

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 °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., Pesseable 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

[▼] Nitrogen plant, CPP alongwith HRS (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 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 18⁰. 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 18⁰.

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,

* 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 de-hired 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
10 th 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 (<i>per cent</i>) 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.

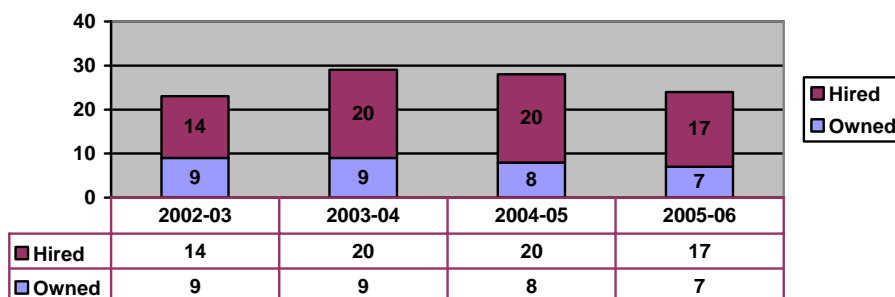
Recommendation

- 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**



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 (<i>per cent</i>)	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.

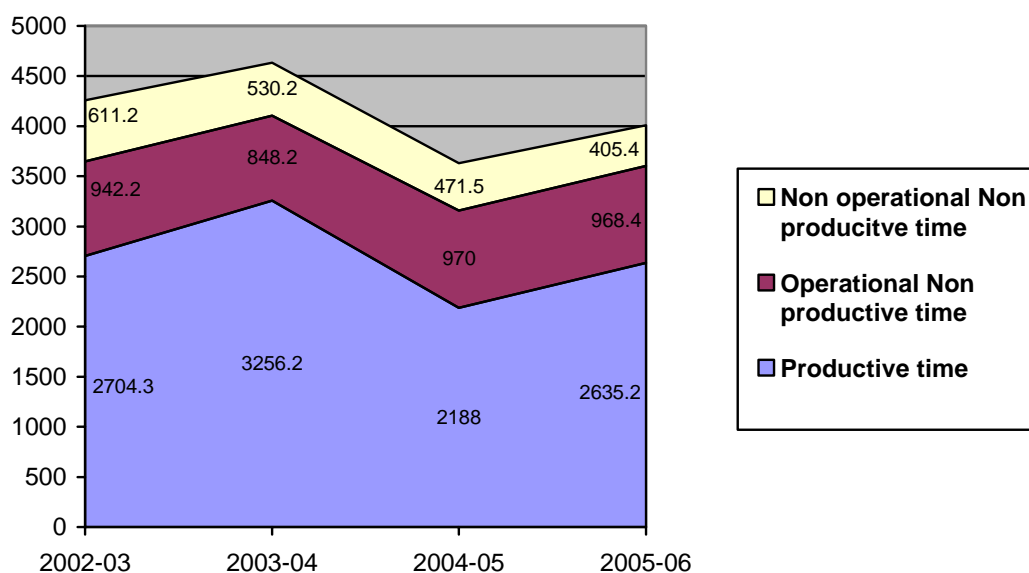
7.7.3.4 Inefficient utilisation of rigs due to high unproductive time

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	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-upgradation 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,

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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).