

## CHAPTER VII

### Oil and Natural Gas Corporation Limited

#### Production and surface facilities in western onshore areas

##### *Highlights*

Thirty nine *per cent* of the production and surface facilities in western onshore were more than 25 years old as of October 2008. The Company did not have a standard policy for replacement of critical equipment in onshore surface installations.

*(Para 7.7.1.1)*

Out of 31 cases nine lump sum turnkey (LSTK) contracts and 22 purchase orders (POs) valuing above Rs.five crore, delay from the date of indent/requisition to placement of order was upto 240 days in 1 LSTK/10 POs, 241 to 780 days in 6 LSTK/11 POs, and more than 780 days upto 1357 days in 2 LSTK/1 PO as against the norm of 180 and 77 days for finalisation of LSTK contract and POs respectively.

*(Para 7.7.1.3)*

Two Group Gathering Stations scheduled to be commissioned by December 2003 were yet (July 2008) to be finalised. Resultantly, the incremental oil gain of 3.17 lakh MT could not be achieved.

*(Para 7.7.1.4 (i))*

Due to inordinate delay in awarding contract, the cost of storage tanks increased by Rs.10.05 crore besides non-achievement of the objective of creation of spare capacity for reprocessing and maintenance requirements.

*(Para.7.7.1.6 (ii))*

Gujarat Pollution Control Board regulations on handling and disposal of sludge being hazardous material had not been complied. As of March 2008, 21904 MT of sludge/oil contaminated soil accumulated in 51 installations was awaiting disposal.

*(Para 7.7.2.1)*

The transit loss exceeded the norm of one *per cent* by 0.18 to 3.31 *per cent* with consequent loss of revenue of Rs.73.38 crore during the last four years ended March 2008.

*(Para 7.7.3.1)*

Oil Mines Regulations on Safety Committee of Mines and maintenance and updation of pipeline network plan had not been adhered to.

*(Paras 7.7.3.3 and 7.7.3.5)*

The statutory requirement of providing security fencing to 1175 well locations could not be complied due to inordinate delays at different stages of tendering process initiated in November 2006.

*(Para 7.7.3.4)*

Compliance to 149 observations of Director General of Mines Safety (DGMS) and 35 observations of Oil Industry Safety Directorate (OISD) on inspection of installations were pending for over two years as of March 2008.

*(Para 7.7.3.10 (i) and 7.7.3.10 (iii))*

**Summary of recommendations**

**The Company may:**

1. *formulate appropriate norms for regular maintenance and replacement of critical equipment for onshore surface installations expeditiously keeping in view the applicable safety and environmental regulations;*
2. *study the industry best practices in terms of procurement system being adopted by various leading PSUs, JVs, international companies, and based on the above, revised comprehensive procurement practice may be formulated and discussed with the stakeholders before its approval and implementation;*
3. *expedite completion of requisite surface infrastructure to avoid hazardous operations involved in road transportation through private road tankers besides attendant exposure to safety risks and malpractices;*
4. *evolve a system for timely identification and replacement of old transportation pipelines to avoid unsafe operations which entail huge safety and environmental risks;*
5. *create adequate storage facility of crude oil at various installations to ensure uninterrupted production of crude oil;*
6. *expedite introduction of a system for periodic identification, estimation of quantity, handling and disposal of hazardous sludge;*
7. *regularly monitor the condition of pipelines and ensure timely replacement to minimise the line losses and unsafe conditions;*
8. *initiate urgent action to arrest emission of hazardous hydrogen sulphide (H<sub>2</sub>S) gas into the environment and monitor the progress;*
9. *ensure strict monitoring of project execution to commission the envisaged Effluent Treatment Plant to achieve the objective of recycling of effluent for the purpose of water injection;*
10. *make efforts to sensitise the Assets for strict adherence to norms of transit losses and monitor the compliance;*
11. *adhere to the Capital Overhauling Schedule and monitor it regularly to reduce instances of unplanned shutdowns and also maintain necessary documentation as prescribed by Oil Industry Safety Directorate (OISD);*
12. *assign priority to update plans of the pipeline network as stipulated in the Oil Mines Regulations and also commented upon by the Director General of Mines Safety (DGMS) so as to ensure quick identification of leakages and the safety and security of pipelines;*
13. *ensure that deficiencies in fire water system are attended to on priority to ensure safe working environment and to effectively handle unforeseen fire accidents;*

14. *evolve a system for periodical inspection and cleaning of oil storage tanks as stipulated in the OISD and DGMS regulations and monitor the compliance at an appropriate level; and*
15. *expedite efforts for early compliance and monitoring of the observations of DGMS and OISD.*

### **7.1. Introduction**

**7.1.1** The western onshore of Oil and Natural Gas Corporation Limited (ONGC) consists of three Assets at Ankleshwar, Ahmedabad and Mehsana which produce oil and gas from the explored and developed reservoirs. The production and surface facilities were created, maintained, revamped and upgraded as per the development plan of the field. The main production and surface facilities for processing of crude oil and gas were Group Gathering Stations (GGS), Gas Compression Plant (GCP), Gas Collection Station (GCS), Early Production System (EPS), Effluent Treatment Plant (ETP), Water Treatment Plant (WTP), Central Tank Farm (CTF), Desalter Plant, In-situ Combustion plant and pipelines. As of October 2008, there were 120 production and surface facilities in western onshore. A brief of these facilities along with flow chart of the production is given in *Annexure XIV (A and B)*. The activities of the Assets were managed by the Asset Managers and monitored by the Director (Onshore).

The performance review of the production and surface facilities in western onshore was carried out keeping in view the criticality of the facilities with respect to production, processing of oil and gas and their transportation in western onshore. Furthermore, there had been incidents of leakages, accidents as well as a case of blow-out (November 2007) in an injector well. The Company had a separate Directorate headed by an Executive Director responsible for issues pertaining to Health, Safety and Environment (HSE) and also had a well documented HSE policy with a system of periodic and regular surveillance audits for maintaining Quality, Health, Safety and Environment (QHSE) accreditations<sup>1</sup> in the test checked work centres and installations. However, certain deficiencies were noticed in the practices and procedures with environmental and safety implications which have also been discussed subsequently in the audit findings.

### **7.2. Scope of Audit**

Audit covered the planning, construction, maintenance and operations of Production and Surface Facilities in Western Onshore comprising of three Assets *i.e.* Ahmedabad, Ankleshwar and Mehsana for the period from 2004-05 to 2007-08.

### **7.3. Audit objectives**

The performance audit was conducted to assess that:

- (i) planning and implementation of capital projects pertaining to production and surface facilities was efficient and effective with reference to time, cost and achievement of objectives;
- (ii) stipulations of environmental regulations, standards and norms were adhered to; and

---

<sup>1</sup> *QMS-ISO-9001:2000, EMS-ISO-14001:2004, OHSAS-18001:2007. The Company also has a well documented emergency and disaster management plan for the test checked installations. The three Assets had separate HSE groups headed by Deputy General Manager.*

- (iii) stipulations of safety and health regulations, standards and norms were adhered to.

#### **7.4. Audit criteria**

The following criteria were used for the performance audit:

**(i) Planning, design and construction of Production and Surface Facilities: Feasibility Reports and recommendations of the Institute of Oil and Gas Production Technology (IOGPT), stipulations of the Board while approving capital projects, Material Management Manual (MM Manual) of the Company, terms and conditions accompanying contracts for purchase and construction of capital assets.**

**(ii) Adherence to stipulations of Environmental, Health and Safety Regulations:**

Applicable environmental pollution related acts and regulations and Environmental Audit Reports, Code of Safe Practices of the Company, industry regulations enacted through Oil Mines Regulations, Mines Act, standards and norms fixed by major original equipment manufacturer (OEM) and Oil Industry Safety Directorate (OISD) standards pertaining to production, treatment and transportation of oil and gas.

#### **7.5 Audit methodology**

Audit commenced after holding Entry conferences with the Asset Managers of Ahmedabad, Ankleshwar and Mehsana in April/May 2008. Desk review of records was supplemented by field visits to selected production and surface installations.

To elicit a structured response, questionnaires were devised pertaining to maintenance, production, health, safety and environmental issues. Discussions were held with the Management at different levels to familiarise the process, constraints of operations and their root causes. Selection of production and surface installations was done after segregating them into the distinctive functional areas such as GGSs, ETPs, GCPs and CTFs, etc. and within this stratification, individual units were selected following statistical sampling methodology ensuring that the total units selected represented 25 per cent of the units in the respective functional areas. The list of units test checked is given in *Annexure XV*.

Subsequently, during the Exit conference held on 17 October 2008 major issues incorporated in the report were discussed.

#### **7.6. Acknowledgement**

Audit is thankful for the cooperation received from the Management of the Company in providing information, records, clarifications and for arranging discussions with the concerned officers from time to time. Their cooperation facilitated the conduct of the review within the time frame.

#### **7.7. Audit findings**

##### **7.7.1 Planning, design and construction of production and surface facilities**

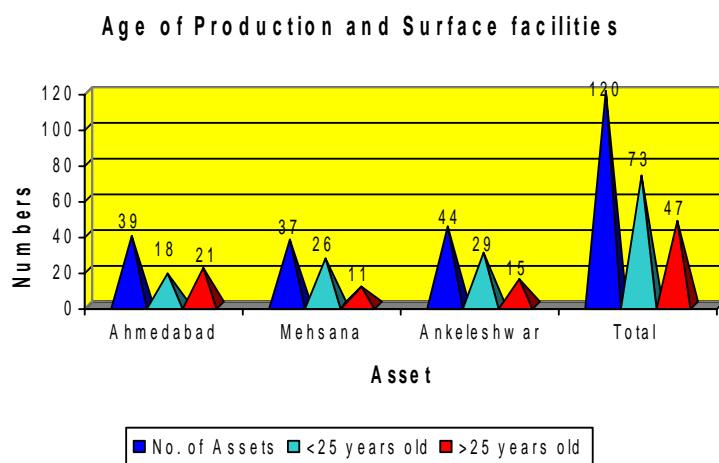
###### **7.7.1.1 Large number of old and aging installations**

Production and surface facilities include installations for processing of oil and gas and their transportation. These also include installations for ensuring adequate pressure of the reservoir and plants for treatment and disposal of effluents that get generated during

production and processing of crude oil. The Ahmedabad, Mehsana and Ankleshwar Assets had 39, 37 and 44 production and surface facilities respectively as of October 2008 (*Annexure XVI*). The average life of the facilities was considered to be 25 years.

However, Audit observed that the Company did not have a standard/approved policy for replacement of critical equipment for onshore surface installations. Audit also observed that out of 120 facilities, 47 facilities were more than 25 years old as of October 2008 as shown below:

**Chart 7.1**



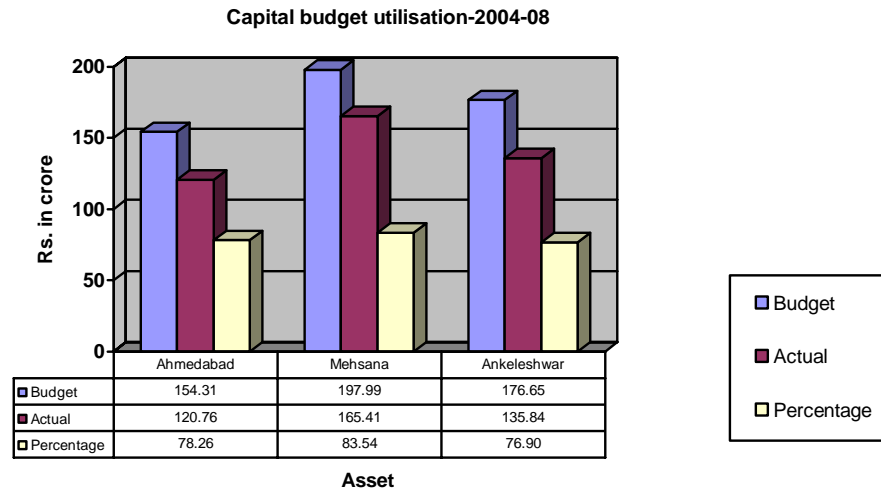
Further, as the facilities were old, induction of modern technology had not taken place in many of the installations. These facilities were also not meeting the safety requirements stipulated by the Directorate General of Mines Safety (DGMS) and Oil Industry Safety Directorate (OISD). The stipulations of the regulatory bodies came into force after these facilities were constructed. The individual deficiencies as had been observed on account of non-modernisation of technology and non-compliance with requirements of DGMS and OISD have been listed in *Annexure XX, XXI and XXII*.

In the Exit conference, the Management while accepting (October 2008) the audit finding as well as the recommendation stated that after detailed field-wise analysis, norms including periodicity of inspection of static equipment would be formulated which could help not only in upkeep and maintenance but also point towards critical static equipment that need replacement.

#### **7.7.1.2 Under utilisation of budget**

The Assets had not utilised their capital budget in any of the four years (except Ahmedabad Asset in 2004-05 and Mehsana Asset in 2007-08) ending March 2008. The shortfall ranged between 10 and 60 per cent (*Annexure XVII*) of the capital budget. The overall utilisation of the capital budget by the three Assets was as follows:

Chart 7.2



The reasons for under utilisation were mainly on account of procedural delays at various stages of tendering in the award of contracts as detailed in the following paragraphs.

#### **7.7.1.3 Delays in processing of tenders**

The Assets placed purchase orders/contracts/Lump sum turnkey contracts (LSTK) for procurement and installation of plants and machinery relating to production and surface facilities. Audit reviewed all the 31 cases (nine LSTK cases and 22 purchase orders) valuing above Rs. five crore placed by the three Assets during the last four years ending March 2008. Out of 31 such cases, 20 cases pertained to Ahmedabad Asset, eight cases pertained to Mehsana Asset and balance three cases pertained to Ankleshwar Asset.

In terms of MM Manual, the notice inviting tender (NIT) was to be issued within 17 days from the date of indent/purchase requisition. Audit observed that in 31 cases<sup>2</sup>, the NITs were issued after a delay of 13 days to 1243 days. Further, the purchase orders, as per MM Manual were to be placed within two months from the date of NIT. However, in 21 cases<sup>2</sup> the purchase orders were delayed by 10 to 487 days. The LSTK contracts, as per MM Manual, were to be finalised within six months from the date of indent. During 2004-05 to 2007-08, the three Assets placed nine LSTK orders (Ahmedabad-4, Ankleshwar-2 and Mehsana-3). However, it was observed that all the nine LSTK cases were not placed in time and the delay ranged between 173 and 1357 days.

In the Exit conference, the Management while accepting (October 2008) the audit finding as well as the recommendation stated that industry best practices in terms of procurement system being adopted by various leading PSUs, JVs, international companies, would be studied and based on which, revised comprehensive procurement practice would be formulated and discussed with the stakeholders before its approval and implementation.

<sup>2</sup> Delay in placement of order from date of indent/purchase requisition was upto 60 days in two cases (one LSTK/one purchase order), 61 to 240 days in nine cases (nine purchase orders), 241 to 420 days in seven cases (three LSTK/four purchase orders), 421 to 600 days in seven cases (two LSTK/five purchase orders), 601 to 780 days in three cases (one LSTK/two purchase orders) and more than 780 days upto 1357 days in three cases (two LSTK/one purchase order).

The Management added that an Onshore Design Engineering Group was established (April 2007) for expediting contracts for major onshore facilities.

***7.7.1.4 Delays in creation of various production and surface facilities***

***i) Delay in creation of GGS-II and III at Gamij leading to avoidable movement of crude oil through road tankers***

The Feasibility Report (FR) on the development plan of Gamij oil fields of Ahmedabad Asset proposed (July 2002) creation of GGS-II and III including water injection facilities at a cost of Rs.15.20 crore by December 2003. The FR was approved in September 2004. Meanwhile, the tender procedure for construction of GGS-II and III was initiated in May 2003. However, the price bids were not opened as the expenditure sanction from the Chairman and Managing Director was not received within the validity period of September 2004. As none of the bidders agreed to extend the validity of the price bids till November 2004, the tender was closed in April 2005.

A fresh NIT was issued only in January 2006 with revised cost estimate of Rs.21.65 crore. The second tender was also cancelled as the FR (2002) required revision. Though the cost estimate of GGS-II and III was revised to Rs.27.01 crore in May 2006, the tender process for award of contract was still (July 2008) to be initiated. The land required for creation of the surface facility had also not been acquired (July 2008). Thus, the surface facilities scheduled to be completed in December 2003 were awaiting the approval, initiation of tender process and acquisition of land, as of July 2008.

Audit observed that the indefinite delay in planning and creation of surface facilities of GGS-II and III had resulted in an additional estimated cost of Rs.11.81 crore with reference to the initial estimated cost. The delay also resulted in rescheduling of the drilling plan. As of March 2008, 13 producer wells and five injector wells had been drilled as against the scheduled 19 producer wells and 15 injector wells. The drilling of balance six producer wells and 10 injector wells had been deferred till commissioning of GGS-II and III including Water Injection facility. Meanwhile, oil production from five wells was transported through road tankers to the nearby GGS causing safety and environmental hazard besides operational difficulties.

Thus, due to inordinate delay in obtaining the approval for implementation of development plan of the Gamij oil field and consequent delay in execution of the project resulted in non-achievement of incremental oil gain of 3.17 lakh MT (2003-04 to 2007-08).

The Management stated (October 2008) that in spite of sincere efforts, the tender could not be finalised and that every effort would be made to avoid such delays in future. The Management in the Exit conference added (October 2008) that efforts would be made to replace tanker transportation through pipelines, wherever possible.

***ii) Delay in setting up of a GGS at Ramol leading to operational hazards***

A proposal for additional GGS with water injection at Ramol oil field of Ahmedabad Asset to connect the new development wells was approved in July 2003. The cost estimate of Rs.6.32 crore along with bid package and design was prepared in July 2004.

Audit observed that the expenditure sanction for additional GGS was obtained only in September 2005 after more than two years from the date of approval for installing the GGS. Meanwhile, in anticipation of expenditure sanction the tendering process was

initiated in May 2005 but it was terminated as the cost estimate was to be revised based on new costing methodology being adopted by the Company in September 2005. Accordingly, the cost estimate of the facility was revised to Rs.11.09 crore in September 2005. As against this cost estimate, price bids received were very high resulting in re-tendering. The contract was yet (July 2008) to be finalised. In the absence of GGS, the crude oil was being transported from oil wells through tankers hired from private parties. The delay in finalisation of the contract resulted in cost overrun besides transportation of crude oil through hired road tankers and exposing the Company to the vulnerabilities of safety and environmental risks and malpractices.

The Management confirmed (October 2008) that though the case was tendered twice but the same could not be concluded as the bids received were higher than the revised estimates. Further, a new pipeline was indented with expected date of completion by March 2009 as GGS alone would not help in avoiding tanker transportation. Also due to urgency an Early Production System (EPS)<sup>3</sup> was planned at the proposed location.

In the Exit conference, the Management expressed (October 2008) concern regarding movement of the product through road tanker which were not only hazardous to safe operations but also had adverse consequences on environment.

***Recommendation No.7.1***

***The Company may expedite completion of requisite surface infrastructure to avoid hazardous operations involved in road transportation through private road tankers besides attendant exposure to safety and environmental risks and malpractices.***

***iii) Delay in completion of gas lift facility resulted in loss of production besides hazards to environment on account of leakages***

A pipeline of 15.5 km. from Jotana GGS-I to Sobhasan in Mehsana Asset was commissioned in 1985-86 for transportation of High-pressure (HP) compressed gas for use in gas lift facility. The compressed gas of around one LSCMD<sup>4</sup> was being transported through this pipeline. The Construction and Maintenance division (C&M), Baroda had observed (October 2001) that the condition of the pipeline was not good and was leaking frequently. As it was not advisable to operate the pipeline from the safety point of view, C&M advised replacing the pipeline at the earliest.

Accordingly, a proposal was initiated in February 2003. However, this was put on hold due to requirement of new Gas Compression Plant (GCP) at Sobhasan to cater to the gas requirement of Sobhasan. After installation of new GCP the proposed replacement of pipeline would have become redundant. Hence, the existing pipeline was continued to be operated. The proposal was again re-initiated in May 2005 considering the latest development in conversion of air compressors to gas compressors. The gas lift wells at Sobhasan were re-commissioned in April 2006 after conversion of idle air compressors to gas compressors.

Audit observed that between July 2002 and May 2005 there were 76 instances of leakage. These frequent leakages had interrupted the operation of gas lift wells resulting in loss of production of oil, besides causing environmental damage. There was also a fire accident in January 2005 due to heavy leakage from the pipeline. However, Mehsana Asset

<sup>3</sup> EPS- akin to a GGS – pending creation of the GGS, EPS proposed to be set up as a temporary measure

<sup>4</sup> Lakh Standard Cubic Metres per day

continued to operate the pipeline for transportation of HP compressed gas to operate the gas lift wells of Sobhasan oil field till May 2005.

Audit further observed that the pipeline was shutdown in May 2005 after a major accident resulting in stoppage of transportation of compressed gas to Sobhasan gas lift wells. As a result, the 33 gas lift wells of Sobhasan GGS-I and II were closed for want of compressed gas for gas lift facility from May 2005 to March 2006 with consequential loss/deferment of oil production of 27251 MT.

The Management stated (October 2008) that operating life of the pipeline was considered to be 20 to 25 years and the leakages were on account of aging. The delay was attributed to holdup of proposal on account of requirement of new GCP in Sobhasan area and the pipeline was operated after repair of leakages.

The fact remains that despite being pointed out, the pipeline was not replaced in time causing safety risks besides frequent release of gases into the environment on account of leakages.

***Recommendation No.7.2***

***A system may be evolved for timely identification and replacement of old transportation pipelines to avoid unsafe operations which entail huge safety and environmental risks.***

***7.7.1.5 Non-recovery of additional condensate due to delay in modification***

Central Processing Facilities (CPF), Gandhar of Ankleshwar Asset handled oil from Gandhar field. Oil was stabilised in Crude Stabilisation Unit (CSU) and Low Pressure (LP) and Medium Pressure (MP) gases from the area were sent to Off Gas Compressor-II (OGC-II) for recovery of condensate. This condensate was processed at Condensate Fractionation Unit (CFU) where LPG and Naphtha were generated. If incoming crude in between MP and LP separators of CSU was heated by hot gas of OGC-II, it resulted in a small gain in condensate production. Out of four trains<sup>5</sup> of OGC-II i.e. 16, 17, 18 and 19, facility of gas-oil exchangers to heat CSU oil was available only in two trains i.e. 18 and 19.

To obtain this additional gain in condensate, Ankleshwar Asset referred (March 2005) the project to IOGPT to study the feasibility of installing gas-oil exchangers in trains 16 and 17 of OGC-II. IOGPT recommended (January 2006) a scheme of pipeline modification utilising existing gas-oil exchangers of trains 18 and 19 at a cost of Rs.39.58 lakh. A gain of approximately 21 TPD of condensate was computed by IOGPT involving an additional revenue of Rs.4.12 crore *per annum*.

Audit observed that the scheme of pipeline modification in line with IOGPT recommendations was not carried out till October 2008. As a result, additional revenue of Rs.4.12 crore *per annum* was not realised.

The Management, while accepting the audit comment, stated (October 2008) that as suggested by IOGPT, sanction for modification of piping system was obtained and the job was being awarded.

---

<sup>5</sup> *A set of equipment arranged so as to work in parallel mode for the purpose of load distribution and facilitate ease in maintenance.*

**7.7.1.6 i) Delay in construction of storage tank in Mehsana CTF with adverse implications on quality of crude dispatched**

Mehsana Asset initiated a proposal for two crude oil storage tanks of 10,000 M<sup>3</sup> capacity each at Mehsana CTF in October 2001 in view of the critical stock position at Mehsana CTF. The construction of new tanks was to provide additional storage capacity both from a safe (buffer) stock point-of-view as well as from quality control considerations. The cost of the two tanks was estimated (March 2004) at Rs.9.23 crore and the expenditure sanction obtained in July 2005.

The tendering procedure for award of contract for two storage tanks was initiated in August 2004. In response to the NIT (March 2005) only one bid was received from M/s Bridge & Roof Co. Ltd., Kolkata. The price bid opened in July 2005 revealed that the firm had quoted Rs.15.12 crore as against the estimated cost of Rs.9.23 crore. The estimated cost was then revised (October 2005) to Rs.13.31 crore in view of change in the costing methodology. The price negotiations were held and contract for construction of tanks was awarded (December 2005) at the negotiated price of Rs.14.65 crore.

Audit observed that the proposal for two additional tanks though initiated in October 2001 was commissioned only in July 2007 at an additional cost of Rs.5.41 crore on account of delay of over four years in obtaining sanction and award of contract. During the period the Asset was functioning with inadequate storage facilities resulting in higher percentage of base sediments and water (BS&W) in the crude oil. Audit also observed that in February 2005 the wells had to be closed due to non-availability of storage facilities which resulted in deferment/loss of oil production of 4405 MT.

The Management admitted (October 2008) that the wells had to be closed on account of non-availability of storage tanks. It, however, stated that the cost estimate of October 2001 was a notional budgetary estimate and, hence, should not be considered as a reference.

The reply of the Management, however, did not take into account the fact that Audit had calculated the cost escalation with reference to the estimate of March 2005.

**ii) Avoidable expenditure due to non-inclusion of additional floating roof tank in the tender**

With a view to maintain quality of crude oil of not more than 0.2 *per cent* BS&W and avoid penalty in the crude dispatched to the refinery of Indian Oil Corporation Limited (IOC) and enhance storage capacity, the Company approved (July 2004) a proposal to construct a floating roof tank of 30,000 M<sup>3</sup> capacity in the Desalter Plant at Nawagam in Ahmedabad Asset at an estimated cost of Rs.8.00 crore. NIT was published in April 2005 and the contract awarded in March 2006 at a cost of Rs.12.00 crore. The tank was commissioned in May 2008. Audit observed that due to inordinate delay, the cost of facilities had increased from Rs.8.00 crore to Rs.12.00 crore, besides non-maintenance of the stipulated quality in the dispatched crude.

While the NIT for the first tank had not been published, IOGPT had recommended (December 2004) one additional floating roof tank of similar capacity to facilitate operational flexibility in the event of maintenance/shutdown of the storage tank and to reprocess non-dispatchable crude. NIT for the additional tank was published in July 2007 and the contract awarded in June 2008 at a cost of Rs.18.05 crore.

Audit observed that the additional floating roof tank could have been combined with the NIT of the first tank floated in April 2005. Failure to include the procurement of an additional floating roof tank resulted in an avoidable extra expenditure of Rs.6.05 crore, besides non-creation of spare capacity for reprocessing and maintenance requirements.

The Management stated (October 2008) that the delay was due to procedural limitations.

The reply of the Management was not satisfactory since to avoid the cost and time overrun and to ensure better quality of crude, it was imperative that requirement for both the tanks should have been combined in a single NIT of April 2005 when IOGPT's recommendation had been received in December 2004.

With regard to the stated procedural limitations, the Management agreed (October 2008), during the Exit conference, to undertake a study of the industry best practices in procurement system and formulate a revised procurement practice after discussion with the stakeholders.

***Recommendation No.7.3***

***The Company may create adequate storage facility of crude oil at various installations to ensure uninterrupted production of crude oil.***

***7.7.2 Adherence to stipulations of Environmental Regulations***

Due to deficiencies in planning as highlighted above, there were delays in construction of adequate and requisite infrastructure which also had adverse implications on environment and safety of operations. Adherence to applicable environmental and safety regulations, standards and norms were test checked in audit. Illustrative cases highlighting environmental and safety concerns are discussed in succeeding paragraphs:

***7.7.2.1 Accumulation of oily sludge causing environment hazards***

Gujarat Pollution Control Board (GPCB) stipulated that the hazardous waste of more than 10 MT or a truck load, whichever was less, for a period beyond 90 days should not be stored. Prior permission was necessary for storage beyond 90 days or for storage of quantity exceeding 10 MT.

Audit observed that under the contracts awarded by the Company during 2007-08 for disposal through bio-remediation of 6674 MT of the oily sludge/soil at various installations of Ahmedabad Asset, only 44 *per cent* of the awarded quantity was cleared by the end of the year. As of March 2008, 9354 MT of the oily sludge/soil excluding that already awarded during 2007-08 was awaiting disposal at 33<sup>6</sup> installations of the Asset. Similarly, of the aggregate quantity of 28357 MT awarded during 2007-08 for disposal at various installations of Mehsana Asset, only 50 to 65 *per cent* of the quantity was cleared during the year and 12550 MT was awaiting disposal at 18<sup>7</sup> installations at the year end. Though the quantity of the oily sludge/oil contaminated soil accumulated at these Assets

---

<sup>6</sup> *Gamij GGS, Jhalora GGS I and II, Jhalora ETP, Kalol GGS I to IX and XI, Kalol GCS, Kalol CTF, Limbodara I and II, Motera GGS, Nandej GGS, Nawagam GGS I to III, Paliyad GGS, Ramol GGS, Sanand GGS I and II, South Kadi-CTF, Viraj GGS, Wadu GGS, CWIP II, Wasna GGS and Zundal GGS of Ahmedabad*

<sup>7</sup> *Balol-I, Bechrajee GGS I, Jotana GGS, Lanwa field, Mehsana CTF, North Kadi GGS I to IV, North Kadi ETP, North Kadi CTF, North Santhal CTF, South Santhal CTF, Sobhasan CTF, Sobhasan CTF/Pit, Sobhasan GGS-II, Sobhasan ETP and South Santhal GGS I of Mehsana.*

was in excess of the ceilings of time and quantity stipulated by GPCB, the Company had not obtained any permission from the Board.

The Management stated (October 2008) that efforts were being made by the Assets for disposal of hazardous waste as per GPCB guidelines. In the Exit conference, the Management, while accepting (October 2008) the audit finding as well as the recommendation, stated that a system would be evolved for periodic and regular identification, estimation of hazardous waste and its quick handling and disposal.

#### ***7.7.2.2 Frequent pipeline leakages leading to avoidable spillages***

The pipeline leakages in flow lines and trunk lines need to be continuously monitored for replacement of pipelines. The leakages disrupted normal flow of production and also time taken in attending to the repair led to closure of wells, besides loss of produced oil due to spillage.

Audit observed that in Ahmedabad Asset there were leakages on 3505 occasions and in Mehsana Asset on 5071 occasions during the last three years ending March 2008. In Ankleshwar Asset, there were 1087 leakages during the last two years ending March 2008. The Assets had no procedures in place to determine the loss of production on spillage of oil due to leakages. However, Mehsana and Ankleshwar Assets had estimated the loss of production of 4622 MT and 1630 MT respectively due to closure of wells while attending the repairs of the line leakages. Ahmedabad Asset did not have a system of working out the similar loss of production due to pipeline leakages.

The spillage of oil on account of leakages led to contamination of soil, besides affecting flora in the adjacent area.

The Management replied (October 2008) that Ahmedabad Asset was taking all steps for replacement of leaking pipelines on a war footing and that beneficial results of this would be experienced in coming times. As regards Ankleshwar Asset, it stated (October 2008) that all steps were taken to avoid leakages by introducing three layered coated pipes and glass reinforced plastic pipes in a phased manner while at Mehsana Asset, appropriate actions were being taken for timely replacement of leaking pipes. It also stated that a system existed for quantification of leakages in trunk pipeline and same would be evaluated for flow lines also.

In the Exit conference, the Management while accepting (October 2008) the audit finding as well as the recommendation stated that regular monitoring of pipelines would be carried out and based on line condition, timely replacement would be done to minimise the line losses and unsafe conditions.

#### ***7.7.2.3 Non-removal of Hydrogen Sulphide (H<sub>2</sub>S) from flue gas at Mehsana Asset***

Mehsana Asset had implemented the Enhanced Oil Recovery (EOR) scheme at Santhal, Balol, Becharaji and Lanwa fields. Content of hydrogen sulphide (H<sub>2</sub>S) in the flue gas of these EOR fields was very high ranging from 100 to 800 parts per million (ppm). The flue gas from the EOR fields was being disposed off at the rate of 10.85 lakh NM<sup>3</sup> per day in the atmosphere without removing H<sub>2</sub>S due to absence of the required facility in the installations causing environmental pollution.

Audit observed that the surface facilities at Santhal, Balol, Becharaji and Lanwa installations of the Asset were constructed more than 20 years back i.e. prior to implementation of EOR scheme and were not designed for handling the high H<sub>2</sub>S content in the flue gas. As a result, flue gas was being disposed off in the atmosphere through flare stake without removing H<sub>2</sub>S. This was in violation of pollution control regulations and had been objected to by the GPCB by issuing notices in December 2006. Apart from operational problems, odour of H<sub>2</sub>S was being felt by nearby villagers who objected to it.

Audit further observed that the matter was referred to IOGPT by Mehsana Asset only in March 2008 for a study to remove H<sub>2</sub>S from flue gas before flaring to avoid environment pollution and to adopt safe operating practices.

The Management stated (October 2008) that necessary measures were being taken for removal of H<sub>2</sub>S from flue gas and services of a consultant were also being hired for suggesting suitable process for it.

***Recommendation No.7.4***

***The Company may initiate urgent action to arrest emission of hazardous H<sub>2</sub>S gas into the environment and monitor the progress.***

***7.7.2.4 Delay in construction of Effluent Treatment Plant (ETP) at South Kadi leading to non-achievement of recycling of effluent***

The Feasibility Report (FR) on development plan of South Kadi oil field approved in August 2001 proposed construction of ETP for recycling of effluent for water injection purposes and upgradation of capacity of existing water injection facilities. The commissioning of ETP and upgradation of water injection facility were scheduled to be completed by November 2003. Due to delays in various stages of planning, preparation of bid package and finalisation of technology/drawings, the contract for construction of ETP was awarded only in November 2004 at a cost of Rs.6.14 crore. As per the contract terms, the scheduled commissioning of the ETP was January 2006.

Audit observed that trial runs of the ETP failed to achieve the desired parameters and, therefore, ETP had not been commissioned till October 2008. Consequently, the payment of Rs.4.87 crore to the contractor from October 2005 to October 2006 remained unproductive. In the absence of ETP, the effluent generated during this period was being disposed off in the effluent disposal wells after treatment in the wash tanks. Hence, the objective of recycling the effluent after treatment in ETP remained to be achieved since November 2003 till date (October 2008). In the absence of the ETP, fresh water was being pumped into the reservoir to maintain adequate pressure instead of recycled effluent.

The Management stated (October 2008) that all efforts were being made by the contractor and the Company to make the ETP functional at the earliest.

***Recommendation No.7.5***

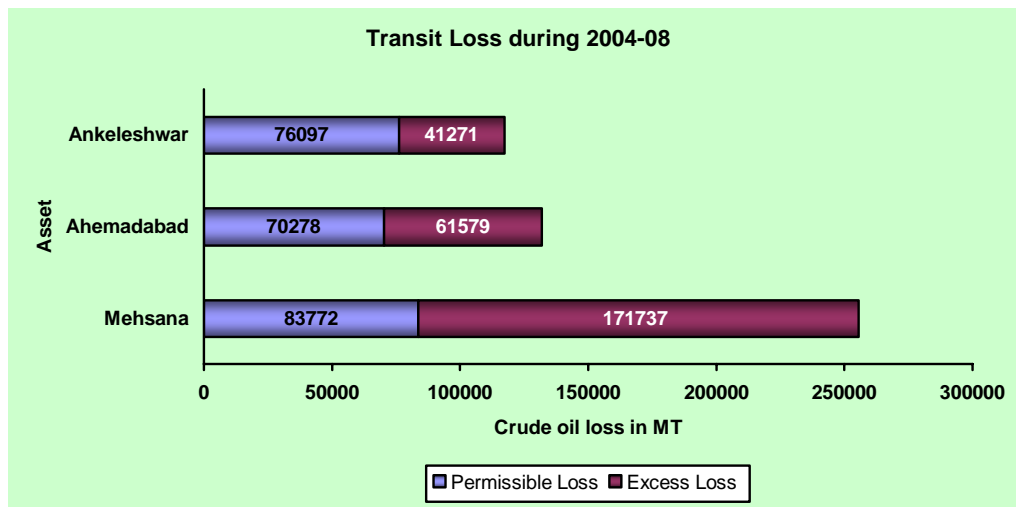
***The Company may ensure strict monitoring of project execution to commission the envisaged ETP to achieve the objective of recycling of effluent for the purpose of water injection.***

### 7.7.3 Adherence to stipulations of Safety and Health Regulations

#### 7.7.3.1 Loss of crude oil in transit

In terms of the Company's order (March 1990), the permissible pipeline losses for all sectors would be upto a maximum of one *per cent* of the crude oil production. Audit observed that due to frequent leakages, handling and movement through road tankers coupled with *ad hoc* and partial replacement of pipelines in the absence of regular replacement policy, the transit loss during the four years 2004-05 to 2007-08 was in excess of the norm by 0.18 to 3.31 *per cent* (*Annexure XVIII*) leading to loss of production. The aggregate loss of revenue on this account in the last four years ended March 2008 for the three Assets was Rs.73.38 crore. The total transit loss of all the three Assets during the period was 5.05 lakh MT as shown below:

Chart 7.3



The Management, while agreeing to the audit comment, stated (October 2008) that corrective action had been initiated to bring the transit loss within the permissible limits by intensifying patrolling and that efforts were being made to identify a system to detect leakages. In the Exit conference, the Management, while accepting (October 2008) the audit recommendation, stated that all efforts would be made to sensitise the Assets for strict adherence to norms of transit losses and this aspect would be closely monitored.

#### 7.7.3.2 Failure to undertake capital overhauling of major equipment

Capital overhaul is a maintenance activity in equipment's life cycle to restore equipment reliability and ensure smooth operations. Considering the large variety of equipment of different makes, models and capacities deployed at onshore installations, norms for first and subsequent capital overhauling of Onshore Surface Installation Equipment were formulated for the first time in September 2005 for ensuring better maintenance planning, budgeting and uniformity in the Company.

On test check of records relating to capital overhauling, Audit observed that the eight main oil dispatch pumps at CTF and Desalter Plant of Ahmedabad Asset, which were overdue for first overhauling after operation for 25000 hours, had been operated for 25883 to 77633 hours. Further, out of these eight pumps, six were operated for hours

ranging from 52457 to 77633 hours and, thus, became overdue for first as well as subsequent overhauling as per the laid down norms. No pumps were planned for overhauling during 2006-07. Though four pumps were planned for capital overhauling in 2007-08, none of these pumps were actually overhauled, indicating ineffective planning and monitoring of compliance to the norms. Further, four out of 17 main gas compressors, which were operated for hours ranging from 99793 to 105163 hours, were overdue for overhauling as per laid down norms of 90000 to 100000 operating hours. However, these compressors were not taken up for overhauling in 2007-08.

Similarly, in Mehsana Asset, 37 pumps, which were due for capital overhauling after 25000 hours (first overhauling) of operation and 20000 hours thereafter for subsequent overhauling, had been operated for hours ranging from 40000 to 164603 hours and planned for capital overhauling in 2008-09. Out of these 37 pumps, 24 pumps had become overdue for first as well as subsequent overhauling as per the laid down norms.

The non-compliance to the laid down norms would have serious consequences on operational efficiency of the equipment, energy consumption and higher maintenance cost, besides having environmental and safety implications.

The Management stated (October 2008) that the equipment in respect of Mehsana Asset were planned for capital overhauling in 2008-09 as the equipment planned for capital overhauling in 2007-08 could not be attended due to procedural and operational constraints. It, however, did not offer any comments in respect of Ahmedabad Asset.

***Recommendation No 7.6***

***The Company may adhere to the Capital Overhauling Schedule and monitor it regularly to reduce instances of unplanned shutdowns and also maintain necessary documentation as prescribed by OISD.***

***7.7.3.3 Non-fulfilment of requirement of Safety Committee of Mines***

The Mines Rules, 1955- Chapter IV-B stipulated formation of Safety Committee of Mines (SCM) to promote safety in the mines. The Committee was required to meet at least once in 30 days to consider the matter placed before it and that action should be taken within 15 days from the date of receipt of the Committee's recommendations.

The SCM was constituted for the Surface Mine at Ahmedabad Asset in February 2008 only after Audit had pointed out its non formation and the first meeting of the SCM was held in May 2008. Audit further observed that action on the SCM recommendations in five cases in Mehsana Asset was pending for more than a year. In Ankleshwar Asset, the SCM was not in existence.

The Management stated (October 2008) that in Ankleshwar Asset separate SCM would be formed. However, the reply was silent on the action to be taken on five pending cases in Mehsana Asset.

***Recommendation No. 7.7***

***The Company may assign due importance to the SCM as stipulated in the Mines Rules to ensure safe working environment, operation of the installations and monitor compliance to the action points as per recommendations of the SCM.***

#### **7.7.3.4 Delays in providing of security fencing at well sites**

DGMS had recommended (July 2005) for providing security fencing around operational wells as a statutory requirement. The provision of fencing around the operational wells safeguarded against encroachment of the well area besides ensuring safety. Ahmedabad Asset identified (October 2005) 1175 well locations and invited tenders in November 2006 at an estimated cost of Rs.32.51 crore.

Audit observed that the tender process was terminated (October 2007) as one of the two bidders had refused to extend the validity of offer beyond the stipulated date of 16 August 2007. Therefore, the recommendations of DGMS were yet to be complied with since further action for re-tendering was still (October 2008) awaited.

The Management stated (October 2008) that the work had now been taken up on top priority and would be completed by June 2009.

#### **Recommendation No.7.8**

***The Company may expedite erection of security fencing for all the wells as recommended by DGMS.***

#### **7.7.3.5 Oil Mines Regulations, 1984 – Non-maintenance and updation of pipeline networks**

Regulation 9 of Oil Mines Regulations, 1984 (OMR) stipulated accurate maintenance and updation of key plan showing the area duly demarcated in which operations for winning of petroleum and ancillary operations were carried on. A surface plan showing the location of all the wells including abandoned wells, group gathering stations (GGS), railways, power transmission lines, public roads, buildings or other permanent structures not belonging to the owner, rivers and water courses within the mining areas were also to be indicated.

Audit observed that the Ahmedabad Asset, which was operating trunk lines of 637 kilometres (km.) and oil/gas and other flow lines of 3262 km., had not maintained the route and cadastral survey despite operating for over 30 years. Further, DGMS had directed (May 2006) that at every GGS, the plan showing the details of all connected wells, layout of pipeline routes and operating pressure should be maintained and submitted to them. The route survey of 1340 km. and cadastral survey of 1990 km. pipeline had been completed in January 2007. However, there had been inordinate delay in initiating action against the DGMS directives of route survey and cadastral survey of 1200 km. of pipelines. Award of work in this regard had not been completed till date (October 2008).

Similarly, Mehsana Asset operated trunk lines of 133 km., oil flow lines of 2087 km. and gas lines of 326 km. The route and cadastral survey of 450 km. pipeline was completed in April 2006. The work for carrying out route and cadastral survey for 2922 km. pipelines of other fields of Mehsana Asset awarded in January 2008 was yet (October 2008) to be completed. In respect of Ankleshwar Asset, it was observed that the records of route and cadastral survey of pipelines were not maintained (October 2008).

The Management accepted (May 2008) that the route and cadastral survey of pipeline would help in quick identification of leakages and in safety and security of pipelines. The Management, while accepting the audit comment, stated (October 2008) that in respect of

Ahmedabad and Mehsana Assets the survey work was in progress. As regards Ankleshwar Asset, a case had been initiated for preparation of drawings.

**Recommendation No. 7.9**

***The Company may assign priority to update plans of the pipeline network as stipulated in the OMR and commented upon by DGMS so as to ensure quick identification of leakages and the safety and security of pipelines.***

**7.7.3.6 Discrepancy in system of Fire water network at the installations**

The OISD standard 189 clause 7 regulates the firefighting facilities in CTF/GGS. As per this standard, the fire water system in an installation should be designed to meet the fire water flow required for fighting one largest risk at a time and, therefore, stipulated the design flow rate and requirement of water at the installations.

On test check of records relating to availability of fire water *vis-à-vis* the projected requirement at 12 installations of Mehsana Asset, Audit observed that in six installations there was a huge gap between requirement and availability of water in case of fire. The shortfall in availability of water in these six installations ranged between 40 to 458 M<sup>3</sup>. Similarly, test check of records relating to fire safety network in various installations of Ahmedabad Asset (Nawagam CTF) revealed various deficiencies as detailed in **Annexure XIX**.

While accepting the audit comment, the Management stated (October 2008) that in Ahmedabad Asset the double headed fire hydrant as required was included in the revamping proposal and for other points corrective action was being taken. As regards Mehsana Asset, the Management stated that in five out of six installations pointed out by audit, the augmentation work for water storage capacity was either planned or under construction.

**Recommendation No. 7.10**

***The Company may ensure that deficiencies in fire water system are attended to on priority to ensure safe working environment and to effectively handle unforeseen fire accidents.***

**7.7.3.7 Non-compliance to Company's Code of Safe Practices**

In terms of Company's Code of Safe Practices 2001, flare lines were to be provided with a pilot burner with remote control electrical ignition device to ensure that the pilot burner was continuously lighted in the installations as an effective environment management and safety measure. It was observed that in Ahmedabad and Mehsana Asset the remote control electrical ignition system to the pilot burners was not provided in any of the test checked installations.

The Management while accepting the audit comment stated (October 2008) that action was on hand for installation of flare system.

**Recommendation No. 7.11**

***The Company may monitor compliance to the Code of Safe Practices and ensure provision of the facilities specified therein.***

### **7.7.3.8 Inadequacy of facilities for processing of oil in production installations**

The operating functionaries at the various installations in the Assets from time to time had identified a number of issues constraining smooth and efficient operations. These issues mainly were in the nature of inadequacy of the present equipment and systems. Similarly, the Assets had also engaged outside expert engineering consultants to suggest modifications and revamping which were necessary to make these installations in line with norms of Health, Safety and Environment (HSE) as well as to comply with relevant regulations and statutes. An illustrative list of these requirements is brought out in *Annexure XX* along with actions that the Management had proposed.

Audit observed that action to ensure the availability of the required facilities in the various installations test checked was pending and in most of the installations it was at the initial stage of planning.

The Management stated (October 2008) that action was on hand to make available the required facilities in various installations.

***Recommendation No. 7.12***

***The Company may initiate timely action for addition and modification of facilities in production installations and monitor the progress.***

### **7.7.3.9 Non-compliance of inspection and maintenance requirements of tanks**

The standard code 129 of Oil Industry Safety Directorate (OISD) stipulated that inspection programme for tanks in service should be drawn to avoid failures and inconveniences in operation due to sudden reduction in tank storage capacity. The OISD code further stipulated that crude storage tanks should be inspected at a frequency of 10 years for internal inspection and five years for external inspection in respect of sweet crude. In case of sour crude, the duration for internal inspection and external inspection was six years and three years respectively.

Audit observed that the details of inspection programme drawn up as well as actual inspections carried out against the programme (both internal and external), maintenance observations made and action taken thereon were not on record in the installations/Asset.

While accepting the audit comment, the Management stated (October 2008) that action plan was being drawn to attend to the inspection requirement of tanks on need basis. As regards Mehsana Asset, it stated that proper records would be maintained.

***Recommendation No. 7.13***

***A system may be evolved for periodical inspection and cleaning of oil storage tanks as stipulated in the OISD and DGMS regulations and compliance monitored at an appropriate level.***

### **7.7.3.10 Non-compliance of observations of statutory bodies and Oil Industry Safety Directorate**

#### ***i) Observations of Director General of Mines Safety***

A review of compliance status of the observations of Director General of Mines Safety (DGMS) revealed that 260 DGMS observations were pending as on 31 March 2008 of which 149 observations were pending for over two years. Some of the significant pending

observations and Management's response (October 2008) thereto are detailed in ***Annexure XXI***.

The Management attributed (May 2008) the delays to requirement of time in conceptualisation and in attending to procedures, *etc.* and stated that efforts were on to comply with all the observations in the shortest possible time.

***ii) Non-adherence to DGMS Rules***

Para 55 of DGMS Rules stipulated that effectiveness of earthing of crude oil storage tanks would be tested once in 12 months. The results of every such test should be recorded in a bound-paged book kept for the purpose and should be signed and dated by the person carrying out the test. The code of safe practices of the Company also referred to the requirement of para 55 of DGMS Rules.

However, no such records were available at the installations test checked in audit.

The Management stated (October 2008) that in most of the cases action had been taken and that in the remaining cases, action was in hand to comply with the observations of DGMS.

***Recommendation No. 7.14***

***The Company may expedite efforts for monitoring compliance to the observations of DGMS for appropriate and timely remedial measures.***

***iii) Observations of Oil Industry Safety Directorate***

A review of compliance status of the observations of Oil Industry Safety Directorate (OISD) revealed that 141 OISD observations were pending as on 31 March 2008 of which 35 observations were pending for over two years. Some of the significant observations and Management's response thereto are given in ***Annexure XXII***.

The Management in reply (October 2008) stated that in most of the cases action was taken and that in some case action was in hand to comply with the observations of OISD.

***Recommendation No. 7.15***

***The Company may expedite efforts for monitoring compliance to the observations of OISD for appropriate and timely remedial measures.***

***iv) Non-maintenance of records***

As per OISD standard 127, clause 3.1, each critical rotating equipment should have one separate folder containing the information regarding a) Complete specification sheet of the equipment; b) Characteristic curves; c) Maintenance schedules; d) Standard clearance chart with the maximum and minimum limits; e) Maintenance history sheets; f) Breakdown analysis sheets; g) Vibration and shock pulse measurement log; and h) Complete list of spare parts with store code.

On test check of records of critical rotating equipment installed and operated in different installations of three Assets, Audit observed that history folder was not maintained in respect of any of the major critical rotating equipment and, therefore, the compliance to OISD standard was not ensured.

The Management, while accepting the audit comment, stated (October 2008) that improvement was being made for the maintenance of records as per the OISD requirements.

***Recommendation No. 7.16***

***The Company may ensure maintenance of database in line with OISD requirements for all critical equipment and review it periodically.***

**7.8. Conclusion**

Thirty nine *per cent* of the production and surface facilities in the western onshore were more than 25 years old. The Company did not have a standard policy for replacing the critical equipment in the onshore surface installations. The Company also did not adhere to the overhauling schedule of critical equipment which had serious consequences on operational efficiency besides environmental and safety implications. The contracts for creation of production and surface facilities were inordinately delayed. Consequently, there were operational difficulties and loss in anticipated oil gain besides safety hazards and adverse implications on the environment. Poor maintenance of equipment and pipelines led to exceeding the norm of one *per cent* for transit losses leading to loss of revenue of Rs.73.38 crore. There were inordinate delays in complying with the observations of DGMS and OISD on maintenance of production and surface facilities.

The matter was reported to the Ministry in December 2008; reply was awaited.