Chapter 8
Conclusion

Major share of crude oil production (59 *per cent*) of ONGC comes from the western offshore fields. Mumbai High and Neelam-Heera fields are major oil producers which have been operating from 1976 and 1984 respectively and therefore, these mature fields are susceptible to decline in production. Water injection is a critical input for reservoir health management and for increasing crude oil recovery from the reservoir. Injection of required quantity of water at desired levels is necessary to maintain the reservoir pressure at its initial level. The company in its re-development schemes considered complete voidage replacement (liquid drawn equal to water injected) at 100 *per cent*. ONGC commenced water injection six to eight years after commencement of field production in Mumbai High and Heera. The total cumulative voidage compensation achieved was only 54.43 *per cent* (Mumbai High), 42 *per cent* (Neelam) and 78.8 *per cent* (Heera) as against 100 *per cent* voidage compensation.

Planning of water injection quantity in annual plan was always lower than the injection quantity requirement as per re-development schemes and actual water injection quantity was further lower. Constraints of availability of rigs/ stimulation vessels, water injection infrastructure and pipeline network, etc., were considered as a norm for preparation of annual plan. This resulted in continuous lower cumulative voidage compensation.

The company could not ensure timely replacement /overhaul of water injection equipment; many of the equipment outlived their design operational life, which impacted the operational availability and reliability of the equipment. Revamping of critical equipment was also not ensured in time after their mandated running hours prescribed by the Original Equipment Manufacturer and the company prescribed running hours. This resulted in frequent failures/ tripping of the equipment affecting both quality and quantity of water injected in the reservoir. Thus, the water injection facilities were insufficient to meet the water injection requirements.

Audit noticed gaps in maintaining the quality of water injected vis-a-vis the quality parameters adopted by the company and downgrading its own accepted quality parameters. Audit also noticed incorrect reporting of water quality parameters and continuing gaps of control in ensuring compliance to corrective actions recommended by the internal agencies. Non-availability of equipment coupled with non-adherence to quality parameters by not dosing the chemicals at required level raises concern on efforts to enhance production and reservoir health.

Audit noticed higher levels of corrosion in all the platforms than the desired level which is a matter of concern. Audit also noticed pre-mature failure of pipelines in view of high dissolved oxygen and non-maintenance of flow velocity. The pipelines and injection wells were not maintained as per requirement and the workover, stimulation and backwash operations of injection wells were not carried out effectively, leading to drop in injectivity.

As recorded by in-house committees/ institutes, the remedial actions were delayed, insufficient and ineffective as pressure sinks had developed in certain areas and pipelines were damaged beyond repairs. Continued lesser voidage compensation had resulted in pressure sinks in producing fields. Director General of Hydrocarbons, the upstream regulator of the Ministry of Petroleum and Natural Gas, expressed concern on decline in reservoir pressure, inadequate water injection and poor reservoir management. International benchmarking is not adopted by the company for fixing targets. Inadequate water injection and poor reservoir management resulted in rapid decline in production; however, the corrective actions were lethargic.

Thus, water injection in the field was effected due to ageing of injection infrastructure, frequent pipeline leakages due to poor quality of injection water, non-implementation of envisaged inputs and to some extent, production from high gas-oil ratio wells. This led to drop in reservoir pressure sharply and impacted crude oil production. Even by the estimate by the company itself at the request of Audit, this deficient water injection impacted loss of production of crude worth ₹7,802.50 crore to ONGC and revenue loss of ₹3,474.29 crore to the Government of India during 2014-15 to 2018-19.

(Raj Ganesh Viswanathan)
Deputy Comptroller and Auditor General
(Commercial) and Chairperson, Audit Board

New Delhi
Dated: 13 December 2021

Countersigned

(Girish Chandra Murmu)
Comptroller and Auditor General of India

New Delhi
Dated: 14 December 2021