COMPREHENSIVE ACTION PLAN

for

CONTROL OF AIR POLLUTION

with focus on

CONTROL OF VOC'S

IN MAHUL, AMBAPADA AND CHEMBUR AREA

Case No.40 (WZ) of 2014

At

The National Green Tribunal,

Western Zone Bench, Pune

Maharashtra Pollution Control Board,

Mumbai

June 2016

FOREWORD

Maharashtra Pollution Control Board has received frequent complaints from residents of Village Mahul, regarding smell nuisance and air pollution. The residents have filed an application no. 40 (WZ) of 2014 in National Green Tribunal, Western Zone Bench, Pune on the above issue against Company operating tankages in the area (viz Sea Lord Logistics Ltd) .

Honorable National Green Tribunal, Western Bench, Pune have given judgement vide M.A No. 55/2015 dt 18.12.2015 taking a holistic view, of the complexity of the situation in the Mahul-Ambapada-Chembur area and given directions to the Maharashtra Pollution Control Board to formulate a Comprehensive Action Plan to control the air pollution in the area with a focus on VOC control and get the same approved from Central Pollution Control Board.

The Comprehensive Action Plan being submitted to Central Pollution Control Board is enclosed herewith. The contribution by Shri Rajiv Aundhe, Aditya Environmental Services Pvt Ltd, Mumbai in development of this Action Plan document is gratefully acknowledged.

Date : 30.06.2016 P.K. Mirashe, Asst.Secretary(Tech)

Place : Mumbai

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LIST OF ABBREVIATIONS

Abbreviation	Full form
AAQM	Ambient Air Quality Monitoring
BDL	Below Detectable Limit
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CHWTSDF	Common Hazardous Waste Treatment Storage and Disposal Facility
CMD	Cubic Meter Per Day
CRZ	Coastal Regulation Zone
DISH	Directorate of Industrial Safety and Hygiene
EIA	Environment Impact Assessment
EPA	Environment Protection Agency (United States)
EMP	Environment Management Plan
EC	Environment Clearance
HW	Hazardous Waste
ISO	International Organization for Standardization
KLPA	Kilo Liter Per Annum
KLPD	Kilo Liter Per Day
KW	Kilowatt
KWH	KiloWatt Hours
MOEF	Ministry of Environment and Forest
MTPA	Million Tons Per Annum
MW	Mega Watt
MCZMA	Maharashtra Coastal Zone Management Agency
MCGM	Municipal Corporation of Greater Mumbai
MPCB	Maharashtra Pollution Control Board
MPT	Mumbai Port Trust
PESO	Petroleum and Explosive Safety Organization

1 INTRODUCTION & BACKGROUND

Maharashtra Pollution Control Board has received frequent complaints from residents of Village Mahul, regarding the smell nuisance and air pollution due to tankage and allied operations of M/s Sea Lord Containers Ltd, Ambapada, Mahul village, Chembur, Mumbai and M/s Aegis Logistics Ltd, Mahul village, Chembur, Mumbai. The residents have filed an application no. 40 (WZ) of 2014 in National Green Tribunal, Western Zone Bench, Pune on the above issue principally alleging odour nuisance due to the tankages and allied operations of M/s Sea Lord Containers Ltd.

In order to address the issues raised in the proper perspective and in view of need for specialized expertise, Maharashtra Pollution Control Board constituted a Committee comprising experts in the field such as Petroleum and Explosive Safety Organization (PESO), Directorate of Industrial Safety and Health (DISH) and technical experts in the field to study the matter in-depth and give their recommendations on the issues being raised.

The committee formulated by MPCB pointed out the highly complex land use in Chembur-Mahul area with several contributing factors including large sized refineries, three storage terminals, other industrial units like Tata Thermal Ltd, RCF Ltd and heavy traffic as leading to emissions of hydrocarbons/ VOCs into the atmosphere. Honourable NGT also concurred with the Committee and passed interim order No.3 dt28.05.14directing the Committee to take a holistic view and not restrict to the two tankages viz M/s Sea Lord Containers and Aegis Logistics.

In the course of the deliberations/hearings, NGT asked KEM to conduct health morbidity studies in/near the respondent residents in Mahul- Ambapada as also asked Institute of Chemical Technology (ICT, Mumbai) to study the engineering controls existing with respect to VOC emissions from Sea Lord Containers Ltd**.** MPCB further got the analysis of VOCs and other criteria air pollutants conducted from M/s Goldfinch Pvt Ltd., Thane (MOEFCC recognized laboratory).

The NGT has now passed the judgement vide MA No. 55/2015 dt 18.12.2015- copy enclosed as **Annexure I.**

As per the said judgement, MPCB has been asked to formulate a Comprehensive Action Plan to control the air pollution in the area with a focus on VOC control and get the same approved from Central Pollution Control Board.

The Comprehensive Action Plan being submitted to Central Pollution Control Board is enclosed herewith.

2 GEOGRAPHICAL SETTING: MAHUL AND AMBAPADA

2.1 Study Area in and around Mahul

Mahul is a quiet, fishing village located to the south of Chembur in Mumbai. It is located to the south of Eastern freeway. Mahul gaon is connected to Mumbai city by the Port Road which connects it to Sewree and other areas of Mumbai Port Trust and to Chembur by the Bhikaji Damaji Patil Marg (also called Corridor road) which further connects to Ramakrishna Chemburkar marg. The population majorly consists of Koli community.

The area is highly industrialized being located adjoining to Trombay where the refineries of Hindustan Petroleum Corporation Ltd (HPCL) and Bharat Petroleum Corporation Ltd (BPCL) and thermal power plant of Tata Power Ltd are located. Indian Oil Blending Ltd (IOBL) has two units manufacturing lubricating oil and Pepsico Ltd (a beverage manufacturing unit) is also located here. Some closed industrial units like Calico Ltd are also seen here. The Trombay area is separated from the BARC establishment by the hills which runs in North – south direction. Various small hamlets viz Ambapada, Gavanpada, Prayag Nagar, Vishnu Nagar, Bharat Nagar are seen flanking the industrial units. Townships of HPCL and BPCL are seen towards the North adjacent to the Eastern freeway. Newer developments include the under construction Police quarters (near Mahul gaon) and MMRDA colony, Shastri Nagar, Agarwal nagar which have sprouted up in past few years near the HPCL West and East colonies and connecting road which is disturbing as it brings the populace in close proximity of industries.

Mahul Creek is a tidal creek in north west Mumbai. It opens into the Thane Creek. The creek is located near the neighbourhoods of Chembur and Mahul. It is surrounded by mangrove forests. When measured from the high tide line of one bank to another, the creek is over 350 metres wide. The creek also serves as a discharge for excess rainwater in eastern suburban Mumbai. The creek has good water depth. For handling Crude oil and Petroleum products, there are four jetties at Jawahar Dweep. One of the jetties at Jawahar Dweep, which was commissioned in 1984 can handle tankers with the maximum loaded draft of 12.7 metres corresponding to 125,000 Displacement tons. Two of the jetties can accommodate tankers upto 70,000 Displacement Tons and 228.6 m length and the third one can take tankers of 213.4 m length and upto 48,000 Displacement Tons. Chemical and POL products are handled at two jetties at Pir Pau. Old Pir Pau jetty can accommodate tankers of 170.7 m length while the new one commissioned in December 1996 can handle tankers with a length of 197 m and a draft of 10.5 m. All the jetties are connected to Oil Refineries by a network of pipelines**(source : MPT web site).**

Google Earth Image showing Mahul gaon and vicinity of Trombay area showing the industrial establishments and the petitioner's locations is enclosed as **Fig 2.1.**

2.2 **Meteorological Data**

Mumbai has two IMD meteorological stations one at Santacruz Airport and the other at Navy Nagar near Colaba towards the southern tip of Mumbai. Climatological data for Mumbai (Santcruz airport) giving temperature, humidity, rainfall and sunshine hours is presented in **Table 2.1**.

The Climate of Mumbai is a tropical wet and dry climate. Mumbai's climate can be best described as moderately hot with high level of humidity. Its coastal nature and tropical location ensures temperatures won't fluctuate much throughout the year, the mean annual temperature is 27.2 °C and average annual precipitation is 2422 mm. The mean maximum average temperatures is about 32 °C in summer and 30 °C in winter, while the average minimums are 25 °C in summer and 20.5 °C in winter. Mumbai experiences four distinct seasons: Winter (December–February); Summer (March–May); Monsoon (June–September); and Post-Monsoon (October–December).

The present study area is far away from Santacruz and Colaba meteorological stations, hence the wind data available from Tata Power Ltd weather station has been accessed and wind roses for the period March 2014- May 2014 are presented in **Fig 2.2** below. The wind data presented shows that during the summer season, wind blows primarily towards the North –east. This is expected considering the location of Arabian sea to the south west of the project site. Effects of sea-land breezes during day time and the south westerly monsoon winds clearly have resulted in predominant wind direction from south–west to northeast.

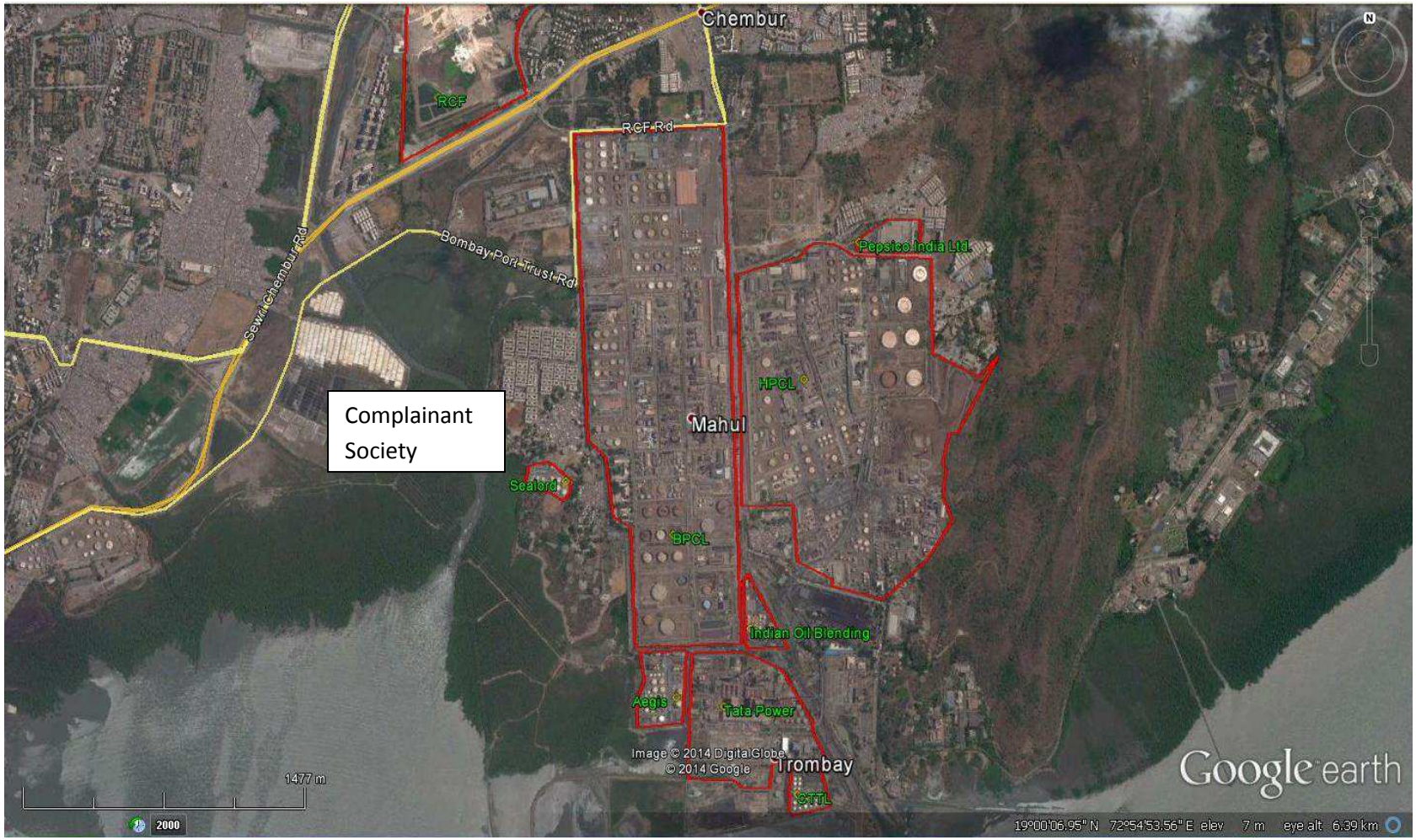


Figure 2.1 Google Earth Image showing Industrial Locations in Area

Table 2.1Summarized Climatological data for Mumbai (Chhatrapati Shivaji International Airport)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C	37.1	39.6	41.7	42.2	41.0	37.1	34.8	33.5	36.4	37.9	37.4	39.8	42.2
Average high °C	30.7	31.2	32.5	33.0	33.3	32.1	30.0	29.6	30.4	33.2	33.5	32.0	31.8
Average low °C	16.8	17.8	21.0	23.9	26.3	26.0	24.9	24.7	24.3	23.4	20.9	18.6	22.4
Record low °C	7.4	8.5	13.8	16.9	20.2	19.8	21.2	19.4	20.7	16.7	13.3	10.6	7.4
Rainfall mm	0.6	1.3	0.2	0.7	12.5	523.1	799.7	529.7	312.3	55.8	16.8	5.3	2,258
Avg. rainy days	0.1	0.1	0.0	0.1	0.7	14.5	23.2	21.4	14.4	3.0	1.0	0.4	78.9
% Humidity	69	67	69	71	70	80	86	86	83	78	71	69	75
Mean monthly sunshine hours	269.5	257.6	274.3	283.7	296.2	148.6	73.4	75.9	165.1	240.2	245.8	253.2	2,583.5
Source #1: India Meteorological Department (Period 1961–1990, record high and low up to 2010)													

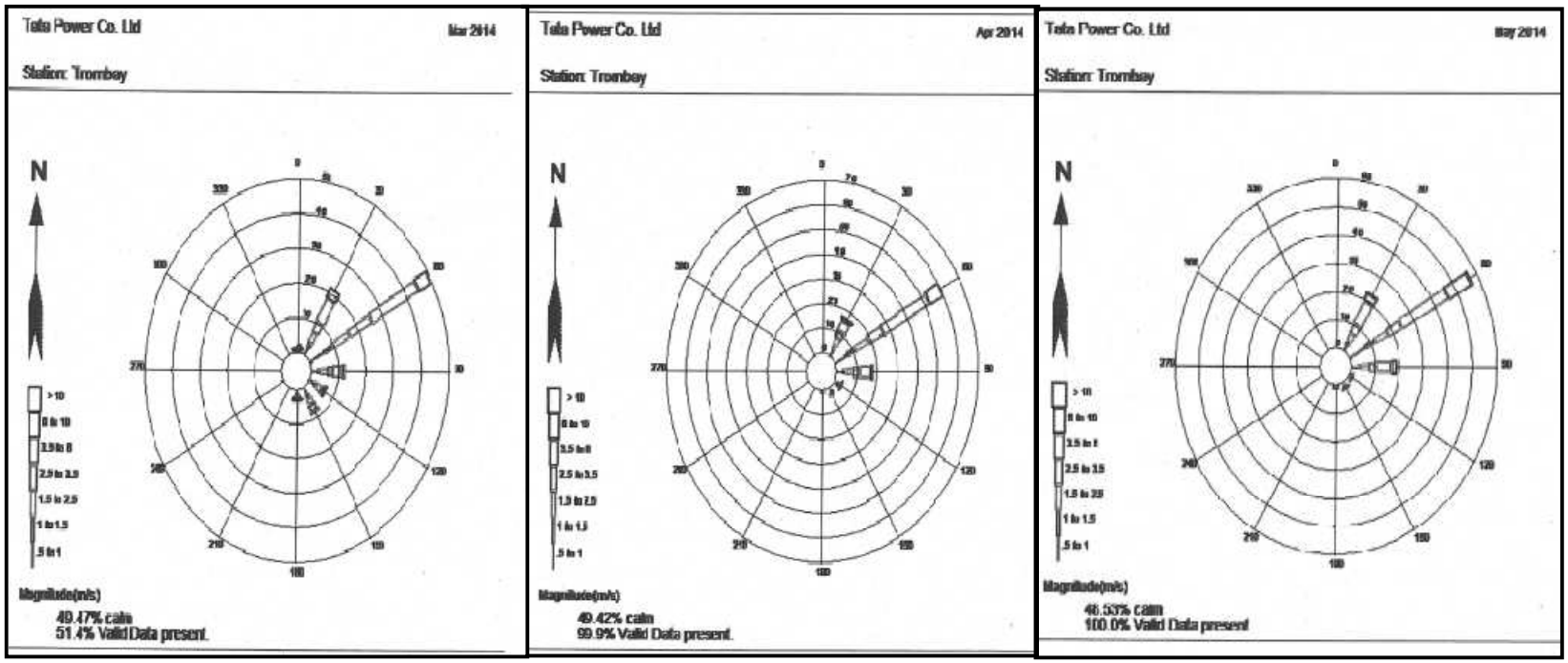


Figure 2.2WIND ROSE DIAGRAMS FOR SUMMER 2014 (March – May)

Source : Tata Power Ltd., Trombay

Note : Wind Direction Petal drawn indicates direction **TO** which wind is blowing.

3 INDUSTRIAL ESTABLISHMENTS IN MAHUL

3.1 Manufacturing facilities in Mahul-Chembur

The following pages give a review of manufacturing facilities in Mahul-Chembur

3.1.1 HPCL

The HPCL refinery was established in 1954 and is spread over an area of 321 acres.

HPCL has following four main processing complexes.

The Fuels Refinery produces fuels from the crude by distillation & by removing impurities. It has three major complexes viz. Fuels Refinery, DHDS (De Hydro De Sulfurization) and GFEC (Green Fuel & Emission Control Products). DHDS was commissioned in the year 2000 to reduce sulphur in the diesel to meet various Bharat Fuel specifications. GFEC was commissioned in 2009 for production of Euro III/IV MS. The fuels refinery has a crude processing capacity of 6.5 MMTPA.

The Lube Refinery manufactures lubricant base material, which, after adding additives is sold as finished lubricants for automobiles. The lube oil refinery is largest in India having a capacity of 335 TMT and accounting for 40% of the total country's production.

Products manufactured at HPCL include Petrol, Diesel, LPG, Aviation turbine fuel (ATF), Bitumen, Emulsion and lubricants.

HPCL Mumbai refinery is certified under ISO 14001 (Environment Management System); with ISO 9002 (Quality Management System), quality certification from NABL for "Quality Assurance Laboratory" and under OHSAS 18001 Occupational Health, Safety Accreditation System

3.1.2 BPCL

Burmah-Shell Refineries Limited (BSR), was incorporated on 3.11.1952 at Mumbai and a refinery was set up by this Company at Mahul, Mumbai.

The company was acquired by Government of India (GOI), and name changed to Bharat Petroleum Corporation Limited. Refinery currently processes about 12 Million Metric Tons of crude oil per annum. BPMR has processed 61 different types of crude in five decades of its operations, making it one of the most flexible Refineries in the country. BPCL Mumbai refinery is certified under ISO 14001 (Environment Management System); with ISO 9002 (Quality Management System), quality certification from NABL for "Quality Assurance Laboratory" and under OHSAS 18001 Occupational Health, Safety Accreditation System.

3.1.3 RCF Ltd

- RCF is one of the largest chemicals and fertilizers complex in India, with 21 operating plants at Trombay,
- RCF Ltd; Trombay is an ISO 14001, OHSAS 18001 and ISO 9001 certified company.
- Now RCF has integrated all the three systems in to Integrated Management System (IMS) and got accredited for all the three systems in 2010.

3.1.4 Tata Power Ltd

The Trombay TPS is in operation since 1956 and Units-1, 2 & 3 have been decommissioned in early 1990's. Unit No.4 (150 MW) is based on gas which is presently kept as standby. Unit No.5 (500 MW) is coal based and is in operation since 1984. Unit No.6 (500 MW) became operational in 1990. Unit No.7 (180 MW) is a combined cycle gas based, commissioned in 1993 and Unit no. 8 (250 MW) is coal based commissioned in 2009. The company is currently implementing modernization of unit no. 6 to imported Coal. Trombay Thermal Power Station is Certified ISO 9001-2008, ISO 14001-2004 and OHSAS 18001-2007 series.

3.1.5 Aegis Logistics Ltd.

Aegis Group has its liquids and gas terminals situated to the west of Tata Power and south of Bharat Petroleum Corporation Ltd (BPCL) and is spread over an area of 20 acres. The terminals are connected by pipelines to various berths in Jawahar Deep for handling the export and import of hazardous chemicals, petroleum products, and petrochemicals. The terminal is for transit storage of petroleum and non petroleum liquid chemical products and liquefied petroleum gases in cryogenic storage tanks. The terminal is certified to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 standards.

Clients include Bharat Petroleum, Hindustan Petroleum, Reliance Industries, Caltex, Supreme Industries, as well as leading chemical companies such as Jubilant Lifesciences, Bombay Dyeing, and Laxmi Organics.

The terminals operate round the clock and is manned 24 x 7. Facilities are offered on a long term contract or spot contract basis, and other services such as customs bonding, inventory management, just in time delivery, and on site product quality testing are also offered.

- Provides import, export, storage, and logistics services, handling Class A, B, and C products as well as all types of chemicals.
- Total capacity: 1,78,350 KL; 49 tanks which include MS, SS, epoxy coated, IFR tanks + 20,000 MT of LPG mounded storage

- 26 tank lorry filling bays more than 300 road tankers filled per day
- 4x12" jetty pipelines including one SS pipeline connected to 5 berths.
- Connected to HPCL and BPCL refineries as well as oil installations in Sewree and Wadala via a network of pipelines.
- Integrated Management System.

3.1.5.1 Chemicals Stored in Aegis Logistics in 2014-15

Company has provided data on chemicals stored in the Tank farm in the period Jan 2014 to June 2014, the data on chemicals used their flash point and boiling point are given below :

Table 3.1 Physical Properties of Chemicals: Aegis Logistics Ltd

Chemical	Flash Point (°C)	Boiling Point (°C)	Petroleum Class
Acetone	- 20	56.2	A
Acetic acid	39	118.1	B
Butyl acetate	23.9	126.5	B
Butyl alcohol	11.1	82.41	A
Base Oil	225	> 280	non petroleum
Caustic Lye	--	--	Non petroleum
Diethylene glycol	138	245.8	Non petroleum
Dimethyl formamide	57.8	153	B
Olefin C12	77	213-216	B
Ethylene dichloride	13	18	A
Ethanol denatured	9	62.7	A
2 Ethyl hexanol	77	184	B
Isopropanol	11.7	82.5	A
Methylene dichloride	NA	39.75	Non petroleum
Mono ethylene glycol	116	199	Non petroleum
Methanol	12	64.5	A
Naphtha	<-2	-12 to 220	A
mix-Xylene	26.1	136-140	B
Olefin C14	104	246-253	Non petroleum
2-Propyl heptanol	100	218	Non petroleum
Styrene monomer	31.1	145.2	B
Toluene	4.44	110.6	A
Vinyl acetate monomer	-8	71-73	A

- Thus, it is observed that out of 22 chemicals stored, 8 are class A petroleum and 7 are class B petroleum compounds and 7 are not covered under Petroleum Rules.

3.1.5.2 PESO License Status

Company's Tankage is approved by PESO and has submitted license to import and store petroleum dt 30.10.2012. The license is granted for 25 aboveground class A &/or B &/or C storage tanks for total capacity of 129,452 KL and non –petroleum (in bulk) of 48,830 KL totaling 178,252 KL.

3.1.6 Sea Lords Containers Ltd

This Terminal is located in vicinity of Ambapada- Mahul villages and west of BPCL refinery. This is a sister concern of Aegis Logistics Ltd and is interconnected to Aegis Logistics Ltd and exclusively stores Liquid Petroleum products and chemicals. This terminal:

- Provides import, export, storage, and logistics services, and handling Class A, B, and C products.
- Has total capacity: 75,000 KL; 10 tanks which include MS and IFR tanks.
- 10 tank lorry filling bays.
- 4x12" jetty pipelines including one SS pipeline connected to 5 berths.
- Connected to HPFR, BPFR, HPCL Wadala Depot, and IOC Sewree depot via a network of pipelines.
- Integrated Management System.

3.1.6.1 Chemicals Stored at M/s Sea Lord Containers Ltd :

Company has provided data on chemicals stored in the Tank farm in the period Jan 2014 to June 2014, the data on chemicals used their flash point and boiling point are given below :

Table 3.2Physical Properties of Chemicals: Sea Lord Containers Ltd

Chemical	Flash Point (°C)	Boiling Point (°C)	Petroleum Class
Acetone	- 20	56.2	A
Caustic Lye	--	--	Non petroleum
Methanol	12	64.5	A
Naphtha	<-2	-12 to 220	A
n-paraffin	108		not covered under Petroleum Rules
o-Xylene	17	144.4	A
Reformate	90	--	B
Styrene monomer	31.1	145.2	B
Toluene	4.44	110.6	A

Thus, it is observed that out of 9 chemicals stored, 5 are class A petroleum and 2 are class B petroleum compounds and 2 are not covered under Petroleum Rules.

3.1.6.2 PESO License Status

PESO license is for Total capacity of 75,000 KL for storage of Petroleum Class A in Bulk wherein it is mentioned that it is granted for ten above ground storage tanks of class A &/or B &/or C storage tanks together with other connected facilities.

3.1.7 Terminalling Facilities of M/s Aegis Logistics and Sea Lord Containers Ltd :

- Licensed for handling all Class A, B, and C cargoes.
- Internal floating roof tanks for volatile products, stainless steel, epoxy coated tanks for sensitive chemicals.
- Connected to 2 nos. berths of Pir Pau and 3 nos. berths of Jawahar Dweep.
- Jetty Pipelines (2 – Carbon Steel, 1 – Stainless Steel & 1 – LTCS) of 12" each for liquid cargo.
- High vessel discharge and loading rates.
- High capacity export pumps.
- Nitrogen blanketing facility in the tanks.
- Connected with BPCL and HPCL refineries and various depots of IOC, BPCL, and HPCL via a network of pipelines.

3.1.8 Indian Oil Blending Ltd

Indian Oil Blending Limited (IOBL) is a wholly owned subsidiary of Indian Oil Corporation Limited (IOCL) and manufactures a diverse range of lubricating oils under brand name 'SERVO' at its two blending plants at Mahul, Mumbai.

3.1.9 Chemical Terminal Trombay Ltd.

Chemical Terminal Trombay Ltd is a tankage terminal located near Mahul creek to the south of unit V of Tata Power Ltd. This terminal is existing since early 1970s as reported by industry/MPCB.

CTTL has obtained license from PESO no. P/HQ/MH/15/1928 (P7227) dt 29.03.2005 valid upto 31.12.2016.

3.2 Summary of Consents granted by MPCB

Table 2.4 below gives the summary of Consent to Operate granted to various units by MPCB.

Table 3.3 Consent details of Industries in Mahul Area

Sr. No.	Industry Name	Date of issue of consent	Consent number	Consent validity	Products
1	**Sea Lord Containers Ltd**				
	C to O -Renewal	11.10.2012	MPCB/RO(HQ)/ EIC-MU-3902-12/R/CC/B-646	31.05.2017	Storage and handling of chemicals to the max. capacity of 75,000 KL at a time (Total 10 nos of tank)
2	**Aegis Logistics Ltd**				
2 A	C to O	08.04.2011	BO/ROP/RO(HQ)/10/TF/29	01.01.2015	Maximum permitted storage at a time : Storage and handling of Petroleum chemicals Products 1,42,250 KL (15 types of petroleum products as per Annexure-II of CRZ Notification)(35 tank sizes specified) + LPG of 20,000 MT (total 37 nos. of tanks)
2 B	C to O	10.10.2012	MPCB/RO(HQ)/ EIC-MU-3332-12/O/CAC/B-646	28.02.2015	For storage and handling of chemicals to the maximum capacity of 36,100 KL at a time (additional 12 nos tank) (excluding CRZ tanks)
3	**Chemical Terminal Trombay Ltd**	16.01.2014	BO/MPCB/RO(HQ)/NK/14959-13/CR/CC-470	13.03.2018	42,132 of petroleum class A, B, C
4	**Hindustan Petroleum Corporation Ltd**(HPCL Mumbai Refinery) B D PatilMarg, Chembur Mumbai 400074	23.05.2012	BO/JD-PAMS/EIC No. MU-3131-12/R/CAC-431	31.12.2013	(1)Light Distillates (LPG, LAN,HAN,Reg. Gasoline, Premium Gasoline) – 1968 MT/Y (2) Middle Distillate (ATF, SKO, HSD, LDO)- 3313 MT/Y (3) Lube Oil Base Stock-331 MT/Y (4) Other Heavy Products including refinery fuel loss (IFO, Asphalt, CBFS, Fuel+Loss)- 2288 MT/Y (5) Elemental Sulphur- 26 MT/Y
5	**Bharat Petroleum Corporation** Limited Mumbai Refinery Mahul,Chembur Mumbai-400 074	26.08.2013	Formate1.0/BO/AST/ EIC No MU-4796-13/6th CAC/7113	31.08.2014	Liquefied Petroleum Gas, Poly propylene feedstock- 1617 MT/day Benzene, Toluene/Xytol – 350 MT/day Special Naphtha (SBP55/115 Deg. C and Hexane (FGH 64/69 Deg. C, Motor Spirit MTBE, Naphtha- 7225 MT/day Superior Kerosene Mineral Turpentine Oil, Aviation Turbine Fuel- 5217 MT/day

Sr. No.	Industry Name	Date of issue of consent	Consent number	Consent validity	Products		
					High Speed Diesel 0.05% wt S, High Speed Diesel 0.035 & 0.005 % wt Sulphur, Light Diesel Oil- 13538 MT/day HS Furnace Oil, Low Sulphur Heavy Stock, Bitumen, Sulphur- 6021 MT/day LOBS- 680 MT/day		
6	**Tata Power Co. Ltd.**, Trombay Generating Station, (Trombay Thermal Power station including Coal Handling Jetty (160mx30m), Mahul Road, Chembur, Mumbai	03.02.2012	BO/JD(APC)/EIC No. MU-2855-11-CAC-233	Valid upto 31.07.2016	Electricity Generation- 1580 MW		
7	**Rashtriya Chemicals & Fertilizers Ltd,** Mahul, Chembur, Mumbai-400074	23.12.2011	MPCBHQ/JD-PAMS/Mumbai/CAC/R-CAC-106	01.08.2016	Ammonia	465000	MT/A
					Biola	1200	MT/A
					Microla	1200	Kilolitre/A
					Sujala (19:19:19) Drip/Foiler	22200	MT/A
					Urea	483600	MT/A
					Complex Fertilizer (15:15:15)	409200	MT/A
					Complex Fertilizer (20:20:20)	406400	MT/A
					Methanol	69960	MT/A
					Methylamines	5242	MT/A
					Ammoniumbicarbonate	25000	MT/A
					Sodium Nitrite/Nitrate	5230	MT/A
					Sulphuric acid	111600	MT/A
					Nitric acid (100% basic)	398040	MT/A
					Conc. Nitric acid	27000	MT/A
					Phosphoric acid	37200	MT/A
					Treated water from STP (CMD)	4932000	M3/A
					Rapid Wall panel (Square meter)	1400000	M2/A
					Wall plaster	48000	MT/A
					Wall putty	7200	MT/A

Sr. No.	Industry Name	Date of issue of consent	Consent number	Consent validity	Products
					By product Argon 4035500 Nm3/A Ammonium nitrate melt (80%) 104160 MT/A Carbon dioxide gas 480000 MT/A
8	**Pepsico India Holdings Pvt Ltd**., lL U Gadkari Marg Village Anik ,Mahul Chembur	04.07.2014	Format1.0/BO/ CAC-CELL/EIC No. MU-5346-13/R/CAC-6304	31.08.2014	(1) Non-Alcoholic Beverages – 865 MT/day (2) Packaged Drinking Water – 450 MT/day
9	**Chemical Terminal Trombay Ltd**	16.01.2014	BO/MPCB/RO(HQ) /NK-14959-13/CR/CC-470	31.03.2018	Handling and storage of materials (Bulk liquids & ABC class petroleum products) - 42132 KL (total 22 tanks)

4 VOC EMISSION SOURCES AND CONTROL MEASURES UNDERTAKEN

The petition filed by the complainants is directed principally against VOC generation leading to odour and health related impacts from activities of M/s Sea Lord Containers Ltd. Study of the activities carried out in and around Mahul area shows that in addition to above unit, there are number of sources which may contribute to VOC emissions and hydrocarbons in the air and may result in odour. Major establishments which handle hydrocarbons and organic compounds in the vicinity of the project site are the two refineries of HPCL and BPCL as well as the chemical/fertilizer plant of RCF Ltd and the high traffic along the various roads (Container road/Eastern freeway/Sion- Panvel highway (passing through Chembur) and congested internal road network in Chembur Mahul area. Tata Power Ltd , Indian Oil Blending Ltd (lube blending plants) are considered as minor sources of VOC/hydrocarbon emissions. Chemical Terminal Trombay Ltd (CTTL) is also a tankage terminal adjoining Tata Power Ltd- however, it is considered to be too far away from the villages of Mahul and Ambapada.

It is observed that operations of M/s Sea Lord Containers and Aegis Logistics are of storage of organic compounds and hydrocarbons while the refineries process huge through put of hydrocarbon material (in Millions of Tons).

This chapter takes a look at operations of each industrial establishment and the VOC emission possibilities, controls provided at each establishment for VOC's.

4.1 Sea Lord Containers Ltd (SLCL) :

4.1.1 Storage Tanks Provided- Design and Construction Aspects :

Various tankages seen in Sea Lord Containers are listed below:

Table 4.1 Storage Tanks Provided at M/s Sea Lord Containers Ltd

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Type of Protections against organic vapour emission during filling / breathing?
201	*POL & Chemical liquids*	*IFR*	*18*	*20*	*5000*	*None*	*Internal Floating Roof*
202	*POL & Chemical liquids*	*Vertical Fixed Roof*	*18*	*20*	*5000*	*Adsorber Pot*	*Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.*

203	*POL & Chemical liquids*	*IFR*	*18*	*20*	*5000*	*None*	*Internal Floating Roof*
204	*POL & Chemical liquids*	*Vertical Fixed Roof*	*18*	*20*	*5000*	*Adsorber Pot*	*Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.*
205	*POL & Chemical liquids*	*Vertical Fixed Roof*	*18*	*20*	*5000*	*Adsorber Pot*	*Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.*
206	*POL & Chemical liquids*	*Vertical Fixed Roof*	*26.2*	*20*	*10000*	*Adsorber Pot*	*Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.*
207	*POL & Chemical liquids*	*IFR*	*26.2*	*20*	*10000*	*None*	*Internal Floating Roof*
208	*POL & Chemical liquid*	*Vertical Fixed Roof*	*26.2*	*20*	*10000*	*Adsorber Pot*	*Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.*
209	*POL & Chemical liquids*	*IFR*	*26.2*	*20*	*10000*	*None*	*Internal Floating Roof*
210	*POL & Chemical liquids*	*IFR*	*26.2*	*20*	*10000*	*None*	*Internal Floating Roof*

4.1.2 Observations on Tankage Design and Construction Aspects:

Company has been granted PESO license for storage of class A &/or B &/or C petroleum compounds. Total capacity 75,000 Kl of which 35,000 KL are fixed roof and 40,000 KL are floating roof. As per the drawing approved by PESO, the tankages is designed as per API code 650/IS 803. It is seen that out of 10 tanks, 5 tanks are fixed roof and 5 of Internal Floating Roof type. Following are the observations:

- Vertical Fixed roof (VFR) tanks have Pressure Vacuum valve (breather valve) which operate between -50mm WC and + 100mm WC above atmosphere
- Activated carbon &/or Silica gel pots have been provided to control evaporative and filling VOC emissions from PV valve
- sprinkler system provided around the tanks with medium velocity spray

- Internal Floating Roof (IFR) tanks have been provided with ULTRAFLOTE USA make marine grade Aluminium Internal floating roof which is light weight 1-1.5 pounds square foot. The internal floating roof is hidden from sight by a fixed roof. Studies carried out by Central Pollution Control Board, Delhi indicate the Internal floating roofs have the least emissions of vapours as compared to fixed roof or Internal or External floating roof types both during breathing and during filling .

Table 4.2Emissions from Above ground and IFR tanks during Breathing

Types of tanks	Vapour Emission (mg/hr)	Ambient Temp (^{o}C)
Above Ground (Vertical Fixed Roof)	0.523	32
	0.737	33
	2.029	38
Internal Floating Roof (IFR)	0.002	34
	N.D.	34

(Monitored at Pressure Vacuum Valve of Benzene tank by AESPL for CPCB)

Source : CPCB report on Development of VOC Emission Standards for Petrochemical Industry

Table 4.3Emissions from Above ground, EFR and IFR tanks during Filling

Sr. No.	Chemical Stored	Capacity MT	Vapour Pressure KPA	Emission TPA	Tank Roof
1.	P-xylene	2000	0.87	9.04	VFR
2.	P-xylene	12,240	0.87	2.105	EFR
3.	Benzene	708	9.87	19.55	VFR
4.	Benzene	2158	9.87	0.557	IFR
Emissions computed using TANKs software					

Source : CPCB report on Development of VOC Emission Standards for Petrochemical Industry

- Ultraseal I double wiper seal with Teflon wrapper provided. These seals may tear/shrink/loose flexibility or become stiff due to constant operation of the roof or due to exposure to natural weather conditions like wind/sun/rain. But the fixed roof provided ensures to minimize the seal wear out to a minimum and the Tank manufacturer manual indicates seal life upto 10 years or more.

- The openings in the Internal floating roof are gasketed and /or provided with covers so as to ensure smooth movement and minimal vapour emissions
- Provision of automatic batch cut off system to ensure tank does not overfill
- Stub drains provided to drain liquids from floating roof top

Photograph showing control equipment on VFR tanks are given below :

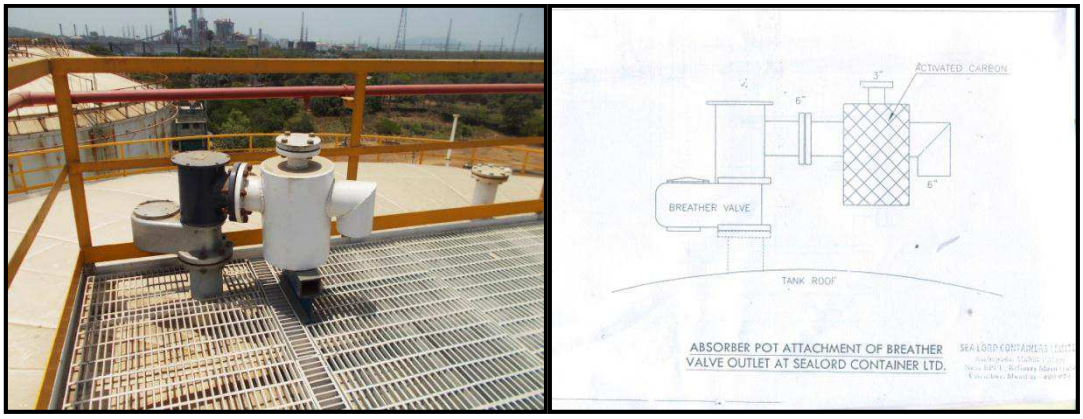


Figure 4.1 Breather Valve on VFR Tank with Activated Carbon Pot

- Committee formed by MPCB has checked that a preventive maintenance schedule exists for the storage tanks covering the tanks and the fixtures
- Filled in Preventive Maintenance checklist No. PM/CHKLST/MECH/SCL/020 dt 12.05.2014 was perused for storage tank T-209 which shows that tank /roof plate/bottom thickness, condition of sprinkler, wiper seals, vacuum breaker, deck drain, pontoons etc are checked during the preventive maintenance checks

4.1.3 Import of Chemicals into Tank Farm

Following Table summarizes the materials handled at the Terminal and their properties viz Flash point, boiling point and Vapour pressure.

Table 4.4 Material Handled in Sea Lord Containers Ltd during 2013-14

Service / Material Handled	Flash Point (^{0}C)	Boiling Point (^{o}C)	Vapour Pressure (KPa at 20 ^{0}C)	Quantity of Material Handled (MT / Month)
Acetone	-17.7	56.2	24.5717	2711
Caustic Lye	-	--	-	5865
Methanol	12.2	64.5	12.9774	13708
Ortho xylene	-	-12 to 220	0.82	3318
Reformate	90	144.4	NA	3198
Styrene Monomer	31	145.2	0.5	2887
Toluene	4.5	110.6	5.4	4016

TOTAL	**~**			**35710**

NA = Not available

4.1.4 Observations on Tank Filling Operations

- For import of chemicals Sea Lord Containers Terminal is connected to 5 berths at Jawahar Deep by 4x12" jetty pipelines including one SS pipeline.

- Committee formed by MPCB has reviewed SOP/SCL/005 rev 02 dt 21.02.2014 for Import of Chemicals provided by the company which indicates that :

- All volatile products are taken to Internal floating roof tanks – this is a good practice and should be diligently followed considering that the internal floating roof tanks have the lowest emission rates during filling or breathing

- During day time water sprinklers are used to reduce vapour pressure of tank while loading is going on. The sprinklers are also to be used in case Vapour pressure exceeds +65 mm WC during storage of products due to whatsoever reason

- Use of Radar gauges to find if tank vapor pressure is within range

  - The above are good practices and necessary records of materials stored in various tanks, vapour pressure inside storage tanks and also record of operation of sprinklers should be maintained by the company

  - Committee also reviewed SOP/SCL/013 rev 02 dt 21.04.2014 made by company for transfer of chemicals to Internal floating roof tanks

  - As per the SOP :

    - Compatibility of chemicals with tank material is ensured before effecting transfer

    - Pipeline/jetty patrol ensures no leakage in pipeline during transfer

    - Procedure for ensuring safe roof movement is prescribed to ensure that the internal roof does not get damaged during the chemicals transfer

  - *During initial period of the transfer the chemicals are taken to the slop tank – the disposal of slops is a matter of concern and slops should be sent to CHWTSDF for safe disposal. The Company's Consent to Operate/Authorization should be amended to ensure safe disposal of slop.*

  - There are no norms on VOC control for isolated storage tank farms under Environmental Protection Act 1986. The GSR 186 (E) dt 18.03.2008 applicable for Petroleum Oil Refineries and GSR 820 (E) dt 09.11.2012 (enclosed). Both have similar provisions for reducing emissions from storage tanks :

As per these provisions all tanks more than 500 KL and holding substances having vapour pressure > 10 KPa shall be Internal floating roof (IFR) type. From the data presented in above Table it is apparent that to comply these provisions, Company should store Acetone and Methanol only in IFR tanks.

The other requirements for IFR Tanks is to have double seals - primary vapour mounted and secondary rim mounted – it is seen that two wiper seals have been provided – one vapour mounted and other rim mounted around the floating roofs to have reduced vapour emissions. *A mechanical shoe seal or a liquid mounted foam seal is the preferred sealing method, but committee does not insist on this, considering that the double seal seems to have been provided as per the norms.*

The regulations stipulate the inspection and maintenance to be carried out as per API RP 575 with in service inspection of seal gap once every 6 months. *In the absence of any other Standards /Guidelines, the storage provisions of the GSR 186 (E) and GSR 820 (E) have been made mandatory by MPCB and Consent to operate granted to the unit is suitably amended to include these clauses. The inspection and maintenance program of Sea Lord Containers will need to be spruced up to meet the requirements under this legislation.*

4.1.5 Material Dispatches and Related Operations

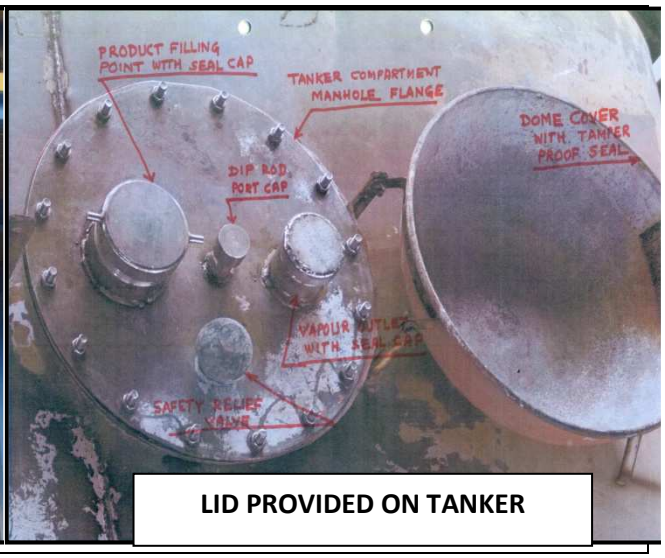
The material dispatch is via road Tankers to various clients and /or through pipeline to other destinations. This section examines the dispatches handled through road tankers:

Table 4.5Information Pertaining to Tanker Filling in 2013-14

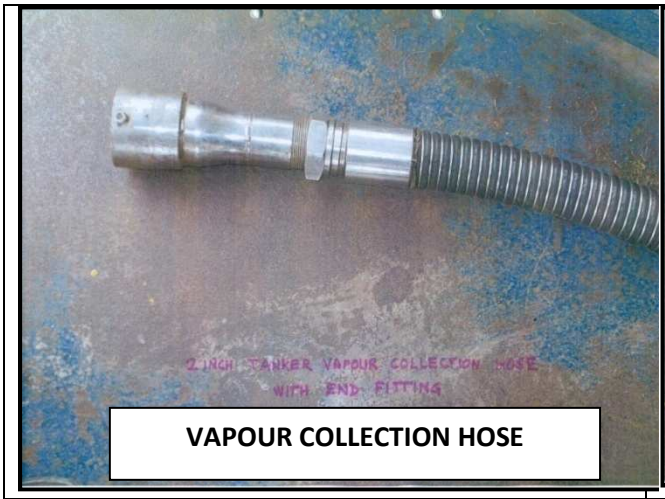
Sr. No.	Average Size Of Tankers (MT)	No. of filling / Emptying Operations (Avg / month)	Precautions taken at Tanker Vent to reduce Emissions	Measures taken to reduce exposure to workers at Filling Point?
1	*15.5 Average (Varies between 9 MT to 17 MT)*	*1166*	*Refer Note Below*	*PPEs as recommended for Eye, Skin, Head, Fall from height etc.*
	NOTE:			
	Materials handled in the tank farm over the last one year (01.04.13 – 31.03.2014)		*Acetone, Caustic Soda Lye, Methanol, Ortho Xylene, Styrene Monomer, Toluene*	
	Details of air pollution control system provided.		*Tanker compartment vapour collection header, Scrubber pot and Activated Carbon Adsorption unit.*	

Photographs of emission control system provided at tanker filling area are given below :

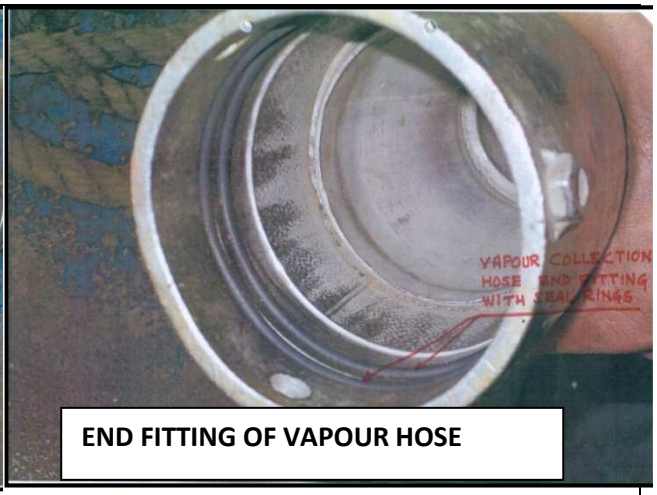
COMPATIBLE LOADING ARMS



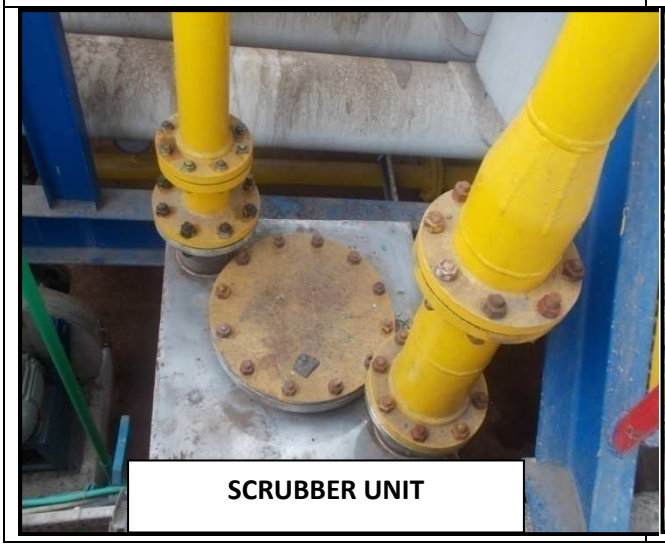
LID PROVIDED ON TANKER



VAPOUR COLLECTION HOSE



END FITTING OF VAPOUR HOSE



SCRUBBER UNIT

SCRUBBER UNIT

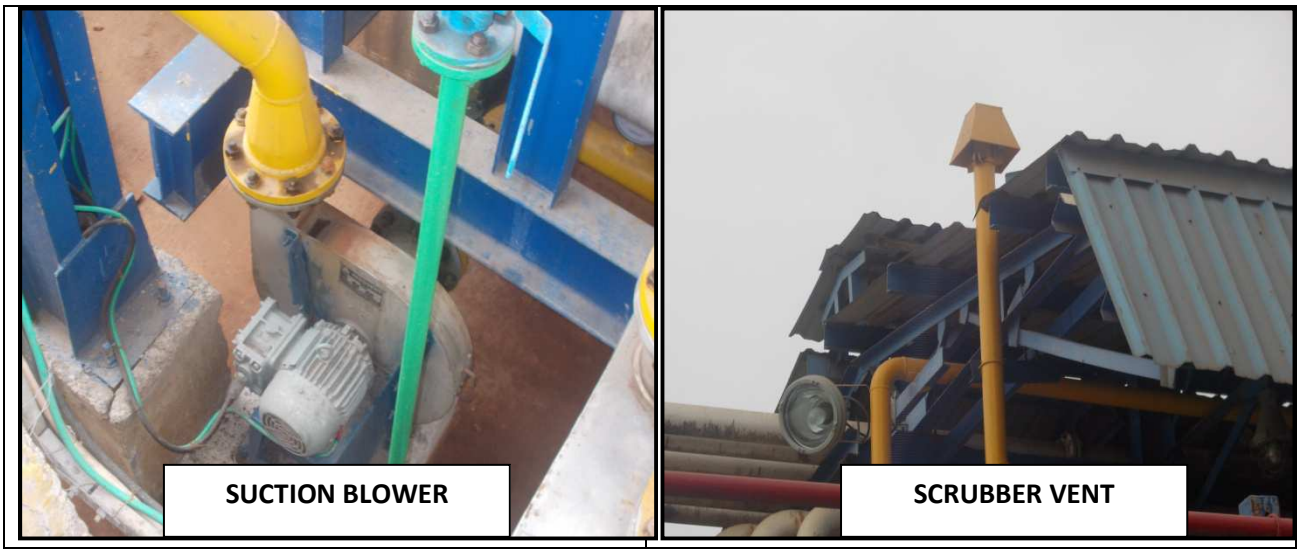


Figure 4.2Photographs of Vent Collection &Scrubber System Provided

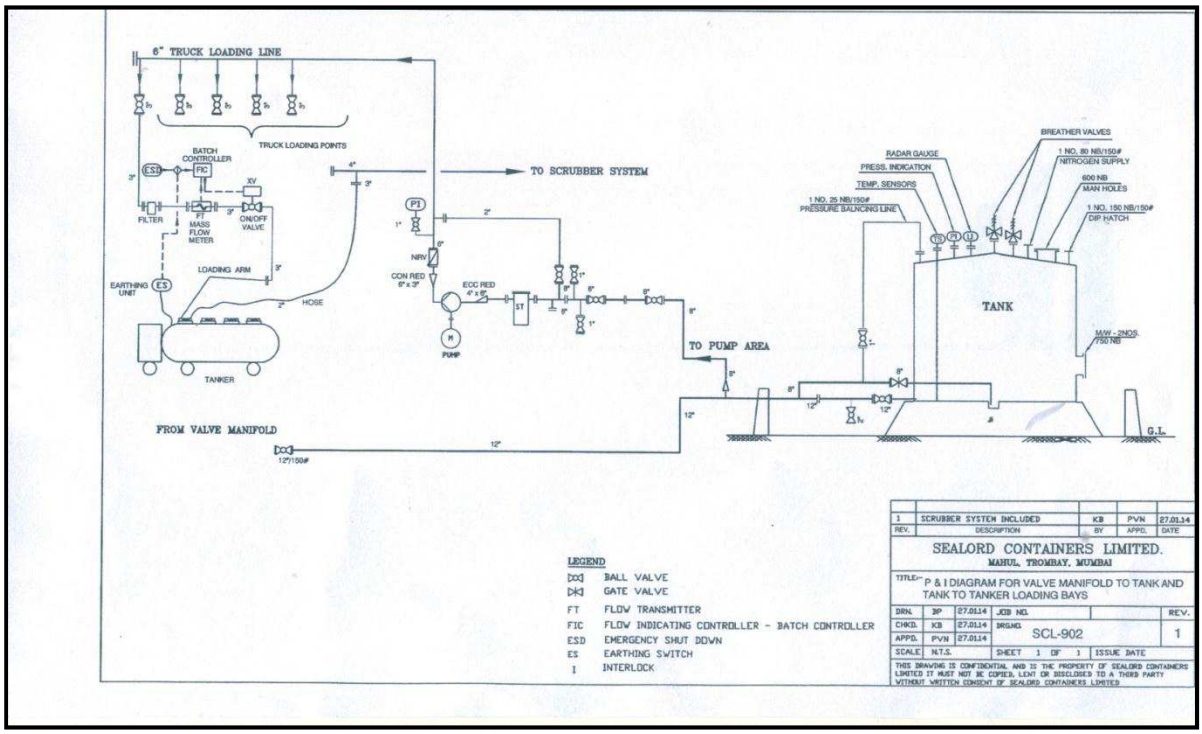


Figure 4.3 P & ID of Tanker Filling Operation

4.1.6 Observations on Tanker Filling Operations/Scrubbing etc.

Company has provided clamping lid with arrangement to insert dip rod (to take level), insert product filling pipe and also connect flexible hose for collecting vapour and safety valve. Company has provided 12 numbers flexible vent collection pipes connected to a common header further connected to suction blower which takes vapours to scrubber pot.

Tanker loading SOP/SCL/004 rev 2 dt 01.02.2014 was reviewed and it includes procedures for:

- connecting flexible hose , operation of blower to suck gases to scrubber
- use of flow meters with auto batch flow cut offs to avoid tanker overfill and spill control

SOP needs to be updated to include clamping of lid on to the tanker manhole prior to start of filling operation and also PPE's to be used should include gas mask and respirator

P & ID SCL 902 for tanker filling was reviewed along with HAZOP document dt 29.01.2014. The HAZOP includes scrubber/blower operation but needs to be updated to include scenario of no-flow of suction blower.

Committee formed by MPCB reviewed the design of scrubber and noted that it consists of a water tank in which water is bubbled in order to have maximum water gas contact. *However, committee doubted the effectiveness of water scrubbing considering that most organics have low solubility in water. Activated carbon pads are provided with demister on the outlet of scrubber. Also, it is felt that water vapour released during bubbling may choke activated carbon pores and render them useless. Committee also noted that no port holes are provided at inlet or outlet of scrubber and hence effectiveness of scrubbing cannot be gauged.*

SOP for Scrubber unit operation SOP/SCL/002 rev 0 dt 01.02.2014 was reviewed and it indicates that scrubber water to be changed every 4 days and taken to ETP and fresh water to be taken in. Also, it indicates need to periodically replace activated carbon provided in the scrubber outlet (periodicity not mentioned).

Committee feels that effectiveness of scrubbing should be established immediately by monitoring gases at inlet and outlet of scrubber. Shri Aundhe Technical expert pointed out that Reliance Industries Ltd has provided scrubber at Patalganga Tanker filling bay which uses chilled slop oil (heavy petroleum oil) at 8-9 deg C. Oil being organic scrubs the organics and efficiencies of 75-90 % are obtained. Similarly, Reliance Industries Ltd at Hazira has provided condenser with chilled water supply and followed by activated carbon bed. This has very good efficiency.

Company should check the efficiency of scrubbing else make suitable modifications in system considering that system has to be effective to treat organics.

4.2 Aegis Logistics Ltd (ALL)

4.2.1 Storage Tanks Provided- Design and Construction Aspects

Details of Storage tanks provided at above terminal are as below:

Table 4.6 Storage Tanks Provided at ALL

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
T 113	POL & Chemical Liquid	Vertical Fixed Roof	12.50	8.70	1000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 114	POL & Chemical Liquid	Vertical Fixed Roof	12.5	10.5	1250	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 115	POL & Chemical Liquid	Vertical Fixed Roof	12.5	10.05	1250	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 116	POL & Chemical Liquid	Vertical Fixed Roof	12.72	10.65	1350	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 117	POL & Chemical Liquid	Vertical Fixed Roof	12.72	10.65	1340	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 118	POL & Chemical Liquid	Vertical Fixed Roof	12.72	10.65	1330	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T 119	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T120	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T121	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
							sprinkler grid.
T122	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T123	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T124	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T125	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.05	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T126	POL & Chemical Liquid	Vertical Fixed Roof	21.0	15.0	5000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T127	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T128	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T129	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T130	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
							and Water sprinkler grid.
T131	POL & Chemical Liquid	IFR	26.0	20.0	10000	None	Internal Floating Roof
T132	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T133	POL & Chemical Liquid	Vertical Fixed Roof	26.0	20.0	10000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T134	POL & Chemical Liquid	Vertical Fixed Roof	14.20	20.0	3000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T135	POL & Chemical Liquid	Vertical Fixed Roof	14.20	20.0	3000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T136	POL & Chemical Liquid	Vertical Fixed Roof	14.20	20.0	3000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T137	POL & Chemical Liquid	Vertical Fixed Roof	14.20	20.0	3000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T138	Non-Petroleum Chemical	Vertical Fixed Roof	5.80	25.0	640	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T139	Non-Petroleum Chemical	Vertical Fixed Roof	6.90	25.0	900	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
							sprinkler grid.
T140	Non-Petroleum Chemical	Vertical Fixed Roof	6.90	25.0	900	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T141	Non-Petroleum Chemical	Vertical Fixed Roof	7.0	25.0	930	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T142	Non-Petroleum Chemical	Vertical Fixed Roof	6.0	25.0	685	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T143	Non-Petroleum Chemical	Vertical Fixed Roof	11.0	25.0	2300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T144	Non-Petroleum Chemical	Vertical Fixed Roof	8.50	25.0	1200	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T145	Non-Petroleum Chemical	Vertical Fixed Roof	8.50	25.0	1375	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T146	Non-Petroleum Chemical	Vertical Fixed Roof	10.0	25.0	1900	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T147	Non-Petroleum Chemical	Vertical Fixed Roof	10.0	25.0	1900	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T152	Non-Petroleum Chemical	Vertical Fixed Roof	10.0	25.0	1900	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
							and Water sprinkler grid.
T154	Non-Petroleum Chemical	Vertical Fixed Roof	11.0	25.0	2300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T156	Non-Petroleum Chemical	Vertical Fixed Roof	11.0	25.0	2300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T157	Non-Petroleum Chemical	Vertical Fixed Roof	10.25	25.0	2000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T159	Non-Petroleum Chemical	Vertical Fixed Roof	15.0	25.0	4300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T160	Non-Petroleum Chemical	Vertical Fixed Roof	11.0	25.0	2300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T161	Non-Petroleum Chemical	Vertical Fixed Roof	15.0	26.82	4300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T162	Non-Petroleum Chemical	Vertical Fixed Roof	12.0	25.0	2800	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T163	Non-Petroleum Chemical	Vertical Fixed Roof	12.5	25.0	3000	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.

Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Protection against organic vapour emission during filling / breathing?
T164	Non-Petroleum Chemical	Vertical Fixed Roof	15.0	25.0	4300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T165	Non-Petroleum Chemical	Vertical Fixed Roof	15.0	25.0	4300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.
T166	Non-Petroleum Chemical	Vertical Fixed Roof	11.0	25.0	2300	Adsorber Pot	Pressure Vacuum Valve, Vapour pressure Device and Water sprinkler grid.

4.2.2 Observations on Tankage Provided

Company has been granted PESO license for storage of class A &/or B &/or C petroleum compounds. Licensed capacity of Petroleum class A &/or B &/or C tanks is 1,29,452 KL and non Petroleum products 48,830 KL TOTAL 1,78,282 KL. As per the as built drawing enclosed approved by PESO, the tankage is designed as per API code 650/IS 803. It is seen that out of 49 tanks, 2 numbers double walled cryogenic storage tanks, 44 tanks are fixed roof and 3 of Internal Floating Roof type. Following are the Committee observations :

- Company has provided two numbers of double walled cryogenic storage tanks for storing Liquefied petroleum gas (LPG) specially designed to recycle LPG boil off gas through refrigeration compressors
- Fixed roof tanks have Pressure Vacuum valve (breather valve) which operate between -50mm WC and + 100mm WC above atmosphere
- Activated carbon &/or Silica gel pots have been provided to control evaporative and filling emissions from PV valve (similar to those at Sea Lord Containers)
- sprinkler system provided around the tanks with medium velocity spray

Figure 4.4 Sprinklers Provided on Storage Tanks

- Internal Roof tanks have been provided with ULTRAFLOTE USA make marine grade Aluminum Internal floating roof which is light weight 1-1.5 pounds square foot. The internal floating roof is hidden from sight by a fixed roof. Internal floating roofs when well maintained have the least emissions of vapours as compared to fixed roof or External floating roof types.
- Ultraseal I double wiper seal with Teflon wrapper provided. These seals may tear/shrink/loose flexibility or become stiff due to constant operation of the roof or due to exposure to natural weather conditions like wind/sun/rain. But the fixed roof provided ensures to minimize the seal wear out to a minimum and the Tank manufacturer manual indicates seal life upto 10 years or more.
- Stub drains provided to drain liquids from floating roof top.
- Committee has checked that a preventive maintenance schedule exists for the storage tanks covering the tanks and the fixtures.
- Filled in Preventive Maintenance checklist No. PM/CHKLST/MECH- LTD/021 dt 16.02.2013 was reviewed for storage tank T-131 (Internal floating roof type) which shows that tank /roof plate/bottom thickness, condition of sprinkler, wiper seals, vacuum breaker, deck drain, pontoons etc are checked during the preventive maintenance checks.

4.2.3 Material Imported at ALL

The materials handled at ALL and the physical properties are given below:

Table 4.7 Information Pertaining to Material Handled 2013-14

Service / Material Handled	Flash Point (^{0}C)	Vapour Pressure (KPa) at 20 ^{0} C)	Boiling Point (^{o}C)	Quantity of Material Handled (MT/ Month)
Acetone	- 20	24.5717	56	1167
Acetic Acid	39	1.58384	118	16175
Butyl Acetate	23.9	1.99	126	476
Butyl Alcohol	11.1	0.55	82.2	57
Base Oil	225	NA	288 and 566	2141
Caustic Soda Lye	--	0.20	1,388	7364
Diethylene glycol (DEG)	138	0.0002	244–245	46
Dimethyl Formamide	57.8	3	153	258
Olefin C 12	77	0.026	213-216	255
Ethylene dichloride	13	8.53	84	7572
Ethanol denatured	9	5.85	78.37	209
2 Ethyl Hexanol	77	0.007	180 to 186	854
Iso Propyl Alcohol	11.7	<6.02	82.6	41
Iso nonanol	76	0.2	193.5	636
Methylene dichloride	NA	47	39.6	1178
Mono ethylene glycol	116	0.0075	197	31266
Methanol	12	12.9774	64.7	14321
Mix Xylene	26.1	1.105	136-140	553
Olefin C 14	104	0.013	246-253	78
o-Xylene	17	0.9	144.4	233
2Propyl Heptanol	100	0.02	205–225	373
Styrene Monomer	31.1	0.6	145	14666
Toluene	4.44	2.93	110.6	429
Vinyl acetate monomer	-8	12.26	72.7	1979
			Total Quantity	**102339**

4.2.4 Observations on Tank Filling Operations

- For import of chemicals Aegis Logistics Ltd is connected to 5 berths at Jawahar Deep by 4x12" jetty pipelines including one SS pipeline.

- Committee formed by MPCB has perused SOP/LTD/006 rev 06 dt 23.04.2014 for Import of Chemicals provided by the company which indicates that :
  - All volatile products are taken to Internal floating roof tanks – this is a good practice and should be diligently followed considering that the internal floating roof tanks have the lowest emission rates during filling or breathing.
  - During day time water sprinklers are used during day time to reduce vapour pressure of tank while loading is going on. The sprinklers are also to be used in case Vapour pressure exceeds +65 mm WC during storage of products due to whatsoever reason
  - Use of Radar gauges to gauge if tank vapor pressure is within range
  - Compatibility of chemicals with tank material is ensured before effecting transfer
  - Pipeline/jetty patrol ensures no leakage in pipeline during transfer
  - Procedure for ensuring safe roof movement is prescribed to ensure that the internal roof does not get damaged during the chemicals transfer

- *The above are good practices and necessary records of materials stored in various tanks, vapour pressure inside storage tanks and also record of operation of sprinklers should be maintained by the company.*

- The Committee has reviewed HAZOP dt 12.02.2010 prepared for P & ID no. ALL-LTD-901 and 902 which has been prepared to cover various impacts including environmental pollution, product loss, product spill, fire hazard and health hazard. During review, company officials have affirmed that all actions as identified in the HAZOP are being taken by Company.

- *During initial period of the transfer the chemicals are taken to the slop tank – the disposal of slops is a matter of concern and slops should be sent to CHWTSDF for safe disposal.*

- There are no norms on VOC control for isolated storage tank farms under Environmental Protection Act 1986. The GSR 186 (E) dt 18.03.2008 applicable for Petroleum Oil Refineries and GSR 820 (E) dt 09.11.2012 (enclosed Annexure ---). Both have similar provisions for reducing emissions from storage tanks :

  As per these provisions all tanks more than 500 KL and holding substances having vapour pressure > 10 KPa shall be Internal floating roof type. Thus, from the data presented above it is apparent that to comply these provisions, Company should store Acetone, Vinyl acetate Monomer and Methanol only in IFR tanks.

  The other requirements for IFR Tanks is to have double seals - primary vapour mounted and secondary rim mounted – it is seen that two wiper seals have been

provided – one vapour mounted and other rim mounted around the floating roofs to have reduced vapour emissions. *A mechanical shoe seal or a liquid mounted foam sealis the preferred sealing method by the committee, but committee does not insist on this, considering that the double seal seems to have been provided as per the norms.*

The regulations stipulate the inspection and maintenance to be carried out as per API RP 575 with in service inspection of seal gap once every 6 months. *In the absence of any other Standards /Guidelines, Committee felt that the storage provisions of the GSR 186 (E) and GSR 820 (E) be made mandatory for M/s Aegis Logistics Ltd and their Consents to Operate be amended to include clauses to comply the above standard. The inspection and maintenance program of M/s Aegis Logistics Ltd will need to be spruced up to meet the requirements under this legislation.*

4.2.4.1 Material Dispatch:

The material dispatch is via road Tankers to various clients and /or through pipeline to other destinations. This section examines the dispatches handled through road tankers :

Table 4.8 Information Pertaining to Tanker Filling in 2013-14

Sr. No.	Average Size Of Tankers (Cum)	No. of filling / Emptying Operations (Avg. / month)	Precautions taken at Tanker Vent to Reduce Emissions	Measures taken to reduce exposure to workers at Filling Point?
1	15.5 Average (Varies between 9MT to 17MT)	5644	Tanker compartment vapour collection header with scrubber system and Activated carbon filter at scrubber vent.	PPE's on recommended for eyes , body protection hands, foot, fall from height etc.
	NOTE:			
	Materials handled in the tank farm over the last one year (01.04.13 – 31.03.14)		List of material as per (ii) above	
	Details of air pollution control system provided.		Tanker compartment vapour collection header with scrubber system and Activated carbon filter at scrubber vent.	

Photographs of emission control system provided at tanker filling area are given below :

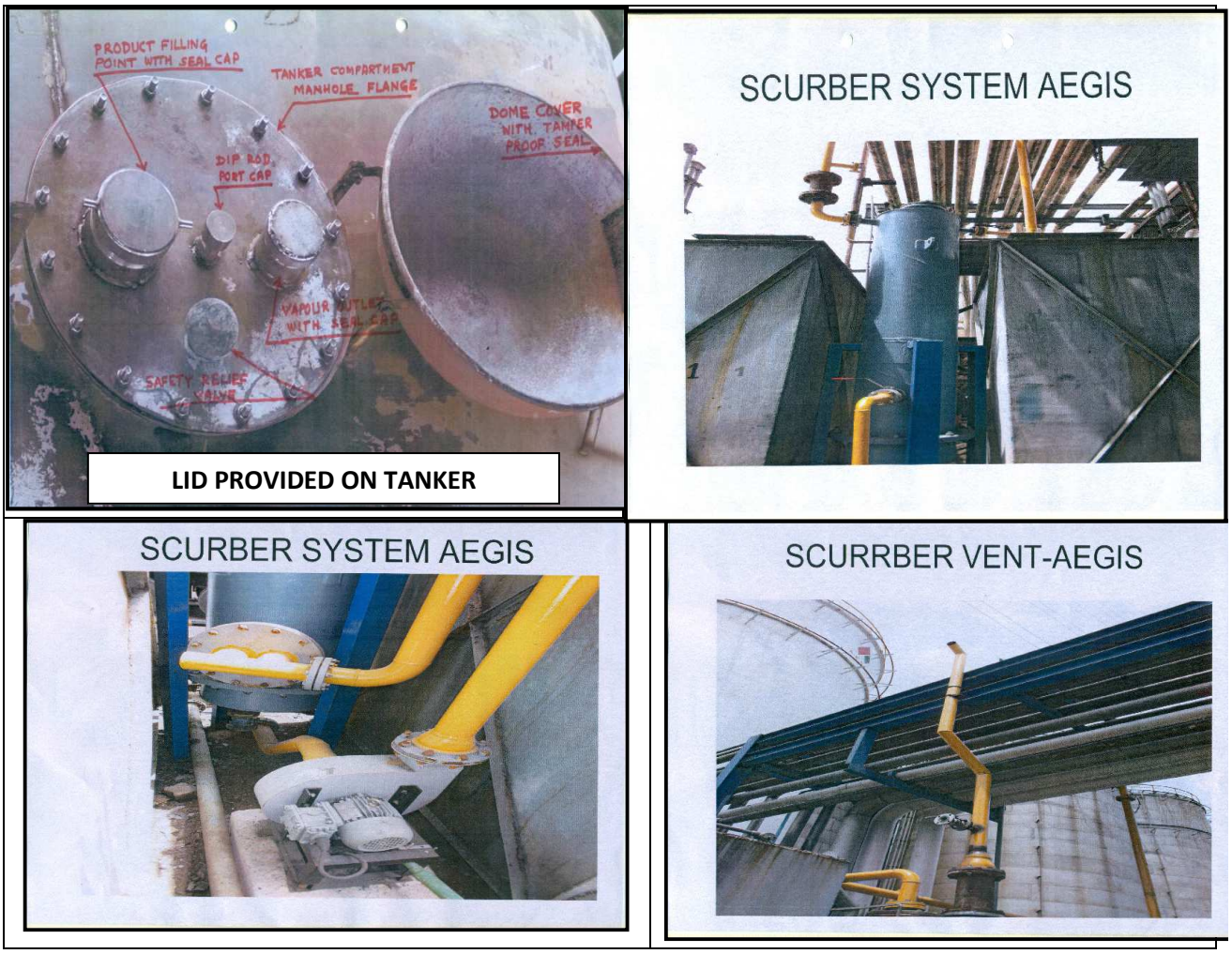


Figure 4.5Scrubber System – Aegis Logistics Ltd

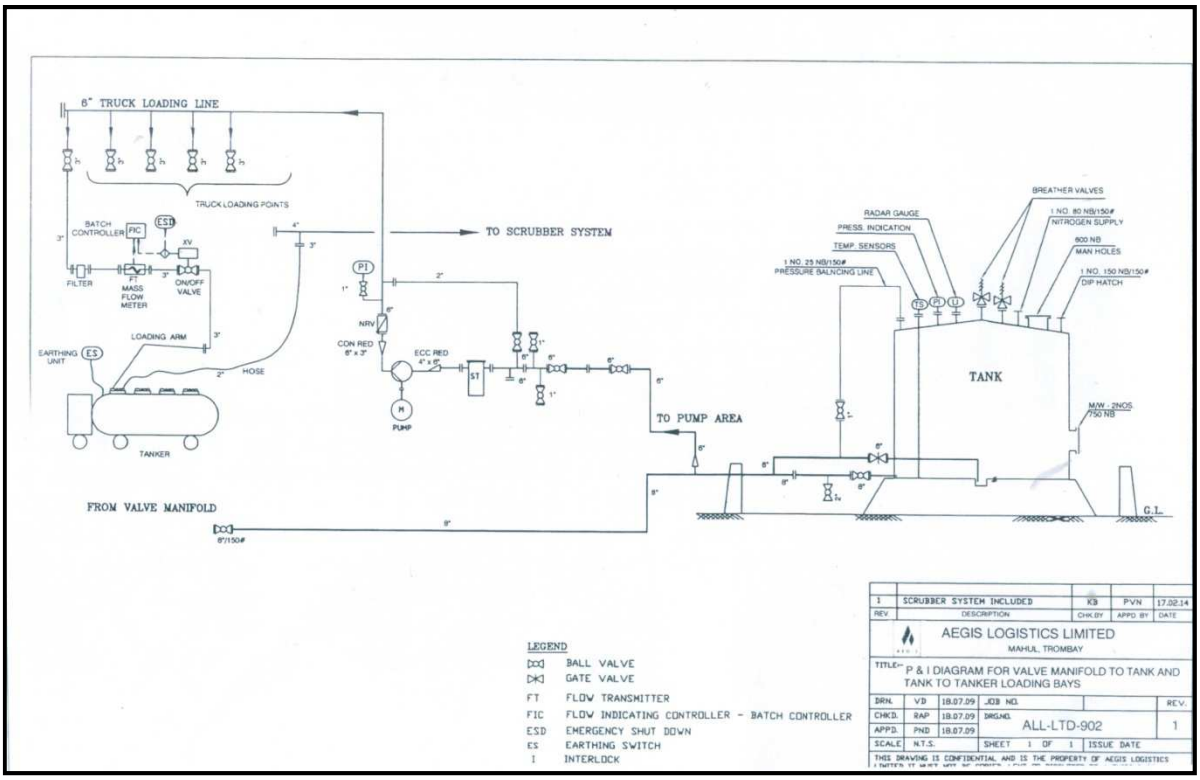


Figure 4.6P & ID of Tanker Filling Operation

4.2.5 Observations on Tanker Filling Operations/Scrubbing etc :

Company has 26 tanker loading bays. Company has provided clamping lid with arrangement to insert dip rod (to take level), product filling pipe, connect flexible hose for collecting vapour withprovision of safety valve. Company has provided 12 numbers flexible vent collection pipes connected to a common header further connected to suction blower which takes vapours to scrubber pot.

Tanker filling SOP/LTD/005 rev 03 dt 23.04.2014 was reviewed and it includes procedures for:

- connecting flexible hose , operation of blower to suck gases to scrubber
- use of flow meters with auto batch flow cut offs to avoid tanker overfill and spill control

SOP needs to be updated to include clamping of lid on to the tanker manhole prior to start of filling operation and also PPE's to be used by tanker operators should include gas mask and respirator

P & ID ALL-LTD- 902 for tanker filling was reviewed along with HAZOP document dt 20.02.2014. The HAZOP includes scrubber/blower operation and considers various

consequences like environmental pollution, fire, health hazards, product loss, product spill. *SOP needs to be updated to include scenario of no-flow of suction blower.*

Committee reviewed the design of scrubber and noted that it consists of a water tank in which water is bubbled in order to have maximum water gas contact. Committee doubts the effectiveness of water scrubbing considering that most organics have low solubility in water. Activated carbon pads are provided with demister on the outlet of scrubber. Also, committee felt that water vapour released during bubbling may choke activated carbon pores and render them useless. Company has provided port holes at inlet or outlet of scrubber but use dragger tubes for checking effectiveness of scrubbing.

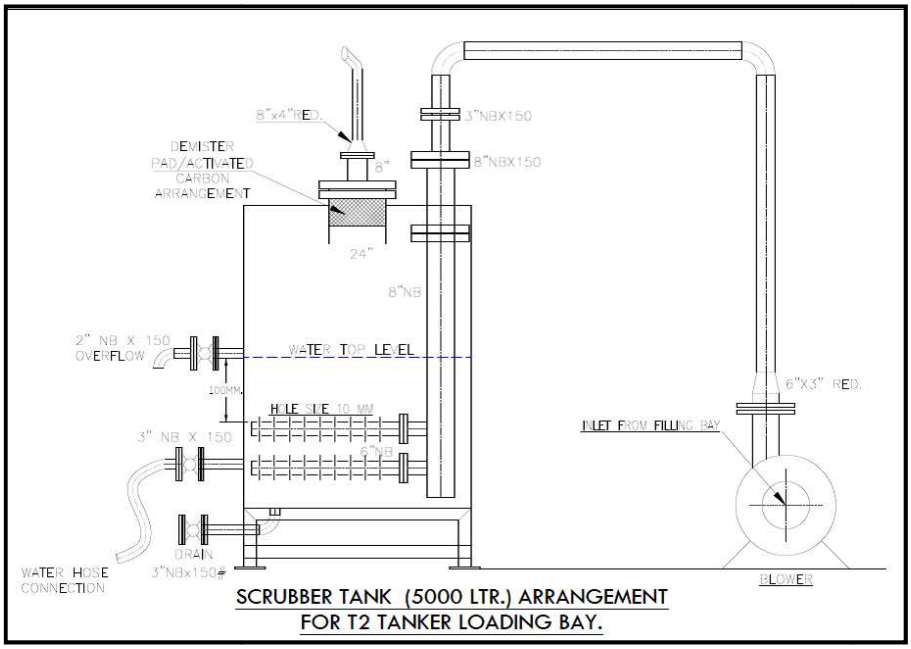


Figure 4.7 Scrubber Cross Section : Aegis Logistics Ltd.

SOP for Scrubber unit operation SOP/LTD/056 rev 0 dt 23.04.2014 was reviewed. It requires scrubber water to be changed every 4 days and taken to ETP and fresh water to be taken in. Also it indicates need to periodically replace activated carbon provided in the scrubber outlet (periodicity not mentioned).

Committee felt that effectiveness of scrubbing should be established immediately by monitoring gases at inlet and outlet of scrubber. Shri Aundhe Technical expert pointed out that Reliance Industries Ltd has provided scrubber at Patalganga Tanker filling bay which uses chilled slop oil (heavy petroleum oil) at 8-9 deg C. Oil being organic scrubs the organics and efficiencies of 75-90 % are obtained. Similarly, Reliance Industries Ltd at Hazira has provided condenser with chilled water supply and followed by activated carbon bed. This has very good efficiency.

Company should check the efficiency of scrubbing, else make suitable modifications in system considering that system has to be effective to treat organics.

4.3 BPCL Ltd

4.3.1 Process Vents to Atmosphere

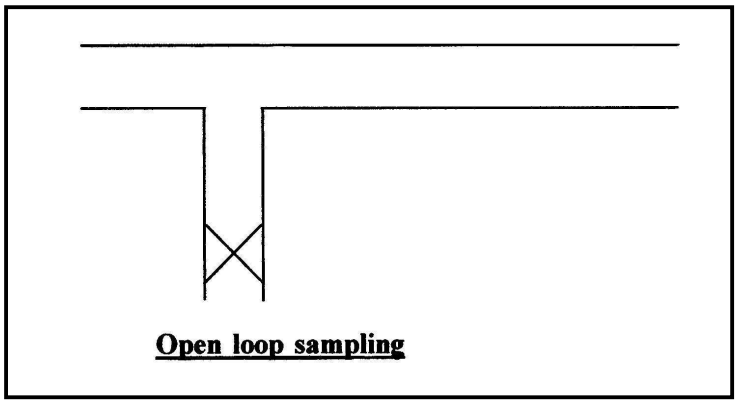
BPCL's response to query as to whether there are any direct process emissions to the environment are as under :

Process vents are a closed system and have been connected to refinery flare system for safe handling.SRU trains are equipped with a thermal incinerator/oxidiser facility where emission gases from the SRU trains are discharged through the vent stack at higher altitude. Tail gases and sweep gases are routed through Incinerator where they are completely burnt off.

Process plants have been provided with Closed Blowdown systems for liquid hydrocarbon effluents generated during normal and emergency operations. These CBD tanks are normally underground tanks with provision of receiving through underground system, a small buffer/storage and then pumping out facility to slops. In order to stop escaping of any hydrocarbon outside, these tanks are provided with connectivity with flare system as well. Auto start/ stop facility has been also provided to maintain the liquid in the tank within permissible levels. Usually, this system handles pure light to medium hydrocarbons with the complete system as CLOSED.

Oily waste system (OWS) system is also provided in process plants which handle liquid effluent generated as consequence of freeing the various equipments from hydrocarbon after flushing out with water/ steam etc. Plant oil catchers have been provide with facilities of weirs, skimmers, hay filters, oil adsorbent booms, pillows and vacuum system for removal of oil from the OWS and storm water systems.

During discussions, BPCL has replied that all safety relief valves/pressure relief valves are vented to flare header and also all sampling points for sampling of intermediate stream are closed ended that is there is no discharge into atmosphere even during the brief period of sample collection. Generalized diagram showing open ended sampling connections (which results in atmospheric discharges) is given below for the understanding of reader :



A detailed technical audit of facilities is essential to check the efficacy of systems provided within the manufacturing plants.

4.3.2 Fugitive Emissions from Process

Fugitive emissions in plant include emissions from pump/agitator/compressor seals/valves/flanges etc. In a typical refinery processing 12 million tons of crude, there are bound to be thousands of components from which fugitive emissions can occur from the gap which occurs between the moving component and the stationary component. Generally seals are provided for reducing the emissions, but emissions vary with the type/quality of packing and seal type provided. The Table overleaf published by DNV indicates how fugitive emissions vary with seal/packing type and also with type of component. This indicates that a double mechanical seal pump is much more effective in reducing VOC emissions in lieu of single mechanical seal pumps.

The fugitive emissions are also a function of preventive maintenance standards prevailing in the unit since more or less tightening of nuts/bolts etc may result in a "leaking" component source. Also operation at high pressures and with volatile liquids and/or gases may influence emission levels.

As defined in the GSR 182 (E) for petroleum oil refinery, a source is said to be "leaking" if the emissions around the leaking component when measured with a PID/FID type meter indicates concentration of more than 5,000 ppm for pump/compressor seals and more than 3000ppm for valves/flanges and other components.

Table 4.9 Fugitive Emission From Equipment

Fugitive Emissions From Equipments

Equipments	Emission Rates Mgs. Sec $^{-1}$
Pump	
• Regular packing without external lube sealant	2.40
• Single Mechanical Seal	1.7
• Double Mechanical Seal	0.006
• Bellow Seal/Diaphragm pump/Canned pump	NIL
Compressors	
• Reciprocating – Rod packing Single/Labrynth Seal	45
• Double	3.6
• Liquid Film Seal	0.006
Valve Stems	
• Rising stem valve & Regular Packing (Rating ≤300 pounds)	1.7
• Rising stem valve & grafoil packing (Rating ≤300 pounds)	0.2
• Non-Rising stem valves	0.005
Piping/Equipment Connections	
• Open Ended	0.63
• Screw Cap	0.009
• Blind Flange	
- Asbestos Gasket	0.009
- Grafoil Gasket	0.0009
Flanges, Bolting & Fittings	
• Flanges and Asbestos Gasket	
150 – 300 lb	0.256
> 300 lb	0.303
• Flanges & Grafoil Gasket	0.206
150 – 300 lb	0.0003
> 300 lb	
• Threaded & Welded/Welded only	NIL

Thus, to ensure that fugitive emissions are indeed having lowest emissions, following aspects need to be checked:

- Detailed component inventory including type of component/seal/packing provided and the service they are in
- LDAR (Leak Detection and Repair program)

BPCL has provided the following details on measures undertaken to reduce fugitive emissions to atmosphere:

BPCL has implemented Leak Detection and Repair (LDAR) program using a portable hydrocarbon detector instrument. These programs are carried out regularly on a large number of valves, flanges, at pumps, compressors, other equipments in process units and offsite areas wherein leaks are detected and rectified. In addition, Hydrocarbon leak detectors have been provided in the plant area at strategic locations. In the month of September 2013,new GMI Leak Surveyour with a leak detection range of 0-10,000 ppm, was procured. The summary of leaks detected and attended at BPCL MR is attached as **Annexure-4**

The new pumps in the refinery are as per API 682 with double mechanical seal, and have plan 52/53 and 53 M for environmental protection.Double mech seal has been provided for all pumps on light hydrocarbon service. The compressors have dry gas seal and closed system for effective emission control. There is provision for safe routing of hydrocarbons to refinery flare system in case of any upset/emergency.Product sampling is carried out in closed loop, with provision for diversion to plant Closed Blow Down CBD system.

The releases from all the Pressure Release Valves (PRV) and Safety Release Valves (SRV's) is connected to the flare system for safe handling of hydrocarbons.

The data on LDAR surveys and corrective actions is as given overleaf (Annexure -4 given by BPCL with its questionnaire) . This indicates that the system of LDAR exists and also that there is marked reduction in identification of "leaky" components as is evident – probably due to increased awareness amongst maintenance staff and changeover of components with newer non leaking seal. Also, as per Company's reply they are replacing old components to low leaking types for eg double mechanical seal pumps to replace single mechanical seal pumps. This program needs to be expedited to the extent possible so that reduced emissions result through use of better engineered components of low leaky types.

By itself the measures taken are seen to be in order however, a detailed technical audit of refinery is essential to ascertain any further measures required for reduction of fugitive component leaks.

Table 4.10 LDAR Fugitive Emission Surveys Conducted BPCL

Annexure-4

LEAK DETECTION & REPAIR (LDAR) FUGITIVE EMISSION SURVEY

PERIOD OF SURVEY YEAR	NO.OF GLANDS/ FLANGES SURVEYED	NUMBER OF LEAKS FOUND
Surevy-1 (1998/99)	5351	366
Surevy-2 (2000)	5374	175
Surevy-3 (2001)	10022	672
Surevy-4 (2001/02)	9080	213
Surevy-5 (2002/03)	5510	157
Surevy-6 2003/04)	10000	90
Survey-7 (2004/05)	10000	70
Survey-8 (2005/06)	10242	14
Survey-9 (2006/07)	13226	12
Survey-10(2007/08)	6035	4
Survey-11(2008/09)	10200	162
Survey-12(2009/10)	4450	89
Survey-13(2010/11)	14150	36
Survey-14(2011/12)	15704	32
Survey-15(2012/13)	9280	1
Survey-16(2013/14)	11583	16
*Survey-17(2014-15)		

. *In progress Remarks: The Leaky points have been attended

4.3.3 Flaring

Flaring is a necessity for petroleum refineries and a requirement from safety point of view since if flaring is not working effectively; it might result in large discharges ofhydrocarbons into environment creating hazardous condition for nearby residents.

VOCs discharged to Flares include:

- Process vents
- Fugitive emissions (through plant main header)
- Other plant emissions
  - Stabilisation losses (start-ups/shut-downs)
  - Intentional venting (PRV/SRV releases)
  - Releases during catalyst regeneration & during maintenance activities

From view point of hydrocarbon emissions, Committee directed 3 queries at the company viz

- Measures taken to reduce flaring
- Controls at Flare to ensure Flame continuity
- Measures taken to reduce possibility of black smoky flare

4.3.3.1 Measures to reduce Flaring

BPCL has in its replies submitted the following clarifications on measures to reduce flaring:

Since flaring of gases means a direct loss of equivalent fuel, all efforts are put to ensure that the flare losses are bare minimum and technically the least. Plant wise flare losses are monitored through the Ultra Sonic flare flow meters, and if any deviation is noticed, corrective actions are taken immediately. Minimum amount of purge gas is burnt in the flare to ensure the required purge flow through the stack and KODs. To reduce flaring, fuel gas generated in the refinery as byproduct is consumed in all the furnaces as fuel. Plant conditions are so tuned that valves opening towards the flare to release the pressure are very minimal (only C1 and C2) and no heavier hydrocarbons.Flare gas recovery system is also being put up for recovery of gases flared into Fuel Gas system. The estimated capital expenditure is Rs 14 crores, and expected completion by March 2015.In addition, in-house schemes are continuously being implemented to reduce flaring from process units. Some examples are :

- Modification carried out in Hydrocracker Recycle Gas Compressor to change routing of seal gas drain pot vent from flare to RGC suction, resulting in reduction of around 2 MT/day of H2 flaring.
- CDU/VDU cold reflux drum (V103) gases were routed to heater to minimize hydrocarbon flare losses.
- Advance Process Control (APC) has been implemented in New Hydrogen Unit (N HGU) to predict the change in requirement of Hydrogen for hydro cracking as the Crude being processed in CDU changes. This control has helped in reduction of flaring of hydrogen gas.
- Reduction of 2 MT/D of Hydrogen loss to flare from MUG section of Hydro cracker Unit by resetting of set point of control valve.
- Off gases from plant gas KOD at Feed Preparation Unit and Crude Distillation Unit-2 OPA vent was modified to furnace from refinery flare system to reduce flaring to nil.

The Company thus seems to be taking effective steps for reducing flaring.

4.3.3.2 Controls at Flare to ensure Flame continuity :

Committee felt that failure of flame will result in hydrocarbons release to environment. To ensure continuity of flame at flare, BPCL has replied as follows :

Pilots are continuously kept on with an eye on DCS indications, displays and monitoring of parameters so as to ensure that flare is continuously on without any interruption.

Committee recommends to have continuous thermocouple and /or heat sensing device to monitor presence of pilot flame – this should be interlinked to plants trip system.

4.3.3.3 Measures taken to reduce possibility of black smoky flare:

Committee felt that black smoky flares represent un burnt hydrocarbon emissions to atmosphere. The company has given following replies about efforts to ensure a clear flare:

Center steam and outer periphery steam is adjusted as soon plant upset conditions are seen which are leading to smoky flare conditions. CCTV monitors are placed in the Control room to continuously monitor the flare condition.

Committee noted that steam injection is indeed the practice followed for providing oxygen at the flare tip and reduce black smoky flare. This, coupled with CCTV for continuous monitoring will help in reducing black smoky flare.

4.3.4 Storage Emissions

Committee noted that huge storage inventories are required for operation of a large sized refinery like BPCL. The Committee sought and reviewed data pertaining to storages of class A, class B and class C compounds and also storage licenses received from PESO and list of storage tanks. The findings are given below :

4.3.4.1 Types of Storages

Hydrocarbon storage tanks at BPCL (MR) are used for storing the raw material, ie crude oil,finished products, and intermediate components. Tanks are classified as class A, B & C based on their flash point as mentioned below.

Sr no	Product names	class	
1	CRUDE,SLOPS,MTBE,BENZENE,TOLUNE,MS, NAPTHA,HEXANE,METHANOL,SBP	'A'	Hydrocarbon liquids with flash point below 23 DegC
2	HSD,ATF,SK,MTO	'B'	Hydrocarbon liquids with flash point of 23 DegC & above but below 65 DegC
3	LSHS(SR),FLUSHING OIL,LDO,FO, BITUMEN, LUBE OIL	'C'	Hydrocarbon liquids with flash point 65 DegC & above but below 95 degC

As per Environmental Standards for Petroleum Oil refineries, External Floating Roof Tanks (EFRT) or Internal Floating Roof Tanks (IFRT) have been provided for storage of hydrocarbons.In addition, the following have been provided.

- Primary and secondary seals for effective control of vapour emission for floating roof tanks. Two of the tanks i.e, Tk425 (ATF) & Tk119 (Crude Oil) are due for maintenance in the Q2 of 2014-15, and the secondary seal will be installed during the outage.
- Further, Aluminium dome roof is being provided on EFRT in a phased manner for enhancing safety and reducing emission of VOC's.
- Fixed roof tanks have PV valves and floating roof tanks have rim vents for vapour control system.
- External inspection is being carried out for all tanks once in every three years.
- Deck check is being done every year for floating roof tanks as a part of pre-monsoon job list. Earth check of all tanks is also being done every year before monsoon.
- List of tanks and their details are given in **Annexure-1**.

Table 4.11List of PESO licenses obtained :BPCL

LIST OF CCOE LICENCES IN BPCL REFINERY AS ON 26 / 06 / 2014			
SR NO.	LICENCE NO.	TITLE	VALIDITY
1	P/HQ/MH/15/2388(P161732)	Storage Tanks in Refinery - Class A / B / C excluding LPG	31-12-2016
2	P/HQ/MH/15/833(P-6176)	6 nos. Storage Tanks in Butcher Island - Class-B	31-12-2016
3	P/WC/MH/14/1905(P27755)	2no. Underground Storage Tank in Garage	31/12/2016
4	S/HO/MH/03/949(S25377)	Liquid Nitrogen Vessels -RMP	31/03/2017
5	S/HO/MH/03/1794(S52112)	Liquid Nitrogen Vessels -CCR	31/03/2017
6	MR/BY/PVS-125 S/HO/MH/03/549(S-819)	V-01 to V-08 LPG Mounded Bullets	31-03-2015
7	G/HO/MH/06/20 (G871)	LPG Storage Shed	30-09-2015
8	G/HO/MH/05/27 (G871)	LPG Filling 3nos. Carousel	30-09-2015

DISH License number 89442 valid upto 31st December 2015 is attached as **Annexure-3.**

4.3.4.2 Storage Tanks at BPCL

Table 4.12 presents list of storage tanks at BPCL and Table 4.13 presents physical properties of some of the petroleum compounds stored. As seen in the Table, BPCL handles number of volatile liquids which are required to be stored in External floating roof or Internal floating roof tanks or Fixed roof tanks with vapour control or with vapour balancing system as per the GSR 186 (E) dt 18.03.2008 under Environmental Protection Act 1986 as applicable to Petroleum refineries. ***However, it is seen that number of petroleum compounds including volatiles like Motor spirit, Benzene, Aviation Turbine fuel, Kerosene oil etc are yet being stored in Cone Roof Tanks – which should be discontinued as soon as practicable. In particular the GSR 186 (E) has separate provision for Benzene which should have been adhered to immediately considering its carcinogenicity. Refinery has indicated that they have a phased program for replacing the cone roof tanks.***

In view of the large handling/inventory of hydrocarbons, following actions are recommended:

- A detailed inventory of storage tanks should be obtained and make the company agree for phased changeover timetable to ensure that the tanks are replaced or corrective actions taken as soon as practicable.

Table 4.12 List of Storages : BPCL

SR. NO	PRODUCT SERVICE	NUMBER OF TANKS	TOTAL CAPACITY IN TMT	TYPE OF TANK	SECONDARY SEAL
1	NAPHTHA	7	74	FR & CR (part)	YES
2	MS	7	56	FR & CR (part)	YES
3	MT	5	5	FR & CR (part)	YES
4	ATF	6	31	FR & CR (part)	YES
5	CRUDE	14	534	FR	YES
6	SLOPS	5	68	FR & CR (part)	YES
7	BENZENE	4	5	FR & CR (part)	NA
8	SK	4	34	FR & CR (part)	NA
9	HSD	14	118	FR & CR (part)	NA
10	FO	9	67	CR	NA
11	LDO	4	1	CR	NA
12	LSHS	3	9	CR	NA
13	HEXANE	2	2	FR	YES
14	BITUMEN	8	11	CR	NA
15	TOLUENE	2	2	FR & CR (part)	NA
16	LPG	6-MOUNDED BULLETS	6		NA
17	C3	2-MOUNDED BULLETS	2		NA

SR. NO	PRODUCT SERVICE	NUMBER OF TANKS	TOTAL CAPACITY IN TMT	TYPE OF TANK	SECONDARY SEAL
18	DHDS (IS)	3	33	FR & CR (part)	NA
19	WAXY (IS)	4	44	CR	NA
20	LR (IS)	2	13	CR	NA
21	SR (IS)	2	8	CR	NA
22	METHANOL(IS)	2	1	FR & CR (part)	NA
23	LOBS(LUBE OIL BLEND STOCK)	13	42	CR	NA
24	MTBE (IS)	1	1	FR & CR (part)	NA
25	EXTRACT(IS)	1	0.4	FR & CR (part)	NA
26	NAPTHA (IS)	7	34	FR & CR (part)	NA
27	HGO (IS)	2	1	CR	NA
28	FLO (IS)	2	2	CR	NA

ISD : INTERMEDIATE STORAGE

CR. : CONICAL ROOF TANK (FIXED ROOF)

FR.: FLOATINGROOF TANK (EFR)

CR & FR : FLOATING & FIXEDROOF TANK (IFR)

Table 4.13 Properties of Some of the Petroleum Compounds Used : BPCL

Service / Material Handled	Flash Point (^{0}C)	Vapour Pressure (KPa) at 20 ^{0} C)	Boiling Point (^{o}C)
Naphtha (*)	<-21.6	75.8 – 89.6	26.7-148.9
MS (Motor Spirit Oil) (*)	-38 to -42	39.99 - 79.99	30°C to 215 °C
MT (Mineral Turpentine)	31	0.067	148-200

Aviation Turbine Fuel(ATF)	>46	0.13	>32
Crude	NA	NA	NA
Slops	NA	NA	NA
Benzene	-11	10.018	80.1
SK (Superior kerosene)(*)	38	0.1	149
HSD (High Speed Diesel)(*)	35	0.28 - 3.46	215 - 376
FO (furnace oil) (*)	38 to 54	0.28 -3.51	184 to 339
LDO (Light diesel oil) (*)	38	0.26	163-357
Low Sulphur Heavy Stock (LSHS) (*)	76		
Hexane	-22	3.19	69 deg C @ 760 mmHg
Bitumen (*)	166	NA	40-45 % boiling at 524 °C
Toluene	4.44	2.93	110.6 °C
LPG	< -60	239.98	-0.5 °C (31.1 °F) at 1,013.25 hPa
C3	NA	NA	NA
DHDS (*)	NA	NA	NA
WAXY (*)	NA	NA	NA
LR (long residue) (*)	NA	NA	NA
SR (short residue) (*)	NA	NA	NA
Methanol	12	12.9774	64.7
LOBS (lube oil blend stock) (*)	NA	NA	NA
MTBE(Methyl tertiary butyl ether)	-28	26.8	54 - 56 deg C @760mmHg
Extract (*)	NA	NA	NA
HGO(heavy gasoline oil) (*)	>80	>80	205 to 600
FLO (*)	NA	NA	NA

Note : (*) These compounds are mixtures and data presented are typical values – subject to change for each refinery /type of crude etc (NA = Not available)

4.3.5 Emissions during Product Dispatches

BPCL has submitted following response regarding product loading and dispatches:

More than 80% of the products from refinery are transported via pipelines. The 1389 kilometers long Mumbai Manmad Manglia Bijwasan pipeline carries more than 50% of refinery production (Petrol, Diesel & Kerosene).There are dedicated product pipelines for ATF delivery to airports, naphtha and kerosene delivery to RIL Patalganga, LSHS to Tata Electric Company, black oil and white oil pipelines for product delivery to Sewree and Wadala installations, and dedicated pipelines exist for product delivery to Marine Oil Terminus (Jawahar Dweep) for coastal deliveries.
The piggable pipeline from BPCL MR which has connectivity to Pirpau jetty is handling only Benzene, hence no requirement for product switchover and pigging.

Product delivery through wagons and lorries is carried out at Trombay Dispatch Unit, TDU located at BPCL MR. Only black oil products (FO/LDO), which has a flash point greater than 66°C is being loaded on wagons.

There is no dispatch of white oil products though wagons.Liquified Petroleum Gas(LPG) wagon loading from LPG plant has been discontinued, and the gantry is being dismantled with the commissioning of LPG pipeline from Mumbai to Uran LPG plant. The 28 Kms long pipeline set up at an estimated cost of Rs. 206 crores is a facility jointly shared by BPCL and HPCL Mumbai refineries for reducing transportation of bulk LPG via road/railways.

During the loading of white oil products on tank lorries, emission of hydrocarbons is checked through controlled loading at gantry. Benzene vapour recovery unit (BVRU) is in operation during benzene tank lorry filling. Records are maintained for number of tank lorries filled, and volume of benzene vapours recovered. Benzene concentration is being regularly monitored in the TDU area. Results of benzene monitoring and details of BVRU are attached as **Annexure-2.** LPG tank lorry loading is through closed system to prevent emissions. LPG cylinder filling is also through closed system using automated carousels for control of emissions.

Following are Committee's observations and recommendations:

- It is good that company has taken resort to have transfer of white oil products primarily through pipelines
- However, it is seen from company's reply that some white oil products are been dispatched through rail wagons/road tankers – controlled loading rate does not ensure reduction of VOC emissions
- GSR 186 (E) dt 18.03.2008 applicable to Petroleum Oil refineries stipulates the following :

Table 4.14 Norms for Filling Emissions: MOEF

Standards for emissions from loading of volatile products

S. No.	Item	Standards
1	Applicable products	Gasoline, Naphtha, Benzene, Toluene, Xylene
2	Type of loading: (i) Road tank truck (ii) Rail tank wagon	 (i) Bottom loading (ii) Top submerged
3	Vapour collection: Road tank truck/ Rail tank wagon	Annual leak testing
Emission control for Road tank truck/ Rail tank wagon loading		
4	Gasoline and Naphtha: (i) VOC reduction, % (ii) Emission, gm/m^3	 (i) 99.5 or (ii) 5
6	Benzene: (i) VOC reduction, % (ii) Emission, mg/m^3	 (i) 99.99 or (ii) 20
7	Toluene/Xylene: (i) VOC reduction, % (ii) Emission, mg/m^3	 (i) 99.98 or (ii) 150

Ref : GSR 186 (E) under Environmental Protection Act 1986

There is no time limit stipulated for implementation. Thus, the standard is applicable immediately and steps should have been initiated by company immediately for implementation. Company has provided Vapour collection and control system at Benzene loading gantry – details provided overleaf. Company has also submitted Monitoring data near benzene tanker – but no monitoring seems to have been taken within the vent prior to and after Air pollution control device- thus it cannot be ascertained if the air pollution control device has efficiency > 99.99 % as stipulated by the GSR 186 (E).

In light of the above, the following actions are identified:

- *a detailed inventory of gantries in BPCL handling white oil products (atleast gasoline, naphtha, Benzene and Toluene) needs to be made and a time bound action plan taken from the industry to comply with the stipulations in GSR 186 (E)*

BENZENE VAPOUR RECOVERY SYSTEM

In order to recover and control benzene vapour while loading / unloading operation, Bharat Petroleum Refinery installed a Benzene vapour recovery unit at tank truck loading gantry at refinery Mahul in July 2004. The system has been indigenously designed and supplied by M/s. Elgin Process Equipment Pvt. Ltd, Mumbai. The system caters for two bays for loading benzene at the white oil gantry. Tank lorry filling is done from top through a loading arm. Automatic mass flow meter system has been provided at new revamped benzene loading gantry.

The recovery of benzene vapours from air stream is by adsorption on activated carbon. Benzene vapour recovery skid mounded system includes carbon absorption and refrigeration system, which is a batch-wise operation. The process can be broadly classified into following sections:

1. Pre-Chilling
2. Adsorption
3. Steam Regeneration
4. Drying & Cooling

BENZENE CONCENTRATION MONITORING DATA

Location: Trombay Dispatch Unit (TDU)

Sr No.	Date	Benzene ($\mu g/m^3$)
1	1/1/2014	1.81
2	13/01/2014	1.68
3	3/2/2014	1.37
4	17/2/2014	1.43
5	3/3/2014	1.22
6	18/3/2014	1.17
7	1/4/2014	1.31
8	14/4/2014	1.19
9	2/5/2014	1.27
10	12/5/2014	1.38
11	2/6/2014	1.22
12	9/6/2014	1.17

4.4 HPCL Ltd.

4.4.1 Process Vents

There are no process vents opening into atmosphere- all vents are in closed loop system & open to flare system.

The Committee felt that response by HPCL is very scanty.A detailed technical audit is required to ascertain compliance to GSR 186 (E) dt 18.03.2008 and check if all VOC /odorous emission sources are properly controlled.

4.4.2 Fugitive emission control in refineries

Regular Leak Detection & Repair Program (LDAR) is in place and is undertaken every year for all the flanges, Block Valves, Compressors, pumps and Heat Exchangers etc. This LDAR survey is being outsourced and leaky points above the prescribed norms are being identified and attended immediately.

Sampling points of all the major operating units are connected to a close loop system.

All the PRVs are maintained on Auto Control mode with a predetermined set pressure values. Any excess pressure in the system either gets released to the fuel gas system which is used in the refinery as fuel gas or gets released to the flare system.

LDAR is undertaken in the refinery as a regular activity.

The Committee felt that response by HPCL is very scanty. A detailed technical audit is required to ascertain compliance to GSR 186 (E) dt 18.03.2008 and check if all VOC /odorous emission sources are properly controlled.

4.4.3 Measures taken to reduce flaring emissions

a) Facility of injecting steam at hydrocarbon flare tip to improve combustion and make the flare smokeless.

b) Operational controls are in place to increase fuel gas consumption whenever flare is high and thus reducing the flare load.

c) 2 nos. flare gas recovery compressors are installed which are used for putting back the flare gas (low pressure) into fuel gas header (high pressure) and thus preventing the valuable gas from being flared.

d) Water-seal drum is provided at the bottom of flare stack which acts as a non-return device for flare gas ensuring safe operation.

e) Molecular seal, which is provided below the flare tip, works by relying on the density difference between the flare/ purge gas and air. When the purge gas is lighter than air it forms a gas rich zone at the top of the molecular seal that air cannot penetrate,

conversely when the purge gas is heavier than air the molecular seal is formed at the base of the device

f) Tall stack of 110 m is provided for both hydrocarbon and sour gas flares to ensure proper dispersion and reduce pollution.

g) CCTV is installed in control room for round-the-clock monitoring of flare and take immediate measures to minimize flaring

The Committee felt that response by HPCL is very scanty.A detailed technical audit is required to ascertain compliance to GSR 186 (E) dt 18.03.2008 and check if all VOC /odorous emission sources are properly controlled.

4.4.4 Storages Provided :

Table below lists the storage tanks provided at M/s HPCL.

Table4.15 FR Tankage Details: HPCL

Sr No	Tank No	Service	Dia	Height	Type of roof	Gross
			Mtr	Mtr		Cap Kls
1	101	MS	43	13.8	Floating/single deck	17749
2	102	HSD	43	20	Floating/single deck	26564
3	103	MS	43	20	Floating/single deck	26396
4	104	MS	43	14	Floating/single deck	17189
5	107	MS	21	20	Floating/double deck	6422
6	108	MS	21	20	Floating/double deck	6763
7	110	Crude	79	20	Floating/single deck	90465
8	111	Crude	79	20	Floating/single deck	88622
9	112	Crude	79	20	Floating/double deck	89529
10	113	Crude	79	20	Floating/single deck	88875
11	114	Slop	12	9	Floating/double deck	852
12	115	Crude	79	20	Floating/double deck	90846
13	116	Slop	12	9	Floating/double deck	897
14	117	Crude	79	20	Floating/double deck	89312
15	118	Crude	32	20	Floating/single deck	14910
16	119	Crude	32	20	Floating/single deck	14878
17	213	Hexane	13.8	20	Floating/double deck	2745
18	214	Hexane	13.76	20	Floating /double deck	2749
19	250	Naphtha	24.5	20	Floating/double deck	8972
20	251A	Naphtha	21.36	20	Floating /double deck	6579
21	251B	Naphtha	21	20	Floating /double deck	6760
22	252	Naphtha	33.5	20	Floating /single deck	16045
23	253	Naphtha	34	20	Floating /single deck	16339

24	254	Naphtha	33.5	20	Floating /single deck	16435
25	256	Hexane	14	13	Floating /single deck	1728
26	257	14-25/HEX	14	20	Floating/ double deck	2378
27	259	14/25/HEX	13.6	20	Floating/ double deck	2768
28	260	Hexane	14	20	Floating/ double deck	2849
29	261	MS	24.5	20	Floating /single deck	8622
30	264	HSD	18.5	20	Cone roof	5255
31	301	HSD	24.38	14.48	Cone roof	6458
32	302	MS	24	15	Floating /single deck	6243
33	304	LVGO	13.7	12	Cone roof	1750
34	306	HSD	25	20	Cone roof	9232
35	307	HSD	25	20	Cone roof	9141
36	308	HSD	18.52	20	Cone roof	5144
37	309	HSD	18.53	20	Cone roof	5080
38	311	MS	16	20	Floating /single deck	3564
39	312	SCN	16	20	Floating /single deck	5393
40	313	HSD	22	20	Floating /single deck	7041
41	314	HSD	22	20	Floating /single deck	7036
42	315	HSD	24.5	20	Floating /single deck	8471
43	349	LDO	18	20	Cone roof	4913
44	354	RHSD	21	20	Cone roof	6960
45	359	Cat feed	24.39	14	Cone roof	6277
46	360	RHSD	22	20	Cone roof	6972
47	361	Kerosene	24	15	Cone roof	6395
48	362	RHSD	22	20	Cone roof	7085
49	363	ATF	25	20	Floating & Cone roof	9089
50	364	ATF	25	20	Floating & Cone roof	9028
51	365	ATF	25	20	Floating & Cone roof	9238
52	366	ATF	25	20	Floating & Cone roof	9049
53	367	ATF	20	20	Floating & Cone roof	5723
54	368	ATF	20	20	Floating/single deck	5885
55	369	ATF	12	9	Floating/single deck	825
56	370	SCN	29	20	Floating/single deck	11750
57	371	SCK	29	20	Floating/single deck	11942
58	372	SCK	28.52	20	Floating/single deck	12038
59	373	SCK	29	20	Floating/single deck	11828
60	451	ATF	21	20	Cone roof	6695
61	455	HSD	15	20	Cone roof	5534
62	457	RHSD	21.35	14.55	Cone roof	5025
63	459	Kerosene	21	18.45	Cone roof	6182
64	461	LDO	21.3	14.6	Cone roof	4989
65	462	VTB	21.3	14.6	Cone roof	5000

66	463	VTB	20.5	20	Cone roof	7140
67	554	Cat feed	31	14.6	Cone roof	10301
68	555	Cat feed	27	14.6	Cone roof	8304
69	556	IFO	27.5	14.5	Cone roof	8339
70	557	SKO	15	18	Cone roof	3105
71	558	IFO	25	20	Cone roof	9734
72	559	IFO	25	20	Cone roof	9740
73	560	IFO	25	20	Cone roof	9740
74	561	MTO	12	12	Cone roof	1351
75	562	MTO	12	12	Cone roof	1347
76	571	Cat feed	28	15	Cone roof	8615
77	572	LSHS	25	20	Cone roof	9221
78	573	LSHS	22	20	Cone roof	9249
79	574	IFO	21.5	20	Cone roof	7038
80	575	IFO	25	20	Cone roof	9748
81	604	Wet-Slop	9.12	7.25	Cone roof	446
82	605	Wet-Slop	9.1	10	Cone roof	625
83	610	Dry-Slop	16	20	Floating roof	3757
84	611	Wet-Slop	12.2	17.7	Cone roof	1989
85	612	Sweet Naphtha	12	13.5	Floating roof	1414
86	750	Asphalt	12	12	Cone roof	1423
87	751	Asphalt	12	18	Cone roof	1982
88	752	Asphalt	12	18	Cone roof	1994
89	753	Asphalt	12	18	Cone roof	1991
90	754	Asphalt	12	18	Cone roof	1989
91	755	Asphalt	12	18	Cone roof	1861
92	756	Asphalt	10	15	Cone roof	1150
93	757	Asphalt	10	15	Cone roof	1150
94	760	HSD	22	20	Cone roof	7064
95	1001	Heavy Naphtha	18	16	Floating & Cone roof	3290
96	1002	FCC Gasoline	18	16	Floating & Cone roof	3297
97	1003	Light Naphtha	16.5	15	Floating & Cone roof	2566
98	1004	Light Naphtha	18	16	Floating & Cone roof	3284
99	1005A	Isomarate	16.5	15	Dome Roof	3086
100	1005B	Isomarate	16.5	15	Dome Roof	3086
All the fixed roof tanks have got breather valves (PV) and all the floating roof tanks have got roof seals to prevent/ reduce hydrocarbon emission to atmosphere.						

Table below gives the physical properties of some of the petroleum compounds stored in HPCL. It is observed that the refinery handles number of volatile compounds and many of them being mixtures, the physical properties are not available readily.

Table 4.16Physical Properties of Materials Stored : HPCL

Service / Material Handled	**Flash Point (^{0}C)**	**Vapour Pressure (KPa) at 20 ^{0} C)**	**Boiling Point (^{o}C)**
MS (Motor Spirit Oil) (*)	38 to -42	39.99 - 79.99	30°C to 215
HSD (*)	35	0.28 - 3.46	215 – 376
Crude (*)	NA	NA	NA
Slop (*)	NA	NA	NA
Hexane	-22	3.19	69
Naphtha (*)	<-2	0.1-0.3	
LVGO (Light virgin gas oil) (*)	>61	0.4	175 – 390
SCN (Straight Cut Naphtha) (*)	43	34.5- 103.4	90-400
LDO (Light Diesel Oil) (*)	52	0.04	175.6-370
RHSD (raw high speed diesel) (*)	NA	NA	
Cat feed (*)	>82	0.00001	288 to 649
Kerosene (*)	37-65	0.04	199-254
ATF (Aviation Turbine Fuel (*)	>46	0.13	>32
SCK (Straight Cut Kerosene) (*)	NA	NA	
VTB (vacuum tower bottom) (*)	NA	NA	
IFO (Industrial furnace oil) (*)	60	0.21	154 - 372
MTO (Mineral turpentine oil) (*)	36	1.4	150
LSHS (Low Sulphur Heavy stock) (*)	62	<0.1	> 350
Wet-Slop (*)	NA	NA	
Dry-Slop (*)	NA	NA	
Sweet Naphtha (*)	38	6.9 - 55	65-230
Asphalt (*)	> 218	NA	343
Heavy Naphtha (*)	NA	NA	90 - 200
FCC Gasoline (*)	NA	NA	
Light Naphtha (*) Naphtha - LSR (Light Straight Run)	< -56.66	110.3	26.66
Isomarate (*)	-7.2	26.6	< 35

Note : (*) These compounds are mixtures and data presented are typical values – subject to change for each refinery /type of crude etc (NA = Not available)

Committee appointed by MPCB noted that HPCL has provided External floating roof tanks for storage of compounds- however compliance to provisions of Emissions control for storage tanks as per : GSR 186 (E) dt 18.03.2008 cannot be ascertained with the limited data available.

A detailed Technical Audit of the storages in the refinery is recommended to ensure compliance to the norms.

4.4.5 Product Dispatch

No aromatics are produced in the refinery. More than 95% of the products are pumped out through pipelines. Only filling of asphalt tankers are undertaken which is a heavy hydrocarbon.

Committee noted that HPCL is handling number of volatile products like gasoline and naphtha which are specifically covered under provisions of Emissions control for loading gantries as per : GSR 186 (E) dt 18.03.2008 and it cannot be ascertained with the limited data/time available if the necessary control measures are taken by the refinery to comply with the norms specified. Committee recommends a detailed Technical Audit of the loading areas in the refinery to ensure compliance to the norms.

4.4.6 Emissions control from LPG filling in tankers/ handling into cylinders :

No bulk LPG filling is undertaken inside the refinery. LPG is pumped out of the refinery to a nearby bottling plant for filling of LPG cylinders.

Committee noted that mercaptans are used during LPG filling which have high odours and it cannot be ascertained with the limited data/time available if the necessary control measures are taken by the refinery to ensure that all possible emission points are properly controlled. A detailed Technical Audit of the LPG bottling area is recommended.

4.5 RCF Ltd

From a review of the products manufactured as seen from the Consent to operate, it is felt that only organic compounds produced are Methanol and Methylamine. The ammonia plant uses large quantum of Associated gas as feed and hence was also covered in the survey. The data on organic process emissions obtained is collated below :

4.5.1 In –plant Controls

4.5.1.1 Ammonia (I and V Plants)

The feedstock for the process is Associated Gas and hence there is no possibility of open venting into atmosphere. All process emissions are taken to flare. Control equipment installed are summarized as below :

- Installation of LP/MP Condensate stripper for recovery of ammonia from condensate.
- Hot flare stack to eliminate the chances of ammonia emission to atmosphere.
- Purge gas recovery unit for recovery of Argon, methane, hydrogen and ammonia.

4.5.1.2 Methanol Plant

The feedstock for the process is Associated Gas and hence there is no possibility of open venting into atmosphere. Gases from synthesis section are recycled back to reformer section. Excess gas from synthesis section and other process sources are vented through closed system to hot flare.

Methanol has a strong characteristic pungent odour but detectable at very high threshold (as high as 2000ppm).

4.5.1.3 Methylamines

- Vent absorber is provided in ammonia column to scrub ammonia and ensure minimum discharge to environment.
- Storage section relief valves are connected to hot flare of Methanol plant
- It has a fishy ammoniacal odour having very low odour threshold of 0.02 ppm

4.5.1.4 Measures taken to reduce fugitive hydrocarbon emissions

There are no fugitive emissions of hydrocarbons during normal operation.

To prevent fugitive hydrocarbon emission from flanges and valves with PTFE gaskets are used.

Preventive Maintenance and Preductive Maintenance schedules are followed to control leakages, emissions

For Pump emission control is done by providing Mechanical Seal, Compact seal along with Graphite, SS, Tungsten Carbide packing. For compressors dry gas seals are provided.

For sampling, closed loops are provided.

Discharges from pressure relief valve/Safety relief valves occur only in emergency conditions and are routed to hot flare stacks where they are burnt before venting to atmosphere.

In Ammonia I, after recovery of ammonia from purge gas in recovery section, the methane rich gases are sent to boiler in steam generation plant where it is used as fuel along with natural gas.

In Ammonia V, from the purge gas after recovery of hydrogen in Purge gas recovery unit, the methane rich gases are routed to primary reformer for using as fuel along with natural gas.

In Methanol, purge gases after recovery of hydrogen in Hydrogen recovery unit are routed to boiler in steam generation plant for using as fuel aling with natural gas.

4.5.1.5 Controls at flare

In plant flares are provided with flame front ignition panel. Molecular Seals for flash protection and two pilot burners operating on uninterrupted fuel gas supply are installed.

4.5.2 Prevention of Black Smoky Flare

High efficiency Low NOx burners are provided for the flare stacks which are designed in such a way that proper combustion of the vent gases takes place all the time.

4.5.3 Tankage details

- **Methanol storage** : Vertical Fixed Roof (PESO Licence No. P/HQ/MH/15/141 (P 5493) valid up to 31st Dec 2016)
- **Methylamine :** Compressed gas stored in pressure vessels Licence No. S/HO/MH/03/239 (S 487) valid up to 31st Mar 2015 Pressure Vessels with vents of Safety Relief Valves connected to hot flare.
- **Factory License No**. 083285 dated 5/11/2011 valid up to 31st Dec. 2020

4.5.4 Tanker Filling Emissions

Gases discharged while filling are absorbed in vent absorber.

In tanker filling area of Methylamine Plant, there is provision for work place analyzer and the results are displayed in DCS control room.

4.5.5 Observations &Recommendations:

It is observed that methylamines have very low odour threshold and have a distinctive fishy, ammoniacal odour. Considering the presence of large populace in vicinity it recommends the following actions in Methanol, Methylamine and Ammonia plants :

- *It is seen that RCF Ltd is away from the complainants premises but the operation of some of its plants may result in increased ambient Hydrocarbon levels in the atmosphere as also may be directly associated with the odour complaint of the villagers of Mahul gaon. Hence this industry needs to be taken for detailed review.*
- A detailed technical audit should be conducted to identify sources of VOC/odorous emissions and control measures- this should cover process sources, storages and product dispatch areas
- company should implement a Leak Detection and Repair Program as per GSR 186 (E) dt 18.03.2008 and GSR 820 (E) dt 09.11.2012 which should include :
- detailed inventory of fugitive emission sources like valves/flanges/pumps/compressors

- monitoring of emissions using PID/FID type meter as per USEPA method 21 on 6 monthly/annual basis
- identification of "leaky" equipment as per GSR 186 (E) norms and repair within time schedules as given in the norms

4.6 Chemical Terminal Trombay Ltd :

This Terminal is located near Pir Pau jetty behind Tata Power Unit V in village Mahul.

4.6.1 Details of Storage Tanks

The details of storage tanks provided are as given below :

Table 4.17 Details of Storages : CTTL

i)	Physical / Design Details						
Tank No.	Service / Material Handled	Type of Tank	Dia (m)	Height (m)	Capacity (m^3)	Type of Venting	Type of Protections against organic vapour emission during filling/ breathing?
1	Ortho Xylene	CRT	12	12	1335	PV	2 PV valves are provided on each tanks . MVWSS system for cooling to avoid evaporation due to temperature rise. While gauging & sampling slot dipping device is provided.
2	Lube Oil	CRT	15.5	14.5	2700	PV	
3	Lube Oil	CRT	11	10.5	990	PV	
4	Acetone	CRT	11	10.5	990	PV	
5	Lube Oil	CRT	15.5	14.5	2717	PV	
6	Lube Oil	CRT	15.5	14.5	2717	PV	
7	Cumene	CRT	12	12	1346	PV	
8	Lube Oil	CRT	12	12	1346	PV	
10	Lube Oil	CRT	12	12	1346	PV	
13	Lube Oil	CRT	15.5	15	2831	PV	
14	Lube Oil	CRT	15.5	15	1528	PV	
15	Meta Xylene	CRT	12	12	1346	PV	
16	Lube Oil	CRT	12	12	1346	PV	
17	Lube Oil	CRT	15.5	14.6	2734	PV	
18	Lube Oil	CRT	15.5	14.6	2734	PV	
19	Lube Oil	CRT	14.5	16.5	2648	PV	
20	Lube Oil	CRT	14.5	16.5	2648	PV	
21	Lube Oil	CRT	14	14	2000	PV	
22	Lube Oil	CRT	12	18	1988	PV	
23	Lube Oil	DRT	10	15	1119	PV	
24	Lube Oil	DRT	12	18	1988	PV	
25	Lube Oil	CRT	12	18	1988	PV	

Committee observed that there are 25 storage tanks provided – 23 of Cone roof (vertical fixed roof type) and 2 of Dome Roof type. Storage tank sizes are small (maximum 3000 KL) compared to those of Aegis Logistics Ltd and Sea Lord Containers Ltd.

The Company is also offering its tankages for use of clients in operations similar to Aegis Logistics Ltd and Sea Lord Containers Ltd.

The company is mostly handling lube oils at its terminal. However, it is also seen to be handling Acetone, o_Xylene, m-Xylene and Cumene which are all class A/B/C compounds and have high volatility. Also, company has been granted Consent to operate by MPCB for class A/B/C compounds giving them flexibility of storing any compound. The tankage provided by the company is Cone roof type with breather (pressure vacuum) valve which is known to emit high volumes of VOCs due to evaporation and during filling.

It is noted by the Committee that no norms exist for storage of organic compounds in Isolated storage Tank farms under Environmental Protection Act 1986. In view of the fact that the study area is in Mahul Mumbai with close populace in vicinity, with lot of complaints from local villagers about odours and health problems - Committee has decided to insist that provisions pertaining to reduction of emissions from storage tanks as given under GSR 186 (E) for Petroleum oil refinery and GSR 820 (E) for Petrochemical Plants shall be strictly implemented for all storages in the area.

Introspection of these provisions shows that they are applicable based on volatility of the compound and the storage size. The physical properties of various compounds stored in CTTL premises are given below :

Table 4.18 Physical Properties of Materials Handled : CTTL

Service / Material Handled	Flash Point (^{0}C)	Vapour Pressure (KPa) at 20 ^{0} C)	Boiling Point (^{o}C)
Ortho xylene	17	0.69	144
Lube oil	above 93	NA	300 to 400
Acetone	- 20	24.5717	56
Cumene	43.8	1.06	152-154
Meta xylene	25	1.10	138-139

*However, in light of the fact that the site is in Mumbai and close to populace which is complaining of odours and VOC levels in ambient air Committee recommends that the Company should be asked not to store Acetone in Cone Roof tanks without providing effective control system or alternately prov****ide Internal/External floating roof tank with double seal as given in GSR 186 (E) dt 18.03.2008. It is also noted that these provisions were already mandated to the Company vide Consent to operate order dt 16.01.2014 which stipulates all the norms ofGSR 186 (E) for storage tanks.***

4.6.2 Material Imported

The company has not given any information on quantity of individual products /materials handled in this storage terminal. Total monthly quantity is given as 21,800 MT/M.

4.6.3 Tanker Filling

The company has given following information about filling of materials in road tankers.

iii)	Information Pertaining to Tanker Filling			
Sr. No.	Average size of Tankers (Cum)	No. of filling / emptying operations (Avg / month)	Precautions taken at Tanker Vent to reduce Emissions	Measures taken to reduce exposure to workers at Filling Point?
1	20 KL	1250 road tanker filling per month	We are filling in controlled manners	Workers are provided with Organic vapour mask , Splash Goggles, hand gloves etc.
	NOTE:			
	While filling above details of: 1) Materials handled in your tank farm over the last one year (1st April, 2013 – 31st March, 2014).			Acetone, Cumene, Meta Xylene, Ortho Xylene and Lube oils.
	2) Details of air pollution control system Provided.			NA

4.6.3.1 Committee Observations: CTTL

The company is mostly handling lube oils at its terminal. However, it is also seen to be handling Acetone, which is a volatile compound and has high volatility. As reported by them they have no control system installed to capture fumes released during filling of road tankers. They are providing Organic vapour mask, splash goggles, hand gloves to workers but this only ensures protection to workers/tanker filling operator. *But the emissions to atmosphere are going uncontrolled*.

In light of the site being located in Mumbai city and constant complaints on odours and VOC emissions in ambient air and in light of fairly high levels of some organic compounds (like Benzene, Toluene and Xylene) and high levels of non methane hydrocarbons observed in ambient air during the monitoring carried out, Committee recommends :

- *The company should immediately be asked to install a vapour recovery system comprising :*

- *Covered lid for tanker top with arrangements for safety valve, taking dip, inserting filling pipe, and connecting flexible hose to remove vapours*
- *Compatible loading arms*
- *Air Pollution control device like activated carbon /incinerator etc to give more than 99% efficiency in reduction of VOC emissions*

Company should designate some loading points specifically for loading volatiles and all such points should be used only when it is connected to the fume extraction system. MPCB should take a time bound action plan for completion of this measure.

It is seen that this Tank farm is away from the complainants premises but the activities of this unit are similar to those of M/s Sea Lords and Aegis Logistics and may result in increased ambient Hydrocarbon levels in the atmosphere as also the operations of may be directly associated with the odour complaint of the villagers of Mahul gaon. Hence this industry needs to be taken for detailed review.

4.7 Other Sources

4.7.1 Indian Oil Blending Ltd.

Indian Oil Blending is involved in blending of base oil and additives to produce SERVO brand of lubricating oils. Base oils have high boiling points. Generally Blending is done at 65+/- 5 deg C.

For Blends with additive component having flash point below 70 Deg C and quantity used is more than 1%, the blending is done at ambient temperature.

They have 35 numbers of storage tanks – 24 numbers for base oil, 1 for slop oil, 5 for additives and 5 for finished products. None of the tanks are chemicals are covered under Petroleum Rules, since they have boiling points > 100 deg C.

It is seen that the materials handled at M/s Indian Oil Blending have low volatility and thus, the operations are not important from VOC emission point of view. Hence this industry need not be taken for detailed review.

4.7.2 Tata Power Ltd

Tata Power Ltd is a Thermal Power Plant. It has total generating capacity of 34.32 million units per day based on coal, gas and Furnace oil fuels. Of these, Furnace oil is a class C product having Flash Point above 66^0C. Furnace oil is a residual fuel and thus has high boiling point and as far as storage of Furnace Oil storage is concerned, the rules governing the same are less stringent when compared to more volatile fuels like Petrol, diesel etc.

It is seen that inadequate combustion of coal gives rise to Carbon monoxide and unburnt hydrocarbons which may result in increased ambient Hydrocarbon levels in the atmosphere.

However, it is felt that the operations of Tata Power Ltd are not directly associated with the nature of complaint of the villagers of Mahul gaon. Hence this industry need not be taken for detailed review.

4.7.3 Non Industrial Sources

The Mahul village is located close to Chembur in Mumbai. Various other sources of hydrocarbon emissions identified were high traffic along the Eastern Freeway (more than 22000 vehicles/day) , Sion – Panvel Highway (more than 50,000 vehicles per day).

Decaying organic waste also releases organic gases – this problem is exacerbated by unscientific solid waste disposal and open burning of waste – including plastics which results in increase in unburnt hydrocarbon emissions to the air. The Mahul gaon/Chembur area is located close to Mankhurd waste disposal site of MCGM which received close to 6000 MT of solid waste from Mumbai city daily. Open burning has been frequently reported in Mankhurd area.

Other industries on small scale such as painting of civil/mechanical structures, as also painting activities carried out in small engineering shops, wood burning in small establishments (like Bakeries) and hutments, industrial laundries, disinfection, carpentry activities all of these result in VOC emissions to atmosphere.

5 TANK CLEANING OPERATIONS

Tank cleaning operations are required for cleaning of storage tanks before changeover of products. The complainants to the case filed in National Green Tribunal No. 40 (WZ) have alleged that tank cleaning operations carried out by M/s Aegis Logistics Ltd and M/s Sea Lord Containers Ltd result in damage to environment in the following way :

- Results in generation of effluent which is not properly treated by the proponents
- Results in release of organic vapours to the environment due to opening of manholes during cleaning operation

Committee took a look at the tank cleaning being done by the two proponents and also enquired about practices adopted in other industrial establishments in the vicinity (with reference to tank cleaning effluents). Details are given below :

5.1 SeaLord Containers Ltd

5.1.1 Observations on Tank Cleaning

Since this is a Tankage terminal, the incidence of tank changeover for storing different chemicals may arise and in such situation Tank cleaning is undertaken by the proponent. Company has shared Standard Operating Procedure SOP/SCL/002 rev 02 dt 21.02.2014 for tank cleaning. Observations on tank cleaning are as below :

- tank cleaning frequency depends upon requirement of product changeover
- tanks are designed with slope towards the center whereby tanks can be emptied completely using tanker loading pumps and bottom production sent to clients tankers
- Confirm all connected pipeline / tank fully empty
- Tank cleaning machine Butterworth make installed on top of tank by opening blind nozzle which sprays water and cleaning agents through nozzles revolving in 360 in degrees. Use of this machine with nozzle spray arrangement ensures use of least water for tank cleaning as compared to traditional high pressure hosing. Effluent water is sent to Effluent Treatment Plant
- Top & side manhole opened & oxygen checked and if more than 20%, then person enters inside with vessel entry permit without PPE
- Mopping of tank to make it dry
- Connected pipeline separately cleaned with under water &/or cleaning agents upto loading point

- Dry Pigging of pipeline
- Air is blown from manifold to filling points – and exhaust vapours are directed to Scrubber

P & ID for tank cleaning operation SCL-903 is enclosed below :

The SOP is silent on how internal floating roof tanks are cleaned using this machine. This procedure maybe drawn up and submitted to MPCB.

During tank cleaning the opening of manhole will result in residual organic vapours being let off to environment, which cannot be much helped considering that tank cleaning is a need of the Tankage operation of this type. The company may explore possibility of having flexible hoses with suitable hood type openings at the tankage areas to evacuate the organic vapours from the tanks to the scrubber/air pollution control device. However, the company has adopted a good practice in diverting the nitrogen blown during pipeline cleaning to scrubber.

5.1.2 Effluent Treatment Facility :

Flow sheet of ETP installed by M/s Sea Lord Containers Ltd are as given below :

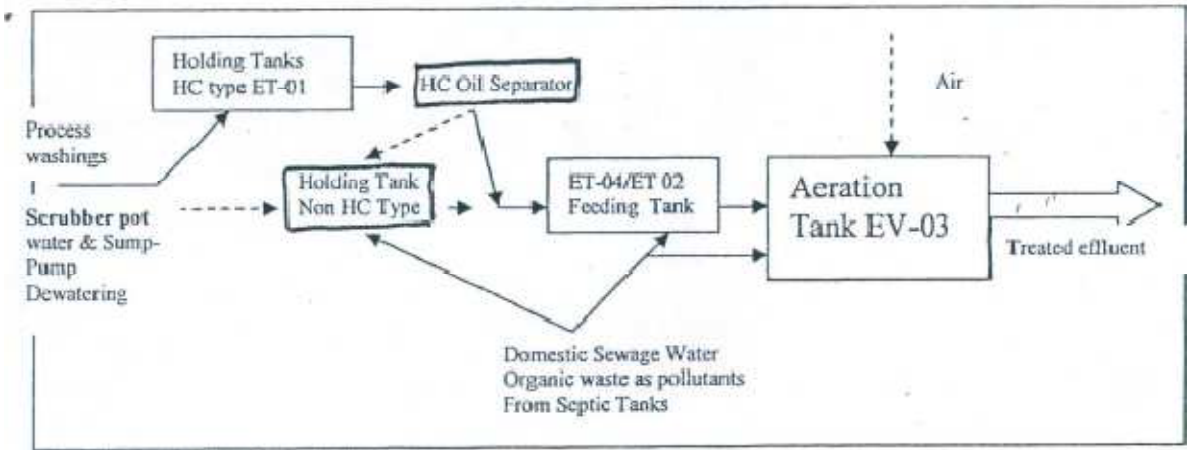


Figure 5.1Simplified Flow Sheet of ETP

Photographs of ETP are as given below:

Figure 5.2 Photographs of ETP

Design basis of ETP is given below:

Table 5.1 Design Basis of ETP

Sr no.	Parameters	Inlet	Outlet	Unit
	Flow 25 cmd (plant washing) + 3 cmd (sewage effluent) = 30 cmd			
1	pH	5.5 - 9.0	5.5 - 9.0	
2	Total Suspended solids	300 max.	100 max.	mg/ lit.
3	B.O.D	500 max.	30 max.	mg/ lit.
4	C.O.D	1000 max.	250 max.	mg/ lit.
5	Oil & Grease	150 max.	10 max.	mg/ lit.

The JVS analysis results of MPCB for the ETP are presented below and indicates that the ETP meets the desired norms.

Table 5.2 JVS Analysis Results of Sea Lord Containers Ltd : conducted by MPCB

Sr. No	Parameter	Consented Standard	May-13	Jul-13	Oct-13	Nov-13	Dec-13	Jan-14	27.03.14	21.04.14	26.05.14
1	pH	5.5 to 9.0	7.2	7.7	7.2	7.8	7.4	4.4	7.5	7.7	7.4
2	Suspended Solids	100	14	8	14	8	10	10	10	10	8
3	TDS	2100	710	678	640	744	1026	513	632	683	75
4	Sulphates	1000	156	34.8	9.4	13.1	77.1	15.8	16.2	55.4	22.7
5	COD	250	40	24	40	16	24	40	32	32	36
6	BOD	100	8	6	10	5	5	12	8	10	10
7	Chlorides	600	197	97.5	86	105	96	62.5	145	82.5	758
8	Oil & Grease	10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
9	% Na	60%	*104.4*	33.79	30.25	39.71	52.2	45.76	41.99	43.24	51.91

Note : All parameters given in mg/L

Samples of analysis as done by MOEF recognized laboratory indicates the following :

Table 5.3 Effluent Analysis Results : MoEF Approved laboratory (Jun13- Nov 14)

Sr. No	Parameter	Jun-13		Jul-13		Aug-13		Sep-13		Oct-13		Nov-13	
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1	pH	7.8	7.17	7.83	8.21	7.62	7.8	7.85	8.28	8.48	8.31	9.16	8.17
2	TSS, mg/ L	104	82	20	12	23	<1.0	125	<10.0	678	24	54	42
3	TDS, mg/ L	794	454	1116	1040	757	723	801	712	173	652	926	640
4	$SO4^{--}$,mg/ L	47.69	78.18	60.19	72.67	84.06	99.4	66.49	101.36	68.11	70.47	19.75	167.69
5	COD, mg/ L	292.32	10.08	80	18.8	19.8	<10.0	16.66	<10.0	30.6	<10.0	57.6	<10.0
6	BOD, mg/ L	36.69	<5.0	19.44	<5.0	<5.0	<5.0	<5.0	<5.0	14.33	<5.0	23.84	<5.0
7	Chloride Cl^-, mg/ L	195.05	152.83	175.49	173.56	138.79	153.14	118.76	104.51	95	95	104.51	90.26
8	O& G, mg/ L	6	4	2	<1.0	2	<1.0	2	<1.0	2	<1.0	<10.0	<10.0
9	Sodium as Na, %	0.012	0.01	0.015	0.014	0.067	0.076	0.096	0.081	0.006	0.073	0.51	0.46

Table 5.4 Effluent Analysis Results : MoEF Approved laboratory (Dec 13- May 14)

	Dec-13		Jan-14		Feb-14		Mar-14		Apr-14		May-14	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
pH	7.76	7.77	7.87	8.11	8.26	8.27	6.9	7.58	7.3	7.81	7.2	7.12
TSS, mg/ L	18	76	274	<10	78	68	36	<10	36	<10	146	50
TDS, mg/ L	700	618	930	90	650	398	312	192	695	599	654	654
$SO4^{--}$, mg/ L	77.08	62.5	37.12	37.03	97.73	70.19	141.92	111.62	88.55	61.6	57.99	79.48
COD, mg/ L	324.12	<10	3400	<10	86.4	<10	70.56	<10	271.44	<10	1400	760
BOD, mg/ L	35.9	<3	295	<3	14.15	<3	28.23	<3	121	<3	200	91
Cl^-, mg/ L	105.29	95.71	152.01	95.01	109.2	95	162.71	114.86	125.35	96.42	867.78	101.25
O & G, mg/ L	<10	<10	<10	<10	<10	<10	<10	<10	8	<1	<10	<1
Sodium as Na, %	0.03	0.02	0.05	0.02	0.014	0.07	BDL	BDL	0.023	0.051	0.014	0.009

As per company officials and as verified from Cess returns filed with MPCB, the treated effluent is reused back for gardening, flushing and is not discharged outside.

5.1.3 Committee Observations

Considering that effluent is reused back fully for gardening etc and the fact that MPCB results as also results of MOEF recognized laboratory are meeting statutory norms consistently over last year, the Committee has not gone into detailed evaluation of the ETP process.

As a good operating practice, it is recommended that company should keep proper log book keeping record of operation of pumps, chemical addition etc and install separate energy /flow meter for ETP. Records of hours of pumping treated effluent back for gardening should be maintained.

Committee has already pointed out lacunae in the Consent To Operate granted by MPCB about accepting effluents from M/s Aegis Logistics Ltd (which is not reflected in the CTO of Sea Lord Containers Ltd) as also Consent To Operate granted for Aegis indicates full reuse of treated effluents within own premises. Both Consents need amendment.

5.2 **Aegis Logistics Ltd**

Since this is a Tankage terminal, the incidence of tank changeover for storing different chemicals may arise and in such situation Tank cleaning is undertaken by the proponent. Company has shared Standard Operating Procedure SOP/LTD/003 rev 05 dt 23.04.2014 for tank cleaning. Observations on tank cleaning are as below :

- tank cleaning frequency depends upon requirement of product changeover
- tanks are designed with slope towards the center whereby tanks can be emptied completely using tanker loading pumps and bottom production sent to clients tankers
- confirm all connected pipeline / tank fully empty
- Tank cleaning machine Butterworth make installed on top of tank by opening blind nozzle which sprays water and cleaning agents through nozzles revolving in 360 in degrees. Use of this machine with nozzle spray arrangement ensures use of least water for tank cleaning as compared to traditional high pressure hosing. Effluent water is sent to Effluent Treatment Plant
- Top & side manhole opened & oxygen checked and if more than 20%, then person enters inside with vessel entry permit without PPE
- Mopping of tank to make it dry
- Connected pipeline separately cleaned with under water &/or cleaning agents upto loading point
- Dry Pigging of pipeline

Air is blown from manifold to filling points – and exhaust vapours are directed to Scrubber

P & ID for tank cleaning operation SCL-903 is enclosed below.

The SOP is silent on how internal floating roof tanks are cleaned using this machine. This procedure maybe drawn up and submitted to MPCB.

During tank cleaning the opening of manhole will result in residual organic vapours being let off to environment, which cannot be much helped considering that tank cleaning is a need of the Tankage operation of this type. The company may explore possibility of having flexible hoses with suitable hood type openings at the tankage areas to evacuate the organic vapours from the tanks to the scrubber/air pollution control device. However, the company has adopted a good practice in diverting the nitrogen blown during pipeline cleaning to scrubber.

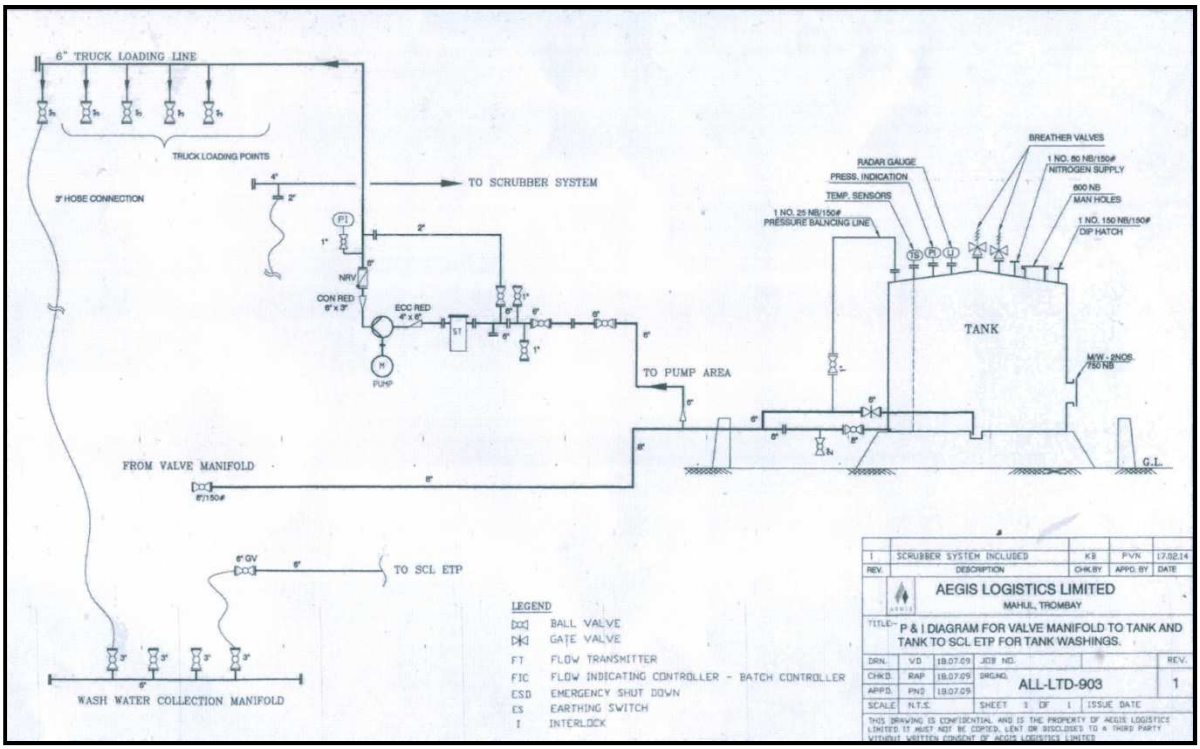


Figure 5.3 P & ID for Tank Cleaning Operation

As per the P & ID presented by company, and the SOP, the effluent from tank washing is taken to ETP at Sea Lord Containers Ltd for treatment by pipeline.

Committee has already pointed out lacunae in the Consent To Operate (CTO) granted by MPCB that disposal of effluents from M/s Aegis Logistics Ltd to Sea Lord Containers Ltd should be reflected in the CTO of both Aegis Logistics Ltd and Sea Lord Containers Ltd as also Consent To Operate granted for Aegis indicates full reuse of treated effluents within own premises. Both Consents need amendment.

5.2.1 BPCL

In response to query raised by Committee, BPCL has replied as below :

> In refinery operation, hydrocarbons are stored in dedicated storage tanks. Product changeovers are very rare as the quality (specifications) of the final product is required to be maintained at all times. However, during product change over, the tank level is brought down to bare minimum and the residual material is absorbed in the new product. Hence tank service changes are normally made in products with comparable properties for example, change of grade within same product(BS III, BS IV etc), from Naphtha to MS in white oil tanks and FO, LDO & LSHS in black oil tanks.

The functioning of ETP provided by M/s BPCL and its performance was considered beyond the Committee's scope. However from the records of field visit reports shown by SRO Mumbai (III), treated trade effluent have installed full fledged ETP with tertiary treatment

facilities and is entirely reused for make up for raw water cooling tower purpose. BPCL uses sea water for product cooling purpose, blow down is taken through API separator which is discharged through open channel back into creek. At present sewage is treated in septic tank and overflow to nearby nallah which meets the creek. They are presently in process of installing Sewage Treatment Plant.

5.2.2 HPCL

In response to query raised by Committee, HPCL has replied as below :

Tanks are designed for fixed services and are normally not undertaken for interchangeability. Tanks are cleaned by pumping out the entire liquid to the desired destination and then cleaning it with light hydrocarbon and again pumping it to the slop tank. Final water wash is carried out which is taken in effluent treatment plant for necessary treatment.

The functioning of ETP provided by M/s HPCL and its performance was considered beyond the Committee's scope. However from the records of field visit reports shown by SRO Mumbai (III), treated trade effluent have installed full fledged ETP with tertiary treatment facilities (including Reverse Osmosis) and is further taken to de mineralization plant. RO reject is reused for fire water makeup. HPCL uses sea water for product cooling purpose, blow down is taken through API separator which is discharged through open channel back into creek. At present sewage is treated in Sewage Treatment Plant and treated sewage discharged into aeration basin of trade effluent ETP.

5.2.3 RCF Ltd.

RCF Ltd has dedicated tanks for storage of its organic products viz methanol and Methanolamines and hence question of tank cleaning does not arise.

The functioning of ETP provided by M/s HPCL and its performance was considered beyond the Committee's scope. However from the records of field visit reports shown by SRO Mumbai (III), treated trade effluent have installed full fledged ETP with tertiary treatment facilities – treated effluent reused for scrubbing and partly sent to creek for disposal. RCF Ltd have provided a STP for treating sewage generated in Mahul- Chembur area (from MCGM pipeline) and treated sewage is used as water source for in-plant use.

5.2.4 CTTL (Chemical Terminal Trombay Ltd)

CTTL has indicated that they have dedicated tankages and no washing of tanks undertaken. However, committee noted that in past correspondence with MPCBoard they have indicated a list of about 35 chemical compounds and have sought permission for class A &/or B &/or C compounds without specifying the chemicals. Also, they have been granted Consent to operate which indicates disposal of 2 cmd of trade effluent.

This claim of the Company of no changeover of tanks needs to be ascertained.

6 PIPELINE PIGGING OPERATIONS

The principal transfer of products in between Aegis Logistics Ltd and Sea Lord Containers Ltd occurs by pipeline. Both terminals are connected to 5 berths at Jawahar Deep as also to areas in Wadala, Sewree and also supply petroleum products to BPCL, HPCL, Tata Power Ltd by pipeline. M/s HPCL and BPCL also have laid an array of pipelines to transfer their products to far away locations (HPCL has pipeline laid to Pune and BPCL to Manmad). The pipelines are required to be cleaned by undertaking pigging using a foam pig which travels in the pipeline and is driven by nitrogen and/or air. The complainants to the case filed in National Green Tribunal No. 40 (WZ) have alleged that waste from pigging operations are improperly disposed off by M/s Aegis Logistics Ltd and M/s Sea Lord Containers Ltd as also the nitrogen released carry over organic vapours which pollute the environment.

Committee took a look at the pipeline pigging operation being done by the two proponents and also enquired about practices adopted in other industrial establishments in the vicinity (with reference to tank cleaning effluents). Details are given below :

6.1 Sea Lord Containers Ltd

Committee formed by MPCB has reviewed SOP/ SCL /005 rev 02 dt. 21.02.2014 for Import of Chemicals which gives procedure for pigging. As per the SOP :

Pipelines of 'A' Class product are pigged with Nitrogen/ Air not used (due to safety reasons) and Nitrogen is released to scrubber.

6.1.1 Observe Line Pressure

Pig Wastes are sent to CHWTSDF if not reusable (this is confirmed from the HW returns submitted by the company- although pigging waste is not reflected in the CTO granted to the unit)

6.1.2 Foam Pig Squeezing Machine

Committee formed by MPCB has reviewed SOP/ SCL /022 rev 01 dt. 12.07.2013 for Operation of Foam Pig Squeezing Machine which gives procedure for squeezing of waste from pigging foam . Squeezing all waste from foam pigs into tanks for reuse.

6.2 Aegis Logistics Ltd.

Committee formed by MPCB has reviewed SOP/ LTD /006 rev 06 dt. 23.04.2014 for Import of Chemicals and SOP/ LTD /001 rev 05 dt. 23.04.2014 which gives procedure for pigging. As per the SOP :

Pipelines of 'A' Class product are pigged with Nitrogen/ Air not used (due to safety reasons) and Nitrogen is released to scrubber.

6.2.1 Observe Line Pressure

Pig Wastes are sent to CHWTSDF if not reusable (this is confirmed from the HW returns submitted by the company- although pigging waste is not reflected in the CTO granted to the unit)

6.2.2 Foam Pig Squeezing Machine

Committee has reviewed SOP/ SCL /022 rev 01 dt. 12.07.2013 for Operation of Foam Pig Squeezing Machine which gives procedure for squeezing of waste from pigging foam . Squeezing all waste from foam pigs into tanks for reuse.

6.2.3 Handling of Waste from Pigs

Committee has reviewed SOP/LTD/023 Rev 02 Dt. 15.06.2013 for Operation of Foam Pig Squeezing Machine which gives procedure for squeezing of waste from pigging foam.

6.3 **BPCL Ltd.**

In response to query raised by Committee, BPCL has replied as below:

More than 80% of the products from refinery are transported via pipelines. The 1389 kilometers long Mumbai Manmad Manglia Bijwasan pipeline carries more than 50% of refinery production (Petrol, Diesel & Kerosene).There are dedicated product pipelines for ATF delivery to airports, naphtha and kerosene delivery to RIL Patalganga, LSHS to Tata Electric Company, black oil and white oil pipelines for product delivery to Sewree and Wadala installations, and dedicated pipelines exist for product delivery to Marine Oil Terminus (Jawahar Dweep) for coastal deliveries.

The piggable pipeline from BPCL MR which has connectivity to Pirpau jetty is handling only Benzene, hence no requirement for product switchover and pigging.

Thus, question of pigging waste generation does not arise from BPCL operations as per the information provided.

However, this aspect maybe reviewed in the detailed Technical audit to be taken up of the company.

6.4 **HPCL Ltd.**

In response to query raised by Committee, HPCL has replied as below :

Refinery operations does not undertake any pigging operations. Pigging operations are normally undertaken for cross country pipelines by our marketing division.

However, more details are not available, hence disposal of pigging cannot be commented upon.

This aspect maybe reviewed in the detailed Technical audit to be taken up of the company.

6.5 **RCF Ltd.**

There are no cross country pipelines, hence question of pigging doesnot arise.

6.6 **Chemical Terminal Trombay Ltd.**

In response to query raised by Committee CTTL have responded that :

They have pipelines laid from jetty to terminal. But generally lines are dedicated and hence pigging not carried out.

However, this aspect needs to be firther checked with respect to number of pipelines available since they are handling atleast 5 chemicals – lube oil and acetone, o-xylene, m-xylene and cumene at their site.

7 VOLATILE ORGANIC COMPOUNDS & THEIR ODOURS

This chapter discusses the environmental impacts of Volatile Organic compounds. It is based on compilation from various literature sources :

Volatile organic compounds (**VOCs)**are organic chemicals (containing carbon) that can easily evaporate into the air that is they have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air. For example, formaldehyde, which evaporates from paint, has a boiling point of only –19 °C.

There are large number of VOCs known – which include both man-made and naturally occurring chemical compounds. Some VOCs are dangerous to human health or cause harm to the environment. Anthropogenic VOCs are regulated by law, especially indoors, where concentrations are the highest. Harmful VOCs typically are not acutely toxic, but have compounding long-term health effects. Because the concentrations are usually low and the symptoms slow to develop, research into VOCs and their effects is difficult.

7.1 Indoor VOCs,their sources and harmful effects :

Chemicals and related odors can be sources of Indoor Environmental Quality (IEQ) problems in buildings. Odors are organic or inorganic compounds and can be both pleasant and unpleasant. Some odors can be health hazards and some are not. While most chemical contaminants originate from within the building, chemicals can be drawn into a building from the outdoors as well. At present, not much is known about what health effects occur from the levels of organics usually found in homes.

The presence of odor can cause people to suspect exposures to be harmful to their health. The presence of odors in a building does not always mean that there is an overexposure to chemicals. Some chemicals have very low odor thresholds, which means you can smell them at very low levels. Interestingly, VOCs maybe released by number of sources inside residences such as :

- sealants, and coatings
- Adhesives
- Paints, varnishes and/or stains
- Wall coverings
- Cleaning agents
- Fuels and combustion products
- Carpeting

- Vinyl flooring
- Fabric materials & furnishings
- Air fresheners and other scented products like perfume, shampoos, etc.

United States Environmental Protection Agency (EPA) has found concentrations of VOCs in indoor air to be 2 to 5 times greater than in outdoor air and sometimes far greater. This is found to be especially true in new buildings due to abundance of new materials generating VOCs in the closed atmosphere of the building. High indoor VOC levels are attributed to the low rates of air exchange between the indoor and outdoor environment as a result of tight-shut windows. To reduce exposure to these toxins, one should buy products that contain low-VOCs or no VOCs, use products with VOCs in well ventilated areas.

7.2 Odour Sources in Study area

Odour maybe generated by number of activities in urban environments such as the present study area. A quick reconnaissance of the study area shows that odours maybe generated due to the following sources :

- organic/VOC emissions from industrial establishments (principally refineries) and tankage operations
- organic/VOC/hydrocarbon emissions from other human activities like petrol pumps, gas filling stations, laundries, laboratories, hospitals, garages, activities like painting etc
- organic emissions from being located in urban setting – eg decaying solid waste, burning of rubber tyres, plastics, open uncontrolled burning at dump site (Mankhurd dump site is about 6 km to the North east of BPCL), unsanitary conditions existing etc
- organic emissions from natural sources like marsh lands (typically associated with methane gas)

7.3 Committee observation on health morbidity study of KEM Hospital submitted by complainants:

The Environmental pollution research Centre Department of Health Medicine, KEM Hospital, Parel has conducted a health (respiratory) morbidity studies in the period April 2003 to March 2014 in total 8 areas in the city of which 5 are in Chembur-Mahul area. The study report of the same is enclosed by the complainant and has been reviewed by the committee. This section gives the major findings and observation of the committee on the study report.

- The study area have been chosen based on complaints received from citizens in Mumbai of respiratory morbidity e.g. cough, breathlessness, wheezing, phlegm, chest tightness,throat irritation

- It is said that Borivali is selected as control area due to closeness to Sanjay Gandhi National Park (data on Borivali is not seen in the report)
- The five localities selected in study area include Anikgaon, Ambapada, Mahul, Gawanpada and Vishnunagar.
- The study show prevalence of respiratory symptoms in the 5 areas studied is significant. Cough was reported by 36.4% subjects from Mahul gaon, 43.6% complained of breathlessness and headache and eye irritation was reported by 20%.
- Onsite portable spirometry flow volume graph showed 8.74% restrictive; 8.74% obstructive defects and 4.37% had mixed ventilator defects respectively in the 5 areas of Chembur.
- 40% of population studied has respiratory complaints, pulmonary functions are affected in 21.84% and hence an early intervention with environment control measures to reduce levels of suspended particulates and other pollutants will bring down respiratory morbidity
- The report concludes that 5 areas from Chembur show significant respiratory morbidity.
- In the city of Mumbai where EPRC studies have been conducted, ambient air quality results indicate ***high SPM (PM_{10}) levels and oxides of nitrogen exceeds permissible levels.***
- ***The findings suggest that PM_{10} and NO_2 are critical pollutants for the health of Mumbai.*** Both pollutants have a significant relationship with symptoms like cough, breathlessness, wheezing and diseases like allergic rhinitis and COPD, SO_2 is significantly related to cardiac ailments and other diseases, while NH3 has a significant relationship with phlegm and other chest diseases.
- Based on the concentration response (CR) coefficients obtained in the study and estimated percentage change in health effects, the incidence of health outcomes has been calculated for Mumbai. The estimates indicate that 50-µg/m^3 increase in PM10 is likely to cause additional 42000 cases of cough, 52000 cases of breathlessness, 36000 each instances of wheezing and cold and 84000 each instances of allergic rhinitis and COPD among 12 million people in Mumbai. On the other hand 50-µg/m^3
- Increase in NO_X is likely to cause additional 126,000 cases of cough, 168,000 instances of breathlessness and 120,000 instances of wheezing, 108,000 cases of cold, 276, 000 instances of allergic rhinitis and 138,000 instances of COPD per 12 million people.

7.3.1 MPCB Committee Observation on KEM Report

The committee appreciates the detailed assessment done by EPRC, KEM Hospital Parel and believes that such studies should be encouraged as it links the air pollution levels and the health effects seen.Committee observations on the findings/reports are as given bellow:

- *The report points a linkage between particulate matter PM_{10}, sulfur di oxide, nitrogen dioxide and ammonia levels to the health effects seen rather than any correlation with concentrations of organic substances seen*
- Committee notes that respiratory diseases like coughing, wheezing, throat irritation, breathlessness etc maybe a result of number of other factors like obesity, smoking, use of low quality of fuel for cooking etc
- BMI (Body Mass Index) has been checked only for Anikgaon residents and Vishnunagar *but not been done at Mahulgaon (Chereshwar Coop), Ambapada and Gavanpada.*
- The findings of the study as seen from the final diagnosis presented for the five locations in Chembur- Mahul with the data of workers survey in Pise Panjrapol water treatment plant is compared below and does not show any major variation :

Table 7.1 Comparison of Findings of Diagnosis: 6 study areas

	Ambapada	**Anikgaon**	**Gavanpada**	**Vishnunagar**	**Pise – Panjra- Pol**
	Percent				
Normal	75.0	61	52.6	68.3	75.3
Bronchitis	6.3	3.8	3.2	5.9	5.5
TB	4.2	1.9			
Other chest	4.2	7.6	12.6	7.9	6.8
Cardiac		1.9	7.4	1.0	
URTI	2.1	1.9			
Asthma	2.1	3.8	3.2	2.0	2.7
General disease	4.2	4.8	13.7	5.9	1.4
Allergic and frequent rhinitis	2.1	3.8			
Post TB		1.0		1.0	
GERD		1.9			
DM+ HT		4.8		1.0	1.4
DM		1.0	1.1	2.0	
HT		1.0	5.3	3.0	5.5
Other				1.0	
HT &other chest					1.4
Total	**100**	**100**	**100**	**100**	**100**

- The data from the control station Borivali near National park is not presented in the report.

- Yearly health check up of all workers is undertaken by Certifying Surgeon as compliance to Factories Act, 1948. This has been verified by the officer from DISH (Committee Member) during in-plant visits and no abnormality were observed were noticed.

- Health morbidity data gives good pointers to not-cause-effect relationship and also helps identify corrective steps to be taken and gives a realistic parameter for measurement. However, is it not an exacting science and the results may be influenced by the number of extraneous factors as given above.

8 ENVIRONMENTAL MONITORING

Generally, environmental monitoring provides an insight into the seriousness of a air pollution situation and provides a benchmark to find if control strategies are effective. In India, However, in the present case the major complaint is of odour which may manifest due to number of other factors – such as VOC emissions from within the premises from construction materials as also from VOC/hydrocarbon emissions from industrial establishments nearby, organic emissions from natural and artificial causes like decaying organic matter, unsanitary conditions etc

The National Ambient Air Quality Standards are prescribed by the Central Pollution Control Board (CPCB) vide Gazette Notification GSR826 (E) dt 16.11.2009, under Schedule VII of the Environmental Protection Rules 1986. In this Notification standards have prescribed for ambient air quality in two types of areas viz (a) Industrial , Residential , Rural & Other Areas and (b) Ecologically Sensitive Areas (as notified by Central Government).

All the Industries in Chembur- Mahul- Trombay area are RED category industries and hence, are regularly monitoring Ambient Air Quality either by themselves (by installing Continuous Ambient Air Quality Monitoring Station) or through MOEF recognized laboratories.

8.1 Environmental Monitoring Programs of Existing Industrial Establishments

Summary of environmental monitoring locations established by Industrial Establishments is as below:

Table 8.1 Summary of Environmental Monitoring Carried out- study area

Company	No. of locations	Parameters CAAQMS	Parameters Manual
HPCL	3(CAAQMS) + 3 (Manual)	SPM, PM_{10}, SO_2, NOx, CO, Ozone, Benzene, NH_3, Meteorological data	Pb. As, Ni, BaP, $PM_{2.5}$
BPCL	3 (CAAQMS) +1 (Manual)	PM_{10}, SO_2, NOx, Meteorological data	PM_{10}, $PM_{2.5}$, SO_2, NOx, Pb. As, Ni, BaP, CO, Ozone, Benzene, NMHC, NH_3,
Tata Power	2 (CAAQMS)+ 6 (manual)	PM_{10}, $PM_{2.5}$, SO_2, NOx , Meteorological data	NAAQS

Company	No. of locations	Parameters CAAQMS	Parameters Manual
RCF Ltd	3 (CAAQMS) + 1 (CAAQMS)	PM_{10}, SO_2, NOx, NH_3 (3 stations) PM_{10}, $PM_{2.5}$, SO_2, NOx, NH_3, (1 stations) Meteorological data	None

8.1.1 Summary of Data Reported

Data from April 2013 to May 2014 was collected from the Industries and summarized monthly average values are presented overleaf.

From the Table it is seen that the criteria pollutants i.e those specified in the NAAQS are being monitored at HPCL, BPCL and levels seen are within the norms/ Guidelines established by NAAQS.

From amongst the criteria pollutants, Benzene is important from viewpoint of this study. The range of values for Benzene are between 1.3 to 2.8 ug/cum at BPCL and 0 to 0.8 ug/cum at HPCL. No Benzene monitoring is undertaken at other stations.

Benzo-a –pyrene levels are Below Detectable Limits at all locations.

BPCL is undertaking non methane hydrocarbon monitoring at its station. This shows values of between 1 to 1.3 ppm. There is no standard prescribed by CPCB for non methane hydrocarbons – but previously CPCB used to specify standard of 0.24 ppm for non methane hydrocarbons. If compared to this value, levels of nMHC are exceeded many times over at BPCL station.

Table 8.2 Summarized Monthly Average AAQ Data for BPCL, HPCL and Tata Power (April 2013- May 2014)

YEAR 2013-2014			BPCL Refinery Mahul, Chembur (*)			HPCL ($)			TATA POWER COMPANY LTD (*)			RCF Ltd (*)		
No.	Parameters	LIMIT (24 Hrs)	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
1	PM_{10} (µg/m³)	100	44.4	59.8	53.8	23.5	88.4	52.0	29.2	90.0	58.7	20	87	58.9
2	$PM_{2.5}$ (µg/m³)	60	13.8	21.2	17.4	21.0	39.2	34.4	16.2	39.9	28.3	19	47	30.6
3	SPM (µg/m³)	NS	NA	NA	NA	45.7	146.0	79.2	NA	NA	NA	NA	NA	NA
4	SO_2 (µg/m³)	80	6.1	11.2	7.9	22.1	33.2	28.0	3.1	24.0	8.7	14	54	27.9
5	NOX (µg/m³)	80	11.6	26.7	18.3	25.1	29.9	27.3	3.1	38.0	16.7	20	57	39.7
6	Lead (µg/m³)	1	0.1	0.2	0.1	0.0	0.1	0.1	NA	NA	NA	NA	NA	NA
7	#CO (mg/m³)	4	1.1	1.3	1.2	0.4	0.6	0.5	NA	NA	NA	NA	NA	NA
8	NH3 (µg/m³)	400	7.1	18.8	10.7	0.7	1.5	1.3	NA	NA	NA	7	176	58.8
9	*Ni (ng/m³)	20	1.3	5.2	2.7	0.0	0.0	0.0	NA	NA	NA	NA	NA	NA
10	*As (ng/m³)	6	<1.0	<1.0	<1.0	0.0	0.0	0.0	NA	NA	NA	NA	NA	NA
11	#O3 (µg/m³)	180	5.6	10.5	8.1	1.1	1.5	1.3	NA	NA	NA	NA	NA	NA
12	*Benzene (µg/m³)	5	1.3	2.8	1.8	0.0	0.8	0.1	NA	NA	NA	NA	NA	NA
13	*BaP (ng/m³)	1	<0.5	<0.5	<0.5	0.0	0.4	0.0	NA	NA	NA	NA	NA	NA
14	HC (ppm)	NS	1.0	1.3	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note :

1. BaP = Benzo-a- pyrene
2. NS : Standard Not specified
3. NA : Not Analysed
4. (*) MoEF lab data (#) CAAQMS data ($) Mixed Data

8.2 Monitoring Carried out through AESPL

As decided by the Committee the Monitoring for baseline environmental monitoring for ambient air parameters was conducted through M/s Aditya Environmental Services Pvt Ltd., Mumbai, a Ministry of Environment and Forest recognized laboratory under Environmental Protection Act at 8 locations under supervision of RO Mumbai officers and Scientists from Central Laboratory of MPCB. Monitoring is completed as per below:

Table 8.3 Summary of Monitoring Conducted in study area

Sr. No.	From Date	To Date	Name of the Location
1	04.06.2014	06.06.2014	Sealord Main gate
2	04.06.2014	06.06.2014	Ambapada
3	04.06.2014	09.06.2014	Chereshwar Society Terrace
4	10.06.2014	12.06.2014	Gawanpada (Tata Power Canteen area)
5	10.06.2014	12.06.2014	BPCL Cricket Club (Main Gate)
6	10.06.2014	12.06.2014	PEPSICO Main Gate
7	07.06.2014	09.06.2014	RCF Guest House
8	07.06.2014	09.06.2014	Aegis Main Gate

Parameters monitored were as follows :

- NAAQS parameters (12 parameters)
- NMHC (non methane hydrocarbons)
- Volatile Organic Carbons (VOCs) particularly 1. Methanol 2. Toluene 3. Xylene 4. Ethyl alcohol 5. Butyl Acetate 6. Vinyl acetate 7. Ethylene glycol 8. Acetone 9. Styrene (primary products stored at Aegis Logistics and Sea Lord)

Results of analysis available from M/s Aditya Environmental Services Pvt Ltd are summarized in Table overleaf and detailed values presented in **Annexure ---.**

8.2.1 Observations on Monitoring Results

Following are observations on data observed at the site with reference to the National Ambient Air Quality Standards (NAAQS) of CPCB:

- Levels of criteria pollutants (parameters specified in) are more or less within the norms
- Some exceedences are seen for PM_{10} and $PM_{2.5}$ on few occasions – this maybe attributable to high industrial activity and high traffic along the various connecting roads and high urbanization in the area

- Levels of other criteria pollutants are within CPCB norms
- Amongst organic pollutants -Benzene, Toluene and Xylene are observed in various analysis carried out- amongst these Benzene is a criteria pollutant regulated under NAAQS and observed values are lower than the NAAQS values. Levels of Toluene are quite high. No ambient air quality standard is specified for Toluene and this Committee is not aware of any standards abroad specifying ambient Toluene levels. Low levels of Xylene and Ethyl benzene are also seen in some areas.
- No detectable concentration of other organic substances was noticed during study period
- Committee noted that wind direction during the period of monitoring is towards North east that is away from the Chereshwar Coop Housing society – since it is located nearest to the creek
- Committee observes that hydrocarbon/VOC values maybe influenced by number of contributors or sources in the complex urbanized scenario as existing in Mahul area and it is difficult to pin point the sources
- Committee notes that odours maybe perceptible to humans at concentrations much below the detection range of compounds and non detection of a substance may not be taken as NIL values. In line with this philosophy, Committee has undertaken a detailed scrutiny of all establishments while preparing this report.

Table 8.4 Results of monitoring done by AESPL (June 2014)

Sr.No.	Parameters	RCF Guest House			Pepsico Main Gate			BPCL Sports Club (Main Gate)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
1	Sulphur Dioxide SO2 (µg/m^3)	10.1	15.8	13.8	13.9	21.1	17.2	11.3	18.1	15.7
2	Nitrogen Dioxide NOx (µg/m^3)	22.2	25.4	24.2	14.5	19.1	17.4	18.5	34.7	24.9
3	Particulate Matter PM10 (µg/m^3)	76.6	101.7	88.2	58.8	85.3	73.0	65.9	121.6	86.6
4	Particulate Matter PM2.5 (µg/m^3)	31.1	58.3	43.8	25.2	32.0	28.6	37.9	48.8	42.8
5	Ozone (µg/m^3)	6.4	20.1	14.3	6.1	21.4	15.1	10.6	23.2	17.0
6	Lead (µg/m^3)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Carbon Monoxide (mg/m^3)	0.6	0.9	0.8	0.5	0.6	0.5	0.6	0.7	0.6
8	Ammonia NH3 (µg/m^3)	59.2	72.3	66.7	14.6	64.3	45.7	32.4	68.7	50.8
9	Benzene C6H6 (µg/m^3)	0.5	0.6	0.5	0.5	1.2	0.8	0.5	0.9	0.7
10	Benzo(a)pyrene (ng/m^3)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11	Arsenic As (ng/m^3)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	Nickel Ni (ng/m^3)	3.7	6.6	5.3	2.4	3.6	2.9	2.7	13.0	8.0
13	NMHC ppm	0.2	0.5	0.4	0.5	0.8	0.7	0.3	0.5	0.4
14	Toluene (µg/m^3)	14.6	31.9	20.6	1.0	15.4	6.9	13.0	83.0	40.0
15	Xylene (µg/m^3)	BDL	2.3	1.3	BDL	2.1	1.0	BDL	1.1	0.7
16	Ethylbenzene (µg/m^3)	BDL	0.9	0.7	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detectable Limit

Table 8.5 Results of monitoring done by AESPL (June 2014)

Sr.No.	Parameters	Sealord Main Gate			Aegis Main Gate		
		Min	Max	Avg	Min	Max	Avg
1	Sulphur Dioxide SO2 (µg/m³)	14.90	18.23	16.36	17.2	19.2	18.3
2	Nitrogen Dioxide NOx (µg/m³)	16.30	26.10	20.83	22.2	26.5	24.3
3	Particulate Matter PM10 (µg/m³)	51.80	129.19	90.36	76.3	98.9	85.5
4	Particulate Matter PM2.5 (µg/m³)	18.50	47.10	34.87	35.5	47.8	42.5
5	Ozone (µg/m³)	6.05	19.80	14.53	6.7	18.1	12.9
6	Lead (µg/m³)	0.06	0.10	0.09	BDL	BDL	BDL
7	Carbon Monoxide (mg/m³)	0.68	1.26	0.91	0.8	1.3	1.0
8	Ammonia NH3 (µg/m³)	16.60	60.92	42.07	29.3	53.7	42.5
9	Benzene C6H6 (µg/m³)	0.80	2.35	1.62	0.7	0.8	0.7
10	Benzo(a)pyrene (ng/m³)	BDL	BDL	BDL	BDL	BDL	BDL
11	Arsenic As (ng/m³)	BDL	BDL	BDL	BDL	BDL	BDL
12	Nickel Ni (ng/m³)	BDL	BDL	BDL	0.8	2.8	1.7
13	NMHC ppm	0.50	1.20	0.81	0.6	1.1	0.8
14	Toluene (µg/m³)	22.70	83.0	57.23	54.0	103.0	75.3
15	Xylene (µg/m³)	BDL	1.60	0.87	BDL	0.8	0.6
16	Ethylbenzene (µg/m³)	BDL	1.1	0.8	BDL	0.9	0.6

Note: BDL: Below Detectable Limit

Table 8.6 Results of monitoring done by AESPL (June 2014)

Sr.No.	Parameters	Tata Power (Canteen Kitchen Terrace)			Ambapada (Kamalakar Bhoirs Terrace)			Mahulkar Terrace (Chereshwar Society)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
1	Sulphur Dioxide SO2 (µg/m³)	13.8	15.9	14.8	15.3	17.4	16.4	15.3	19.2	16.7
2	Nitrogen Dioxide NOx (µg/m³)	11.0	22.5	17.4	17.6	31.5	25.8	10.4	29.4	19.9
3	Particulate Matter PM10 (µg/m³)	66.5	107.7	81.8	69.2	102.8	86.5	43.7	86.5	71.7
4	Particulate Matter PM2.5 (µg/m³)	33.1	47.5	39.8	27.5	45.6	38.6	22.1	42.1	32.3
5	Ozone (µg/m³)	7.1	19.8	14.5	7.7	16.7	13.3	7.1	21.4	14.6
6	Lead (µg/m³)	0.1	0.2	0.2	0.1	0.7	0.3	0.1	0.4	0.2
7	Carbon Monoxide (mg/m³)	0.7	1.0	0.9	0.6	1.1	0.8	0.5	1.0	0.7
8	Ammonia NH3 (µg/m³)	14.5	47.2	32.1	12.8	67.3	44.5	14.8	68.1	45.5
9	Benzene C6H6 (µg/m³)	0.5	0.8	0.6	0.5	1.5	0.9	0.5	2.3	1.0
10	Benzo(a)pyrene (ng/m³)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11	Arsenic As (ng/m³)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	Nickel Ni (ng/m³)	0.8	1.5	1.2	BDL	BDL	BDL	BDL	BDL	BDL
13	NMHC ppm	0.5	0.9	0.6	0.5	4.2	2.0	0.5	4.2	1.4

14	Toluene (µg/m^3)	1.0	61.0	26.4	15.3	65.9	36.0	1.0	15.3	6.3
15	Xylene (µg/m^3)	BDL	BDL	BDL	BDL	3.2	1.4	BDL	1.2	0.7
16	Ethylbenzene (µg/m^3)	BDL	0.9	0.7	BDL	BDL	BDL	BDL	1.1	0.7

Note: BDL: Below Detectable Limit.

9 OPERATIONAL PARTS OF NGT ORDER

9.1 Issues Raised by Petitioner

Various issues raised by Petitioner include

- substantial issue of air pollution, allegedly caused by the industrial operations of Respondent Nos.1 (Sea Lord) and 2 (Aegis Logistics Ltd), in terms of Volatile Organic compounds (VOC) emissions and associated adverse health impacts on the surrounding population

- concern over the air pollution caused due to polluted emissions mixed with obnoxious smell i.e. Volatile Organic Compounds (VOC) fromthe loading, storage and unloading operations of the chemicals at the Terminal of Respondent No.1 (Sea Lord)

9.2 Findings and Conclusions of Honourable NGT

Findings and Conclusions of Honourable NGT as per its above order are as below

- odour being reported by petitioners qualifies within the definition of air pollution as per the Air (Prevention and Control of Pollution), Act 1981
- there is a persisting problem of air pollution in Mahul, Ambapada and Chembur areas
- There is strong evidence that this air pollution is linked and can be scientifically correlated to the adverse health effects on the surrounding population as observed through KEM (Govt. Hospital) studies
- complex urban situation exists in/near the respondent area with number of large industries, traffic, use of solvents for various applications in small, medium scale establishments and also in domestic uses etc
- large scale handling and storage of petroleum products and chemicals can be considered as major source of VOCs besides the transport and other sources thus, respondent no. 1(Sea Lord), 9 (BPCL) and 10 (HPCL) are the major contributory sources of VOC emission in the area
- contribution of each of the above on continuous basis is not clear as also no clarity on the possibility of instantaneous release of air pollutants
- Chembur is a critically polluted area by CPCB (severely polluted) under CEPI (2010). Limited air quality data available on VOC HAP levelsin ambient air available fromNEERI and other studies indicates that air quality is not sound. There is certain level of uncertainty in reported data

- need for composite system for notifying ambient air quality standards – criteria and Hazardous air pollutants more importantly HAPs in view of the effects on health. HAPs have complex reactive behaviorand may have complex health effects even at low concentrations
- Odour thresholds have been recommended as screening criteria on acceptable ambient air quality (**ref :** Guide to odour threshold for HAPs identified by USEPA)
- There is an urgent need to control this air pollution by devising the suitable action plan as per section 17 of the Air (Prevention and Control of Pollution), 1981, may be on the lines of CEPI action plan prepared by MPCB for some other areas
- The contribution of individual source of air pollution in the air quality in the area is not available on record (source apportionment). However, considering the complexity involved in measurements, prediction and modelling of VOCs, it is prudent to evolve such an action plan for all the identified sources of VOCs. However, considering the principle of proximity and findings of ICT/KEM, it would be necessary to deal with emissions from respondent no. 1 on priority in the first phase of such action plan.

9.3 Actions Identified and Directions issued

NGT order has identified various actions and issued directions with timelines for compliance

Sr. No	Direction	Timeline	Remarks
1	Prepare a comprehensive action plan for control of air pollution in Mahul-Ambapada- Chembur area with focus on VOC control	2 months Submission to CPCB for approval CPCB to confirm in 2 months	Implementation of action plan within 12 months from approval
2	MPCB to issue directions for compliance of MPCB committee recommendations as per August 2014 report and ensure compliance within 12 months	Immediate issue of directions 12 months for implementation of recommendations	
3	Health effect impact assessment studies proposed by KEM to be studied for minimum 3 years KEM to give proposal including ambient air quality monitoring and get the same done through reputed	3 years Monitoring within 2 months under MPCB supervision	Cost to be borne equally by respondent 1 (Sea Lord), 9 (BPCL), 10 (HPCL), 11 (Tata

Sr. No	Direction	Timeline	Remarks
	Institute like NEERI		Thermal) and 14 (RCF Ltd)
4	MPCB to carry out VOC assessment studies in line with CEPI studies as per CPCB protocol for Mahul, Ambapada and Chembur areas for next three years	3 years	
5	Respondent 6 (MCGM) to provide necessary medical facilities and treatment for residents of Mahul, Ambapada and Chembur areas		Cost to be borne equally by respondent 1 (Sea Lord), 9 (BPCL), 10 (HPCL), 11 (Tata Thermal) and 14 (RCF Ltd)
6	MPCB and SEIAA to assess the environmental compliance of respondent 1 (Sea Lord) by control of APC measures and change in capacity from 75,000 KL/M to 75,000 KL/3 months or at a maximum of last 6 months on monthly basis MPCB to serve copy of this Order on SEIAA for necessary action	Immediate Immediate	
7	MPCB to evolve standards for VOC HAPs in ambient air and source emission in consultation with CPCB	4 months	
8	MPCB to formulate a Committee to suggest location criteria of industries and activities involved in handling hazardous chemicals handling more specifically safe distance from residential areas	4 months	

- undertake study regarding human exposure assessment in view of specific air pollutants prevalent in the area
- first priority to establish credible and quantifiable air quality- health linkages

10 CONCLUSIONS & RECOMMENDATIONS

As per the directives of the Honourable National Green Tribunal the study were carried out by taking a holistic approach of the Mahul area. The conclusions and recommendations with respect to individual industrial establishments are already presented above.

However, the basic thrust of the complainants is about the facility of Sea Lord Containers Ltd., the conclusions and recommendations about the issues raised by the complainants are summarized below :

10.1 VOC Emission Reduction :

Sr. No.	Name of Company	Type of Study to be carried out	Expected time Period Required
1.	• **SeaLords Containers Ltd (SCL)** • **Aegis Logistics Lts (ALL)** • **Chembur Trombay Tankage Ltd (CTTL)**	**Physical audit of facility to see that** 1. Tankage design meets API standards & various SOP's followed / & maintenance undertaken as stated. 2. Secondary seal on IFR tank. 3. Adherence to provision of GSR 186(E) & 820(E) 4. Check efficiency of water scrubber & suggest change. 5. Tank cleaning / pipeline pigging operation & emissions control during these operations.	3 days each
2	• **Bharat Petroleum Corporation Ltd (BPCL)** • **Hindustan Petroleum Corporation Ltd (HPCL)** • **Rashtriya Chemicals and Fertilizers Ltd (RCF LTD)**	**Detailed in plant audit** 1. Process emission vents/emergency vents & air pollution control system provided 2. Check company's adherence to GSR 182(E) 3. LDAR program 4. Study/evaluation of plant trip system/interlocks. 5. Storage tanks & other off site facilities / tanker filling bay etc.	15 days each

10.1.1 Observations on the KEM Report on Health- Morbidity study:

The Environmental pollution research Centre Department of Health Medicine, KEM Hospital, Parel has conducted a health (respiratory) morbidity studies in the period April 2003 to March 2014 in total 8 areas in the city of which 5 are in Chembur-Mahul area.

The MPCB committee and the Hon NGT has appreciated the detailed assessment done by EPRC, KEM Hospital Parel and believes that such studies should be encouraged as it links the air pollution levels and the health effects seen.

However, MPCB Committee had following observations on the findings/reports:

- *The report points a linkage between particulate matter PM_{10}, sulfur di oxide, nitrogen dioxide and ammonia levels to the health effects seen rather than any correlation with concentrations of organic substances seen*
- Committee notes that respiratory diseases like coughing, wheezing, throat irritation, breathlessness etc maybe a result of number of other factors like obesity, smoking, use of low quality of fuel for cooking etc
- BMI (Body Mass Index) has been checked only for Anikgaon and Vishnunagar residents *but not been done at Mahulgaon (Chereshwar Coop), Ambapada and Gavanpada. Committee feels that a uniform approach should be adopted*
- The data from the control station Borivali near National park is not presented in the report.
- Yearly health check up of all workers is undertaken by Certifying Surgeon as compliance to Factories Act, 1948. This has been verified by the officer from DISH (Committee Member) during in-plant visits and no abnormality were observed were noticed.
- Health morbidity data gives good pointers to not-cause-effect relationship and also helps identify corrective steps to be taken and gives a realistic parameter for measurement. However, is it not an exacting science and the results may be influenced by the number of extraneous factors as given above.
- The study done by KEM is on inorganic pollutants and needs to be extended to cover odorous gases and VOCs and their health impacts. KEM should identify pollutants to be monitored for same. However considering that health- morbidity-epidemeological studies take long time the Hon NGT has given 3 years time frame for the studies