

PART -B

- (I) Water consumption : 856 m³/hr (annual average)
- (a) Process Water : 202 m³/hr
- (b) Cooling Water : 506 m³/hr
- (c) Domestic : 113 m³/hr
- (d) Green belt/ Firewater makeup/
Construction / Precommissioning : 35 m³/hr

Name of the Products	Water consumption per unit of products During Previous Financial Year (2009-2010)	Water consumption per unit of products During Current Financial Year (2010 - 2011)
1. LPG 2. Petrol 3. Naphtha 4. SKO 5. ATF 6. Diesel 7. Fuel Oil 8. Bitumen 9. Sulphur 10. Mixed Xylene	The product quantity will vary with the type of crude processed and hence the water consumption per unit of crude processed has been estimated and furnished	
	0.67 m ³ /MT of Crude processed	0.59 m ³ /MT of Crude processed

Name of the raw materials	Name of Products	Consumption of raw material per unit of output	
1. Crude	i) LPG ii) Petrol iii) Naphtha iv) SKO v) ATF vi) Diesel vii) Fuel Oil viii) Bitumen ix) Sulphur x) Mixed Xylene	During Previous Financial Year (2009-2010)	During Current Financial Year (2010 – 2011)
		12.50 MMT	12.64 MMT
		Gross crude processing	

PART-C

Pollution discharged to Environment/unit of output

Pollutants	Quantity of Pollutants discharged (mass/day)	Concentration of Pollutants discharged (mass/volume)	Percentage of variation from prescribed standards with reasons.
(a) Water	- Oil & Grease: 9.34 kg/day - BOD: 26.49 kg/day - COD: 213.09 kg/day - Phenol: 0.62 kg/day - TSS: 39.43 kg/day - Sulphide: ND	- Oil & Grease: 2.72 mg/lit. - BOD: 7.72 mg/lit. - COD: 62.09 mg/lit. - Phenol: 0.18 mg/lit - TSS: 11.49 mg/lit. - Sulphide: ND	(- 45.60) (- 48.53) (- 50.33) (- 48.57) (- 42.55) (- 100.00)
(b) Air	Total sulphur dioxide emission data is provided		Please refer Annexure-III

Treated Effluent quality, load based standards achieved throughout the year is provided in **Annexure- I**

Central Marine Fisheries Research Institute (CMFRI), Mangalore fortnightly seawater monitoring at Marine outfall point / Study on bioaccumulation of heavy metals / Report on bioassay tests is provided in **Annexure- II**.

PART-D
Hazardous Waste

[As specified under Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008

Hazardous Waste Streams	Category as per HWM Amendment rules 2008	Total Quantity (in MT) During the previous Financial year 2009-10	Total Quantity (in MT) During the current Financial year 2010-11
1. From process			
1. Spent Catalyst from H ₂ reformer	Sch.1 SI.NO.4.2	266.88 (Note B)	20 (Note B)
2. Spent Catalyst from Hydrocracker	Sch.1 SI.NO.4.2		371 (Note B)
3. Spent Catalyst from H ₂ Shift Converter	Sch.1 SI.NO.4.2	0	0
4. Spent Catalyst from H ₂ COMOX	Sch.1 SI.NO.4.2	0	0
5. Spent Catalyst from H ₂	Sch.1 SI.NO.4.2	0	0
6. Spent Activated carbon from Hydrocracker 1 & 2	Sch.No.2, Class D5	390.88 (Note A)	319 (Note A)
7. Spent Catalyst from GOHDS	Sch.1 SI.NO.4.2	119.32	0
8. Spent Catalyst from Naphtha Hydrotreater	Sch.1 SI.NO.4.2	0	1.85 (Note B)
9. Spent Catalyst from Platform	NA	0	0
10. Spent Catalyst from SRU BSR	Sch.1 SI.NO.4.2	0	0
11. Spent Catalyst from SRU Selectox	Sch.1 SI.NO.4.2	0	0
12. Spent Catalyst from SRU Claus	Sch.1 SI.NO.4.5	0	0

13. Crude Tank Bottom Sludge	Sch.1 SI.NO.4.1	310.0 (NOTE F)	247 (NOTE F)
14. Oily Sludge from WWTP	Sch.1 SI.NO.4.1		240 (NOTE F)
15. Discarded Containers	Sch.1 SI.NO.33.3	3801	2841 (NOTE E)
16. Spent Clay	Sch.1 SI.NO.4.5	0	0
17. Used/Spent Oil	Sch.1 SI.NO.5.1	7600 Lts (NOTE D)	7200 Lts (NOTE D)
18. Discarded Batteries	NA	93 (NOTE C)	122 (NOTE C)
19. Electronic Waste	Sch.4 SI.NO.18	0	0
20. Copper Cable (PVC Sheathing)	Sch.4 SI.NO.7	0	0

Note A: Spent activated Carbon being disposed to KIOCL, Mangalore

Note B: Spent Catalysts being disposed to CPCB registered and SPCB approved recyclers.

Note C: Spent Batteries being sold to CPCB registered and KSPCB approved recycler.

Note D: Spent lube oil generated is mixed with crude oil and re-processed in the refinery.

Note E: Cleaned barrels/drums being sold to KSPCB approved recyclers.

Note F: Oily sludge being bioremediated utilizing TERI technology

Note G: Spent clay is stored in lined pits.

PART-E

Solid Wastes:

Solid Wastes	Total Quantity (kg) During the previous Financial year (2009-10)	Total Quantity (kg) During the current Financial year (2010-11)
a. From process	Please refer part-D	Please refer part-D
b. From pollution control facilities	Please refer part-D	Please refer part-D
C. Quantity Recycled within the unit	Spent lube oil 7600 Lts (Note D)	Spent lube oil 7200 Lts (Note D)
D. Sold	Spent Activated Carbon: 383.63 T, Spent Hydrocracker DHC - 8: 266.88 T, Spent Comox Catalyst: 77.65 T, Spent/Spent Mixed TK10/TK711 Catalyst: 13.22 T and Cleaned drums/barrels: 1904 Nos.	Spent Catalyst from H ₂ Reformer: 19.91 T, Spent Catalyst from Hydrocracker- DHC 8: 347.55 T, Spent Activated Carbon: 459.76 T, Spent Catalyst from GOHDS : 121.01 T, Spent/Spent Mixed TK10/TK711 Catalyst: 7.78 T, Discarded Containers: 4750 Nos. and Discarded Batteries: 169 Nos.

PART - F

Sludge concentration and mode of disposal

(From centrifuge)

(Approximate)

Concentration:

Oil : 5 – 10 % by weight

Sand/Silt and Bio solids: 65 % by weight

Water: ~ 25 % by weight

Mode of disposal:

Bioremediation of Oily sludges:

M/s. The Energy and Resources Institute (TERI), New Delhi has developed biological technology for the safe disposal of oily sludges generated in the refinery. "Oilzappers/ Oilivorous-S" a consortium of various microorganisms including many bacterial species is utilized for the biodegradation of the oily sludges. The end products of the biodegradation are carbon dioxide and water.

M/s. The Energy and Resources Institute, New Delhi has conducted bioremediation of oily sludges at MRPL. 2000 MT of oily sludge has been bioremediated and awaiting clearance from the Board for disposal.

Part – G

Impact of pollution control measures on conservation of natural resources and on the cost of production.

1. Facilities like Sulphur recovery unit, Amine treatment Unit, sour water stripping Units and flare system provided improves the Ambient air quality by minimizing the emissions of sulphur dioxide into the atmosphere. SO₂ concentration at ground level is less than 10 Micrograms per cubic meter of air (annual average) against 80 Micrograms per cubic meter stipulated.
2. Low NOx burners provided in various furnaces drastically reduce the NOx emissions into the atmosphere. Ground level concentration of NOx is far lesser i.e. less than 05 Micrograms per cubic meter of air (annual average) against 80 Micrograms per cubic meter stipulated.
3. Tall stacks more than CPCB requirement help in better mixing and dispersion of pollutants in air and dilution. Using LSHS as Fuel with sulfur content always less than 1% and maximum utilization of very less sulphur Fuel Gas, which reduces SO₂ emission drastically. Average sulphur content in the fuel oil for the year 2010-11 was 0.92%.
4. 5 Nos of permanent AAQ stations round-the-clock monitoring is being carried out in and around the Refinery. Ambient Air Quality Monitoring is being done as per MoEF guidelines and reports furnished to KSPCB on monthly basis.
5. Two Continuous Ambient Air Monitoring Stations have been commissioned inside refinery to monitor real time concentration of air emission.
6. Flare system completely burns the organic pollutants to water and carbon dioxide. Flaring is constantly monitored through a Closed Circuit TV.
7. CCR unit produces Environment friendly unleaded petrol. MRPL is supplying EURO-IV quality Petrol and Diesel to Bangalore city and EURO – III for other parts of the State. Presently Less than 1% benzene petrol supplied by the refinery in all cities of the State.
8. Reformate splitter unit is provided to reduce the Benzene content in the petrol. Benzene is a known carcinogen.
9. Gas Oil Hydro-Desulphurisation unit is provided to reduce sulfur and Nitrogen content in the Diesel so that the SOx and NOx emissions from the vehicles using Diesel will be reduced.
10. A Mercox unit is provided for removal of sulphur compounds from the household fuel and thus reduces air pollution.

11. Efficient Wastewater treatment plants (2 Nos), which treats the effluent to quality specified by the Pollution control board, enables recycling treated effluent to the extent of about 70 to 75%. Balance Treated wastewater is routed 650 m into sea at a depth of 6.5 m as per NIO recommendations for proper dispersion & dilutions. A standby submarine pipeline of length 700m is laid to take care of any contingencies.
12. M/s. Central Marine Fisheries Research Institute (CMFRI), Mangalore is conducting fortnightly monitoring of seawater quality for various chemical, biological and other marine parameters in and around the Marine outfall point (MOP) at 7 stations. Additionally 3 seashore stations are also monitored for various parameters. Other studies/tests conducted by CMFRI are fortnightly monitoring of treated effluents including bioassay tests, bioaccumulation of heavy metals in marine organisms etc., till date no adverse effects on marine organisms observed by CMFRI.
13. Greenbelt around the refinery enhances the vegetation and improves Ambient Air Quality & takes care of particulate matter. Further development is planned in a phased manner.
14. A work order accorded to State Forest Department for developing 38,000 trees in and around the refinery
15. Ground water from 10 numbers of borewells (GWM) stations are monitored in and around refinery, whose location is decided along with KSPCB and monthly monitoring is being done.
16. Impervious sludge lagoons are provided (as per NEERI / CPCB guidelines) for storing oily sludges for bio-degradation.
17. Independent Environment Management cell (EMC) & Crisis Management Cell (CMC) set up & functioning round-the-clock.
18. Environment Management Systems (ISO 14001:2004) is implemented in the Refinery. ISO 14001:2004 Certification is obtained, attached as **Annexure A.**
19. Energy conservation projects reduces fuel consumption, improves the bottom-line as well as environmental (Air) emissions in the refinery. Many such projects are derived in-house and implemented/being implemented in the refinery. MRPL has been awarded many awards in the field of energy conservation.
20. Various Condensate recovery projects have also been implemented in the refinery.

21. An anaerobic garbage treating biogas plant is installed for treating organic food wastes of MRPL Township and refinery. By this, entire food wastes of township and refinery is bio-treated in an environment friendly plant producing biogas as well as an excellent organic compost for plants/greenery.
22. Agar probe provided in Crude tank and Slop Oil tank for reduction of oil ingress reaching to WWTP.
23. Cooling Towers are operated at greater than 6 Cycles of concentration, this measure brought down the Cooling Tower blowdown.
24. Minimizing the total effluents generation by recycling the effluents within the units has been incorporated.
25. GOHDS unit revamping for producing EURO-III/IV quality diesel. This measure will help in improving the air quality and reduce the pollution generated by the automobiles.
26. A Sulphur Pastillation Unit is commissioned in the Refinery to avoid sulphur dust emission generated in Sulphur Recovery Unit.
27. A Wet Air Oxidation Plant is being commissioned to improve the effluent quality. Unit will be commissioned shortly.
28. A Reverse Osmosis (RO) Plant is being commissioned as a part of Phase-III expansion project to improve the quality of treated effluent.

Part – H

Additional measures/investment proposal for Environmental protection including abatement of pollution for the financial year (2011 – 2012).

In Lakhs	
Work Environment Monitoring in the refinery	5.0
Manual Stack Monitoring	10.0
VOC monitoring to meet CPCB requirement for Environmental Monitoring	15.0
Oily Sludge treatment	30.0
Wet air Oxidation plant for spent caustic treatment	1100.0
Monitoring of Pollution parameters	100
Total: 1260.0 Lakhs	

Part – I

Any other particulars for improving the quality of the environment:

Expenditure details on Environmental improvement projects initiated/implemented and various environmental monitoring programs undertaken during the year 2010 - 11

In ₹

Oily Sludge Treatment	3,122,412
Activated Carbon Disposal	409,793
Ambient Air quality Monitoring by NITK, Surathkal	1,311,687
Sea water quality monitoring by CMFRI	1,015,204
VOC Monitoring	844,863
Work Environment Monitoring	55,000
ISO 14001 Certification & Consultancy charges	531,570
Oil Spill tackling charges	485,958
KSPCB Analysis charges	352,075
NIO Submarine pipeline inspection charges	1,433,900
Water Cess Charges	898,121
Microbiological Study in WWTP	70,000
Manual Stack Monitoring	272,500
AAQ Monitoring as per new MoEF Guidelines	112,506
Procurement of Oil Absorbent Booms	194,400
Total	11,109,989

Operating Cost incurred for Environment protection (2010 – 2011)

	In ₹
WWTP POWER COST	51,909,300
WWTP CHEMICAL COST	9,276,534
WWTP R&M COST	19,941,000
MEROX R&M COST	4,436,000
GOHDS R&M COST	20,657,000
ISOM R&M COST	1,641,000
SRU/ATU/SWS R&M COST	46,041,000
MEROX ENERGY COST	22,900,000
GOHDS ENERGY COST	1,862,300,000
SRU/ATU/SWS ENERGY COST	832,400,000
Total	2,871,501,834