made in Technical Audit, 234 were pending as on 12 September 2006. Of the pending audit observations, 77 were of vital character including 25 on safety. Details of the pending audit observations of vital character on safety are given in **Annexure-16**.

The Management stated (June 2006) that lot of time was consumed to assess the requirement based on OEM representative's visit on board, to attend to recommendations of auditors and to arrange inputs like manpower and material, of which several items had a long lead time. Carrying out of repairs was also deferred till dry dock.

Recommendation

- Immediate action should be taken on long pending internal audit observations to avoid adverse effect on efficiency and safety of rigs and personnel.

7.7.6. Ineffective monitoring and internal controls

Tender procedure for charter hiring of rigs was defined in the Material Management Manual but it was not monitored and controlled at various stages. As a result, the tender process got delayed almost at every stage. Indents for charter hiring of rigs were not formulated properly by Drilling Services as the requirement of different types of rigs was not determined and firmed up in time. The tenders were not floated in time. Requirement of rigs was changed even after issue of NIT, leading to hiring of rigs on nomination/limited tender basis often at higher rates and by relaxing critical clauses. The rig market was very costly and demand driven but the necessary monitoring system to ensure advance planning and timely tendering to hire rigs at the most appropriate rate was not in evidence.

Audit observed weak internal control over dry dock and major repairs of owned rigs as these failed to meet statutory requirements. The provisions given in the manual and the findings of internal technical audit were not acted upon. The time required for actual placement of Notification of Award after the preparation of scope of work had not been standardised in any of the manuals or the procedure for dry dock work.

Audit noticed that monitoring and internal control over safety, health and environmental issues was weak as:

(i) The recommendations of the Classification society/surveys for owned rigs were not implemented in time and short term extensions were sought,

(ii) Projects were started without environmental clearance from the GOI,

(iii) Adequate measures to reduce accidents on rigs were not taken up,

(iv) Stocking and using Ozone Depleting Substances continued without complying with statutory provisions,

(v) Vital recommendations on safety by technical audit were not implemented.

Recommendation

- Monitoring and internal control system should be strengthened so that planning, charter hiring, deployment, dry dock repairs, etc. are managed efficiently and the health, safety and environment aspects involved in rig operations are adequately addressed.

7.8 Conclusion

The Company did not carry out any detailed cost-benefit analysis for deciding upon acquisition of new rigs vis-à-vis charter hiring. Non-acquisition of new rigs made the Company vulnerable to fluctuations in the rig market and subjected to uncertainties in availability of rigs. The process of tendering and developing bid evaluation criteria etc. needed close monitoring and review.

The Company's target for reserve accretion was affected due to inadequate planning and exploratory drilling. Rigs had been idling due to non-availability of materials and tools,

other logistic reasons. The Company had not taken adequate measures to improve the performance of owned rigs in comparison to charter hired rigs. Rigs of higher capacity had been hired and deployed for drilling in less water depth and work-over operations. The Company had not laid down any policy for dry dock of jack up rigs and these rigs had not been dry docked for long periods.

The Company had not been able to meet international and national safety requirements of owned rigs and could not get renewal of class certificates immediately on their expiry. Four major exploration and production projects which involved drilling of 183 wells were commenced without obtaining mandatory environmental clearance from the GOI. The Company had been stocking and using 'Halon', an ozone depleting substance, without following the due statutory procedure. There was no plan with the Company to replace the ozone depleting substance by the due date.

The monitoring and internal control system was not adequate for effective planning, charter hiring, deployment and dry dock repairs of rigs.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

MINISTRY OF SHIPPING

CHAPTER VIII

The Shipping Corporation of India

System of collection and accounting of freight and other charges from agents

Highlights

During 2005-06, 95 *per cent* of the agents did not submit voyage accounts within the prescribed 20 days.

(Para 8.5.1)

Due to delay in receipt of accounts and their reconciliation, unreconciled amount kept on increasing and amounted to Rs.122 crore as of March 2006.

(Para 8.5.2)

In violation of contractual provisions, 17 agents did not open separate bank accounts for depositing freight and other charges collected by them on behalf of the Company. The Company did not take any action.

(Para 8.5.4)

The Company failed to recover Rs.2.02 crore due to non-enforcement of contractual provisions regarding timely deposit of freight by M/s Norton Lily, USA.

M/s. Strachan Shipping Agency had been remitting freight and other charges collected on behalf of the Company with a delay of one month to two months resulting in loss of interest to the Company. As of November 2006, the Company was to receive Rs.2.86 crore from the Agent.

The Company did not take legal action against the Arcadia Shipping Limited for the outstanding amount Rs.7.01 crore for the year 1997-98 in spite of termination of the agreement in November 2001.

The Company did not take timely action for recovery from M/s. Mathuradas Narandas and Sons, leading to non-recovery of Rs.4.97 crore.

(Paras 8.5.4.1, 8.5.4.2 to 8.5.4.5)

The Company failed to ensure opening of separate disbursement account by agents. Out of 44 major agents, only six agents opened such accounts.

(Para 8.5.5)

The Company failed to prevent overcharging of telephone expenses of Rs.1.79 crore by M/s. Strachan Shipping Agency who subsequently agreed to refund the same in 24 monthly instalments payable from April 2005.

(Para 8.5.6.1)

The Company failed to prevent overcharging of Rs.1.50 crore toward container monitoring fees by the Far Eastern Services Private Limited during the period from August 1997 to March 2002. It did not deduct the same from the amount paid to the Agent. The amount remained blocked till August 2005. Besides this, in a settlement (April 2003) with the Agent, the Company paid Rs.85.31 lakh towards disbursement charges to the Agent which were not prescribed in the agreement

(Para 8.5.6.2)

Recommendations

The Company needs to evolve an unambiguous and comprehensive master agreement to be executed with agents which may be changed according to the local and individual requirements as may be required. It should be ensured that all freight and other charges collected by agents are deposited directly into the account of the Company in time and only *bona fide* expenditure is claimed by the agents. With the development of faster means of communications, the Company is required to develop an effective system of timely receipt of accounts and information from the agents. Accounts have to be reconciled in time and in case of any ambiguity, the same should be resolved without loss of time.

8.1 Introduction

The Shipping Corporation of India Limited (Company), Mumbai was established on 2 October 1961 by amalgamating Eastern Shipping Corporation and Western Shipping Corporation. As on 31 March 2006, the Company had a fleet of 83 ships. The Company had a network of offices at New Delhi, Chennai, Kolkata, London and Shanghai and 128 agents[♣] at various Indian and foreign ports.

The Company conducts its business through three operating divisions viz Bulk Carrier and Tanker (B&T), Technical and Offshore Services (T&OS) and Liner and Passenger Services (L&PS). B&T business involves chartering out of entire vessel to a single party, directly or through brokers. T&OS division transports goods between the offshore facilities of Oil and Natural Gas Corporation Limited and mainland. L&PS transports passengers and cargo booked directly or through agents.

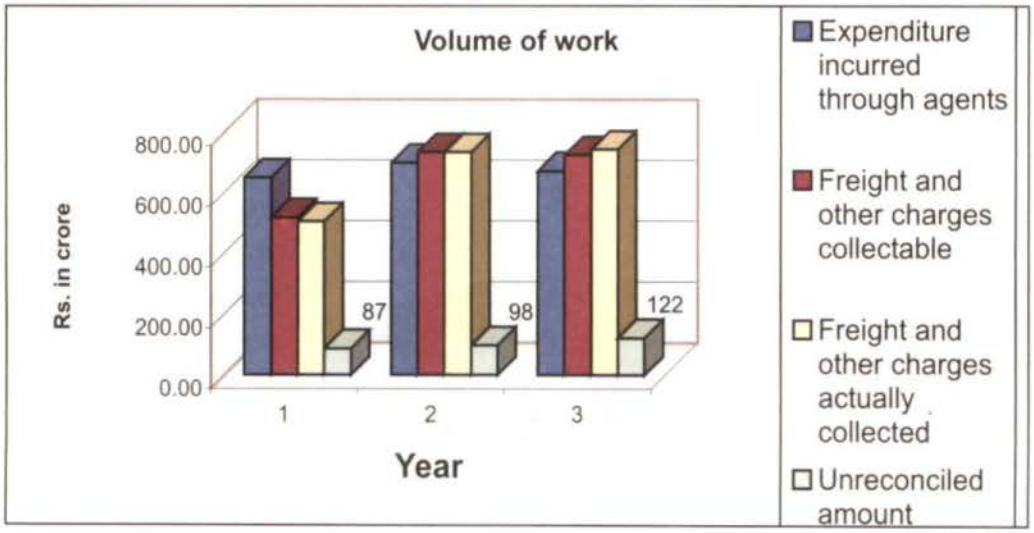
The agents appointed by the Company provide the following services:

- Securing L&PS business
- Collection and remittance of freight and terminal charges
- Handling of cargo and containers
- Husbanding business

8.1.1 The graph given below indicates the expenditure incurred through agents, freight and other charges collectable, amount actually collected and unreconciled amount. It

♣ ***84 regular agents and 44 ad hoc agents***

could be seen that unreconciled amount had been increasing during last three years in spite write off of unmatched collection (receivable Rs.97 crore and payable Rs.119.58 crore) in 2004-06.



8.2 Audit objectives

Performance audit was carried out to assess:

(i) Whether there was a proper system to ensure that freight and terminal handling charges were collected and deposited into the bank account.

(ii) Whether there was a proper system of accounting of freight and terminal handling charges.

8.3 Audit criteria

The audit was carried out and audit conclusions were drawn keeping in view the terms and conditions of the agreement and the procedures prescribed by the Company for receipt of accounts and its reconciliation.

8.4 Audit methodology and acknowledgement

The records of accounts rendered by agents, their reconciliation and settlement of account with agents during the three years from 2003-04 to 2005-06 were examined in the course of Performance audit. The audit programme and objectives were discussed at the entry conference held with the Management on 23 May 2006. The audit findings were discussed at the exit meeting held on 12 September 2006.

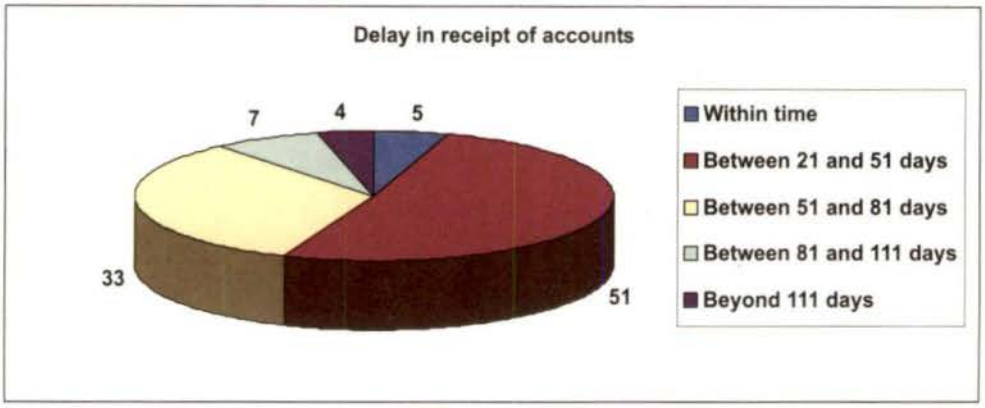
The cooperation of the Management in the course of audit and during the meetings is thankfully acknowledged.

8.5 Audit findings

Review of the records relating to the status of account balances of agents, their reconciliation and settlement of accounts disclosed the following:

8.5.1 Delay in submission of accounts by agents

In August 2002, the Company instructed all the agents that in case of delay beyond the stipulated deadline for submission of accounts, a penalty of US$ 100 for each day of delay would be levied. For submission of accounts by agents, the Company fixed (September 2004) a limit of 20 days from sailing the vessel. A review of the voyage accounts for the year 2005-06 disclosed that accounts were generally not received in time as could be seen from following graph.



A review of the record maintained by the Company to monitor the receipt of information disclosed that in many cases entries were not complete in a manual register maintained by the Company.

The Management admitted that it had not recovered any amount from agents by way of penalty and stated (October 2006) that delay in submission of voyage accounts were noted and the same was taken up with the agents periodically.

The Company needs to strengthen the mechanism for the monitoring of timely receipt of accounts.

8.5.2 Delay in reconciliation of account

Due to delay in receipt of accounts statement and their reconciliation, the unreconciled amount kept on increasing. The Company appointed M/s Khandelwal Jain and Company, Chartered Accountants to reconcile an amount of Rs.4070 crore for the period 1997-2004. However, they could not reconcile Rs.198 crore. Of this, the Company made a provision for Rs.14.13 crore and wrote off Rs.97.03 crore (Rs.119.58 crore was also written back as income) while it did not take any action on the remaining Rs. 86.83 crore for the period 2002-04. For the period 2004-06, the Company made efforts to reconcile the amount departmentally. As of October 2006, there was an unreconciled amount of Rs.35.21 crore as per **Annexure-17.**

8.5.3 Collection without collectable and collectable without collections

A further review of data for the year 2005-06 relating to 17 selected agents and four offices of the Company revealed that in 3,737 cases there were collections without collectables amounting to Rs.11.45 crore and in 1,208 cases there were collectables without collections amounting to Rs.12.73 crore indicating that the booking of collectables and collections were inaccurate.

The Management stated (October 2006) that the freight collection details for some bills of lading were erroneously reported under incorrect account codes. It further stated that freight reconciliation involves identifying the reasons for the mismatched amount, thereafter making the necessary rectification entries and thereby minimising the mismatches to the extent possible. The reply amply emphasised the need for a better system of booking of freight collectable and collection.

8.5.4 Separate bank account for freight and other receivables

As per the agency agreement, agent should open a separate account in the name of 'the Shipping Corporation of India Limited – Freight Account' for crediting the freight and all other monies due and payable to the Company on the same day or maximum on the following day. Where the account could not be in the name of the Company, it should be opened in the name of agent as 'Freight Account–as Agents of SCI'. It was the responsibility of agent to ensure that all monies and other receivables collected on behalf of the Company were deposited into the account immediately on collection to facilitate monitoring and reconciliation of collection on a daily basis. It was, however, noted that out of 38 major freight collecting agents, 17 agents did not open separate freight accounts. The agreements were silent on the consequences of any agent not opening a separate bank account.

The Management did not furnish any reply.

Failure of the Company to enforce opening and operating of separate bank account for freight resulted in the following irregularities:

8.5.4.1 M/s Norton Lily was agent at USA for 36 years. In April 1999, when agreement with them was terminated due to delay in deposit of freight collected and other irregularities♣, the Company was to receive US$ 1.013 million (Rs.4.95 crore♥) from the Agent. To recover the outstanding amount, the Company filed (December 2000) a suit in the United States District Court, New York and reached (June 2002) an out of court settlement, whereby the Company received a sum of US$ 0.6 million (Rs.2.93 crore) only. Thus, due to non-enforcement of agreement for timely deposit of freight, the Company incurred a loss of US$ 0.413 million (Rs.2.02 crore).

The Management accepted the facts.

8.5.4.2 M/s. Strachan Shipping Agency, (SSA) the Agent of the Company in USA had been collecting freight cheques and other receipts in their name and deposited the same in their account instead of the collection account of the Company. Like other major agents, SSA enjoyed a freight float of one to two months of freight collections ranging from Rs.20 crore to Rs.25 crore for more than two years. The float was brought down to 15 days in November 2002. The Company suffered loss of interest on account of the float allowed to agents.

A special audit of the transactions with SSA was conducted by a team appointed by the Company, due to irregularities committed by the Agent. To resolve the issues noticed, a commercial settlement was reached (March 2005) with the Agent. Even after the commercial settlement, the Agent had been remitting the money with a delay ranging from 6 to 67 days. Freight and terminal handling charges due from the Agent for the

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♣ ***Accumulation of containers, inadequate monitoring and conflict of interest***

♥ ***At exchange rate of one US$=Rs. 48.90***

years 2004-05 and 2005-06 amounted to Rs.2.60 crore and Rs.26.28 lakh respectively as of November 2006.

The Management stated (October 2006) that the Agent had recently opened two separate bank accounts for the purpose of depositing freight collections as well as for debiting disbursements and with the opening of these accounts, the delay in remittance of freight was not expected to take place.

According to the settlement, all pending issues were to be reconciled and settled by April 2005. However, freight amounting to Rs.84.29 lakh for 2000-01 to 2005-06 had not been reconciled so far (October 2006).

The Management stated (October 2006) that the unreconciled amount was mainly on account of non-receipt of documentary evidences for cases where the agents had indicated that the freight can not be recovered from the consignees for reasons like abandoned cargo and litigation matters, etc.

SSA had reduced the freight payable by US$ 332,189 (Rs.1.46 crore at an exchange rate of one US$= Rs.43.805) in April 2005 and US$ 177,484 (Rs.81.54 lakh at an exchange rate of one US$=Rs.45.94) in November 2005 as compared to the freight booked. However, the Management could not furnish reasons and the authority for the freight reduction.

8.5.4.3 The Company entered (November 1993) into a Memorandum of Understanding (MOU) with Arcadia Shipping Limited (ASL), Mumbai for shipment from India. As per the MOU, the freight was required to be paid by M/s. Puyvast Chartering, Rotterdam (Principal of Arcadia Shipping Limited) to the Company's account with State Bank of India, London. The Company's office at London was to forward details on monthly basis to its Accounts Department. During the year 1997-98, total freight booked for granite shipments amounted to US$ 3.115 million, out of which the Company could not recover US$ 1.629 million (Rs.7.01 crore). Agency agreement with ASL was terminated (November 2001) for committing a fraud. The Company repeatedly asked ASL to furnish details of remittance of US$ 1.629 million, but, their response was not satisfactory. The Company treated the amount of Rs.7.01 crore as doubtful of recovery in the accounts for the year 2004-05.

The Management stated (October 2006) that the matter for recovery had been referred to lawyers who required documents like MOU, ledger accounts and correspondence with the parties to proceed. It further stated that due to passage of time it was difficult to locate all the documents required by Audit.

Reply of the Management showed that they failed to take timely legal action to recover Rs.7.01 crore in spite of termination (November 2001) of agreement with the ASL for involvement in a fraud.

8.5.4.4 The Company started cellular container services on India-Europe sector in January 1994. The slots in the container services were marketed by the Container Movement (Bombay) Private Limited, Mumbai, marketing agent. Since utilisation of the slots was not satisfactory, it was decided to offer slots to slot operators. Accordingly, M/s. Mathuradas Narandas and Sons (MNS) were marketing the container slots regularly since June 1994. Invoices in respect of slot containers were raised by the marketing agents.

The Marketing agent intimated (June/July 1997) to the Company that the outstanding amount due from MNS was increasing. However, the Company did not take any action against the party and the outstanding amount went up to Rs.4.66 crore. In March 1998, when the Management took up the matter with MNS, the latter issued 49 cheques totalling Rs.2.33 crore. They hypothecated 37 trucks and mortgaged three immovable properties as security for the stated value of Rs. three crore. But all the cheques were dishonoured when presented to the bank. In response to another opportunity given by the Company to clear dues, they issued 14 fresh post dated cheques of Rs.2.45 lakh each payable from 15 June 1998 onwards on daily basis. However, those cheques also bounced when presented to the bank.

The Company filed four criminal cases (August and September 1998) against MNS and a civil suit (June 1999) in the Mumbai High Court. At the direction of the Court, the matter was referred (October 1999) for arbitration.

Against the total receivable of Rs.5.18 crore, the arbitrator awarded (January 2003) Rs.5.04 crore in favour of the Company. However, the Company could recover only Rs.6.81 lakh from auction of 16 trucks seized and auctioned by the court receiver. Other immovable properties mortgaged with the Company could not be auctioned as one property i.e., office space (stated to be valued at Rs.90 lakh) leased from Mumbai Port Trust was taken over by the Port Trust. As stated by the Management, there was no response for the remaining properties at Kandla and New Delhi.

Thus, laxity of the Company in ensuring timely realisation of its dues resulted in non-recovery of Rs. 4.97 crore.

8.5.4.5 Seaster Shipping Lines Limited., Bangladesh appointed as Agent in April 1998 was not regular in remitting the freight collected. The delay ranged between 58 and 230 days, the average period of delay being 159 days. As of August 2006, the freight outstanding from them was US$ 614374 (Rs.2.86 crore[♣]).

The Management stated (October 2006) that delayed remittance of freight from Bangladesh was recognised as part of the trade practice and during meeting with the Agent, it was agreed to enhance the bank guarantee from US$ 100000 to US$ 250000 and efforts were on to reduce the credit period allowed by the Agent to the trade. It was, however, observed (September 2006) that the Company had not obtained bank guarantee of US$ 250000 from Seaster Shipping Lines to protect its interests.

8.5.5 Separate disbursement account

As per the agency agreement, agent would maintain a separate disbursement bank account to keep the funds remitted by the Company for attending to vessels on the basis of 'Cash Requirement Report'. It was, however, noted in audit that out of 44 major agents, only six agents opened separate disbursement account.

Pending reconciliation with agents, the Company was showing net amount receivable/payable from agents. As of March 2006, the Company was to receive Rs.18.84 crore (Rs.17.12 crore from 44 agents and Rs.1.72 crore from 25 former agents) and pay Rs.29.84 crore (Rs.22.77 crore to 74 agents and Rs.7.07 to 29 former agents) **Annexure-18.**

[♣]*At exchange rate of one US$=Rs.46.55*

The Management stated (October 2006) that the matter regarding opening of bank account for disbursements was in progress. In addition, the Company was also contemplating implementation of Global Cash Management System, which if implemented, would take care of this issue.

8.5.6 Control over amount claimed by agents

8.5.6.1 Upto April 2001, M/s. Strachan Shipping Agency, (SSA) was seeking prior approval of the Company for reimbursement of expenses. However, from May 2001, it started netting the expenses from the amount payable to the Company. The Company instead of enforcing compliance regularised the arrangement and thereby lost control over the amount charged by SSA. SSA overcharged container monitoring fee by US$ 281228 (Rs. 1.26 crore at an exchange rate of one US$=Rs. 44.655), commission by US$ 145589 (Rs. 65.01 lakh) and also other charges which could not be quantified. According to the commercial settlement of April 2006, SSA agreed to refund US$ 54363 (Rs.25.28 lakh) to the Company. Further, SSA also agreed to refund a sum of US$ 400000 (Rs.1.79 crore) towards telephone charges overcharged by them in 24 monthly instalments from April 2005 onwards.

The Management stated (October 2006) that the commercial settlement had been reached considering various aspects including agents' cash flow position and recoverability of the money and US$ 283222 (Rs.1.26 crore) had been recovered. Clearly, the Company initially failed to monitor the expenditure charged by the Agent and there was no justification for granting time for recovery of the amount overcharged by the SSA.

Excess fee charged by the Far Eastern Services Private Limited

8.5.6.2 Far Eastern Services Private Limited, Singapore was appointed (August 1989) agent of the Company. By an amendment (February 1992) to the agreement, the agency fees and agency commission payable were fixed with retrospective effect from 15 July 1991. The amendment *inter alia* prescribed handling charges for transhipment containers and container monitoring fee. However, the amendment did not mention anything by way of monitoring fees on consortium partners', ship owner's and slot containers. But, Far Eastern Services Private Limited had been billing the Company for such containers. The excess container monitoring fees charged by the Agent during the period from August 1997 to March 2002 amounted to Singapore dollar 887759 (Rs.2.38 crore at an exchange rate of 1 Singapore $= Rs.26.83).

M/s. Strait Ship Chandlers, Singapore (under the same management as that of Far Eastern Services Private Limited, Singapore) were the contractors for supplying various stores and spares at Singapore. Their bills for various items supplied upto 31 March 2003 amounting to Singapore $1.241 million were pending for resolution of disputes like non-receipt of invoice, non-receipt of put on board certificate, very old bills pertaining to the period September 1987 to March 1997, etc. After negotiations with M/s. Strait Ship Chandlers and Far Eastern Services Private Limited, the Company arrived (April 2003) at a global settlement. Review of the settlement disclosed the following:

(a) According to the addendum of February 1992, no disbursement commission was payable to Far Eastern Services Private Limited. Further, there was no claim from them for such charges from the beginning. It was only at the time of global settlement in April 2003 that these charges were claimed by it. As such, payment of disbursement surcharge

of Singapore $326000 (Rs.85.31 lakh♣) to Far Eastern Services Private Limited was irregular.

(b) The Company paid Singapore $ 157398 (Rs.42.23 lakh at the exchange rate of one Singapore $=Rs.26.83) to M/s. Straits Ship Chandlers without put on board certificate and non-contract approval. This payment was irregular as it did not fall within the laid down procedure for payment of bills by the Company.

(c) According to the settlement, the Company was to pay Singapore $ 1.07 million (Rs.2.87 crore at the exchange rate of Singapore $1=Rs.26.83) to M/s. Strait Ship Chandlers and receive Singapore $ 0.56 million (Rs.1.50 crore) due from the Far Eastern Services. However, the Company paid (up to March 2003) Singapore $ 0.91 million without deducting the receivable amount of Singapore $0.56 million which was subsequently paid by the Far Eastern Services Private Limited in August 2005 after a delay of two years. This resulted in loss of interest and reflects lack of effective internal control in implementation of commercial settlement.

The Management stated (October 2006) that the fees charged by the Agent were as per their interpretation of the agency terms and the matter was resolved commercially by recovering the amounts charged for partners' containers.

The reply is not tenable as there was no proper system of checking the accounts submitted by M/s. Strait Ship Chandlers and Far Eastern Services Private Limited. If the accounts were properly checked in time, the excess charging by them would have been noticed and remedial action taken.

8.5.7 Bank guarantee

The procedure for appointment approved in December 1995 provided for obtaining bank guarantee from agents. However, the Company obtained bank guarantee from only 18 agents as of October 2006 out of total 84 regular agents. In case of M/s. Strachan Shipping Agency, though the Finance Division repeatedly suggested collecting a bank guarantee of US$ one million, the Company did not obtain any bank guarantee from the Agent till May 2006 when it obtained a bank guarantee of US $ 100000 only.

The Management stated (October 2006) that the procedural guidelines for obtaining bank guarantee from agents were under revision and a new set of guidelines would be put in place very soon.

8.5.8 Deposits with customs, port trust, etc.

The Company had to deposit in advance the statutory payments with the customs and port trust authorities. The Company opened running accounts with these authorities and the funds remitted by the Company and the expenditure incurred towards customs or port trust dues were credited/debited to the account opened in the name of the Company. The payments were made by way of demand draft/electronic fund transfer in favour of the respective port trust/customs authority.

As per the agreements with agents, they were required to submit the "Port Deposit" reconciliations on monthly as well as quarterly basis. On receipt of the monthly

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♣*At an exchange rate of Singapore dollar 1 = Rs.26.17 as of August 2005*

statement from the port authorities, agents would validate the various port related entries from their own accounts and prepare the reconciliation statement.

There were 70 such deposit accounts as on 31 March 2006. Though the Company was specifically requested (June 2006) to furnish the balance confirmation obtained from these agencies, the Company produced confirmation in the case of only 18 port authorities, out of which, only in five cases the balances exactly tallied with the book balance of the Company. Out of the 13 cases where the balances did not tally, in 11 cases the balance as per confirmation statement was Rs.3.09 crore whereas the balance as per the Company's books was Rs.12.55 crore. In the remaining two cases there was a negative balance of Rs.24 lakh as per confirmation statement whereas the balance as per the Company's books was a negative balance of Rs.3.06 crore which showed that deposits had not been made in time. Normally, there should not be any such negative balance.

It would be observed from the above that the system of obtaining balance confirmation was very weak and the Company should have held agents responsible for reconciling the balance with port trust/customs authorities.

Recommendation

- Reconciliation of port/customs deposits on a regular basis as required in the agency agreement need to be ensured safeguarding the interests of the Company.

The Management stated (October 2006) that the recommendation had been noted.

8.5.9 Submission of audited freight and disbursement account

As per the agency agreements, agents were required to submit every year freight and disbursement account audited by a Certified Public Accountant. However, so far only three agents out of 128 had submitted audited freight and disbursement accounts. The Company should have insisted on audited freight and disbursement accounts to ensure that all monies due to the Company were collected and deposited/remitted to the Company and only genuine expenses were included in the disbursement accounts.

The Management stated (October 2005) that the observations were noted for following up with agents.

8.6 Conclusions

The Company did not have an effective system to ensure compliance with the contractual terms with agents regarding the following:

(i) Opening of separate bank account and depositing all freight and other charges collected within prescribed time;

(ii) Opening of separate bank account for expenditure and preventing netting of expenditure from freight collected;

(iii) Timely receipt of accounts;

(iv) Furnishing of bank guarantee.

The Company could not carry out timely reconciliation of accounts and resolution of ambiguities and the disputed terms and conditions. This led to blocking of Company's

funds and the agents charging the Company with excessive expenses besides involving the Company in unnecessary litigation.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

MINISTRY OF STEEL

CHAPTER IX

Steel Authority of India Limited.

Coal Dust Injection system in the blast furnaces

Highlights

The increasing cost of coking coal led the Steel Authority of India Limited (Company) to make all out efforts for increased use of non-coking coal in blast furnaces. The Company introduced Coal Dust Injection system (CDI) in six blast furnaces in its two Plants and has a Corporate Plan to introduce CDI in all the Plants in a phased manner. The Company, however, went ahead with its plans before ensuring availability of other infrastructural facilities for successful operation of CDI resulting in underutilisation of the capacity for CDI created.

The important points observed during audit were:

- The existing conditions of the blast furnaces were not conducive to coal injection of 150 kg/MTHM[+]. Therefore, the supplier guaranteed an injection rate of 100 kg/MTHM only which was two-thirds of the installed capacity (150kg/MTHM).

(Para 9.6)

- As a result of non-achievement of hot blast temperature of 1100^{0}C the anticipated reduction in coke consumption of 0.47 lakh MT valuing Rs.24.34 crore could not be achieved during 1999-2000 to 2004-05 in the blast furnace (BF-6) of Bhilai Steel Plant and the blast furnace (BF-4) of Bokaro Steel Plant. This also resulted in the blast furnace productivity not improving and had the effect of loss of hot metal production of 0.97 lakh MT valuing Rs.53.70 crore.

(Para 9.8.3.4)

- As against the guarantee for an injection rate of 100 kg/MTHM the actual coal injection rate ranged between 42 kg/MTHM and 80 kg/MTHM across all blast furnaces during the period covered in audit.

(Para 9.9.1)

- The shortfall in injection of coal dust of 4.45 lakh MT resulted in extra expenditure of Rs.64.56 crore since costly coke had to be consumed in place of proposed non-coking coal.

(Para 9.9.2)

[+] *Metric Tonne of Hot Metal*

- The Management approved proposals for installation of CDI in five more blast furnaces of Bokaro Steel Plant, Durgapur Steel Plant and Rourkela Steel Plant at an estimated cost of Rs.406.08 crore. Before approval, the Company had not taken into consideration the factors responsible for the poor results achieved so far.

(Para 9.10)

Recommendations

- The Company needs to take measures for revamping or capital repair of all the blast furnaces before introducing CDI. The cooling system of the blast furnaces should be improved.
- Equipment should be installed to increase the availability of oxygen for oxygen enrichment. Refractory of the proper quality should be installed in blast furnace that is capable of withstanding the required higher temperature.
- The stoves should be modified to increase the hot blast temperature above 1100^{0}C.
- Before committing fresh investment in the new CDI system in other blast furnaces, commensurate infrastructure should be created to achieve the optimum utilisation of CDI system.

The Management accepted (November 2006) the recommendations.

9.1 Introduction

9.1.1 Steel Authority of India Limited (Company) operates 24 Blast Furnaces (BF) with an annual production capacity of 13.60 million metric tonnes (MMT) of hot metal. Metallurgical coke (Met coke or BF coke) forms a major portion (55 to 60 *per cent*) of the cost of hot metal production. Replacement of expensive metallurgical coke with non-coking coal is being attempted actively the world over due to increasing cost and depleting sources of coking coal, and high operational and capital cost of coke oven batteries. This is being achieved through Coal Dust Injection system (CDI), where certain amount of non-coking coal is injected into blast furnaces. This injection reduces the consumption of coke in blast furnace.

9.1.2 The Company installed CDI in BF-2 of Bhilai Steel Plant (BSP) on experimental basis in 1984 at a cost of Rs.11.59 crore. The system, however, could not achieve sustained injection rates above 30 kg/MTHM. The failure was attributed to low hot blast temperature, high ash content in coal, non-uniform distribution of coal dust in the tuyeres, poor coal injection technology, inadequate monitoring instrumentation, etc. CDI in BF-2 of BSP was abandoned in 1986.

Subsequently in 1995, the Management approved installation of CDI in BF-5 of Bokaro Steel Plant (BOSP) and BF-6 of BSP, with an installed capacity of coal dust injection of 150 kg/MTHM, in order to meet the shortages, replace the costly Met coke and improve the productivity of the blast furnaces. CDI was envisaged to replace coke in the ratio of 1:1 i.e., one kg of coal dust would replace one kg of coke. Later on, the Company extended the facility in some other blast furnaces. The details of CDIs, installed in the Company are summarised below:

Sl. No.	Location of BFs	Sanction by Board/original cost	Month of commissioning/commencement of operation	Actual cost (Rs. in crore)
1	BF-4 (BOSP)*	Board Approval in February 1995 for Rs.48.08 crore.	November 1998	55.66
2	BF-5 (BOSP)**	Initiated in May 2004 for Rs.17.31 crore.	August 2005	10.07
3	BF-6 (BSP)	Board Approval in December 1995 for Rs.48.85 crore.	September 1998	48.93
4	BF-7 (BSP)**	Initiated in July 2002 for Rs.9.69 crore.	December 2004	9.87
5	BF-1 (BSP)	BSP revived the old equipment of CDI in BF-2 (original value - Rs.11.59 crore) installed in 1984 on experimental basis.	October/November 2005	22.27
6	BF-5 (BSP)			
	Total			**146.80**
*	Board had approved CDI in BF-5. But due to long shutdown of BF-5, CDI was installed in BF-4.			
**	Due to lower rate of injection in BF-6 (BSP) and BF-4 (BOSP) i.e., 55 to 71 kg/MTHM during 2001-02 to 2003-04 as against the installed capacity of 150 kg/MTHM, surplus capacity was available for pulverised coal so CDI was installed in other BFs by sharing the common facilities already provided for CDI in BF-6 (BSP) and BF-4 (BOSP).			

Corporate Plan-2012 of the Company provides for installation of CDI across all the plants in a phased manner. The Company has already initiated action for installation of CDI in Durgapur Steel Plant, Rourkela Steel Plant and BOSP with an estimated capital cost of Rs.406.08 crore.

9.2 Audit objectives

The audit objectives were to examine:

(i) The operational efficiency of the CDI – to study the achievement against the capability created;

(ii) Reasons and limitations responsible for low performance;

(iii) Factors considered before committing fresh investments on CDI in other BFs.

9.3 Scope of Audit

The Performance audit review covers the performance of CDI during the period of six years from 1999-2000 to 2004-05. The review extends to the proposed CDI systems in the Company.

9.4 Acknowledgement

Audit is thankful for the co-operation received from the Management in furnishing information, records, data, and clarification with reference to the queries raised from time to time.

9.5 Audit findings

The Company was eager to modernise its blast furnaces for making them cost effective but it did not ensure availability of commensurate infrastructural facilities for successful operation of CDI. This resulted in underutilisation of the capacity for CDI created.

9.6 Guarantee for only two-thirds of the designed capacity

The design capacity of the CDI system selected by the Company for installation was for coal injection of 150 kg/MTHM. As the existing infrastructure of blast furnaces was not suitable for such high injection rates, the supplier of CDI at BF-6 of BSP, viz. M/s Babcock Materials Handling Process Technology GmbH, Germany, guaranteed coal injection rate of 100 kg/MTHM only (i.e., two-thirds of the installed capacity of 150 kg/MTHM). The Management, however, went ahead with the installation of CDIs with 150 kg/MTHM injection capacity.

The Management stated (November 2006) that with a view to introducing CDI technology on experimental basis, which was new to the Company in 1995, the Company's Board of Directors approved CDI in BF-6 with a performance guarantee of 100 kg/MTHM.

Reply of the Management is not tenable as the Company had earlier installed CDI on experimental basis in BF-2 of BSP in 1984; thus CDI technology was not altogether new to the Company.

9.7 Performance guarantee test

9.7.1 As per the results of the performance guarantee test (PG Test) conducted for CDI at BF-6 of BSP (12 to 27 April 1999), an injection rate of 101 kg/MTHM as against the guaranteed 100 kg/MTHM was recorded to have been achieved. However, analysis of the Daily Production Report of BF-6 in BSP for April 1999, made by Audit revealed that there was no consistency in performance and there were wide fluctuations in the injection rates. The injection rate was as low as 21 kg/MTHM (on 17 April 1999) and exceeded 100 kg/MTHM only for three days (out of 15 days of PG test), viz. on 14 April 1999 (108 kg/MTHM), 15 April 1999 (121 kg/MTHM) and 25 April 1999 (103 kg/MTHM).

The Management stated (November 2006) that CDI rate of more than 100 kg/MTHM was achieved during the period prior to PG test but this could not be demonstrated in the PG test. An injection rate of more than 100 kg/MTHM was achieved on a few occasions only in PG test.

9.7.2 Since blast furnace operates continuously, without any break, CDI should also be capable of continuous operation. However, it was observed that for PG Test, CDI was not operated continuously for 15 days. As a result, sustainability of CDI operation for 24 hours a day could not be confirmed.

The Management stated (November 2006) that PG test for CDI would be carried out as per agreed criteria in future.

9.8 Absence of adequate infrastructural facilities

Adequate infrastructural facilities such as proper cooling system, high blast temperature, oxygen enrichment, advanced monitoring and control gadgets, etc. are necessary to sustain a high injection rate. Due consideration was not given to the adequacy of the existing infrastructural facilities while introducing CDI, as discussed below.

9.8.1 Inadequate cooling system

9.8.1.1 The operation of CDI increases heat load on the wall and refractory of the blast furnace, which in turn, increases the possibility of damaging the refractory lining as well as the cooling system. Hence, a very effective and compatible cooling system in the blast furnaces is essential to protect the blast furnace shell and refractory lining. A combination of copper stave coolers and closed recirculation is considered to be the best for blast furnace cooling.

9.8.1.2 The cooling system in the blast furnaces of the Company had remained the same since inception and was inadequate for keeping the temperature of refractory linings at low level. The Management did not carry out necessary modification of cooling system in BF-6 (BSP) during shutdown for capital repair (June 2000 to May 2001); even though the price quoted for the job was Rs.3.62 crore only. In BOSP also, there was intermittent rise of wall temperature, which could not be controlled and 50 *per cent* of bosh & stack coolers were burnt.

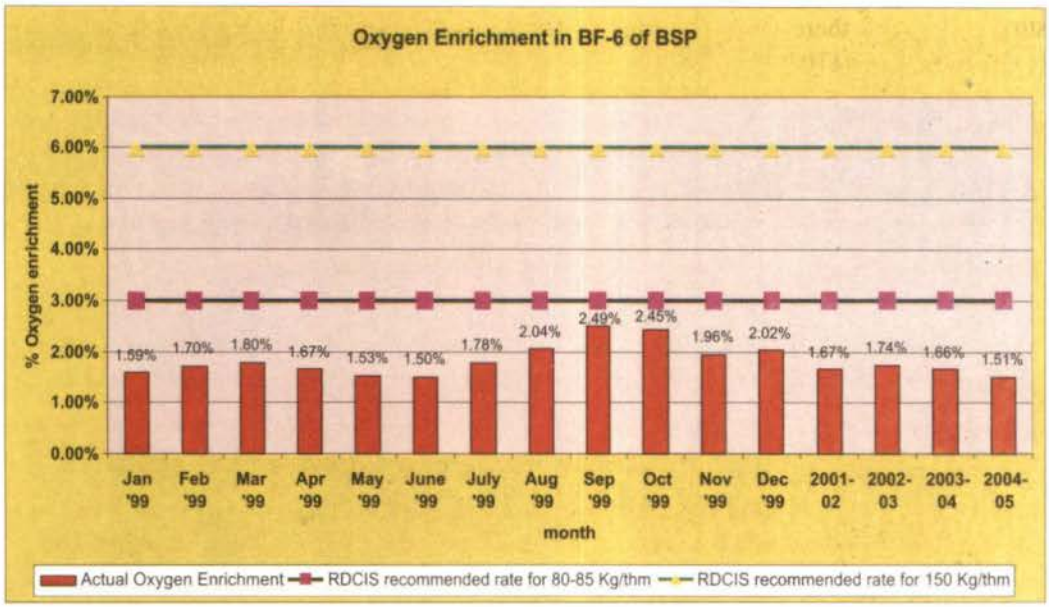
The Management stated (November 2006) that cooling system of BF-6 was not modified during capital repairs due to severe financial crisis. Further, modification of cooling system in BF-7 was already in progress and upgradation of BF-6 was planned shortly.

9.8.2 Inadequate oxygen enrichment facilities

Complete combustion of coal is necessary for smooth and efficient functioning of the blast furnace. Poor coal combustion results in operational problems like reduced permeability, undesirable gas and temperature distribution. These problems impair blast furnace productivity and coke replacement ratio. Complete combustion of coal could be achieved by a suitable rate of oxygen enrichment.

9.8.2.1 The Supplier of CDI had stated that two *per cent* oxygen enrichment was required to reach injection rate of 100 kg/MTHM and four *per cent* for injection rate of 150 kg/MTHM. The Research & Development Center for Iron and Steel, a unit of the Company, had recommended three *per cent* oxygen enrichment for injection rate of 80-85 kg/MTHM and six *per cent* for injection rate of 150 kg/MTHM.

9.8.2.2 In the initial period of CDI operation (1999), the actual oxygen enrichment in BF-6 of BSP ranged between 1.50 *per cent* (June 1999) and 2.49 *per cent* (September 1999). In subsequent periods also it remained in a lower range between 1.51 *per cent* in 2004-05 and 1.74 *per cent* in 2002-03.



Oxygen enrichment was even less than one *per cent* in BF-7 (BSP) and there was shortage of oxygen for enrichment of blast in BOSP.

9.8.2.3 Oxygen plants in BSP and BOSP were operating at much below the rated capacity mainly due to old and obsolete technology, which required regular and extensive revamping in order to sustain even the present level of production. The committee constituted to augment the oxygen supplies for injection system suggested (June 2004) regulation and maintenance of oxygen enrichment at 1.5 *per cent* in place of three *per cent* till long term measures could be taken. As a long-term measure, the installation of additional gas units at all plants of the Company by 2006-07 would require an investment of Rs.1200 crore.

The Management stated (November 2006) that the requirement of oxygen was otherwise high due to increase in the production of hot metal and crude steel and action was under way for installation of oxygen plant at BSP and BOSP to supplement oxygen requirement.

The Company should have ensured the required level of oxygen enrichment before installation of CDI.

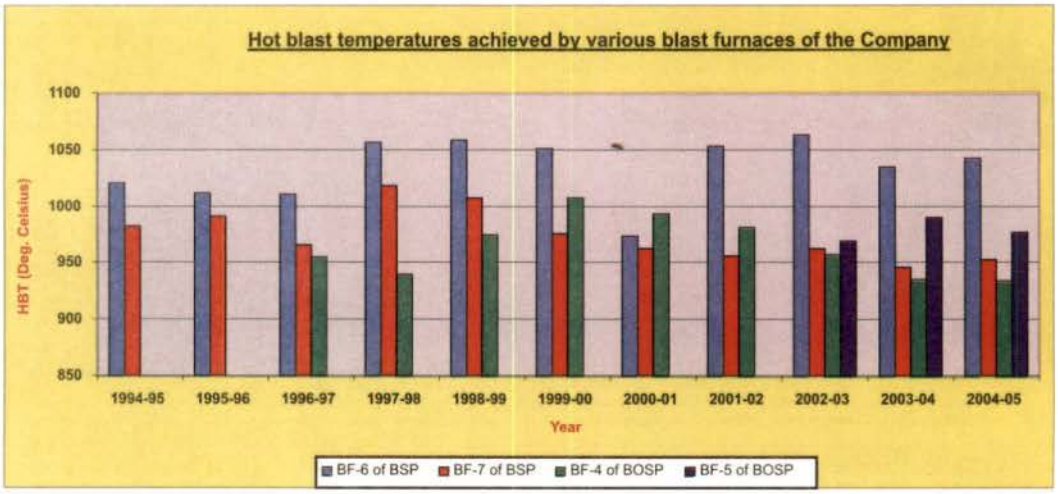
9.8.3 Low hot blast temperature

Injection of coal dust causes a drop in the temperature in blast furnace. Inadequate hot blast temperature affects complete combustion of coal adversely. Required level of temperature needs to be maintained through hot blast temperature and oxygen enrichment.

9.8.3.1 Feasibility Report for CDI in BF-6 of BSP (April 1995) envisaged hot blast temperature of 1100^0C. The Company had also recommended (September 2002) that the success of CDI required higher hot blast temperature (1050-1100^0C). While selecting BF-6 for CDI, it was stated in the feasibility report that modified design of stoves provided in it could give hot blast temperature upto 1200^0C. Regarding BF-7 of BSP, the Centre for Engineering & Technology (CET), in their Report (May 1999) had mentioned that the

stoves provided therein were thermally efficient in design and could provide hot blast temperature upto 1100^0C.

9.8.3.2 The actual hot blast temperature in different blast furnaces containing the CDI during 1994-95 to 2004-05 (both pre as well as post CDI period) were as follows:



9.8.3.3 Low hot blast temperature in blast furnaces was attributed to the inability of the refractory to withstand the hot blast temperature of 1100 ^{0}C. Old design of hot blast stoves and burners and the existing tuyeres were not able to withstand higher hot blast temperature. Low hot blast temperature was one of the reasons for poor performance of CDI system.

9.8.3.4 The hot blast temperature of 1100 ^{0}C, as provided in the feasibility report, was to increase the blast furnace productivity by 0.875 *per cent* and reduce the coke consumption rate by 0.875 *per cent*. It is estimated that failure to achieve 1100 ^{0}C hot blast temperature resulted in excess consumption of 0.47 lakh MT coke valuing Rs.24.34 crore during 1999-2000 to 2004-05 in BF-6 of BSP and BF-4 of BOSP. There was no improvement in blast furnace productivity either. Lower hot blast temperature resulted in less production of hot metal by 0.97 lakh MT valuing Rs.53.70 crore during the same period.

The Management stated (November 2006) that a range of hot blast temperature of 900-1100 ^{0}C in BF-6 and 900-1000 ^{0}C in BF-7 of BSP was given as the parameter in the contracts and the hot blast temperature was maintained in this range. While accepting that lower hot blast temperature was one of the factors affecting the success of CDI in BOSP, it was stated that capital repair of stoves to increase hot blast temperature in BOSP, were being carried out. In BSP too, effort was under way to rectify the problem of the health of the refractory in hot blast system, which would improve the hot blast temperature.

9.8.4 Inadequate numbers of tuyeres for CDI

For proper distribution and complete combustion of coal dust, adequate numbers of tuyeres were required to be installed uniformly in the blast furnace. The non-uniform distribution of coal dust causes increase in the consumption of coke and also affects adversely the productivity of the blast furnaces.

9.8.4.1 In BOSP, in BF-4 there were 20 tuyeres but coal was injected from 14 tuyeres only and in BF-5 out of 24 tuyeres, only 20 tuyeres were envisaged to be used for CDI. In BF-6 BSP, it was observed that the injection of coal was stopped in two tuyeres above the tap hole during tapping.

The Management accepted (November 2006) that injection was not done from all the tuyeres. It happened due to limitation in design of the tap hole and equipment to open and close the tap hole.

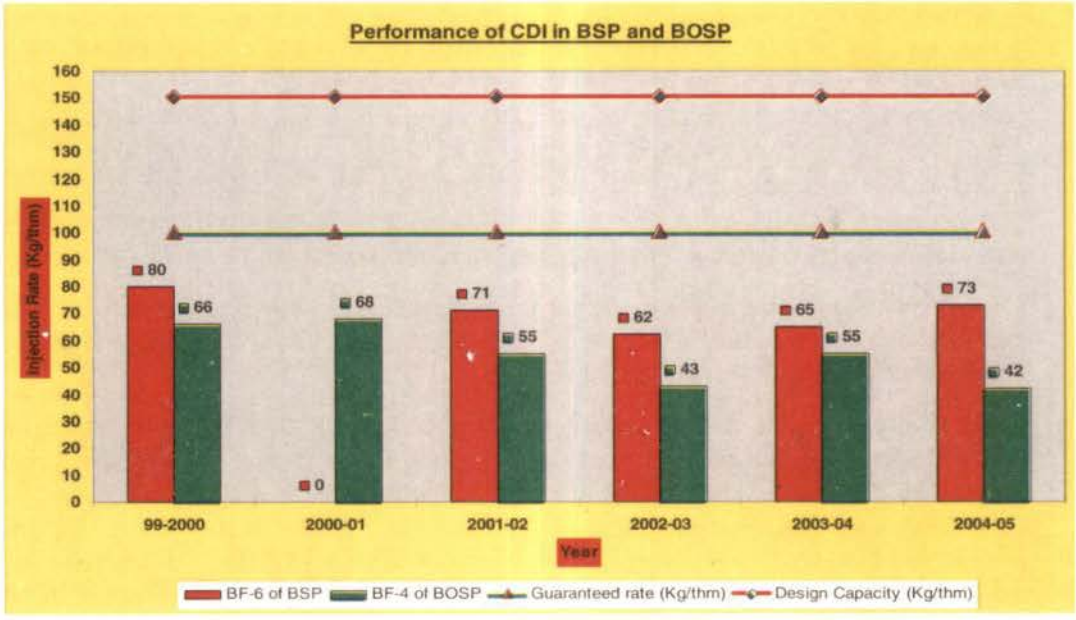
9.8.5 Lack of monitoring and control equipment

High rate of coal injection by CDI requires proper burden distribution[♣] for optimum gas distribution. Measuring instruments are required for optimising gas flow for smooth furnace operation. However, while introducing CDI in blast furnaces, adequate consideration was not given to the level of instrumentation and monitoring system. Due to non-availability of that equipment, proper burden distribution was not ensured.

The Management stated (November 2006) that necessary care had been taken in respect of monitoring and control equipment in the upcoming CDI projects.

9.9 Operational efficiency of CDI

9.9.1 As against the guaranteed injection rate of 100 kg/MTHM, the actual injection rate of CDI of BF-6 (BSP) and BF-4 (BOSP) was much less, as shown below:



9.9.2 Based on the injection rate of 100 kg/MTHM and a coal-coke replacement ratio of 1:1, it was calculated in audit that there was a shortfall of coal dust injection of 4.45 lakh MT during 1999-2000 to 2004-05 in case of BF-6 of BSP and BF-4 of BOSP. This resulted in an extra expenditure of Rs.64.56 crore since costly coke had to be consumed in place of proposed non-coking coal.

[♣] ***Burden distribution – charging of raw materials in the blast furnace such as iron ore, coke, sinter etc. It denotes the radial material distribution as well as the particle size distribution in a blast furnace.***

9.9.3 In BF-6 of BSP, with gradual increase in the injection rate of coal dust, the problems of burning of coolers and tuyeres and increased peripheral flow of gases (i.e., flow of gases towards the wall of blast furnace) were observed as reflected in the increased wall temperature. After taking remedial measures, an injection rate of 80-85 kg/MTHM was achieved during June-August 2003 but this could not be sustained due to excessive wall erosion in the blast furnace. The actual injection achieved subsequently on continuous basis was only 65-73 kg/MTHM (2003-04 to 2004-05).

The operation of CDI in BF-4 of BOSP was discontinued with effect from February 2005 due to bad condition of the furnace, burning of cooler and blast furnace reaching the last stage of its design life. It was put back into operation after completion of capital repairs in October 2006.

The Management while accepting the facts (November 2006) stated that higher injection rates could not be sustained due to operational problems and 65-73 kg/MTHM CDI was maintained in BF-6 of BSP to keep the furnace in good condition. Regarding CDI in BF-4 of BOSP, the poor performance was attributed to utilisation of different types of coal such as high ash indigenous coal and hard coking coal, fluctuations in the quality of raw materials and due to the operational difficulties.

9.9.4 Similarly, in BF-7 of BSP there was problem of peripheral flow of gases during CDI operation and erosion of furnace lining at different zones. To avoid breakdown of the blast furnace, the injection rate was kept on the lower side ranging between 25 and 40 kg/MTHM during December 2004 to March 2005. The injection rate through the newly created system in BF-5 of BOSP also ranged between 35 and 49 kg/MTHM during August 2005 to December 2005.

The Management accepted the facts and stated (November 2006) that capital repair of BF-7 had been taken up for change and modification in cooling system, refractory lining etc.

9.10 Action for installation of CDI in other blast furnaces

The Company approved proposals (between 2004 to 2006) for installation of CDI at BF-3 and BF-4 of Durgapur Steel Plant, BF-2 and BF-3 of BOSP and BF- 4 of Rourkela Steel Plant at a total estimated cost of Rs.406.08 crore.

9.10.1 The CDI facilities have again been designed to achieve an injection rate of 150 kg/MTHM with oxygen enrichment of six *per cent* in Durgapur Steel Plant and Rourkela Steel Plant. In case of BOSP, the injection rate has been designed to achieve 150 kg/MTHM with oxygen enrichment of five *per cent*. In the initial period, the CDI systems are proposed to attain an injection rate of 120 kg/MTHM with four *per cent* oxygen enrichment in case of Durgapur Steel Plant and an injection rate of 100 kg/MTHM in BOSP. To implement the project at Durgapur Steel Plant, an order valuing Rs.37.14 crore has been placed on M/s Shriram EPC Limited as the consortium leader in March 2006.

9.10.2 Before committing fresh investments on the installations of CDIs in other blast furnaces, the Management has not rectified or improved the condition of the selected blast furnaces nor created commensurate infrastructure to achieve the optimum utilisation (150 kg/MTHM) of CDI System. The sanction for installation of the CDI in other blast

furnaces lacked justification in view of the Company's inability to achieve the performance parameters in the existing CDIs.

The Management stated (November 2006) that the limitations and difficulties experienced in the existing CDI were being taken care of gradually.

9.11 Conclusion

While the Company was eager to modernise its blast furnaces for making them cost effective it had not provided commensurate infrastructural facilities, which were essential for the successful operation of CDI. The Company went ahead without assessing the existing capability of their blast furnaces to cope with the CDI system. Such hasty action by the Company resulted in underutilisation of capacity created at a cost of Rs.146.80 crore and loss of Rs.142.60 crore due to fall in the targeted substitution of BF coke, non-reduction in coke consumption and non-increase in blast furnace productivity.

The Corporate Plan-2012 of the Company envisaged ambitious plans for even higher rates of CDI, and that too across all the plants under the Company. However, such plans would succeed only if the operational parameters of the blast furnaces and the supporting infrastructural facilities are adequately improved.

The matter was reported to the Ministry in December 2006; reply was awaited (January 2007).

C. V. Avadhani

(C. V. AVADHANI)
Deputy Comptroller and Auditor General
cum Chairman, Audit Board

New Delhi
Dated: 16 APR 2007

Countersigned

(VIJAYENDRA N. KAUL)
Comptroller and Auditor General of India

New Delhi
Dated: 17 APR 2007

Annexure-1

(Referred to in para 2.6.2.1)

Production Performance

TPS I	Unit	2001-02	2002-03	2003-04	2004-05	2005-06
Calendar Hours	Hours	78840	78840	79056	78840	78840
Planned generation	Hours	61596	62552	62510	63036	63036
Actual Hours utilized	Hours	71584	73893	72407	71106	71591
Planned Generation	MU	3680	3680	3680	3680	3784
Actual Generation	MU	**4182.27**	**4378.52**	**4400.00**	**4259.00**	**3990.00**
Potential Generation *	MU	**4790.85**	**4924.42**	**4799.48**	**4774.23**	**4741.75**
Shortfall	MU	608.58	545.90	399.48	515.23	751.75
Total Shortfall	**MU**					**2820.94**
Selling Price	p/kwhr	185.86	182.05	182.05	182.05	182.05
Value of Shortfall	Rs. in crore	113.11	99.38	72.73	93.80	136.86
Total Shortfall	Rs. in crore					515.88
Budgeted PLF	per cent	70.02	70.02	69.83	70.02	72.00
Actual PLF	per cent	79.57	83.31	83.49	81.03	75.92

**** Potential generation has been calculated by multiplying actual hours worked by 0.05 MU for 6 Units of 50 MW each and by 0.10 MU for 3 Units of 100 MW each***

Thermal Power Station II Stage I						
	Unit	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Calendar Hours	Hours	26280	26280	26352	26280	26280
Planned generation	Hours	21580.47	21688.09	21568.42	21558.38	21370.26
Actual Hours utilized	Hours	23346.25	24082.43	20945.41	20594.16	20701.57
Planned Generation	MU	3864	3864	3864	3864	3974
Actual Generation	MU	**4524.28**	**4605.42**	**4110.10**	**3948.10**	**3855.93**
Potential Generation *	MU	**4902.75**	**5057.37**	**4398.59**	**4324.80**	**4347.41**
Shortfall	MU	378.47	451.95	288.49	376.70	491.48
Total Shortfall	**MU**					**1987.09**
Selling Price	p/kwhr	122.06	122.06	122.06	122.06	122.06
Value of Shortfall	Rs. in crore	46.20	55.17	35.21	45.98	59.99
Total Shortfall	Rs. in crore					242.55
Budgeted PLF	per cent	70.02	70.02	69.82	70.02	72.01
Actual PLF	per cent	81.98	83.45	74.27	71.99	69.87
Thermal Power Station II Stage II						
Calendar Hours	Hours	35040	35040	35136	35040	35040
Planned generation	Hours	28803.06	28880.39	28844.56	28851.58	28385.28
Actual Hours utilized	Hours	30045.29	30312.14	30048.08	28024.12	29056.10
Planned Generation	MU	5151	5151	5151	5151	5298
Actual Generation	MU	**5745.99**	**5897.61**	**5894.74**	**5300.34**	**5318.16**
Potential Generation *	MU	**6309.55**	**6365.57**	**6310.08**	**5885.08**	**6101.79**
Shortfall	MU	563.56	467.96	415.34	584.73	783.63
Total Shortfall	**MU**					**2815.22**
Selling Price	p/kwhr	175.53	175.53	175.53	175.53	175.53
Value of Shortfall	Rs. in crore	98.92	82.14	72.90	102.64	137.55
Total Shortfall	Rs. in crore					494.15
Budgeted PLF	Per cent	70.00	70.00	69.81	70.00	72.00
Actual PLF	Per cent	78.09	80.15	79.89	72.03	72.27

**** Potential Generation = No of Units x 0.21 MU x Actual hours of generation.***

Annexure -2

(Referred to in para 2.6.3.1)

Forced outages

Thermal Power Station I					
	2001-02	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Economiser Puncture	175-39	438-03	247-20	540-00	525-24
Water wall puncture	Nil	232-29	154-40	204-00	245-09
Electrical fault	359-43	100-08	180-55	512-00	274-45
Mechanical fault	2226-35	1021-39	481-37	890-00	1187-48
Generator gas protection	499-39	87-27	Nil	Nil	Nil
Others*	24-57	77-26	Nil	3.50	207-53
Total Forced Outages	3286-33	1957-12	1064.32	2149.50	2440-59
OPLF	88.53	89.63	92.51	90.84	85.90
Loss of generation (MU) at OPLF	145.48	87.71	49.24	97.64	104.84
Selling price p/kwhr	185.86	182.05	182.05	182.05	182.05
Value Rs. in Crore	27.04	15.97	8.96	17.77	19.09
Thermal Power Station II Stage I					
	2001-02	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Tube Punctures	416-05	444-39	182-07	284-49	727-13
Slag Conveyors	103-06	139-06	209-02	0-00	133-17
Electricals	9-46	203-57	19-33	9-41	0-00
Instrumentation	12-50	15-04	31-22	7-03	7-05
Test/Fire/Wet lignite/Others	59-09	430-43	0-00	113-34	1-55
Operation Fault	6-43	10-40	7-00	0-00	0-00
Others	606-19	42-17	100-21	100-57	13-28
Total Forced Outages	1213-58	1286-26	565-22	516-04	892-58
Loss of generation (MU) at actual OPLF	235.25	245.99	110.94	98.93	166.31
Selling price p/kwhr	1.2206	1.2206	1.2206	1.2206	1.2206
Value Rs. in Crore	28.71	30.02	13.54	12.08	20.30
Thermal Power Station II Stage II					
	2001-02	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Tube Punctures	1223-12	783-25	659-34	572-32	723-40
Slag Conveyors	241-25	104-33	30-10	44-22	30-28
Electricals	22-29	40-41	42-30	6-16	35-53
Instrumentation	25-32	28-05	6-55	0-00	17-11
Test/Fire/Wet lignite/Others	507-55	311-08	5-13	40-34	38-28
Operation Fault	10-27	10-11	3-17	12-50	4-09
Others	358-16	26-58	79-73	81-34	35-06
Total Forced Outages	2389-16	1305-01	827-12	758-08	884-55
Loss of generation (MU) at actual PLF	456.94	253.91	162.28	143.38	161.97
Selling price p/kwhr	1.7553	1.7553	1.7553	1.7553	1.7553
Value Rs. in Crore	80.21	44.57	28.49	25.17	28.43

* ***Others include test, rotor earth fault, lignite flow interruption. instrumentation rotor damage generator rotor damage and rotor replacement.***

Annexure-3

(Referred to in Para 2.6.4.1)

Shortfall in generation due to non-availability of lignite

Year	TPS II Stage I			
	No. of Occasion	**Hours Lost**	**Loss of Generation-MUs**	**Rs. in Crore**
2001-02	06	292	56.70	6.92
2002-03	00	NIL	NIL	NIL
2003-04	05	821	161.22	19.68
2004-05	18	3490	669.06	81.67
2005-06	11	3536	658.60	80.39
Total		**8139**	**1545.58**	**188.66**
	TPS II Stage II			
2001-02	06	237	45.36	7.96
2002-03	02	74	14.39	2.53
2003-04	10	2319	454.90	79.85
2004-05	24	3549	671.38	117.85
2005-06	09	2238	409.67	71.91
Total		**8417**	**1595.70**	**280.10**

Annexure-4

(Referred to in para 2.6.5.1)

Table 1

Capacity of Mine II related to PLF of TPS II

PLF per cent	72	74	76	78	80	82	85
Lignite required (MTPA)	**10.08**	**10.44**	**10.66**	**10.93**	**11.20**	**11.49**	**11.90**
Mine capacity (MTPA)	10.50	10.50	10.50	10.50	10.50	10.50	10.50
Shortfall (MTPA)	+0.42	+0.06	-0.16	-0.43	-0.70	-0.99	-1.40

Table 2

Transportation cost

Year	**Lignite Transported From Mine I/ Mine IA to TPS II (MT)**	**Average Transportation Cost (Rs./Tonne)**	**Cost of transportation (Rs. in crore) (2)X(3)**
(1)	**(2)**	**(3)**	**(4)**
2001-02	0.771	28.48	2.19
2002-03	0.606	33.76	2.05
2003-04	1.740	31.48	5.48
	0.440	31.48	1.38
2004-05	0.853	42.90	3.66
	1.504	42.90	6.45
2005-06	1.994	58.47	11.66
Total			**32.87**

Annexure-5

(Referred to in Para 2.6.8.2)

Difference in weight of lignite between Thermal and Mines Division

TPS I

Year	Lignite consumption (Tonne)		Difference (Tonne)
	As per Mines Division	As per Thermal Division	
2001-02	6031274	5408400	622874
2002-03	6301482	5718550	582932
2003-04	6303582	5682320	621262
2004-05	6103319	5467940	635379
2005-06	5731242	5296050	435192

TPS-II – Stage –I

Year	Lignite consumption (Tonne)		Difference (Tonne)
	As per Mines Division	As per Thermal Division	
2001-02	5082064	4725475	356589
2002-03	5152509	4789381	363128
2003-04	4612326	4292802	319524
2004-05	4262348	NA	NA
2005-06	4214636	NA	NA

TPS-II Stage-II

Year	Lignite consumption (Tonne)		Difference (Tonne)
	As per Mines Division	As per Thermal Division	
2001-02	6204913	5770619	434294
2002-03	6284082	5828366	455716
2003-04	6342244	5946864	395380
2004-05	5672699	NA	NA
2005-06	5789266	NA	NA

NA Not available with the Corporation

Annexure-6

(Referred to in Para 2.6.9.1 and 2.6.9.2)

Table 1

O&M Charges - TPS I

(Rs in crore)

Description	2001-02	2002-03	2003-04	2004-05	2005-06
Net Generation	3695.41	3871.83	3894.00	3774	3540.330
O&M cost Actual	83.22	87.27	100.99	99.01	100.85
O&M as per BPSA / CERC	75.61	75.61	75.61	91.20	94.86
Excess over norms	7.61	11.66	25.38	7.81	5.99
Total					**58.45**

Table 2

O&M Charges -TPS II – STAGE I

(Rs in crore)

	2001-02	2002-03	2003-04	2004-05	2005-06
Net Generation (MU)	41.01	41.59	37.12	35.59	34.81
O&M cost (Actuals)	56.37	63.66	69.96	70.74	69.84
O&M Cost	*	*	*	65.52	68.17
Excess over norms	*	*	*	5.22	01.67
Total					**6.89**

TPS II - STAGE II

Net Generation (MU)	52.03	53.29	53.40	47.84	47.98
O&M cost (Actuals)	76.14	78.96	91.20	96.79	93.41
O&M Cost	*	*	*	87.36	90.89
Excess over norms	*	*	*	9.43	2.52
Total					**11.95**

Annexure-7

(Referred to para 3.7.2.2)

(Rs. in lakh)

Sl. No.	Equip-ment model	Material cost (per unit)	Total cost of produ -ction	Market price/ transfer cost	Difference between material cost and price per unit	Qty produ-ced (Nos.)	Total Difference in material cost compared to price
1	BL 200	2.59	3.87	1.58	1.01	6	6.06
2	ATT	2.42	3.79	1.50	0.92	15	13.80
3	BD 50	3.32	4.87	2.59	0.73	58	42.34
4	BD 65	5.47	7.83	3.90	1.57	36	56.52
5	BG 605	5.81	8.39	3.88	1.93	21	40.53
6	BD 80	6.31	8.95	4.57	1.74	17	29.58
7	BH 35-2	6.82	9.88	5.99	0.83	15	12.45
8	BD 155X	6.93	9.63	5.65	1.28	5	6.40
9	BP 70	8.84	11.92	8.64	0.20	6	1.20
							208.88

or say 2.09 crore

Annexure-8

(Referred to in para 5.3.1)

Statement showing details of RCE-I and II approved

(Rs. in crore)

	RCE-I approved in March 2002	**RCE-II approved in January2005**	**Increase in project cost**
Building and civil works	23.66	28.33	4.67
Plant and machinery	231.93	256.05	24.12
Technical assistance	5.40	10.26	4.86
Finance Charges	44.91	75.49	30.58
Others	24.91	28.23	3.32
Total	**330.81**	**398.36**	**67.55**

Annexure-9

(Referred to in para 5.3.3)

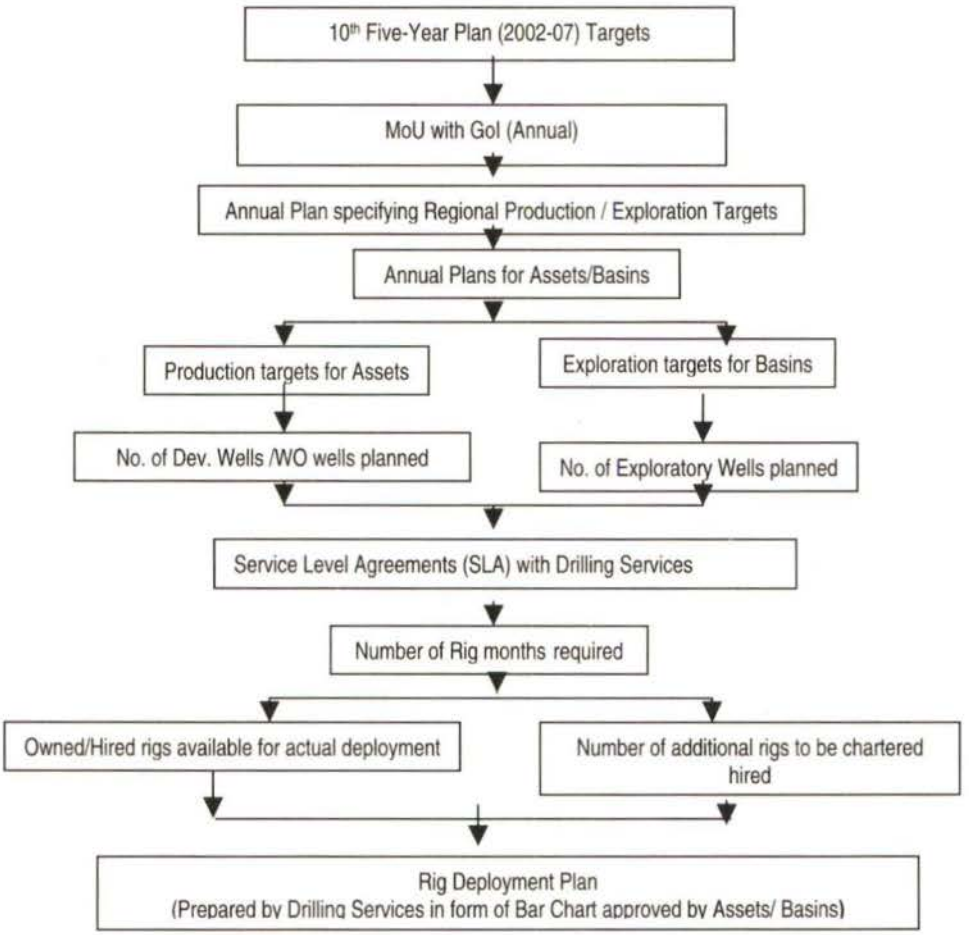
Statement showing delay in commissioning of equipment

Name of Equipment	Scheduled date of Commissioning (assuming restart of activities in April 2000)	Actual date of Commissioning	Delay in Months
Casters I & II along with Melting & Holding Furnaces	7 months to 9 months (December 2000)	January 2005, February 2005	49 months (From Jan 01 to Jan 05) 50 months (From Jan 01 to Feb 05)
Roll Grinding Machine (RGM)	8.5 months (mid December 2000)	April 2002	16 months (From Jan 01 to April 02)
Cold Rolling Mill (CRM)	9 months (December 2000)	March 2002	15 months (From 01 to March02
Slitting Line	9 months (December 2000)	January 2003	25 months (From Jan 01 to Jan03
Cut to length line	9 months (December 2000)	June 2003	30 months (From Jan 01 to June03)
Annealing Furnaces (3)	9.5 months (mid January 2001)	December 2002, November 2004, March 2005	23 months (From Feb 01 toDec'02) 46 months (From February'01 to Nov'04) 50 months (From Feb'01 to July'05)
Caster III & IV along with Melting & Holding Furnaces	11.5 months to 12 months (March 2001)	July and November 2005	52 months (From April' 01 to July' 05) 56 months (From April '01 to Nov'05)

Annexure-10

(Referred to in Para 7.1)

Flow Chart of Planning Process for Deployment of Rigs



Annexure-11

(Referred to in para 7.7.3.1)

Block wise shortfall in achievement of exploratory drilling MWP targets

Block	NELP	Date of acquisition	MWP committed-phase wise-no. of wells		Actual	Shortfall	Estimated cost of the wells (US$) (based on the budget of 2006-07)	Liquidated Damages demanded by DGH (in US$)
MB/OSN 97/4	I	08.5.2000	8.5.03 8.5.05 8.5.07	1 2 1	1 - -	- 2 -	21280434	6384130
MB/OSN 2000/1	II	02.8.2001	2.8.04 2.8.06 2.8.08	5 4 5	3 - -	2 - -	24751286	7425386
GS/OSN/ 2001/1	III	12.3.2003	12.3.06 12.3.08 12.3.10	4 1 1	1 - -	3	33675815	3367582 (Demand notice yet to be received)
KK/OSN/ 2001/2	III	12.3.2003	12.3.06 12.3.08 12.3.10	1 1 1	- - -	1	12496897	1249690
KK/OSN/ 2001/3	III	12.3.2003	12.3.06 12.3.08 12.3.10	1 1 1	- - -	1	12932757	1293275
							Total US$	19720063
							Total: Rs.45 per US$	**Rs. 88,74,02,835**

Annexure-12

(Referred to in para 7.7.3.1 and 7.7.4.1)

Statement showing details of major overhauling/topup overhauling recommended and over due

				Recommended MOH/TOH Hours			Over Due		
				Daihatsu	**MOH**	**20000**		**MOH**	**TOH**
					TOH	**15000**		**8**	**5**
				Caterpiler	**MOH**	**25000**			
					TOH	**15000**			
Sl. No	Rig Name and date of readings of running hours		Engine no.	Engine Make & Sl no.	Last MOH	Hrs. run after Last O/H	Cumm R/Hrs	**Remarks**	
FLOATER RIGS									
1	S/Bhushan Oct 27, 05	**1**	**1**	**Daihatsu 6261019 V**	57880	9938	67818		
2			**2**	**Daihatsu 6261020 V**	62345	13322	75665		
3			**3**	**Daihatsu 6261021 V**	52764	**19893**	72567		**TOH**
4			**4**	**Daihatsu 6261022 V**	51781	**15001**	66782		**TOH**
5	S/Vijay Oct 29, 04	**2**	**1**	**Daihatsu 6261006 V**	75147	**22168**	94227	**MOH is due**	**MOH**
6			**2**	**Daihatsu 6261007 V**	77194	18194	91213	**TOH done**	
7			**3**	**Daihatsu 6261008 V**	78199	6274	82705		
8			**4**	**Daihatsu 6261009 V**	80278	5762	82203		

9			5	**Daihatsu (Aux) 6DS-22-D622754**					
JACK UP RIGS									
10	S/Uday July 20, 05 1325 BHP Capacity	**3**	**1**	**Cater Piller D-399 36Z01795**	78833	12654	91487		
11			**2**	**Cater Piller D-399 36Z01781**	66647	18992	85639	**TOH done**	
12			**3**	**Cater Piller D-399 36Z01791**		24719	83991	**MOH done on 16/9/05**	
13			**4**	**Cater Piller D-399 36Z01851**	70015		92621	**TOH done**	
14	S/Kiran 31 May 06 1325 BHP Capacity	**4**	**1**	**Cater Piller D-399 36Z01940**	56166	**36551**	92717	**Due for MOH(25000)**	**MOH**
15			**2**	**Cater Piller D-399 36Z01746**	59763	**21796**	81559		**TOH**
16			**3**	**Cater Piller D-399 36Z01767**	75490	**19937**	95427		**TOH**
17			**4**	**Cater Piller D-399 36Z02071**	83682	1851	85533	**Premature MOH completed on 12/7/05**	
28	S/Jyoti 1 March 06 1325 BHP Capacity	**5**	**1**	**Cater Piller D-399 36Z01486**	63420	19365	82785	**TOH is done**	
19			**2**	**Cater Piller D-399 36Z01939**	94428	27261	121689	**MOH done in June 06**	
20			**3**	**Cater Piller D-399 36Z01485**	76705	19952	121636	**TOH done**	
21			**4**	**Cater Piller D-399 36Z02487**	94192	**29271**	123463	**Due for MOH**	**MOH**
22			**5**	**Cater Piller D-399 36Z020273**	NA	21500			
23	S/Gaurav 3 March 06	**6**	**1**	**Cater Piller D-399 36Z01143**	16882	**29927**	118002	**Due for MOH**	**MOH**

24			2	**Cater Piller D-399 36Z01129**	30630	12621	109753		
25			3	**Cater Piller D-399 36Z01138**	33140	19595	117174		
26			4	**Cater Piller D-399 36Z01142**	28571	9839	113545		
27			5	**Cater Piller D-399 36Z01137**	31911	13340	103696		
28	S/Shakti 18 Aug, 05	7	1	**Cater Piller D-399 35B06607**		353	106934		
29			2	**Cater Piller D-399 35B06600**		**31292**	107647		**MOH**
30			3	**Cater Piller D-399 35B06604**		**25946**	98361		**MOH**
31			4	**Cater Piller D-399 35B06597**		**24416**	91099		**TOH**
32			5	**Cater Piller D-399 35B06601**		**28895**	98761		**MOH**
33	S/Ratna 31.3.2006	8	1	**Cater Piller D-399 36Z01936**		10131	103056		
34			2	**Cater Piller D-399 36Z01938**		15173	99033	**In reply it was stated that TOH was not due**	
35			3	**Cater Piller D-399 36Z01494**		5732	110382		
36			4	**Cater Piller D-399 36Z02116**		**26054**		**Due for MOH**	**MOH**
37			5	**Cater Piller D-399**		248	86352		

Annexure-13

(Referred to in para 7.7.4.1)

Jack up Rigs

			Dry Dock								Total
Sl. No	**Rig Name**	**Date of commissioning**	**Year**	**Amount (Rs. cr.)**	**Year**	**Amount (Rs. cr.)**	**Year**	**Amount (Rs. cr.)**	**No. of Dry docks**	**Amount Rs. cr.**	**Average dry dock cost (Rs. cr)**
1	Sagar Samrat	1973	1990	7.92	1996	15.02	2003	77.05	3	100.00	33.33
2	Sagar Pragati	1981	1992	4.28	2004	93.08	--	--	2	97.36	48.68
3	Sagar Gaurav	1982	1989	3.12	1998	50.53	2008	100.00	3	153.65	51.22
4	Sagar Shakti	1982	1991	4.76	2000	77.00	2009	100.00	3	181.76	60.58
5	Sagar Jyoti	1983	2001	8.87	--	--	--	--	1	8.87	8.87
6	Sagar Ratna	1985	--	--	--	--	--	--	--	--	--
7	Sagar Kiran	1988	2006	203.95♣	--	--	--	--	1	203.95♣	203.95♣
8	Sagar Uday	1990	--	--	--	--	--	--	--	--	--

Note: Figures excludes other repairs and maintenance under taken from time to time.

Floaters (Drill Ships)

	Rigs	Year	Amount (Rs.Cr.)	Year	Amount (Rs.Cr.)	Year	Amount (Rs.Cr.)	Year	Amount (Rs. Cr.)	Year	Amount (Rs.Cr.)	Year	Amount (Rs. Cr.)	Year	Amount (Rs. Cr.)
1	S/Bhushan	1987	4.53	1993	2.33	1996	12.02	2000	43.17	2003	11.70	2006	92.00	--	--
2	S/Vijay	1988	1.04	1990	5.00	1993	4.02	1995	6.87	1996	137.28	2003	27.12	2006	84.00

♣ *Estimated*

♣ *Estimated*

Annexure-14

(Referred to in para 7.7.5.3)

Projects commenced before obtaining environmental clearance

Sl. No	Name of Project	Application to MoEF	Application to MPCB	Date of Public Hearing	Status of development activities	Approved cost (Rs. in Crore).	Actual cost (Rs.in Crore).	No. of wells drilled (as on March 2006)
1	Mumbai High North Redevelopment	02.12.01	24.03.05	18.10.05	The schedule completion of the project was December 2005. The project was executed through 6 tenders for different activities. The work under tender number 2,3,4 & 5 were completed and work under tender 1 & 6 are under execution(August 2006). The works relating to construction of water injection platform, well platform, pipeline were completed on 31.4.2004, 30/4/2004 and 29.2.2004 respectively.	3239.43	3130.00	72
2	Mumbai High South Redevelopment	15.01.03	24.03.05	18.10.05	Project consists of construction of 17 well platforms, 1 process platform, clamp on structure on existing platforms, 50 new pipeline segments, modification of existing platforms and drilling of 140 new wells. The schedule completion dated is July 2007. The project proposed to be executed through 6 tenders for different activities. The works against tender number 2 completed and work under remaining tenders were in advance stage of completion.	6579.25	4889.43	96
3	IOR-Neelam	01.02.02	16.03.05	16.12.05	ONGC applied for environmental clearance to MOEF on 07.11.2000. MOEF asked (19.03.2001) ONGC to submit the EIA report, which was subsequently generated and fresh application, was sent to MOEF on 01.02.2002. The platform modifications was completed on 3.11.2002. ONGC made application to MSPB for NOC on	347.69	347.69	13

					15.05.2004. MPCB informed revision of fees on 16.08.2004. Revised fees paid on 16.03.2005. The public hearing held on 16.12.2005. NOC from MPCB is still awaited(August 2006).			
4	D-1 Marginal field development	29.3.04	24.3.05	06.12.05	D1 platform commissioned on 8.2.2006. Drilling of 2 wells completed out of 6 planned	506.52	234.29	2
Total						**10672.89**	**8601.41**	**183**

Annexure- 15

(Referred to in Para 7.7.5.3)

Delay in getting environmental clearance

Name of Project	Sanction Initiated for generating EIA	Sanction received for generating EAI	Actual days taken for sanction	Date of work order to NEERI	Time limit	Final Report received	Delays in days submission of report by NEERI	Date of submission appl.to MoEF	Time taken for submission of appl. to MoEF after generation of EIA	Date of submission of appl. to SPCB for public hearing	Time taken from date of submission to MoEF to date of appl. submitted to SPCB for public hearing
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Vasai East	02.09.03	08.01.04	128	19.01.04	42	08.02.05	343	14.03.05	34	29.03.05	15
MH (s) redevelopment	07.12.01	18.02.02	73	21.02.02	90	21.05.02	Nil	15.01.03	238	24.03.05	68
MH (N) redevelopment	26.04.01	04.07.01	69	13.07.01	90	02.12.01	44	02.12.01	0	24.03.05	1237
D-1 (South) Marginal field development	06.02.03	10.04.03	63	10.07.04	50	5.3.05	184	29.03.04	0	24.03.05	300
IOR (Neelam)	04.12.00	11.07.01	219	16.04.01	90	13.07.01	Nil	01.02.02	203	16.03.05	1229

Annexure-16

(Referred to in para 7.7.5.5)

Technical Audit Vital Pending Observations		
Sl. No	**Observation**	**Pending since**
	SAGAR BHUSHAN Audited during 1 to 4 October 2005	
1	6 Nos. of H_2S sensors were defective since March 2004. Needed replacement.	2004-05
	SAGAR SHAKTI Audited during 22 to 23 July 2005	
2	Foghorn was out of order.	2000-02
3	All the pressure vessels and air tanks were not hydro-tested. It was to be done in priority and their thickness gauging should be done urgently.	2003-04
4	DCP flooding system in mud pit room needs overall servicing. Its lines were badly corroded. Same was the condition for room flooding system as Nitrogen cylinders were sent to base for servicing.	2004-05
5	H2S and HC monitoring system was not working, needs immediate repair and restoration of the system.	2005-06
6	All the emergency light available not holding charge for long time. Some of the lights were not working, needed attention.	2005-06
	SAGAR VIJAY Audited during 28 to 29 October 2004	
7	HF SSB sets (main and standby both) were not working. The set was to be condemned if beyond economical repair or be declared idle for others use.	2003-04
	SAGAR GAURAV Audited during 28 February to 3 March 2006	
8	Rescue boat was not in working condition.	2001-02
9	2 nos. of H2S gas detectors were bypassed in the control panel board mounted in barge control room due to defective sensors. They needed repair.	2004-05
10	Gas detector system in Barge Engineer's cabin was not working. It should be made operational.	2005-06
	SAGAR UDAY Audited during 21 to 24 June 2005	
11	VHF radios in both the life boats were not operational. These are reported damaged. Needs replacement.	2001-02
12	HF SSBI set of SKANTI TRP 800 was operational but not satisfactory. Needed replacement.	2002-03
13	Accumulator unit was serviced by M/s Involute Engineering on 02.04.04. They recommended that as per API thickness test and hydrostatic test are required for accumulator bottle, accumulator bank and manifold bank.	2004-05
14	Rescue boat for the rig was non operational since long time. It was lying on the roof of bridge, needed policy decision for condemnation / replacement.	2004-05
15	Foam tank near the helideck was badly corroded. Thick flacks were seen	2004-05

	removed from the surface. Level indicator was in broken condition & valve is leaking. Complete system needed repair / replacement of tank.	
16	All air vessels needed pressure testing for safety point of view.	2004-05
17	NDT had not been done for mast and sub-structure since commissioning of the rig.	2005-06
	SAGAR KIRAN Audited during 24 to 26 April 2006	
18	Condition of BOP handling winches and trolley was not satisfactory. As reported, it would be replaced during dry-docking.	2004-05
19	Breathing apparatus of control room. Shale-shaker area, store & mud pump were defective. These needed repair / replacement.	2004-05
	SAGAR RATNA Audited during 22 to 24 April 2006	
20	Rescue boat was in bad condition. Its engine, gear box, HSD tank and fall wires were in deteriorated condition. It needed to be maintained in perfect condition.	2004-05
21	600 Lts foam system at helideck needed replacement of foam compound due to high ph value.	2005-06
22	Following mandatory certificates on the rig were due for renewal. These are needed for full term renewal: i) Re-testing of cargo gear ii) Cargo gear survey.	2005-06
23	Fire pump was working in manual mode only. Its discharge valve needed to be replaced to make it workable from remote.	2005-06
	SAGAR JYOTHI Audited during 27 February to 1 March 2006	
24	Fire pump was working in manual mode only. Its discharge valve needed to be replaced to make it workable from remote.	2001-02
25	Both the lifeboats are due for overhauling and load testing.	2005-06

Annexure-17

(Referred to in para 8.5.2)

Amount receivable and payable from different regular existing and former agents as on March 2006

(Rs. in crore)

Particulars	No. of Agents	Balance outstanding	Suspense outstanding	Total outstanding	Provision for doubtful debts
Amount payable to existing Agents	74	21.74	1.03	22.77	1.77
Amount recoverable from existing Agents	44	13.62	3.50	17.12	1.56
Amount payable to ex-Agents	29	5.39	1.68	7.07	0.26
Total recoverable from ex-Agents	25	0.31	1.41	1.72	1.29

Freight reconciliation for the years 2004-05 and 2005-06

(Rs. in crore)

	Number of Agents / offices	Freight and terminal handling charges collectable	Freight and terminal handling charges collected	Unmatched collection	
				As of August 2006	As of October 2006
2004-05					
Excess collection	33	383.93	399.01	-15.08	-16.95
Short collection	24	348.67	332.87	15.80	10.77
Total	**57**	**732.60**	**731.88**	**30.88**	**27.72**
2005-06					
Excess collection	31	449.08	483.12	-34.04	-28.03
Short collection	20	274.38	258.84	15.54	24.44
Total	**51**	**723.46**	**741.96**	**49.58**	**52.47**

Annexure-18

(Referred to in para 8.5.5)

Reconciliation of freight and terminal handling charges from 1997-98 to 2003-04

Details	Amount (Rs. in crore)		
	1997-98 to 2001-02	2002-03	2003-04
Total collectable	2983.56	511.49	575.40♠
Collectable reconciled	2872.40	482.45	517.61
Unmatched collectable	111.16♥	29.04	57.79
Unmatched collection	119.58♦	24.16	58.74

♠ ***Pending completion of reconciliation, the figure represents addition of unmatched collectable and reconciled collectable.***

♥ ***Against Rs.111.16 crore, the Company made provision for doubtful debts of Rs.14.13 crore wrote off Rs.97.03 crore in 2004-05 and 2005-06.***

♦ ***The Company wrote back Rs. 119.58 crore as Income in 2004-05 and 2005-06.***

GLOSSARY OF ABBREVIATIONS

ABS	American Bureau of Shipping
API	Acquisition Processing and Interpretation
BEC	Bid Evaluation Criteria
BHN / MHN Platform	Bombay / Mumbai High North Platform
BOP	Blow Out Preventer
CRC	Corporate Rejuvenation Campaign
DG Shipping	Director General of Shipping
DGH	Director General of Hydrocarbons
DTYS	Drilling Tools Yard Stores
E&P	Exploration & Production
EC	Executive Committee
EDR	Effective Day Rate
EIA	Environment Impact Assessment
EPC	Executive Purchase Committee
EPS	Early Production System
FYP	Five Year Plan
GOR	Gas Oil Ratio
GTO	Geo-Technical Order
HSE	Health Safety and Environment
IADC	International Association of Drilling Contractors
ICB	International Competitive Bidding
IIP / H	Initial in place / Hydrocarbon
IMO	International Maritime Organization
IRS	Indian Register of Shipping
ISM	International Safety Management
LD	Liquidated damages
LWD	Logging while Drilling
ML	Mining Lease
MM Manual	Material Management Manual
MM Section	Material Management Section
MMSCMD	Million Metric Standard Cubic Meter per Day
MMT	Million Metric Tonne
MMTOE	Million Metric Tonne Oil Equivalent
MODU	Mobile Offshore Drilling Unit.
MoEF	Ministry of Environment and Forest
MOH	Major Overhaul
MoPNG	Ministry of Petroleum & Natural Gas

MOU	Memorandum of Understanding
MPCB	Maharashtra Pollution Control Board
MWD	Measurement while Drilling
MWP	Minimum Work Programme
NDA	Noble Denton & Associates
NEERI	National Environmental Engineering and Research Institute
NELP	New Exploration Licensing Policy
NIT	Notice Inviting Tender
NL	New Location
NOA	Notification of Award
NOC	No Objection Certificate
ODS	Ozone Depleting Substances
OE	Oil Equivalent
OEM	Original Equipment Manufacturer
OSD	Other Shutdown
OSVs	Offshore Supply Vessels
PEL	Petroleum Exploration License
PMC	Policy Monitoring Cell
PMS	Preventive Maintenance Schedule
PSC	Production Sharing Contract
RE	Revised Estimate
REXB/RDB	Regional Exploratory Board/Regional Development Board
SAP	System Application Products in Data Processing
SLA	Service Level Agreement
SPCB	State Pollution Control Board
STO	Store Transfer Order
TDS	Top Drive System
TOH	Top Overhauling
WOI	Waiting on Instructions
WOL	Waiting on Logistics
WOM	Waiting on Material
WOW	Waiting on Weather

GLOSSARY OF TECHNICAL TERMS

Term	Description
Asset	It refers to an entity involved in production activities from the existing wells and transportation of oil and gas on onshore plants.
Baryte	A dense mineral used to add weight to drilling mud or increase the density of a liquid drilling fluid system, used to facilitate drilling wells.
Basin	A Depression in the earth's crust where sedimentary materials are accumulated over the years. With reference to ONGC, it refers to the entity involved in exploration related activities.
Block	Area identified in a field which is offered by the Government to prospective bidders under New Exploration Licensing Policy, for the purpose of exploration of oil and gas.
Blow Out Preventer (BOP)	When primary control of a well is lost due to insufficient hydrostatic pressure, it becomes necessary to seal the well by some means to prevent the uncontrolled flow, or blow out, of formation fluids into the atmosphere or into an underground formation. The equipment which seals the well is called the blowout preventer.
Casing Pipe	Metal pipe inserted into a well bore and cemented in place to protect both subsurface formations (such as groundwater) and the well bore. A surface casing is set first to protect groundwater. The production casing is the last one set. The production tubing (through which hydrocarbons flow to the surface) will be suspended inside the production casing.
Cementing	To fill the annulus between the casing and the wall of the hole with cement to support the casing and to prevent fluid migration between permeable zones.
Classification societies	Classification societies are organisations that establish and apply technical standard in relation to the design, construction and survey of marine related facilities including ships and offshore structures. These standards are issued by the classification society as published rules.
Class Certificate	A vessel that has been designed and built to the appropriate rules of a society may apply for a Certificate of Classification from Classification society. The society issues this certificate upon completion of relevant classification surveys. It is an attestation that the vessel is in compliance with the standards that have been developed and published by the society issuing the classification certificate.
Commercial Speed	One of the parameters used to evaluate the performance of rigs. It is calculated by dividing the meterage drilled by the rig months actually used for drilling considering from the time the rig is on location and ready to resume operation to Hermetical testing of production casing (to check any leakages before handing over the same for production testing) which is the commercial time of the rig.
Condition of class	When a surveyor identifies defects or damages which affect the ship's class, remedial measures and/or appropriate recommendations/ conditions of the class are implemented before ship continues in service. Condition of the class refers to the requirement that specific measures/repairs are to be carried out by the owner within the specified time limit in order to retain the class.
Cycle Speed	Rig release from various location to rig release from present location

	after drilling and production testing makes a cycle. It is a parameter used to evaluate the performance of rigs. It includes rig move time, drilling time, production testing time and completion time/well abandoning time. It is calculated by dividing the meterage drilled by total rig months available.
CRC	Corporate Rejuvenation Campaign was launched in August 2001. The restructuring has helped in revising the procedures, re-orienting attitudes, rebuilding relationships and reviving the pride of the Company. Administrative and financial authorities have been de-centralised for faster decision making process.
Developmental Wells	These Wells are drilled within the proved area of an oil or gas reservoir after exploration has proved successful.
Directional Well	A well intentionally drilled at an angle from the vertical.
Downhole Problems	The subsurface problems in well bore while drilling, which prevent or obstruct further drilling are termed as down hole problems.
Dry Dock	The process of sending a rig to ship yard where the rig can be subjected to 100% (out of water) inspection to undertake repairs, surveys in order to comply with the mandatory requirements/requirements of classification societies.
Effective Day Rate (EDR)	It is a notional rate worked out for evaluation of bids for charter hire of rigs on yearly basis. The formula for calculating EDR is : Mobilisation Fee+Operating Day Rate x 316 days x n + Non Operating Day Rate x 23 days x n+ Equipment Breakdown DR x 16 days x n + Moving Day Rate x 10 days x n + Demobilization fee + Customs Duty - Duty Draw back + Loading/365n (for the contract for 'n' number of years).
Exploration	The initial phase in petroleum operations that includes generation of a prospect and drilling of an exploration well. Appraisal, development and production phases follow successful exploration. Searching for oil and/or natural gas, including topographical surveys, geological surveys, seismic surveys and drilling wells.
Exploratory Wells	A well drilled to determine whether hydrocarbons are present in a particular area or structure.
Fishing Operations	Operations on the rig for the purpose of retrieving casing or other items from the well bore.
Gas Oil Ratio	The ratio of produced gas to produced oil, commonly abbreviated as GOR.
Geo-Technical Order	The Geo-Technical Order consists of geological & general data pertaining to well which provides broad guidelines for drilling the well.
Horizontal Well	Deviation of the borehole at least 80 degree from vertical so that the borehole penetrates a productive formation in a manner parallel to the formation.
Initial in-place Hydrocarbon (IIP/H)	The estimated quantity of oil and gas in field or lease.
IADC Report	IADC report is a report used for writing down the daily operations carried out by the rig.
Lay-up Repair	The process of sending a rig to shipyard where the rig can be subjected to inspection to undertake repairs and surveys in order to comply with the requirements of classification societies.

Logging Tools	Tools used to make a log (i.e.) to measure the depth or time, or both, of one or more physical qualities in or around a well e.g. LWD, MWD and wireline logging.
New Exploration Licensing Policy (NELP)	New Exploration Licensing Policy was formulated by the Government of India in 1997-98 to provide a level playing field in which all the parties may compete on equal terms for the award of exploration acreage. This was for accelerating the pace of hydrocarbon exploration in the country through which various blocks including deep-water acreages were offered for competitive bidding.
Offshore Supply Vessels	Any Barge, Boat or Ship that brings materials like water, casing pipes etc. and personnel to and from the rig site to supply
Platform	An offshore structure from which development wells are drilled and produced.
Production Testing	Tests in an oil or gas well to determine its flow capacity at specific conditions of reservoir and flowing pressures. This phase occurs after successful exploration and development drilling which hydrocarbons are drained from an oil or gas field.
Pug Marks	The changes in the sea bed levels and the leg marks left on the sea bed by jack up rig.
Rigs	It is an equipment used for drilling a well bore. There are various types of rigs like jack-up rigs, floaters, Modular rigs, etc. Further the jack up rigs can be further classified into Cantilever type jack-up rigs, Slot type jack-up rigs and Mat type jack-up rigs.
Rig Month	Total rig days divided by 30.
Rig Days	No. of days for which rigs were in operation/available.
Service Level Agreement	It is an agreement entered by various asset groups with services groups of ONGC containing the physical parameters which are to be achieved by such services group for the asset groups.
Side Tracking	To drill a secondary wellbore away from an original wellbore. A sidetracking operation may be done intentionally or may occur accidentally. Intentional sidetracks might bypass an unusable section of the original wellbore or explore a geologic feature nearby. In the bypass case, the secondary wellbore is usually drilled substantially parallel to the original well, which may be inaccessible due to an irretrievable fish, junk in the hole, or a collapsed wellbore.
Spudding	Process of starting the well drilling process by removing rock, dirt and other sedimentary material with the drill bit.
Suspension of class	Class is assigned to ship upon completion of satisfactory surveys and where conditions for maintenance of class are not complied with, class will be suspended/withdrawn or revised to different notations thereby ship may loose its class either temporarily or permanently. In the case of surveys that are not carried out within the specified time frame, or if the vessel is operated in a manner that is outside the classification designation, the suspension may be automatic.
Work-over Operations	Operations on a producing well to restore or increase production. A work-over may be performed to stimulate the well, remove sand or wax from the wellbore, to mechanically repair the well, or for other reasons.