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Audit Report on 'Water Injection Operations in Western Offshore, ONGC Presented in Parliament

The Compliance Audit Report No. 19 of 2021 of the Comptroller and Auditor General of India on 'Water Injection Operations in Western Offshore, ONGC' was presented in the Parliament here today.

ONGC is contributing around 70 *per cent* of domestic production of crude oil in the country. Mumbai High, Neelam and Heera fields of western offshore contribute around 59 *per cent* of this production. These fields have been operating from 1976 and 1984 respectively and therefore these mature fields are susceptible to decline in production. Water injection is a method for reservoir health management and increasing crude oil recovery from the reservoir.

A Compliance Audit was conducted to review performance of water injection operations in western offshore of ONGC for the period 2014-15 to 2018-19. The main audit findings are as under:

Audit findings

Planning and implementation of requirement of water injection

The annual plans for water injection were lower than the requirement as provided in the re-development schemes by 5 to 46 *per cent* during 2014-15 to 2018-19. The annual plan is prepared under resources constraints and instead of overcoming the constraints, they were accepted as reality and planned accordingly. Even the reduced annual targets were not achieved.

(Para 3.2 and 3.3)

Water injection quantity was measured regularly at water injection platform end. With multiple leakages in injection lines noticed during 2014-15 to 2018-19, injection quantity measured and reported at water injection platform end was not the correct measure of quantity injected into the reservoir.

(Para 3.5)

The company commenced water injection six to eight years after commencement of field production in Mumbai High, Neelam and Heera. Cumulative voidage compensation as on 1 April 2019 was only 54.43 *per cent*, 42 *per cent* and 78.8 *per cent* in Mumbai High, Neelam and Heera fields respectively.

(Para 3.6)

Water injection surface facilities and equipment

Chemical dosing pumps which were required to maintain desired quality to avoid corrosion of water injection equipment, clogging of wellbore and indirectly affecting crude oil production were not considered as essential equipment.

(Para 4.3)

The equipment replacement policy adopted by the company was not adhered to and failure of equipment was attributed to delay in overhauling and replacement/ revamping along with deficiency in maintenance.

(Para 4.4)

System availability (availability of equipment for un-interrupted flow of production) of critical equipment was below the adopted target of 100 *per cent*. Instances were noticed where system availability of the equipment were shown as 100 *per cent* when the equipment failed to meet the field requirement or equipment was shown available when it was sent on repairs. Absence of data in ERP system, lack of proper mapping and maintaining important equipment details outside the ERP indicated that the company did not use the Plant Maintenance module of SAP-ERP effectively to obtain the intended benefits.

(Para 4.5, 4.6, 4.7 and 4.8)

There were delays in initiating revamping/ replacement process because of improper planning. Original Equipment Manufacturer (OEM) recommended norms/ maintenance practices were not followed leading to equipment deterioration and rendering it unsafe for full scale operation. In Mumbai High, 52 *per cent* of the critical/ major water injection rotary equipment were overdue for overhaul.

(Para 4.9 and 4.10)

Quality of water injection

The company failed to meet desired quality parameters, despite dilution of some of the quality parameters over a period. The quality of water in many water injection platforms was observed as inferior to the quality parameters currently followed by the company.

(Para 5.2 and 5.3)

The dosing of chemicals was not ensured to be within recommended levels and in large number of cases of ‘nil’ and lower dosing of chemicals was observed. This has

consequences of plugging formation, pipeline leakage, etc. Discrepancies and inconsistencies were also noticed in reporting of the water quality. Important quality parameters were not captured due to non-functioning of quality measurement instruments.

(Para 5.4 and 5.5)

Quality of water is measured at water injection platform from where it was despatched and reported the quality of water injected into reservoir. However, due to corrosion in water injection lines, quality of water deteriorated en-route to wellheads. Thus, actual quality of water injected into reservoir was inferior to the quality reported at water injection platform.

(Para 5.6)

Maintenance of water injection pipelines and injectors

Reports of the corrosion monitoring revealed that corrosion rate of water injection pipelines was above safe limit. Pigging helps to remove debris deposited in pipelines, control of microbes and monitoring of pipeline integrity. There was substantial shortfall in pigging operation against requirement and there was inadequate analysis of pigging samples. Internal corrosion was the primary reason for premature failure of water injection lines. Rather than mitigating the corrosion issues, the company reduced the design service life of water injection lines from 25 to 15 years. Time lag was observed between date of leakage and date of repair/ replacement which contributed to substantial loss of water injection.

(Para 6.1, 6.2 and 6.3)

To restore or improve the performance of a well, workover or well servicing activities are taken up. In Mumbai High field, workover was carried out only in 49.59 *per cent* wells against the wells planned. In Neelam and Heera fields, injection wells were serviced after a gap of 15-20 years. This had long term impact on reservoir pressure and ultimate oil recovery.

(Para 6.4)

Well stimulation is a well intervention procedure adopted as water injection wells were prone to plugging. Stimulation jobs were carried out in Mumbai High field and Neelam & Heera field in only 18 *per cent* and 39 *per cent* respectively against the approved workload. Situation did not improve even after hiring dedicated stimulation vessel for injection wells.

(Para 6.5)

Impact of inadequate water injection

There was continuous decline in reservoir pressure due to inadequate water injection since inception of fields which impacted crude oil productivity and its ultimate recovery. Decline in reservoir pressure is further accentuated by higher gas production from the

reservoir. Periodic recommendations of the Ministry on importance of water injection, its distribution and maintenance of reservoir health were not fully implemented.

(Para 7.1)

The Performance Benchmarking Group of the company did not benchmark key performance indicator of 'reservoir health' with world's leading exploration and production companies. Instead, it fixed static targets based on inputs received from its strategic business units. Further, effective 2019-20, the parameter 'reservoir health' is not part of the performance contract indicating lack of monitoring of reservoir health by the management.

(Para 7.2)

Shortfall in water injection is one of the significant reasons for less production of crude oil. At the request of Audit, in-house research institute, Institute of Reservoir Studies (IRS) of the company, used the existing simulation model to arrive at the crude that could not be produced due to lesser water injection and worked out oil deficit of 3.695 MMT during audit period. Audit reworked the IRS quoted oil deficit by considering actual operation losses which was 3.79 MMT. The value of oil deficit of 3.79 MMT due to less water injection worked out to ₹11,276.79 crore. Out of this, value of oil deficit was ₹7,802.50 crore for ONGC after considering the statutory levies and the balance ₹3,474.29 crore is revenue loss to the Government of India.

(Para 7.3)

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