

Chapter 4

Audit Findings on Measurement and Reporting in Onshore Assets

4.1. Inconsistency in measurement procedures

Measurement and reporting system of six onshore Assets were reviewed in Audit (Ankleshwar, Ahmedabad, Mehsana, Assam, Rajahmundry and Cauvery). The Assets accounted for nearly the entire onshore oil production in ONGC. During the period of Audit (2010-2015), there was no standard operating procedure for measurement of crude oil in onshore Assets. As such, different Assets measured production at different points of the value chain using different measurement techniques for the purpose.

Audit observed the following disparities in Western onshore region:

In Ankleshwar Asset, crude oil production was measured through tank-dip at the storage tanks from which crude oil is dispatched to the refineries. Thus measurement of crude oil production was after completion of all processing activities in Ankleshwar. In Mehsana Asset, however, crude oil production was measured using mass flow meters at the inlet of the Central Tank Farm (CTF), before the crude oil was processed in the CTF.

The point of measurement was important as the quantity of liquid would necessarily measure higher before processing than after removal of water and impurities. The method of measurement and the equipment used for the purpose was also important for standard measurement of production quantity. Audit observed need for standardising the measurement process in this regard in ONGC.

Management/Ministry stated in reply (January/April 2016) that a corporate standard operating procedure (SOP) for crude oil measurement at onshore Assets have been issued and Asset specific SOPs based on corporate SOPs have been prepared and issued.

Implementation of SOPs for crude oil measurement in onshore Assets would be verified in future Audits.

4.2. Mismatch between reported and measured quantity of crude oil in Western Onshore Assets

The processing installations of an Asset maintain log books and daily production records for crude oil production which are sent to the base office of the Asset. The base office of the Asset collates the production data of all processing installations to generate the Daily Production Report (DPR) of the entire Asset. The Asset DPRs are consolidated at the corporate level. Audit checked the different sets of crude production records at three Western onshore Assets (physical logs maintained at processing installations, production data communicated by processing installations to base office, production

data reported by the base office of the Asset and the production data of the Asset as recorded in the corporate level statement) and noticed the following discrepancies:

- A. Ankleshwar Asset:** In Ankleshwar Asset, the processing installations maintained physical logbooks recording the production data which were used for preparation of DPR at the processing installations. These installation DPRs are communicated to the base office of the Asset, daily before 8.00 AM. Audit noticed that the DPR of the processing installations (transmitted to base office and incorporated in the corporate level production data) was much higher compared to the data maintained in the physical log books recording actual production. The difference between the reported production (as per DPR of the asset) and the actual production recorded in the log books maintained at the processing installations, over the period 2010-11 to 2014-15 was **6,63,406 MT** (10.66 percent of the reported production of the Asset). The specific details are at Annexure I.
- B. Ahmedabad Asset:** The production figures reported by the base office of the Asset (incorporated in the corporate level production data) were much higher than the production data that was communicated by processing facilities to the base office. Audit noticed that the data communicated by the processing facilities tallied with the physical log books maintained at these facilities. However, there were differences between the figures pertaining to the facilities reported by the base office to the corporate office. The difference between the reported production (as reported by base office to corporate level) and the actual production as seen from the log books maintained at the processing installations, over the period 2010-11 to 2014-15 was **3,75,765 MT** (5.02 percent of the reported production of the Asset). The specific details are at Annexure I.
- C. Mehsana Asset:** In Mehsana Asset, the technical cell at the Asset base reported calculated production data to corporate office. The calculation was done on the basis of fluid received at Mehsana Central Tank Farm. Mehsana Asset also worked out the actual production based on processed crude obtained at the outlet of the processing facility, adjusted for actual water drained. Audit noticed that the calculated production data reported by the Asset (and incorporated in the corporate level production data) was higher than the actual production quantity recorded by the Asset. The difference between the reported production (as reported by base office to corporate level) and the actual production over the period 2010-11 to 2014-15 was **2,62,810 MT** (2.29 percent of the reported production of the Asset). The specific details are at Annexure I.

Management/Ministry in reply (January/April 2016) accepted the audit observations and assured that a host of corrective measures have been set in motion with all stringency. Management also stated that these actions namely forward reporting, withdrawal of authorization at the base stations, uniformity of reporting time, strict monitoring and total reporting based on SAP system (legacy system has been done away) are yielding desired results.

Audit has noted the Management/Ministry reply and will verify the position in the course of future audits.

4.3. Lack of asset specific norms to determine recoverable crude oil used for internal consumption

Producing wells may become sick over a period and need to be repaired through work over operations. The process of work over operation require hot oil circulation (HOC)/squeezing job in the well. Crude oil produced is used for the HOC/squeezing job. A significant portion of this crude is recoverable and would form part of future production from the repaired well.

Audit however noted that production installations accounted the crude oil used for HOC/squeezing jobs as “internal consumption” without indicating the possibility of future recovery of the oil, thus over-stating production.

Review of the records of onshore Assets revealed that Ankleshwar, Ahmedabad and Assam Assets depict the entire usage of crude oil for HOC/squeezing jobs as internal consumption and do not provide for any ‘recoverable’ component (details in **Annexure II**). Besides, no Asset specific norms have been prescribed to determine ‘recoverable’ component of the crude oil used for HOC/ squeezing jobs.

Management in reply (January 2016) stated that though theoretically, most of crude oil used for HOC should return back to the installation where that well is flowing, this is not practically the case. Amount of crude oil returned depends on a number of factors (permeability and pressure of reservoir, distance of well from installation, depth, revival, type of wells, etc.) and hence it is difficult to anticipate quantity of recoverable crude oil, being a field specific phenomenon. Ministry assured (April 2016) that the Asset specific SOPs now implemented, will be addressing the issue.

Ministry has accepted the audit observation and initiated corrective action. The actual implementation of corrective action will be reviewed in future audits.

4.4. Accounting of Pit oil stock as crude oil production

Ahmedabad Asset had recognised **1,34,794 MT** of crude oil as pit oil¹⁵ stock in the closing stock of crude oil for the year 2009-10 (which had accumulated over the period, 2006-07 to 2009-10). The Asset, however, did not consider this pit oil stock for stock valuation in its books of accounts. Subsequently, the Asset accounted a loss of 14,183

¹⁵ In an effort to realise production from exploratory wells expeditiously such wells are often flogged to make shift pits at well sites during initial testing. Oil recovered from effluents was also often stored in wash tanks prior to being recovered. Also during period of high stock due to less evacuation of refineries excess oil is stored in available storage like wash tanks /effluent tanks. The oil which is not stored in crude oil tanks and does not appear in tank stock statement of the Asset is referred to as pit oil.

MT and 10,615 MT during the years 2010-11 and 2011-12 respectively due to bio-remediation¹⁶ and reduced it from the pit stock of those years. Later, the Asset reduced a further quantity of 39,000 MT in 2012-13 from the closing stock of pit oil stating that the said quantity had already been recovered from the pit stock at the Desalter Plant, wash tanks and CTF Nawagam during the years 2009-10 to 2012-13. The Asset has finally written off the balance quantity of 70,746 MT in the year 2014-15.

Management/Ministry in reply (January/ April 2016) stated that the matter has already been intimated to Audit & Ethics Committee and ONGC Board on 14 February 2015 and that pit stock has been corrected as per the Board decision. Management also assured that, at present, there is no pit stock in Ahmedabad Asset.

The corrective action would be verified during future audits.

4.5. BS&W and free water drained after reporting crude oil production

Audit noticed that during the period from 2010-11 to 2014-15, 523,338 MT of BS&W and free water had been removed from crude oil in Ankleshwar and Mehsana Assets, after production had been measured and before custody transfer of crude to refinery. It was noticed that a significant quantum of BS&W and free water had to be removed at the refinery end before custody transfer. In onshore Assets, crude oil production is mostly measured after processing and before its dispatch to refineries. Such quantity was expected to contain less than 0.2 percent of BS&W. It was however seen that Ankleshwar, Rajahmundry and Cauvery Assets have reported high water drainage at the refinery end as shown in the table below:

Table-5: Free water and BS&W drained at refinery end

Asset	Free water and BS&W drained at refinery end	Percentage of free water and BS&W in the dispatch quantity
Ankleshwar	49,835 MT	0.92 %
Cauvery	11,195 MT	0.95 %
Rajahmundry	15,385 MT	1.30 %

Such a high quantity of drainage of free water and BS&W, post reporting of production quantity of crude oil from these Assets has contributed to overstatement of crude production of these Assets.

Management/Ministry in reply (January/April 2016) stated that high BS&W losses were partially on account of higher water cut, due to lack of adequate processing facilities/handling facilities at all the installations resulting in dispatch of high BS&W crude oil to the refinery where it is given some more retention time to drain excess/free water before custody transfer. In case of Rajahmundry Asset, Management stated that the BS&W

¹⁶ Bio remediation is the process of naturally/deliberately introducing micro-organisms to consume and break down environmental pollutants in order to clean a polluted site.

figures included transit losses and assured that corrective action to report BS&W and transit losses separately would be taken in 2015-16.

Management also stated that the high BS&W was partially reported to adjust wrongly reported production in Ankleshwar. Management assured that the matter has been considered by the Audit & Ethics Committee and Board of ONGC and subsequently, control mechanism has been put in place to avoid occurrence of such incidents in future.

Ministry added (April 2016) that 0.20 *per cent* BS&W is excluding free water and accordingly it is maintained in the supply to refineries and steps have been taken to increase retention time at tanks by adding new tanks (by 2017) which will reduce considerably the water draining at refinery end.

The reply of the Management needs to be viewed in the following context:

- (i) It is noted that the Management has initiated corrective action to avoid recurrence of over reporting in future by adjusting BS&W quantity, implementation of which will be reviewed in future audits.
- (ii) It is however stressed that corrective SOPs would not address the inadequacy of processing facilities which lead to higher water content in processed crude or operational constraints in determining accurate water cut in reported crude oil production. Hence, a high quantum of BS&W may continue in the crude oil after the production reporting stage even with revised SOPs. Audit is of the opinion that this concern could be addressed by appropriately shifting the production reporting point to ensure that production of crude oil is reported after adjustment of BS&W.

4.6. Reporting water in closing stock of Assam and Ankleshwar Assets

A. Ankleshwar Asset: Audit observed that the Ankleshwar Asset over reported the crude oil production from 2007-08 onwards by filling the crude oil tanks with the effluent or water at the end of the year so as to match the actual closing stock of crude oil in different product tanks with the reported closing stock of crude oil. During the period from 2010-11 to 2014-15, the Ankleshwar Asset overstated the closing stock of crude to adjust a part of the over reported production of the Asset by **81,800 MT**.

Management accepted (January 2016) the observation and assured that appropriate action has been taken to prevent future cases of this nature.

B. Assam Asset: Test check of log books/DPR of Group Gathering Station-II of Rudrasagar field in Assam Asset, for the years 2013-14 and 2014-15, revealed that the closing stock (as on 31st March) was increased by 2699.54 MT (3139 M³) during the period January to March and was subsequently decreased by draining water during the month of April. As a result the production of crude oil from this field was over reported by **2699.54 MT**.

By over reporting of closing stock, Company had to bear additional subsidy burden of ₹ 160.69 crore as discussed in Para 5.2.B.

Management in reply (January 2016) accepted the audit observation and assured that due care would be taken to avoid such incidents in future.

Ministry stated (April 2016) in reply that post audit observation, Assets have been sensitized of the issue and close monitoring of closing stock is being done to avoid recurrence of such incidents.

The assurance of Management/ Ministry would be watched in future audits.

4.7. Incorrect reporting of theft of crude oil in Ankleshwar for reconciliation

Crude oil from various fields in Ankleshwar Asset is collected at Central Tank Farm (CTF), Ankleshwar and further transported to IOCL Refinery, Koyali through a trunk pipeline. It was observed that on 18 February 2013, the said trunk pipeline was punctured by miscreants to steal crude. The security team of the Asset reached the site on the same day and seized the filled and empty barrels and cans and filed an FIR with the police for theft of 550 liters of crude oil. However, in the crude oil tally statement as on 31 March 2013, the Asset indicated pipeline leakage of 3556 MT as against the reported theft of 550 litres. The excess reporting was done to reconcile the differences between reported production and sale of crude oil by the Asset.

Management accepted (January 2016) that the crude oil theft of 3556 MT was not a correct figure and the same was reported to adjust the over reported production of crude oil. Management/ Ministry (January/April 2016) also accepted the observation and stated that the Asset has been advised to avoid recurrence of such incidents.

4.8. Shortcomings in the measurement system of crude oil in onshore Assets

The measurement of crude oil in onshore systems is mainly carried out through tank dips in storage tanks of the Asset. The Company had also installed Supervisory Control and Data Acquisition (SCADA) system to allow for measurement of the crude oil quantity through electronic instruments without manual intervention and tampering as well as integration of acquired data with the IT system of the Company and SAP. Audit noticed a set of infirmities and shortcomings in the on land crude measurement system as detailed below.

4.8.1. Non-calibration of storage tanks in onshore Assets: Tank calibration is the process of accurately determining the capacity of a tank and expressing this capacity as a volume for a given linear increment or height of liquid. Tank calibration, tank inspection and certification of storage tanks at least once every five years was made mandatory by the Directorate of Legal Metrology. However, the calibration of the storage tanks was not carried out at the required frequency of five years. In cases where calibration was done, deficiencies were noticed as discussed below:

(A) Assam Asset: Audit noticed that most of the tanks in Assam Asset were commissioned during 1970s and re-calibration of these storage tanks have not been carried out since their commissioning, i.e., even after 40 years. Cleaning of tanks was also not regular (with the exception of 14 tanks out of 120 in the Asset).

The Management replied (September 2015) that the contract for calibration of 63 tanks had been awarded in September 2015 to be executed for a period of three years. The reply has to be viewed in the context of non-adherence to the mandatory calibration schedule by the Asset.

(B) Southern Assets: Audit test checked calibration charts in four installations out of 36 in Rajahmundry Asset and Cauvery Asset. It was noticed that the tanks had not been re-calibrated since their commissioning.

(C) Western Onshore Assets: In Western onshore, Audit noticed that the re-calibration of tanks was not carried out every five years as per the prescribed norms.

Non-adherence to the scheduled calibration may result in incorrect reporting of crude oil quantity and reduce the credibility of measurement and reporting.

Management in reply (January 2016), accepted the audit observation and assured that steps had already been taken to increase the tankage, as well as repair and maintenance of out of service tanks and that annual rate contract/one time contract has been placed for repair and maintenance of tanks in Mehsana, Ankleshwar, Ahmedabad and Assam. Action taken by the Management would be examined during future audits.

4.8.2. Poor utilization of SCADA system:

The Company implemented the Supervisory Control and Data Acquisition (SCADA) system in March 2008 at a cost of ₹385 crore for measuring production and drilling parameters. SCADA system in onshore Assets was installed at Group Gathering Station (GGS), Early Production System (EPS), Crude Tank Farm (CTF) and Central Processing Facility (CPF).

Audit observed that though the Company had installed SCADA system in most onshore installations and gross volume of crude oil in tanks were being captured by the SCADA system, the same was not used in reporting production. Production continued to be measured by tank readings based on manual dips. In the case of Ankleshwar, even though the SCADA system was integrated with SAP, the Asset did not generate production reports based on SCADA readings.

Management/ Ministry accepted (January 2016/April 2016) the audit observation and stated that steps are being taken to integrate SCADA system with ICE SAP-ERP¹⁷ to

¹⁷ Information Consolidation for Efficiency through implementation of Enterprise Resource Planning, i.e., SAP Systems and other IT efforts.

address the issues brought out by Audit. The actual implementation of Management assurance will be verified in future audits.

4.8.3. Mismatch between data recorded in log book and SAP in Assam Asset

Crude oil production was manually measured by the Assam Asset (by tank dips) and entered in the log books of the processing installations. The same data was subsequently entered in the SAP-ERP system. A test check of the log books of production installations, and the SAP-ERP data revealed mismatches which raises doubts on the reliability of the crude oil production reported through the SAP system.

Management in reply (January 2016) stated that guidelines have been issued in September 2014 and corporate level SOPs for onshore Assets on metering and measurement of crude oil have also been issued. Besides, Assets have been advised to formulate Asset specific SOPs based on the corporate level SOPs. Management also assured that the measurement and reporting system had some identified inefficiencies which are being addressed in a continuous manner. Ministry stated (April 2016) that all the Onshore Assets have prepared Asset specific SOPs on crude oil measurement. The action taken would be verified during future audits.

4.8.4. Deficiency in using Production Revenue Accounting (PRA) system

The Company had implemented the PRA module in SAP-ERP system w.e.f. February 2010. The PRA system generates daily crude oil production reports (DPR) for a processing installation, based on data (quantity along with density, temperature and water cut) pertaining to closing stock of crude oil and crude oil dispatch from the installation. This forms the basis for the daily, monthly and annual production records in SAP. However, in Western onshore Assets, the data was not correctly fed into the PRA system. The DPR was generated manually, outside the PRA system, by the Asset Technical Cell. A test check of the SAP-DPR figures noticed variation with those reported in the manual DPR data. In Assam Asset and Southern Region, discrepancies were noticed among different reports generated in SAP which indicated different crude production figures.

Audit noticed that Director (Onshore) of the Company had directed (September 2011) that correct production figures should be entered in PRA system on daily basis within stipulated time, so that representative figures can be available to ONGC management through Business Intelligence (BI) module. However, the Production and Development Directorate (P&DD) of ONGC observed differences in the Asset reported figures and BI module figures for the first quarter of 2015-16.

Management in reply (January 2016) stated that the non-matching of data among different reports in Assam Asset was on account of wrong methodology adopted by the Asset and that corrective actions are being taken. Management/Ministry also stated (April 2016) that all Assets have been sensitized to report production data in PRA module. The corrective action taken by Management would be verified during future audits.