Chapter 4 Operation of Support Facilities

Refineries encompass various additional process units of varying complexity and purpose. Some produce special products (waxes, lubricants, asphalt, etc.), others control emissions of air and water and some others provide support to the mainline processes. The primary support facilities include electricity and steam generation, hydrogen production and recovery and light gas handling separation, waste water treatment and oil movement and storage etc.

4.1 Excess consumption of Steam

Steam is used in various process/utility units mainly for chemical reaction and for power generation by Captive Power Plants. Steam is generated with the help of Boilers. The Company is using a Linear Program (LP) software viz., Process Industry Modelling System (PIMS), for planning its production. The software is also used for ascertaining the optimum product pattern as well as the utility consumption.

Data relating to consumption of utilities as per PIMS for the period from 2011-12 to 2015-16 was called for from the Company. Based on the PIMS monthly solution report for the year 2015-16, it was observed that the actual consumption (17.40 MMT) of steam during the year which was 17.40 MMT, was more than the ideal consumption being 15.51 MMT which resulted in an extra expenditure of ₹ 231.94 crore. Data relating to years from 2011-12 to 2014-15 was not furnished by the Company.

The Company stated (November 2016) that the LP model is primarily used for modelling the hydrocarbon side and LP results are not used by refineries to predict and evaluate utility performances. It was further stated that consumption of utilities could be indirectly mapped to energy consumption for which norms have been developed by Ministry of Petroleum and Natural Gas (MoPNG).

In the Exit Conference (June 2017) with the Ministry, the Company stated that the steam consumption was configured in Linear Programming (LP) model which was a mathematical model and not a thermodynamic model. The system of LP had been developed by the Company for its own Management to compare the consumption of steam and possibility of deviation was always there. It also stated that MBN was a better reflection of consumption of steam and the MBN of the Company was in the range of 65 to 85 as compared to Panipat refinery which had the best MBN of 63 to 65 in the public sector. It was informed that

MRPL was getting energy study conducted and was striving to achieve the better target. Ministry informed that the Company had been instructed to lower the MBN as per the MoU.

The reply of the Company/Ministry was not supported by results of any analysis with reference to the norms as mentioned in the reply and actual achievement there-against.

4.2 Low yield of Hydrogen from Hydrogen Generation Unit resulting in excess consumption of Naphtha

Hydrogen is needed for treating products like Petrol (Motor Spirit), High Speed Diesel (HSD), Fuel Oil (FO) and feeds for Petrochemical Fludized Catalytic Cracking Unit (PFCCU) and other plants for bringing down the sulphur content. The feed for Hydrogen plant is Light Naphtha. The Company had three Hydrogen Generation Units[22] (HGUs) with a total annual installed capacity of 138,000 MT[23] to cater to the requirement of the refinery. Hydrogen was also produced from the Continuous Catalytic Reformer Unit[24] (CCR).

Audit observed that none of the HGUs could achieve the designed yield of hydrogen (33 *per cent*) production during the period from 2011-12 to 2015-16. The same was in the range of 22.25 to 27 *per cent.* Due to low yield, 3,35,990 MT of additional naphtha had to be processed for obtaining the required quantity of hydrogen. The value of excess quantity of Naphtha processed was ₹ 1,363.98 crore and considering the value of extra FO produced in the process which was ₹ 339.20 crore, the extra cost worked out to ₹ 1024.78 crore. It was noted that the excess consumption of Naphtha was on account of the operation of HGUs at lower loads, shut down and start-up of the unit due to interruptions in the power supply from Captive Power Plant (CPP) and technical problems in the Hydrogen Generating Unit (HGU) 3.

In the Exit Conference (June 2017) with the Ministry, the Company stated that the audit observation was made on the basis of cost audit report which shows the cost aspect only whereas the actual consumption of hydrogen as per meter reading was equal to the design yield of 33 percent. The Ministry endorsed the reply of the Company.

The reply was not supported by any documentary evidence. However, Audit had computed the loss on the basis of the information available in the year-wise Plant Ledger of the Company which reflects the actual input of feed and actual production of Hydrogen.

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22 ***Produces hydrogen by steam reforming of Naphtha.***
23 ***HGU 1 and 2 – 34,000 TPA each and HGU 3 – 70,000 TPA.***
24 ***It convert lower octane value naphtha into higher octane products***

4.3 Arrangement of power from economic and reliable sources

The Company had established 115.50 MW of Captive Power Plant (CPP) under Phase I and Phase II. In Phase III, another CPP of 114 MW was commissioned in August/September 2014. In addition, the Company maintained a contract demand of 12.5 KVA with Mangalore Electricity Supply Company Limited (MESCOM), Karnataka for meeting non-critical load.

4.3.1 It was noted that one of the thrust areas in oil and gas sector as per XII five year plan period (2012-17) was optimization of energy and evolving a viable plan for the future. The Working Group of the MoPNG had advised (January 2015) the refineries to study the feasibility of shifting to grid supply preferably at 132/220 KV. The Company, in order to overcome the problem of power supply from captive power plants and also to save the energy cost had engaged (January 2015) Power Trading Corporation India Limited (PTC) to conduct feasibility study for assessing and evaluating various alternatives available to the Company for obtaining reliable power from the dedicated Grid connectivity. PTC observed that during the year 2014-15, the cost of procurement of power from State/Open Access was ₹ 7 per kwh as against the average cost of captive power generation of ₹ 13.65 kwh. PTC had recommended (February 2016) to have a direct 220 KV connection with 1200 MW plant of Udupi Power Corporation Ltd. (UPCL) at an estimated cost of ₹ 560 crore so as to reduce MRPL's cost of operation by ₹ 450 crore annually.

Considering the fact that the captive power was costing more than the power from the Grid, action in line with the directions of MoPNG and recommendations of PTC, needed to be expedited.

The Company stated (November 2016) that it had evaluated external power from an economic point of view and not on the view that own power is unreliable and intends to proceed with import of power from the grid based on the economics.

4.3.2 It was also observed that the Company had problems in obtaining uninterrupted power supply to the processing units. Due to non-availability of uninterrupted power to the processing units, the Company lost sizeable production hours. Unit-wise production hours lost during the period 2012-13 to 2015-16 are given in **Annexure VI**. The shut-down of Processing Units due to power failure showed an increasing trend over the years.

As regards erratic power supply from CPP, the Company informed (November 2016) that CPP III units were getting stabilised.

In the Exit Conference (June 2017) with the Ministry, the Company stated that it has initiated necessary steps as per the direction of the Ministry for considering grid supply as a source of power. It further informed that it has done a route survey alongside the railway line of Konkan Railways, who had agreed to allow the Company to use their corridor for power supply from Udupi Power Corporation Limited. Ministry informed that for new refineries, it was not advocating Captive Power Plant.

4.4 Fuel and Loss

Refineries use fuel oil, natural gas and waste gas as fuel in various operation processes and generation of utilities including power and steam. In addition, the processing losses add to the normal operating cost. Fuel and Loss is a very important variable operating cost in the operation of refinery as Gross Refinery Margin (GRM) of the Company could be improved by reducing/controlling this cost.

It was observed that the Company did not prescribe any norms for Fuel and Loss. Audit reviewed the fuel and loss for the period 2011-12 to 2015-16 in respect of various units of the refinery and found that the Company's Fuel and Loss had increased from year 2013-14 onwards as reflected in the following table:

Table 4.1:Fuel and Loss for last five years ending 31 March 2016

(Percentage of throughput)

Year	Fuel	Loss	Total Fuel and Loss [B]+[C]
[A]	[B]	[C]	[D]
2011-12	6.42	0.33	6.75
2012-13	6.48	0.52	7.00
2013-14	7.51	0.39	7.90
2014-15	9.74	0.35	10.09
2015-16	9.88	0.18	10.06

The Company stated (November 2016) that various parameters being followed in industry for fuel consumption and the energy consumption was being monitored based on set targets.

The reply is not supported by results of any analysis with reference to the parameters stated in the reply in the absence of which Audit was unable to derive an assurance that the Fuel and Loss was within norms.

In the Exit Conference (June 2017) with the Ministry, the Company informed that it was in the process of setting the targets. Ministry representative agreed with the reply of the Company.

4.5 Management of Catalyst

Refinery uses catalysts to improve the quality of products to meet the desired specification as well as to improve the distillate yield. Management of catalysts is essential as they play a major role in the overall economics of the refinery.

4.5.1 Audit observed that the Company had drawn (January 2009) policy for utilisation of catalysts for Phase I and II only, but was yet to draw policy for Phase III units (November 2016).

The Company stated (November 2016) that the catalyst policy for Phase III was yet to be framed.

Ministry did not furnish any reply.

4.5.2 Audit observed that CCR unit was generating spent catalyst. This spent catalyst generally contains a small percentage of precious metals including Platinum. It was observed that the Company did not make any evaluation to determine the quantity of precious metals including Platinum in the spent catalyst.

The Company stated (November 2016) that it would evaluate the quantity of platinum present in the spent catalyst and would get in touch with catalyst supplier and other Refineries for disposal.

Ministry did not furnish any reply.