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1.0 INTRODUCTION:

Volatile Organic Compounds (VOCs) mostly industrial solvents which are used in Chemical Industries (Pharmaceuticals, Pesticide, Dye & Dye Intermediates & other Chemicals) are emitted in to the environment in most of the industrial estates. Some of them being known carcinogens can be identified as Hazardous Air Pollutants and needs special attention. Ambient air levels of VOC is required to be monitored primarily because of their role in adverse impacts on human health as well as ecology, and also on the adverse impact on atmospheric factors relating to other environmental changes (Ozone Layer Depletion etc) i.e. increases in levels of troposphere (ground-level) ozone and decreases in levels of stratospheric ozone. Most of the chlorinated VOCs may contribute for 35 – 55% of outdoor air borne cancer risk.

The industrial area of Taloja and Mahad, which are having mostly chemical industries, attracts public complaints because of strong odour & colour in final discharges from the industrial estate. The odour nuisance may be because of raw materials used in the processes like Sulphur based compounds, some organic compounds and finished products.

Presently, criteria pollutants (SPM, RSPM, SO_2 and NO_x) are monitored regularly and other pollutants like NH3, Cl2, Acid mist etc are monitored occasionally to know ambient air quality in critically polluted areas as well as in other industrial areas and major cities. The MPCB, Maharashtra has carried out VOC monitoring as a step towards knowing which VOCs as Hazardous Air Pollutants (HAPs) are found in the ambient air in Chemical Industrial Area of Taloja and Mahad. The study is carried out in order to prioritize some potential HAPs for development of standards and subsequently enforcement.

2.0 ABOUT VOCs

- Volatile Organic Compounds are organic chemical compounds which volatile at the temperature 25^{o}C and vapour pressures greater than 0.14mmHg.

- significantly vaporize at normal ambient conditions and enter in to the atmosphere

- Most compounds are having with less than about 12 carbon atoms.

- This includes any organic compound (any compound containing carbon) other than those compounds determined to have negligible photochemical reactivity. These compounds are referred to as 'exempt VOCs'.

The following are some of compounds which are not volatile organic compounds

(1) Carbon monoxide (2) Carbon dioxide; (3) Carbonic acid; (4) Metallic carbides or carbonates; (5) Ammonium carbonate; (6) Methane; (7) Ethane;

CLASSIFICATION OF THE VOC BY BOILING POINT

WHO classification of VOC, based on boiling points is as given below

- VVOC : Very Volatile Organic Compounds : < 0 upto 50 – 100^{o}C
- VOC : Volatile Organic Compounds : 50–100 up to 250 – 260^{o}C
- SVOC : Semi Volatile Organic Compounds : 250 – 260 up to 380 – 500^{o}C
- POM : Polycyclic Organic Materials : > 380^{o}C

VOCs are organic substances which are volatile and are photo chemically reactive. It includes a long list of individual substances, many of which are toxic.

3.0 METHODOLOGY:

Maharashtra Pollution Control Board had assigned M/s. SGS India Private Ltd., Chennai for VOC monitoring at Taloja and Mahad Industrial Estate in Maharashtra.

The background information and dry data about industrial estate were collected from MPCB. The ambient monitoring locations were selected on the basis of dry data collected and preliminary survey of the industrial estate. Locations for collection of effluent samples were identified on the basis of industrial effluent flow pattern and effluent management scheme of the industrial estates. Industries were selected from the inventory available with MPCB. Collection of relevant information from industries and detailed information of plant premises was carried out to finalise the important locations for monitoring of fugitive emission points/spots.S

The VOC monitoring study was carried out at ambient environment at selected industries, CETPs / effluent sumps. The monitoring covered following:

VOC monitoring at

- Ambient air quality monitoring was conducted across the industrial estate at five locations which covers up, down and cross wind directions and center of the industrial estate.

VOC Monitoring at Selected Industries for

- Fugitive emission samples was collected near to the source
- Wastewater samples was collected from the inlet of the ETP
- Hazardous waste samples was collected in a composite manner from the available stock of distillation residue, spent carbon, ETP sludge etc.,

VOC Monitoring at CETP and Effluent sumps of Industrial Estate

- Samples were collected from the inlet sump and equalization tank of CETP at Mahad.

- The list of 60 VOCs which are identified for the sampling and analysis is enclosed as **Annexure-I** and important physical properties of all 60 VOCs is enclosed as **Annexure – II.**

VOCs monitoring was carried out in association with the officials of MPCB and analysis was carried out in M/s. SGS Laboratory, Chennai.

4.0 OBJECTIVE:

The Objectives of the study are as below:

- To identify and quantify the VOCs presence in the ambient air in Industrial area of Taloja and Mahad, surface water.
- To identify and quantify the VOCs presence in the air (fugitive emission), raw wastewater and hazardous waste in the industrial units mostly pharmaceuticals, Pesticides, Dye & Dye Intermediates and other Chemicals.
- To prioritize the most toxic and most predominant VOCs in the Ambient air
- To generate the database for future monitoring and subsequent standard development process for enforcement
- To develop a protocol for sampling and analysis method for VOCs in Indian context
- To address the complaints received from Public/NGOs

5.0 LIMITATIONS OF THE STUDY

This study is an attempt to develop the baseline data and profiles of the VOCs present in ambient air, industrial effluents discharges and hazardous waste generated. The methods adopted for sampling and analysis are developed by overseas international institutions and standardized methods for Indian conditions are not developed and notified yet. Considering the fact, the total numbers of samples are optimized to cover wide range with available infrastructure for handling management and transportation of the samples for analysis.

6.0 ABOUT TALOJA AND MAHAD INDUSTRIAL ESTATE:

Taloja:

The industries in this area are mainly Engineering, Chemical mfg., Fertilizer, Pesticide, Bulk drugs, Glass mfg., food processing units. All the units are connected by closed pipeline network for discharging their effluent into the CETP. Further, first Common Hazardous Waste Treatment Storage and Disposal Facility is in operation in the area serving industries in Maharashtra and Goa. Also,Bio-Medical treatment facility provided in Taloja caters to hospitals in Mumbai, Navi Mumbai and Raigad district.

The treated effluent generated from industries is sent to CETP for treatment and disposal into Panvel creek through closed pipeline. The industrial distribution in MIDC Taloja is as below:

Category	Large	Medium	Small	Total
Red	49	25	229	**303**
Orange	1	9	41	**51**
Green	1	1	297	**299**
Total	**51**	**35**	**567**	**653**

Mahad:

Mahad Industrial area is having mainly Chemical mfg, Bulk drugs mfg industries. All the industries are well connected for closed pipelines for discharge of their effluent in to CEPT, which having capacity of 7.5 mld. and treated effluent is final discharged at ovale village in to the saline zone of Savitri River. The industrial distribution in MIDC Mahad is as below:

Category	Total
Red	**71**
Orange	**12**
Green	**18**
Total	**101**

7.0 METHODS FOR SAMPLING:

7.1 Air sampling:

It is decided to follow EPA TO-17 for sampling of Ambient Air Quality and Fugitive emissions using pre and post calibrated personal samplers.

The criteria of choosing the Method TO-17 for sampling:

- Many compounds which boils at above 100^{o}C also efficiently collected by these methods
- These methods have a flexibility of sampling the gas stream at a high flow rate of 1 lpm and at low flow rate of 0.1 to 0.5 lpm
- These methods have an option of sampling smaller volumes at lower flow rates and should be used when the boiling points of the VOCs of interest are below 35^{o}C.
- The target detection limit of these methods is 0.1µg/m^{3}.

The selection of the method of sampling and analysis mainly depend on three important common factors.

- ***Representation:*** the extracted gases must be representative of the gas stream within the ambient air.

- ***Integrity:*** the extractive system and any sampling media used for grab sampling must be managed and operated in a manner which maintains integrity of the sample. If any of the VOCs are lost or changed during delay between sampling and analysis, then it must be known and understood both the extent and nature of these threats to sample integrity.

- ***Validity:*** The methods used for sampling and analysis must be valid, unbiased, accurate and precise within the ranges defined by the criteria of acceptance.

7.2 Water and Hazardous Waste Sampling:

Wastewater samples were collected from the identified locations of industries, CETP and Industrial estates. The water samples collected in purge & trap amber vials directly with neck full of samples which can avoid any head space formation. After collection the samples were preserved in cooler with proper identification mark and the same is sealed.

The hazardous waste samples were collected from the identified locations of selected industries. Representative samples were collected from various locations, well mixed and sealed in an aluminium foil followed by polythene cover.

8.0 SAMPLING PROCEDURE FOR AMBIENT AIR QUALITY AND FUGITIVE EMISSION MONITORING

8.1 About Adsorbent Tubes:

Based on the merits and demerits, it was decided to adopt EPA TO-17 method for the ambient level of VOCs as well as Fugitive emissions.

Active Thermal Desorption (ATD) combination tube: –
Compodium method TO-17 using Tenax and Chromosorb ATD method.

The advantage of method 17:

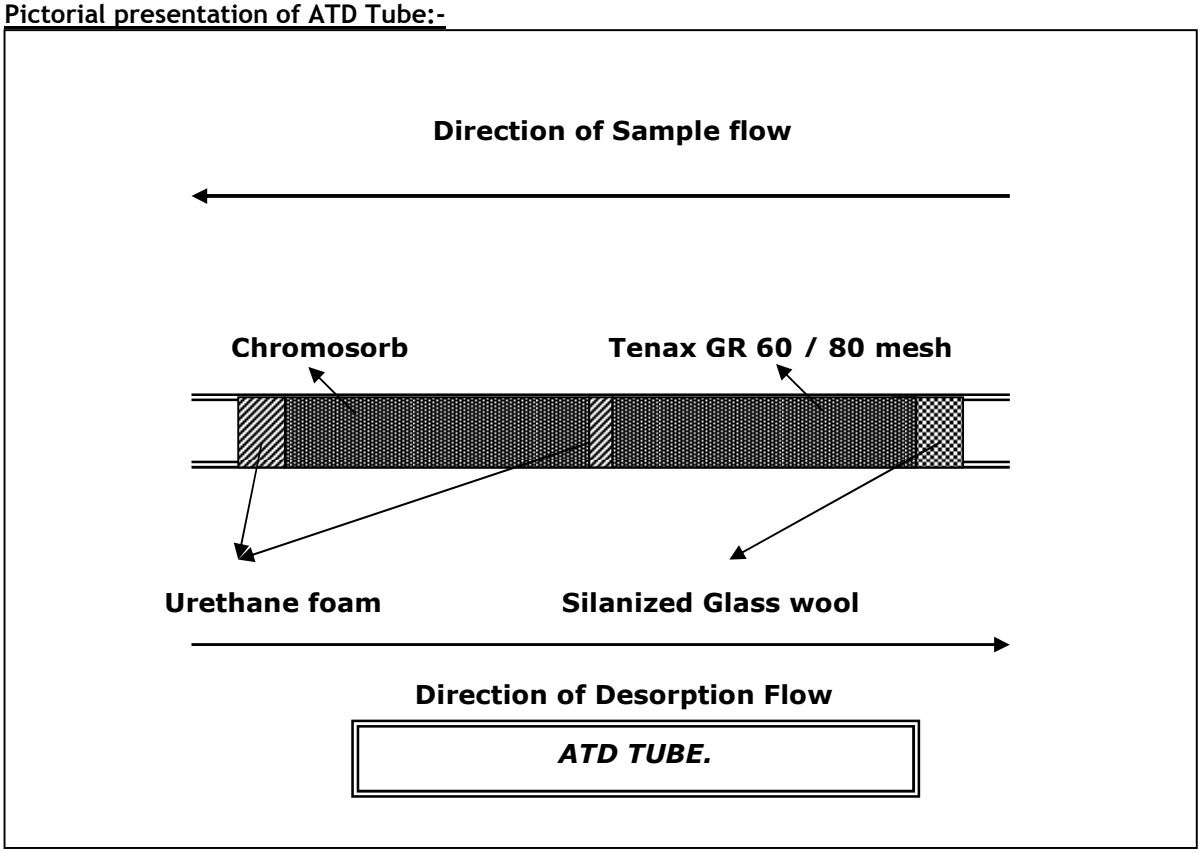
- No contamination occur since the sample is directly injected
- Wide spectrum of high molecular weight chlorinated and aromatic VOCs are captured
- Easy to capture

Disadvantages:

- Replication is not possible
- Does not cover broad spectrum of VOCs
- Breakthrough is not measurable
- Moisture affects the analysis.

Photograph showing use of ATD tubes in field monitoring

Pictorial presentation of ATD Tube:-



8.2 Sampling Preparation:

The steps followed are as given below

- Determined the extent of the sampling effort, the sampling methods to be employed the type and amounts of equipment and allied supplies needed.
- Organized the necessary sampling and monitoring equipment
- Sampling pumps are pre calibrated before sampling with soap bubble techniques.
- Prepared a schedule in consultation with MPCB officials
- Performed a general site survey prior to the study, in accordance with the site specific health and safety plan for sampling locations.

8.3 Calibration Procedure:

To save time in the field, sampling pumps are pre-calibrated in the laboratory prior to arrival on-site. The calibration is checked in the field prior to and upon completion of sampling.

The steps followed are as given below

- Assembled the calibration train using a calibrated (external) rotameter, sampling pump, a tube holder system and a adsorbent tube. The adsorbent tube is a representative tube from the same lot of tubes that is used for sampling.
- Turned on the pump and adjust the flow using the flow adjust mechanism on the tube holder until the float ball on the rotameter is aligned with the rotameter's pre-calibrated flow rate value.
- Marked to the manifold and pump indicating the pre-calibrated flow rate and sampling media.
- Calibrated sampling system, flow regulator and tubing kept ready before sampling. Broke both ends of the adsorbent tube before sampling and ensured that each opening is at least one half the inside diameter of the tube.
- Kept one field blank at each sampling station and three at laboratory blank with opened both ends of the ATD tube. This blanks will give if any contamination in field during sampling as well as during the analysis in the laboratory.

- Fixed the ATD tube into sampling line and placed back-up section nearest to the pump. Position the tube in a vertical position to avoid channeling of air through adsorbent section.

8.4 Field Operation:

- Mobilized the pre-calibrated sampling equipment to save the time at the sampling site and fine tuning of the flow should be required.
- Placed the sampling tubes in the breathing zone. The pump and adsorbent tubes are placed on any solid stationary surface.
- Removed the caps of ATD tubes and Cracked the adsorbent tube ends using a glass tube cracker
- To set up the sampling train, Tenax end of the adsorbent tube is open to atmosphere and the Chromosorb back up portion is towards the manifold of the sampler. The manifold is attached to the inlet plug on the pump.
- Adjusted time on the pump to required sample time. The sampling flow rate of 0.5 LPM is constantly maintained at all locations. The total timing of sampling is fixed for 360min.
- Verified regularly the sampling flow using the calibrated rotameter. Recorded the final flow rate on the air sampling data sheet.

8.5 Post Operating Procedure:

- Recorded the sampling time on the air sampling data sheet
- Removed the adsorbent tube from the sampling pump
- Covered the adsorbent tubes with teflon tape followed by Caped adsorbent tubes with plastic caps immediately after sampling. Never use rubber caps.
- Placed the sample in a whirl bag labeled with sample ID Number
- Recorded all applicable information on the air sample data sheet (sample volume, ID number, location of the sampling, date and weather parameters)
- Sampled adsorbent tubes are stored in a cooler box (less than $10^{o}C$) and the maximum storage time is one week from the date of sampling.

8.6 Sample Storage and Preservation:

1. After sampling the identified samples are capped securely.

2. Samples collected in adsorbent tubes should not be kept in warm places or exposed to direct sunlight. After sealed the samples are kept in a cold storage box.
3. Samples are transported immediately after the sampling is over and stored under refrigeration until they are analyzed which were analyzed within two to four days.

8.7 Quality Assurance / Quality Control:

- Data pertaining to the VOCs study are documented on a data sheet
- All instruments are operated in accordance with operating instructions as supplied by the manufacturer.
- Equipment check and calibration activities were carried out before and after sampling.
- For every 20 samples one field blank and lab blank were set aside. These field blanks will be handled in the same manner as the sampling tube (break, seal and transport) except that no air is drawn through the tube.
- At all sampling stations, the samples were collected in ATD method.

8.8 Data Validation:

Results of the quality control samples will be evaluated for contamination. This information will be utilized for quality assessment of the environmental sample.

The process flow chart for VOC sampling in ambient air is given at **Annexure – IIIA & IIIB**

9.0 MONITORING:

9.1 Ambient Air Quality Monitoring:

9.1.1 Selection of Ambient Air Quality Monitoring Locations:

The sampling locations are governed by:

- Objectives of study,
- Instrumentation and method involved availability
- Accessibility of the sampling site,
- Obstruction (tall trees, wall etc.,) free environment which can obstruct the free air flow and can reduce pollutant concentrations in ambient air.
- At a height of minimum 5M from ground level so that the interferences by locally generated pollutants are minimized.
- Consideration of up wind – down wind method.
- Security against loss and tampering of instrument.

The meteorological parameters have been studied and accordingly prevailing wind direction is North West to South East with minimum temperature of 22.4^{o}C and Maximum 39.9^{o}C. The relative humidity was found in the range of 22 – 60% and wind speed is ranging from 0.8m/sec to 2.2 m/s. Meteorological data is given in **Annexure-IV.**

9.1.2 Ambient Air Quality Monitoring (AAQM) Locations at Taloja:

Up wind : (1) Premises of Titan Organics Ltd., T-29, MIDC in the North West direction of industrial area.

Downwind : (2) Premises of Sindhu Organic Ltd., J-61, MIDC in the South East of industrial area.

Cross - wind : (3) Premises of Trans Vision Engineering, M-54, MIDC in North East direction of industrial area.

Cross - wind : (4) Premises of Sanghi Industries in the South West direction of industrial area.

Centre **:** (5) Premises of Dena Bank, MIDC Building (almost in the centre of industrial area).

The Ambient Air Quality Monitoring locations at Taloja is depicted in the MAP at **Annexure- V A**

9.1.2 Ambient Air Quality Monitoring (AAQM) Locations at Mahad:

Up wind : (1) Premises of CETP, Near Collection Tank in the West direction of industrial area.

Downwind : (2) Premises of Pearl Polymers Ltd., in the South side of industrial area.

Cross - wind : (3) Premises of Titan Labs Pvt Ltd., in the North East direction of industrial area.

Cross - wind : (4) Premises of Konkan Guest House in the South West direction of industrial area.

Centre **:** (5) Premises of Perfect Proteins Ltd., (almost in the centre of industrial area).

The Ambient Air Quality Monitoring locations at Mahad is depicted in the MAP at **Annexure- V B**

VOC sampling details viz. Date of sampling, time of sampling, sampling locations, flow rate, sampling duration and volume of air sampled for Taloja and Mahad given in **Annexure- VI (A & B)** respectively.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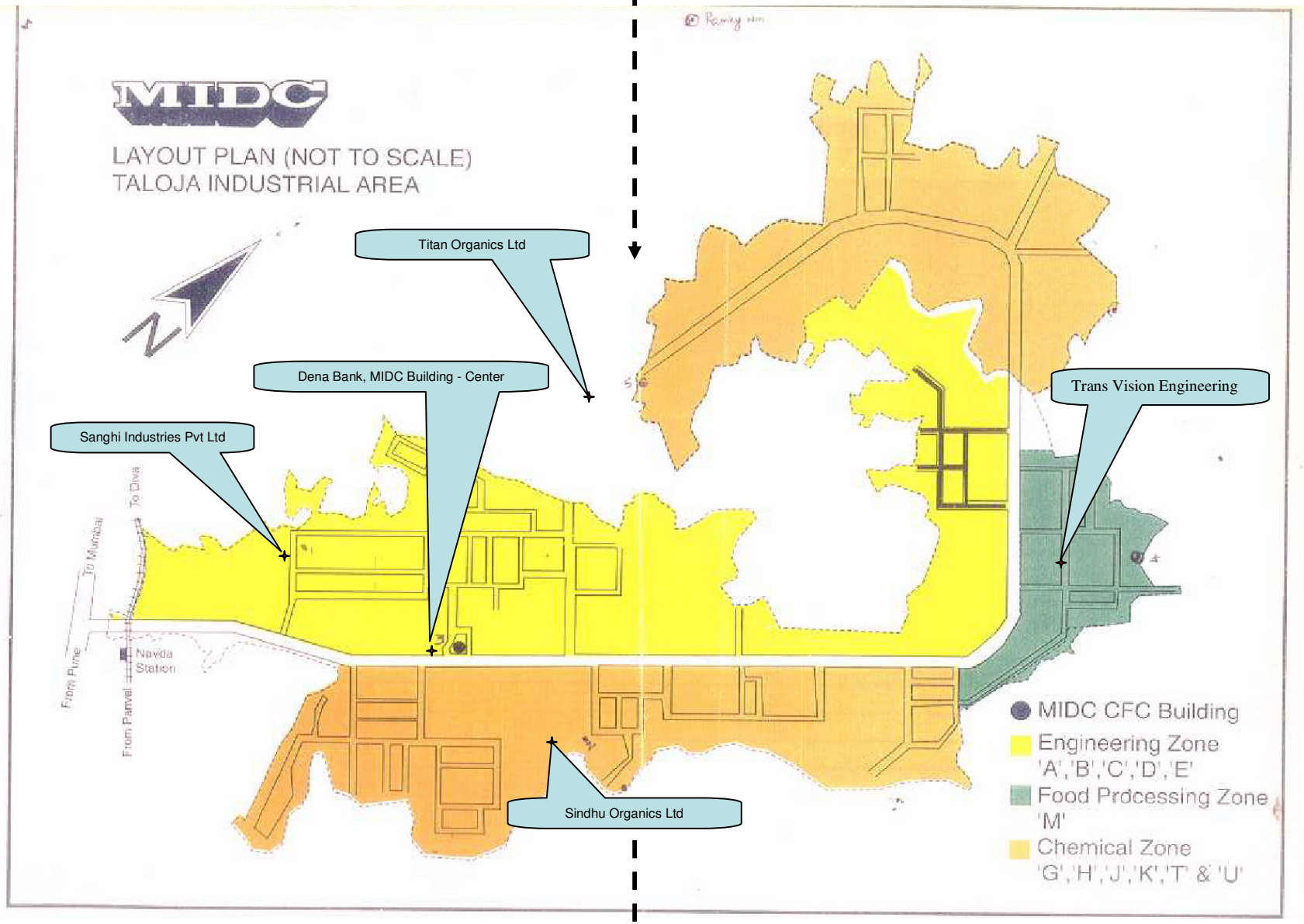
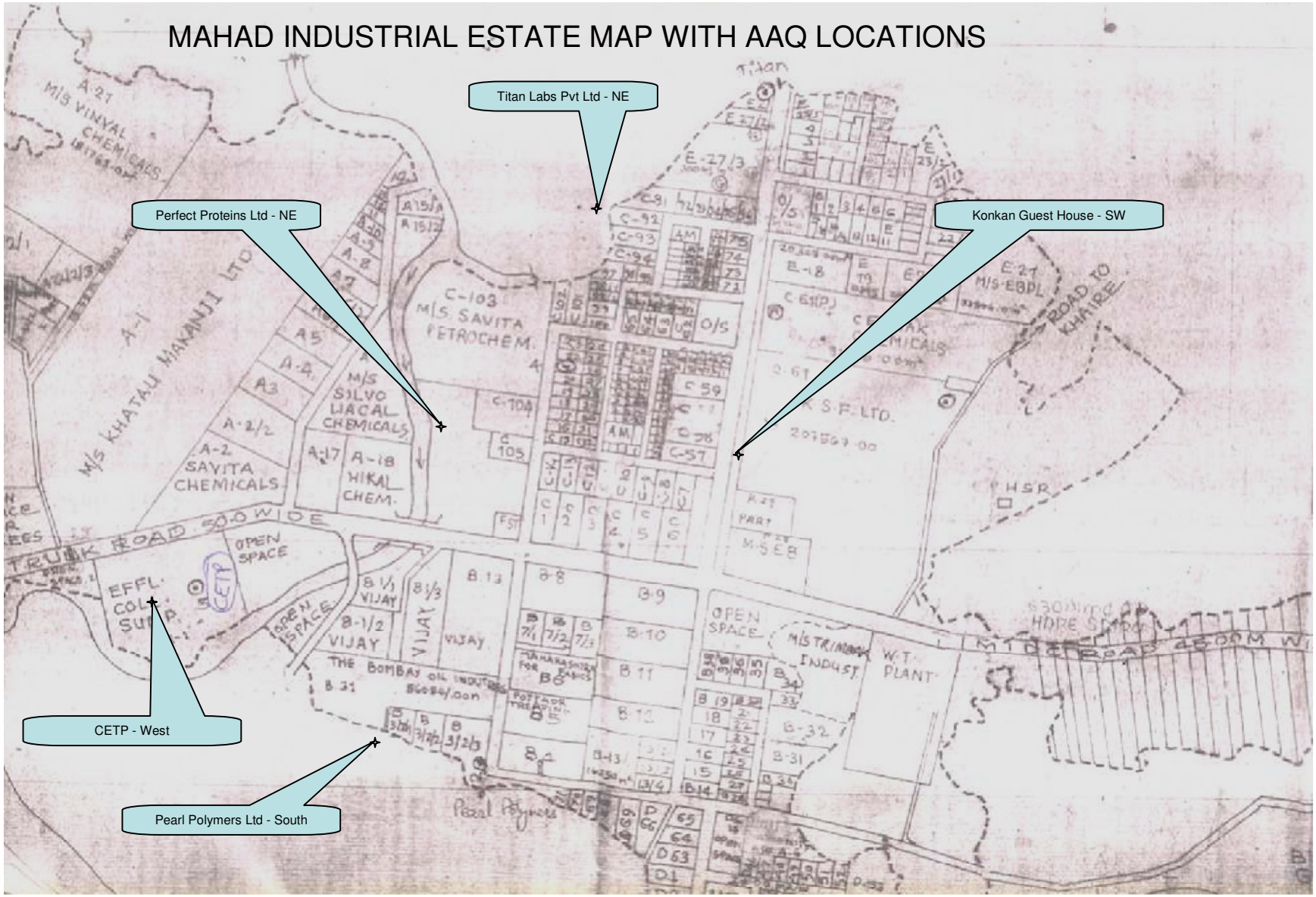

MIDC
LAYOUT PLAN (NOT TO SCALE)
TALOJA INDUSTRIAL AREA
Titan Organics Ltd
Dena Bank, MIDC Building - Center
Sanghi Industries Pvt Ltd
Trans Vision Engineering
Sindhu Organics Ltd
To Diva
To Mumbai
From Pune
From Panvel
Nayda Station
MIDC CFC Building
Engineering Zone 'A','B','C','D','E'
Food Prdcessing Zone 'M'
Chemical Zone 'G','H','J','K','T' & 'U'


MAHAD INDUSTRIAL ESTATE MAP WITH AAQ LOCATIONS
Titan Labs Pvt Ltd - NE
Perfect Proteins Ltd - NE
Konkan Guest House - SW
CETP - West
Pearl Polymers Ltd - South
M/S VINYAL CHEMICALS
M/S KHATAU MAKANJI LTD
C-103 M/S. SAVITA PETROCHEM.
M/S SILVO LIACAL CHEMICALS
A-2 SAVITA CHEMICALS
A-18 HIKAL CHEM.
TRUNK ROAD 50 WIDE
OPEN SPACE
EFFL. COLL. SUMP
CETP
THE BOMBAY OIL INDUSTRIES
M/S EBPL
ROAD TO KHAIRE
M.S.E.B.
H.S.R.
MISTRI MARK INDUST
W.T. PLANT
MIDC ROAD 45.00M WI
Pearl Polymers

9.2 Monitoring at Selected Industries at Taloja and Mahad:

9.2.1 Selection of Industries:

Chemical Industries, mainly Pharmaceuticals, Dyes and Dye Intermediates, Pesticide, use variety of solvents (volatile organic compounds) in their processes. These solvents, as pollutants, come into environment along with air, wastewater, and hazardous waste. Therefore some industries at Taloja and Mahad Industrial Area, from Pharmaceutical, Dyes, Organic, Fine Chemicals, were selected for VOC Monitoring study.

In Pharmaceuticals, Dyes, Organic & Fine Chemicals Units, chemical synthesis (Reaction, Separation, Purification, Drying) and Extractions are the manufacturing phases responsible for significant emission of VOCs. Some VOCs, mostly chlorinated solvents, are known carcinogens and can be identified as Hazardous Air Pollutants. VOC emissions are generated as fugitive from reactor vents, filtering systems in the separation process, solvent vapours from purification tanks, dryers (including loading and unloading operations) and also from valves, tanks, pumps, and other equipments (e.g. centrifuge). VOCs are also emitted from effluent, Hazardous waste collection and treatment units because of carry over of solvents from the processes.

Following Industries were selected for VOC monitoring:

Taloja Industries :

01. M/s HIKAL Ltd., [Pesticide]
02. M/s Asian Paints Ltd., [Chemical]
03. M/s Chemspec Pvt Ltd., [Pharmaceutical & Bulk Drug]

Mahad Industries :

04. M/s Privi Ltd., [Chemical]
05. M/s Astec Life Sciences Ltd., [Fine Chemicals]
06. M/s Anjenaya Biotech [Organic Chemicals]
07. Sandoz Pharma Ltd., [Bulk Drug]
08. Sidharth Colour Chem Ltd., [Dyes & Dye Intermediates]
09. Emmellen Bio-tech Pharma Ltd., [Bulk Drug]

9.2.2 Monitoring at Industries:

Monitoring was carried out in three ways i.e. emission monitoring (Fugitive, Ambient), wastewater and hazardous waste.

Emission monitoring was carried out within the Plant area near reactors, centrifuge, dryers, storage tanks etc for fugitive air emission and in the ambient air in the down wind direction. The samples of raw wastewater (Inlet to ETP) and hazardous wastes (ETP Sludge/ Incinerable waste) were collected to find out the presence as well as concentration of VOCs in the wastewater and hazardous waste which find its way in to the environment along with air emission.

10.0 METHODS FOR ANALYSIS:

10.1 Analysis for Ambient Air Quality & Fugitive Emission Samples:

Method EPA TO-17 (Active Thermal Desorption) methods of analysis are used for Ambient Air Quality and Fugitive emission samples. EPA TO-17 Method is described at **Annexure- VII.** This annexure includes method validation also.

10.2 Analysis for Water & Hazardous Waste Samples:

EPA Method 5035A/5035C/8260B is adopted for the analysis of VOCs in wastewater and hazardous waste samples which is described in **Annexure - VIII**.

One Set of Chromatogram is given at **Annexure-IX**

11.0 RESULTS & DISCUSSIONS:

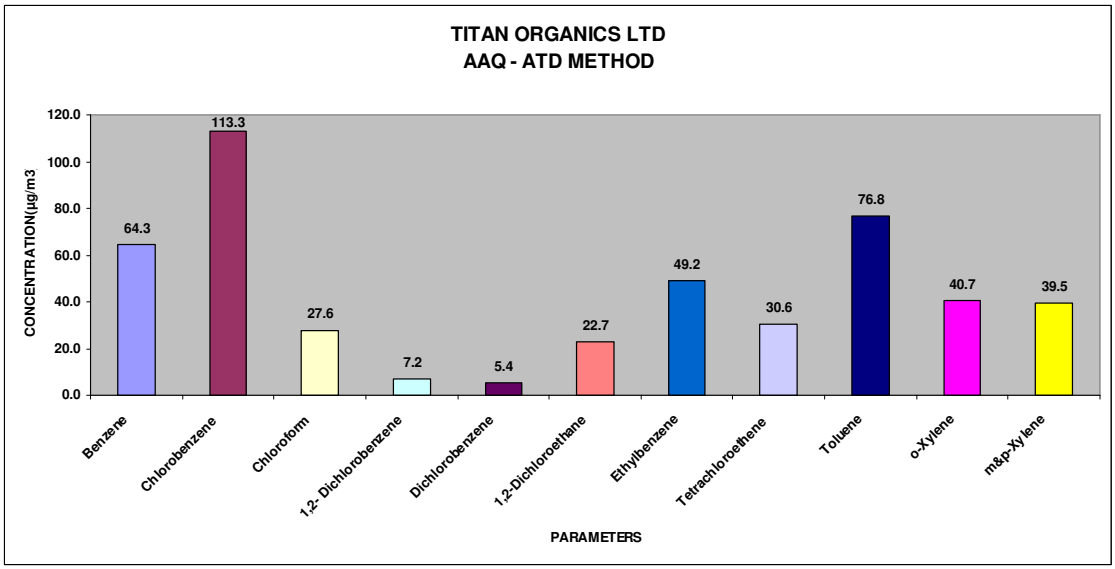
11.1 Results & Discussion for Ambient Air Quality Monitoring:-

11.1.1 Ambient Air Quality Monitoring and Analysis at Taloja:

Station 1: Premises of Titan Organics Ltd., T-29, MIDC in the North West direction of industrial area.

This station is located in up-wind direction of the industrial estate. 11 VOCs are found at the location. The average concentration of total VOC was found to be 477.3 $\mu g/m^3$ by ATD method. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

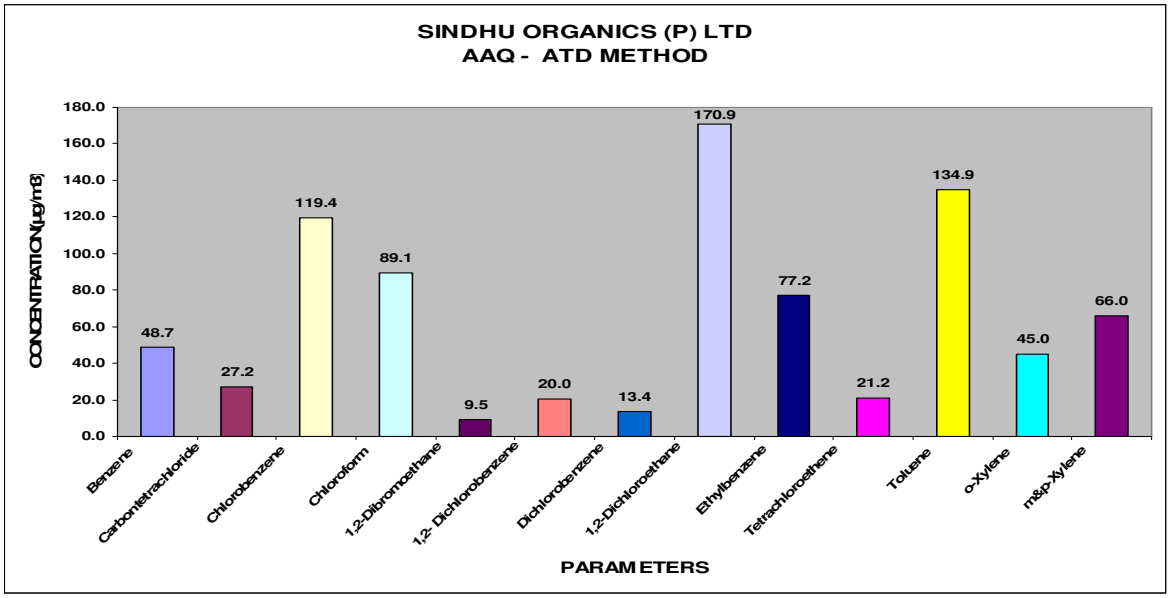
SAMPLING AREA : TALOJA					
SAMPLING LOCATION :TITAN ORGANICS LTD					
SAMPLLING LOCATION: TOP OF THE SECURITY GATE					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :24.02.09 - 25.02.09					
S.NO	**PARAMETERS**	**24.02.09 (1.15pm-7.15pm)**	**24 & 25.02.09 (9.40pm-3.40am)**	**25.02.09 (03.50am-9.50am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	54.7	15.3	122.8	64.3
2	Chlorobenzene	260.9	17.8	61.3	113.3
3	Chloroform	10.3	67.0	5.6	27.6
4	1,2- Dichlorobenzene	20.0	0.0	1.4	7.2
5	Dichlorobenzene	16.1	0.0	0.0	5.4
6	1,2-Dichloroethane	14.4	45.6	8.2	22.7
7	Ethylbenzene	114.5	8.3	24.9	49.2
8	Tetrachloroethene	89.5	1.1	1.3	30.6
9	Toluene	89.5	69.0	72.0	76.8
10	o-Xylene	106.5	4.3	11.3	40.7
11	m&p-Xylene	94.5	10.2	13.7	39.5
	Total VOC =	**870.8**	**238.6**	**322.5**	**477.3**



Station 2: Premises of Sindhu Organic Ltd., J-61, MIDC in the South East of industrial area.

The AAQ station-2 is identified as down-wind station as per prevailing wind direction at the time of the study. 13 VOCs were found at this sampling location. The average concentration of total VOC was found to be 824.4µg/m^3 by ATD method. Benzene, Chlorobenzene, Toluene and Xylene having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations. The concentration values at this station found to be higher than station-1 because of down-wind location.

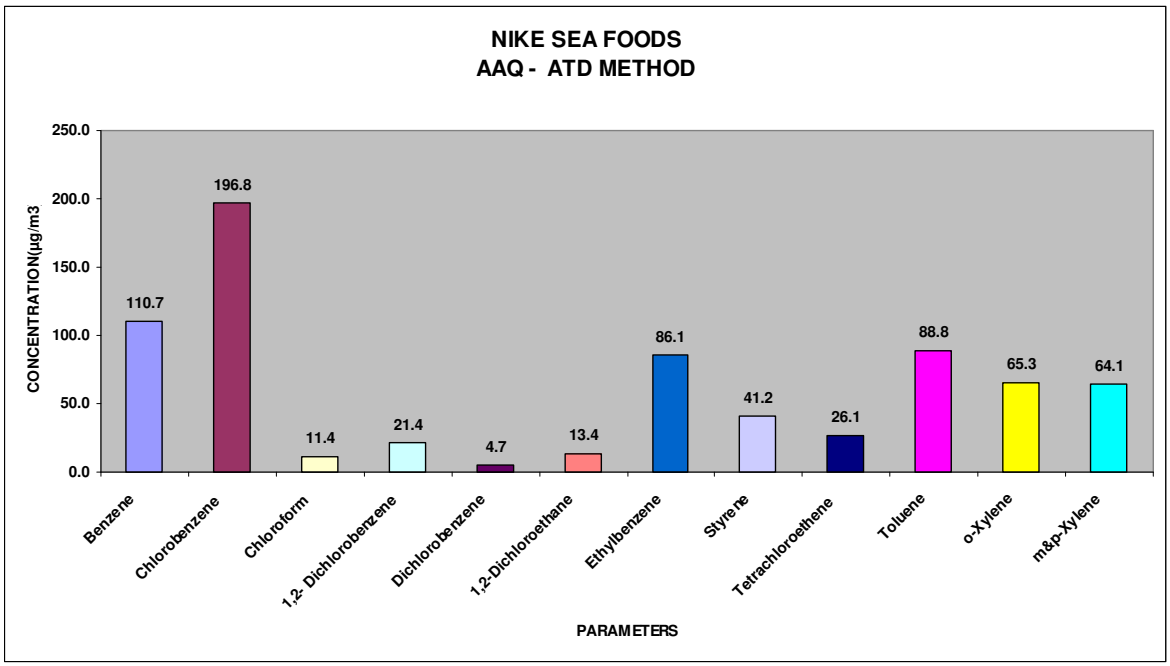
SAMPLING AREA : TALOJA					
SAMPLING LOCATION :SINDHU ORGANICS (P) LTD.,					
SAMPLLING LOCATION: TOP OF THE PROCESS PLANT					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :24.02.09 - 25.02.09					
S.NO	**PARAMETERS**	**24.02.09 (11.40am-5.40pm)**	**24 & 25.02.09 (9.10pm-3.10am)**	**25.02.09 (03.20am-9.20am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	18.9	55.1	72.0	48.7
2	Carbontetrachloride	BDL	66.0	15.4	27.2
3	Chlorobenzene	111.0	125.5	121.5	119.4
4	Chloroform	9.7	233.4	24.3	89.1
5	1,2-Dibromoethane	2.5	25.9	0.2	9.5
6	1,2- Dichlorobenzene	BDL	50.1	11.0	20.0
7	Dichlorobenzene	BDL	31.1	15.3	13.4
8	1,2-Dichloroethane	16.6	484.5	11.5	170.9
9	Ethylbenzene	82.9	44.8	104.0	77.2
10	Tetrachloroethene	3.0	48.3	12.4	21.2
11	Toluene	89.1	208.2	107.2	134.9
12	o-Xylene	27.6	15.2	92.3	45.0
13	m&p-Xylene	71.1	42.4	84.6	66.0
Total VOC =		**425.1**	**1430.5**	**671.7**	**842.4**



Station 3 : Premises of NIKE Sea Foods, MIDC in North East direction of industrial area.

The AAQ station-3 is identified as cross-wind station as per prevailing wind direction at the time of the study. 12 VOCs was found at this location. These numbers include VOCs detected by the ATD method. The average concentration of VOC was found to be 730.0µg/m^3 by ATD method. Benzene, Chlorobenzene, Ethylbenzene, Toluene and Xylene are having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

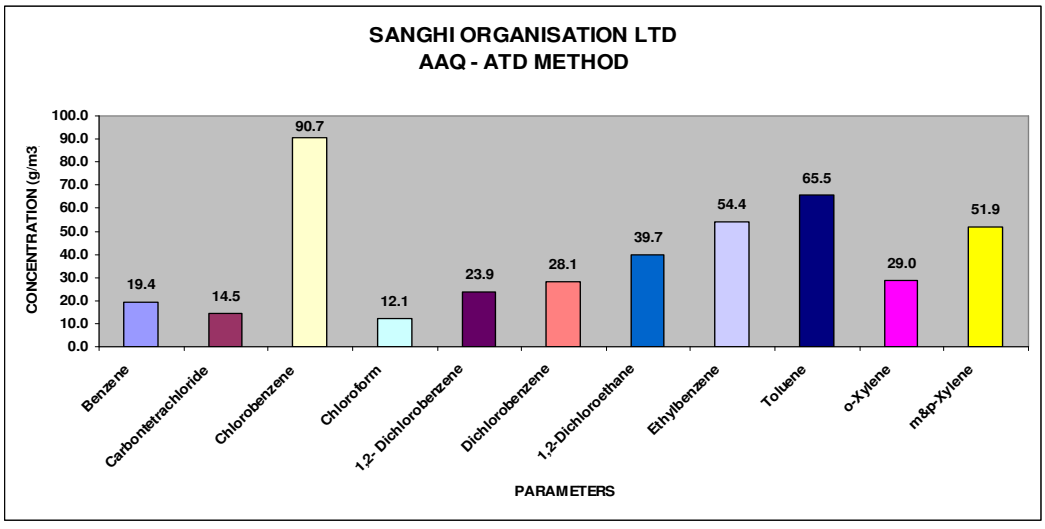
SAMPLING AREA : TALOJA					
SAMPLING LOCATION :NIKE SEA FOODS					
SAMPLLING LOCATION: TOP OF THE PROCESS BUILDING					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :24.02.09 - 25.02.09					
S.NO	**PARAMETERS**	**24.02.09 (12.40pm-6.40pm)**	**24 & 25.02.09 (9.30pm-3.30am)**	**25.02.09 (03.40am-9.40am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	137.1	156.0	39.0	110.7
2	Chlorobenzene	132.5	151.4	306.5	196.8
3	Chloroform	BDL	28.1	5.3	11.4
4	1,2- Dichlorobenzene	11.6	15.4	37.2	21.4
5	Dichlorobenzene	BDL	BDL	23.9	4.7
6	1,2-Dichloroethane	BDL	32.6	7.7	13.4
7	Ethylbenzene	20.3	101.4	136.6	86.1
8	Styrene	14.3	5.8	103.4	41.2
9	Tetrachloroethene	BDL	24.2	53.6	26.1
10	Toluene	53.0	113.6	99.7	88.8
11	o-Xylene	10.2	62.0	123.7	65.3
12	M&p-Xylene	16.3	74.8	101.1	64.1
Total VOC =		**390.7**	**761.7**	**1037.7**	**730.0**



Station 4: Premises of Sanghi Industries in the South West direction of industrial area.

The AAQ station-4 is identified as cross-wind station as per prevailing wind direction at the time of the study. 11 VOCs was found at this location. The average concentration of total VOC was found to be 429.1µg/m^3 by ATD method. Chlorobenzene, Dichlorobenzene, Ethylbenzene, Toluene and Xylene are having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

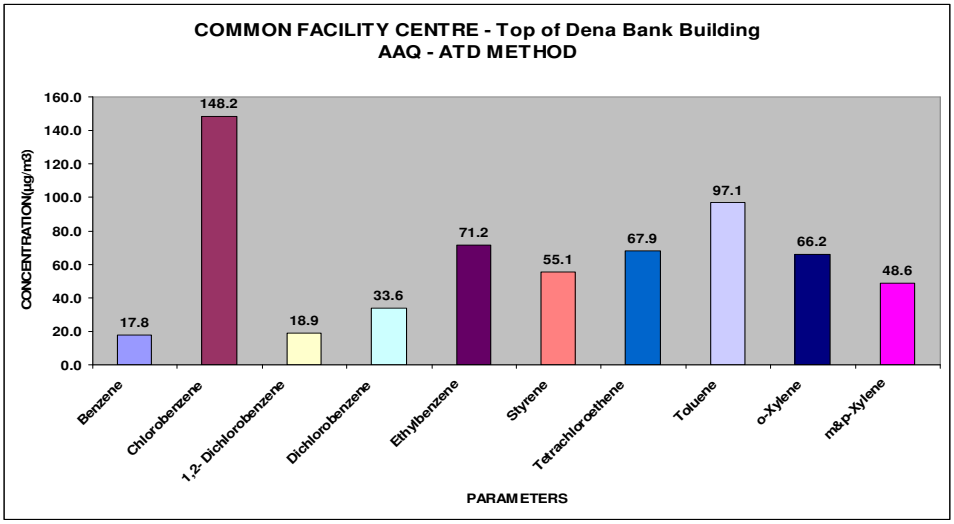
SAMPLING AREA : TALOJA					
SAMPLING LOCATION :SANGHI ORGANISATION					
SAMPLLING LOCATION: TOP OF THE ADMIN BUILDING					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :24.02.09 - 25.02.09					
S.NO	**PARAMETERS**	**24.02.09 (10.40am-4.40pm)**	**24 & 25.02.09 (9.00pm-3.00am)**	**25.02.09 (03.10am-9.10am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	55.0	2.8	0.3	19.4
2	Carbontetrachloride	43.4	0.0	0.0	14.5
3	Chlorobenzene	84.3	150.3	37.5	90.7
4	Chloroform	36.3	0.0	0.0	12.1
5	1,2- Dichlorobenzene	56.1	15.3	0.2	23.9
6	Dichlorobenzene	34.8	35.8	13.6	28.1
7	1,2-Dichloroethane	117.2	2.0	0.0	39.7
8	Ethylbenzene	14.8	83.9	64.4	54.4
9	Toluene	139.0	57.6	0.0	65.5
10	o-Xylene	9.5	46.8	30.7	29.0
11	m&p-Xylene	16.3	70.4	69.1	51.9
Total VOC =		**606.6**	**464.9**	**215.8**	**429.1**



Station 5: Premises of Dena Bank, MIDC Building (centre of industrial area).

The AAQ station-5 is identified as centre of the industrial estate. 10 VOCs was found at this location. The average concentration of total VOC was found to be 624.7 µg/m^3 by ATD method. Chlorobenzene, Ethylbenzene, Toluene, Styrene and Xylene are having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

SAMPLING AREA : TALOJA					
SAMPLING LOCATION :COMMON FACILITY CENTRE					
SAMPLLING LOCATION: TOP OF THE DEENA BANK					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :24.02.09 - 25.02.09					
S.NO	**PARAMETERS**	**24.02.09 (11.50am-5.50pm)**	**24 & 25.02.09 (9.20pm-3.20am)**	**25.02.09 (03.30am-9.30am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	26.9	7.4	19.2	17.8
2	Chlorobenzene	175.8	10.2	258.8	148.2
3	1,2- Dichlorobenzene	41.2	2.5	13.0	18.9
4	Dichlorobenzene	94.4	6.3	0.0	33.6
5	Ethylbenzene	86.2	0.5	126.9	71.2
6	Styrene	35.7	0.0	129.7	55.1
7	Tetrachloroethene	27.4	0.0	176.4	67.9
8	Toluene	72.8	33.6	184.8	97.1
9	o-Xylene	77.9	3.4	117.1	66.2
10	m&p-Xylene	50.3	0.4	95.2	48.6
Total VOC =		**688.7**	**64.3**	**1121.1**	**624.7**



AMBIENT AIR QUALITY MONITORING ANALYSIS REPORT: TALOJA

Station No	Location & Date of Air Sampling	(Pollutants in micro gram / cubic meters) VOCs Concentration by ATD		
1	Premises of Titan Organics Ltd., T-29, MIDC in the North West direction of industrial area. **(24/02/09 – 25/02/09)**	870.8 (13:15 Hrs - 19:15Hrs)	238.6 (21:40 Hrs - 03:40 Hrs)	322.5 (03:50 Hrs - 09:50Hrs)
2	Premises of Sindhu Organic Ltd., J-61, MIDC in the South East of industrial area. **(24/02/09 – 25/02/09)**	425.1 (11:40 Hrs - 17:40Hrs)	1430.5 (21:10 Hrs - 03:10Hrs)	671.7 (03:20 Hrs - 09:20Hrs)
3	Premises of NIKE Sea Foods, MIDC in North East direction of industrial area. **(24/02/09 – 25/02/09)**	397.2 (12:40 Hrs – 18:40Hrs)	765.2 (21:40 Hrs – 03:30Hrs)	1037.7 (03:40 Hrs – 09:40Hrs)
4	Premises of Sanghi Industries in the South West direction of industrial area. **(24/02/09 – 25/02/09)**	606.6 (10:40 Hrs – 16:40Hrs)	464.9 (21:00 Hrs – 03:00Hrs)	215.8 (03:10 Hrs – 09:10Hrs)
5	Premises of Dena Bank, MIDC Building (almost in the centre of industrial area). **(24/02/09 – 25/02/09)**	688.7 (11:50 Hrs – 17.50 Hrs)	64.3 (21:20 Hrs - 03:20Hrs)	1121.1 (3:30 Hrs – 09:30Hrs)

A A Q M Station in **up wind direction** : Station-1
A A Q M Station in **down wind direction** : Station-2
A A Q M Stations in **Cross wind direction** : Station-3 & 4
A A Q M Stations in **Center of Industrial Estate** : Station-5

Land Use Classification	Industrial Zone
Sky Conditions	Sunny Sky
Ambient Temperature	32°C to 39°C
Predominant Wind Directions	North West to South East

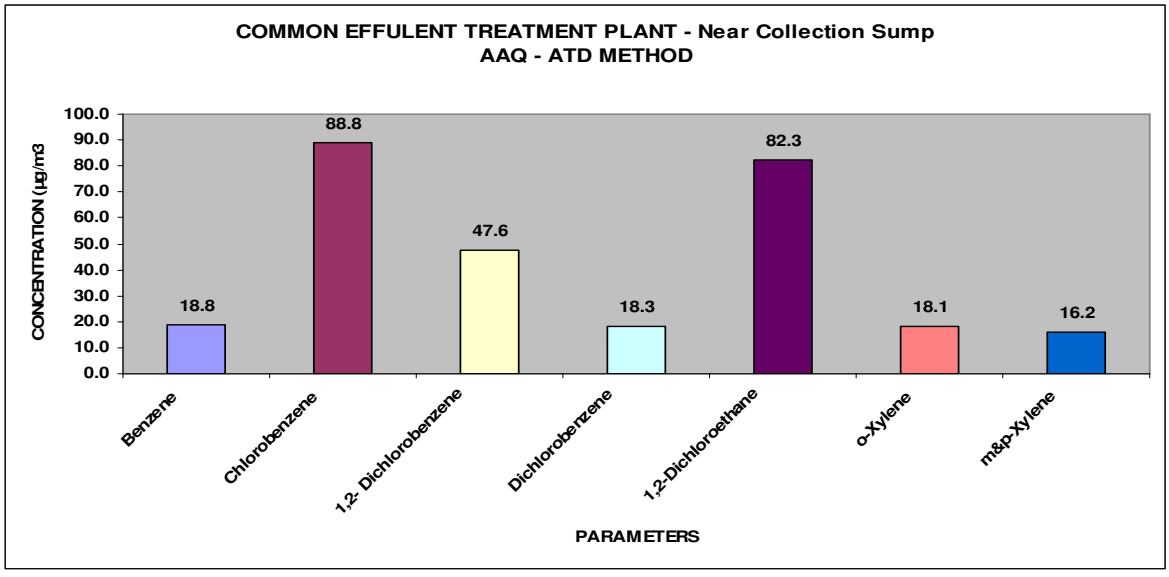
Analytical Methodology Adopted: EPA TO-17

11.1.2 Ambient Air Quality Monitoring and Analysis at Mahad:

Station 1: Premises of CETP, Near Collection Tank in the West direction of industrial area.

This station is located in up-wind direction of the industrial estate. 7 VOCs are found at the location. The average concentration of total VOC was found to be 290.2 µg/m^3 by ATD method. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

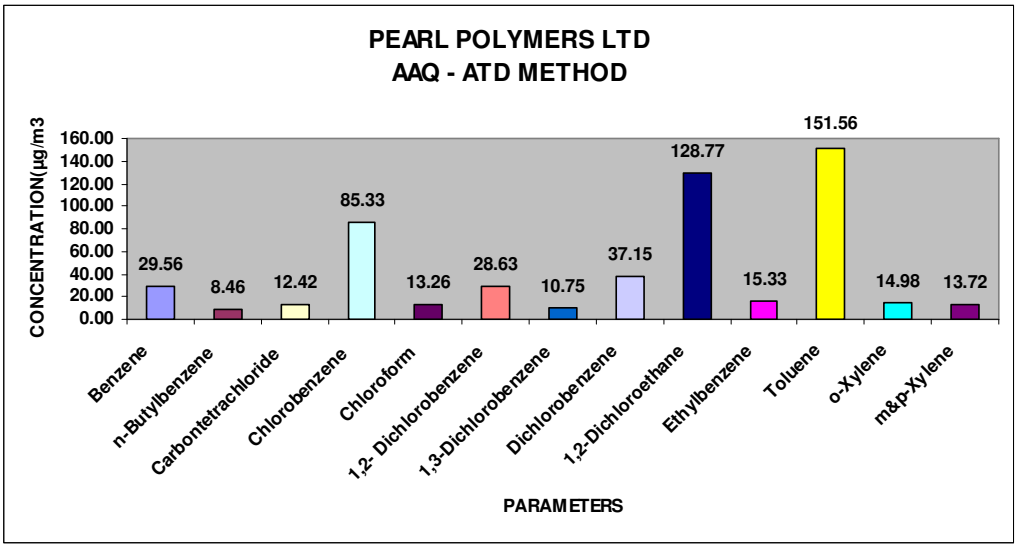
SAMPLING AREA : MIDC MAHAD					
SAMPLING LOCATION :COMMON EFFLUENT TREATMENT PLANT					
SAMPLLING LOCATION: NEAR EFFULENT COLLECTION TANK					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :26.02.09 - 27.02.09					
S.NO	**PARAMETERS**	**26.02.09 (12.30pm-6.30pm)**	**26 & 27.02.09 (8.50pm-2.50am**	**27.02.09 (03.00am-9.00am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	16.8	7.5	32.2	18.8
2	Chlorobenzene	36.6	123.9	105.9	88.8
3	1,2- Dichlorobenzene	BDL	117.2	25.5	47.6
4	Dichlorobenzene	BDL	40.1	21.3	18.3
5	1,2-Dichloroethane	31.2	41.2	174.5	82.3
6	o-Xylene	2.8	31.0	20.6	18.1
7	M&p-Xylene	1.4	29.4	17.9	16.2
Total VOC =		**82.4**	**390.3**	**398.0**	**290.2**



Station 2: Premises of Pearl Polymers Ltd., in the South side of industrial area.

The AAQ station-2 is identified as down-wind station as per prevailing wind direction at the time of the study. 13 VOCs was found at this sampling location. The average concentration of VOC was found to be 550.0µg/m^3 by ATD method. Benzene, Chlorobenzene, Toluene and Xylene having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations. The concentration values at this station found to be higher than station-1 because of down-wind location.

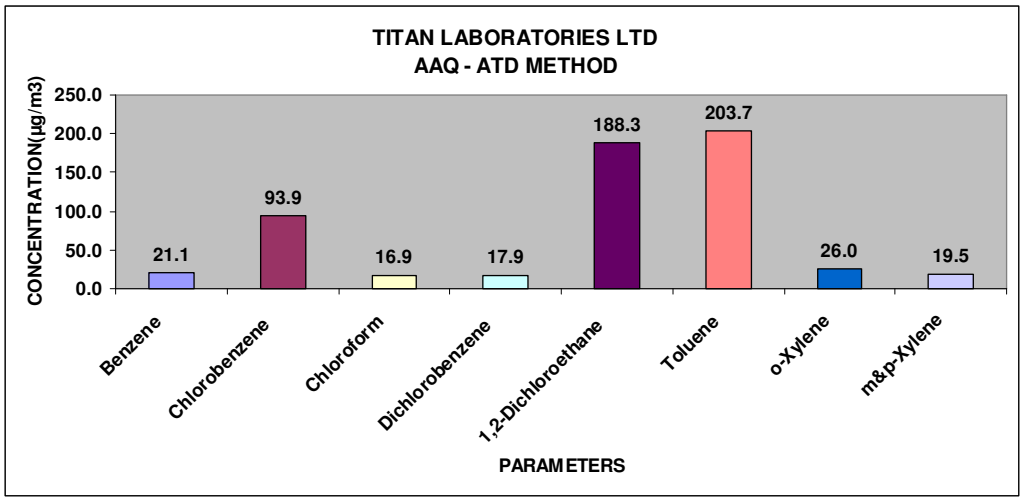
SAMPLING AREA : MIDC MAHAD					
SAMPLING LOCATION :PEARL POLYMERS LTD					
SAMPLLING LOCATION: TOP OF THE ADMIN BUILDING					
SAMPLE DESCRIPTION : AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :26.02.09 - 27.02.09					
S.NO	**PARAMETERS**	**26.02.09 (11.50am-5.50pm)**	**26 & 27.02.09 (8.40pm-2.40am**	**27.02.09 (02.50am-8.50am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	10.201	68.573	9.915	29.56
2	n-Butylbenzene	BDL	BDL	25.048	8.46
3	Carbontetrachloride	BDL	36.921	BDL	12.42
4	Chlorobenzene	62.603	123.540	69.836	85.33
5	Chloroform	BDL	36.343	2.564	13.26
6	1,2- Dichlorobenzene	1.403	78.870	5.611	28.63
7	1,3-Dichlorobenzene	BDL	32.258	BDL	10.75
8	Dichlorobenzene	7.076	66.469	37.909	37.15
9	1,2-Dichloroethane	8.832	312.584	64.898	128.77
10	Ethylbenzene	11.609	21.838	12.552	15.33
11	Toluene	79.296	268.946	106.437	151.56
12	o-Xylene	16.873	15.812	12.243	14.98
13	m&p-Xylene	8.175	22.405	10.577	13.72
Total VOC =		**207.269**	**1084.560**	**357.927**	**549.919**



Station 3 : Premises of Titan Labs Pvt Ltd., in the East direction of industrial area.

The AAQ station-3 is identified as cross-wind station as per prevailing wind direction at the time of the study. 8 VOCs was found at this location. The average concentration of total VOC was found to be 587.4 µg/m^3 by ATD method. Benzene, Chlorobenzene, Ethylbenzene, Toluene and Xylene are having pre-dominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

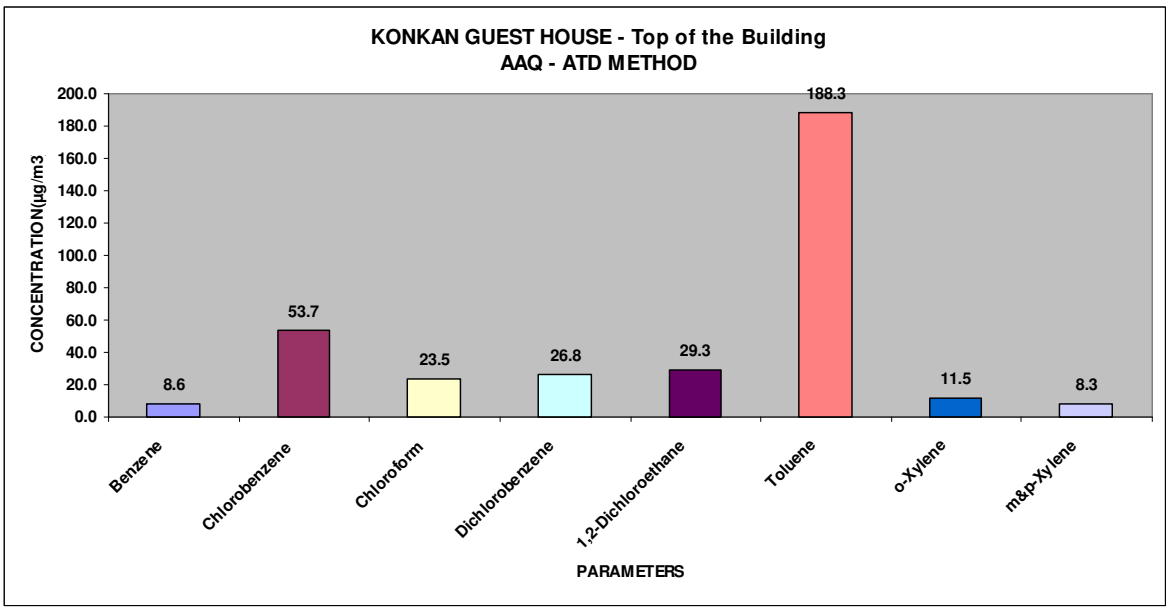
SAMPLING AREA : MIDC MAHAD					
SAMPLING LOCATION :TITAN LABORATORIES LTD					
SAMPLLING LOCATION: TOP OF THE ADMIN BUILDING					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :26.02.09 - 27.02.09					
S.NO	**PARAMETERS**	**26.02.09 (11.30am-5.30pm)**	**26 & 27.02.09 (8.30pm-2.30am**	**27.02.09 (02.40am-8.40am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	1.1	32.3	30.0	21.1
2	Chlorobenzene	53.9	99.3	128.4	93.9
3	Chloroform	0.5	35.0	15.2	16.9
4	Dichlorobenzene	17.2	0.0	36.5	17.9
5	1,2-Dichloroethane	5.9	355.5	203.6	188.3
6	Toluene	63.1	185.2	362.9	203.7
7	o-Xylene	17.9	10.4	49.8	26.0
8	m&p-Xylene	9.1	10.0	39.6	19.5
	Total VOC =	**168.6**	**727.7**	**865.9**	**587.4**



Station 4: Premises of Sanghi Industries in the South West direction of industrial area.

The AAQ station-3 is identified as cross-wind station as per prevailing wind direction at the time of the study. 8 VOCs was found at this location. These numbers include VOCs detected by the ATD method. The average concentration of VOC was found to be 350.0µg/m^3 by ATD method. Chlorobenzene, Dichlorobenzene, 1,2-Dichloroethane, Toluene and Chloroform are having predominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

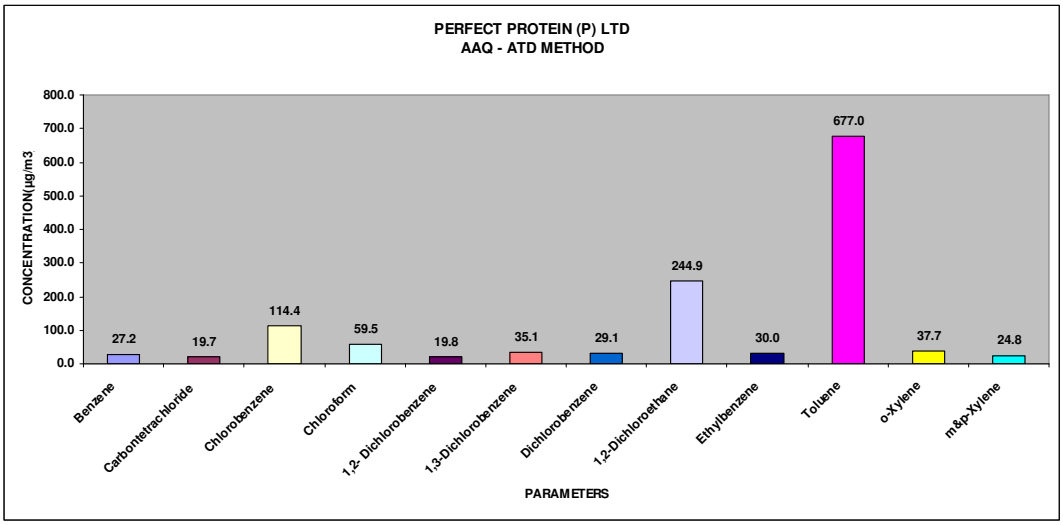
SAMPLING AREA : MIDC MAHAD					
SAMPLING LOCATION :KONKAN GUEST HOUSE					
SAMPLLING LOCATION: TOP OF THE GUEST HOUSE					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :26.02.09 - 27.02.09					
S.NO	**PARAMETERS**	**26.02.09 (1.50pm-7.50pm)**	**26 & 27.02.09 (9.10pm-3.10am)**	**27.02.09 (03.20am-9.20am)**	**AVERAGE RESULTS (µg/m3)**
1	Benzene	7.5	11.9	6.3	8.6
2	Chlorobenzene	80.8	6.7	73.5	53.7
3	Chloroform	16.8	51.6	2.1	23.5
4	Dichlorobenzene	37.2	BDL	46.7	26.8
5	1,2-Dichloroethane	32.9	45.0	10.1	29.3
6	Toluene	120.9	90.8	353.3	188.3
7	o-Xylene	14.7	BDL	19.9	11.5
8	M&p-Xylene	7.3	BDL	17.6	8.3
Total VOC =		**318.1**	**202.4**	**529.4**	**350.0**



Station 5: Premises of Perfect Proteins Ltd., (almost in the centre of industrial area).

The AAQ station-5 is identified as centre of the industrial estate. 12 VOCs was found at this location. These numbers include VOCs detected by ATD method. The average concentration of VOC was found to be 1319.3 µg/m^3 by ATD method. Chlorobenzene, Chloroform, 1,2 – Dichloroethane, Toluene and Xylene are having predominant presence among other VOCs at this location. Inversion effect and low wind velocity during night and early morning hours showed higher concentration than day time concentrations.

SAMPLING AREA : MIDC MAHAD					
SAMPLING LOCATION :PERFECT PROTEIN(P) LTD					
SAMPLLING LOCATION: TOP OF THE LAB BUILDING					
SAMPLING DESCRIPTION: AMBIENT AIR- VOC MONITORING					
DATE OF SAMPLING :26.02.09 - 27.02.09					
S.NO	**PARAMETERS**	**26.02.09 (12.50pm-6.50pm)**	**26 & 27.02.09 (9.00pm-3.00am)**	**27.02.09 (03.10am-9.10am)**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	51.2	19.0	11.4	27.2
2	Carbon tetrachloride	55.0	3.5	0.7	19.7
3	Chlorobenzene	104.6	112.6	126.0	114.4
4	Chloroform	160.3	15.6	2.6	59.5
5	1,2- Dichlorobenzene	42.7	13.5	3.3	19.8
6	1,3-Dichlorobenzene	15.5	89.9	0.0	35.1
7	Dichlorobenzene	31.9	17.6	37.9	29.1
8	1,2-Dichloroethane	262.5	435.3	37.0	244.9
9	Ethyl benzene	9.6	65.3	15.2	30.0
10	Toluene	188.3	1533.8	308.8	677.0
11	o-Xylene	11.5	81.0	20.4	37.7
12	m&p-Xylene	10.5	49.4	14.5	24.8
Total VOC =		**943.7**	**2436.5**	**577.7**	**1319.3**



AMBIENT AIR QUALITY MONITORING ANALYSIS REPORT: MAHAD

Station No	Location & Date of Air Sampling	(Pollutants in micro gram / cubic meters) VOCs Concentration by ATD		
1	Premises of CETP, Near Collection Tank in the West direction of industrial area. **(26/02/09 – 27/02/09)**	88.7 (12:30 Hrs - 18:30Hrs)	390.3 (20:50 Hrs - 02:50 Hrs)	398.0 (03:00 Hrs - 09:00Hrs)
2	Premises of Pearl Polymers Ltd., in the South side of industrial area. **(26/02/09 – 27/02/09)**	207.3 (11:50 Hrs - 17:50Hrs)	1084.6 (20:40 Hrs - 02:40Hrs)	357.9 (02:50 Hrs - 08:50Hrs)
3	Premises of Titan Labs Pvt Ltd., in the North East direction of industrial area. **(26/02/09 – 27/02/09)**	168.6 (11:30 Hrs – 17:30Hrs)	727.7 (20:30 Hrs – 02:30Hrs)	865.9 (02:40 Hrs – 08:40Hrs)
4	Premises of Konkan Guest House in the South West direction of industrial area. **(26/02/09 – 27/02/09)**	318.1 (13:50 Hrs – 19:50Hrs)	202.4 (21:10 Hrs – 03:10Hrs)	529.4 (03:20 Hrs – 09:20Hrs)
5	Premises of Perfect Proteins Ltd., (almost in the centre of industrial area). **(26/02/09 – 27/02/09)**	943.7 (12:50 Hrs – 18.50 Hrs)	2436.5 (21:00 Hrs - 03:00Hrs)	577.7 (3:10 Hrs – 09:10Hrs)

A A Q M Station in **up wind direction** : Station-1
A A Q M Station in **down wind direction** : Station-2
A A Q M Stations in **Cross wind direction** : Station-3 & 4
A A Q M Stations in **Center of Industrial Estate** : Station-5

Land Use Classification	Industrial Zone
Sky Conditions	Sunny Sky
Ambient Temperature	32^{o}C to 39^{o}C
Predominant Wind Directions	North East to South West

Analytical Methodology Adopted: EPA TO-17

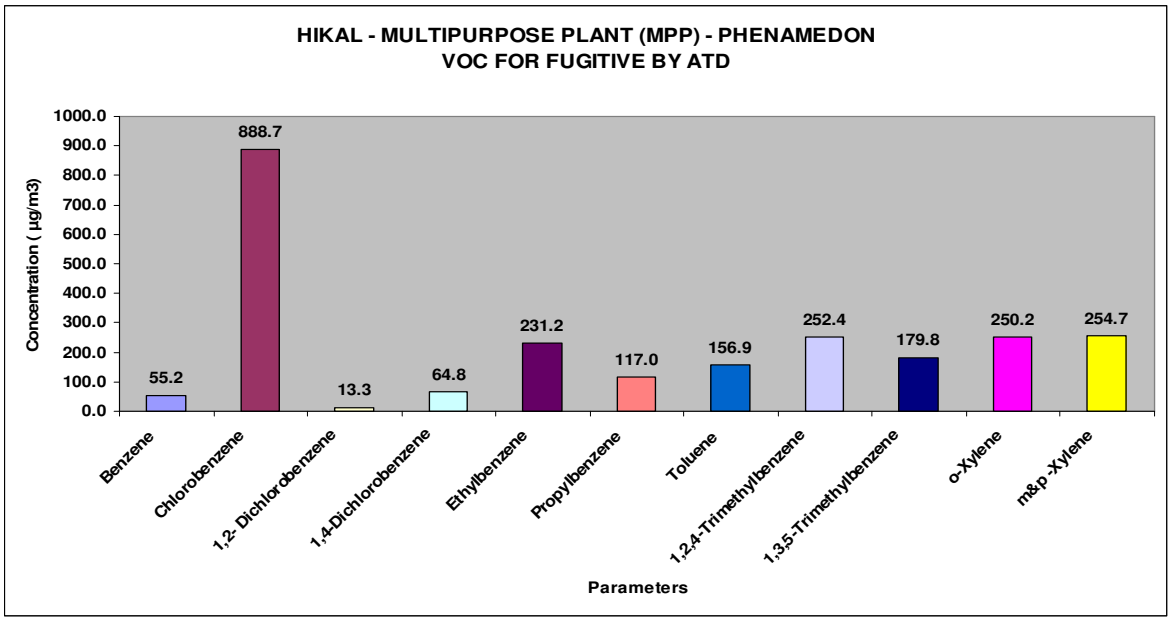
11.2 Result of Monitoring at Industries at Taloja:

11.2.1 M/s Hikal Ltd.,

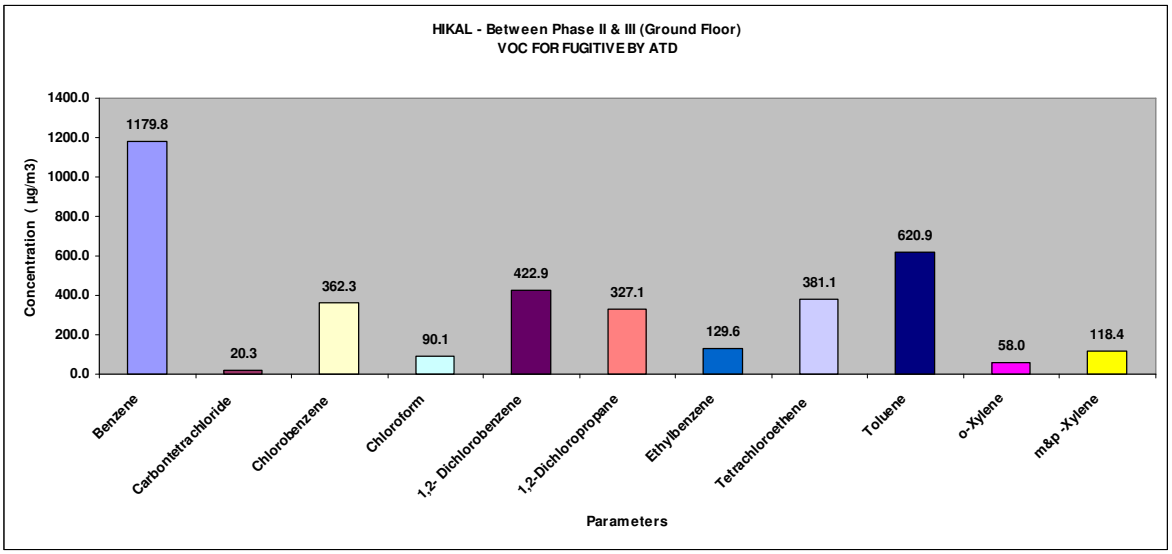
- Pesticide Industry
- Major Products: Phenamedon, ODBC etc.,
- Major Solvents: Monochloro Benzene, Xylene, Toluene
- Date of sampling : 25.02.09

Samples of fugitive emissions, wastewater and hazardous waste were collected from the unit and analysed for VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in the range of 664.8 to 3710.5 $\mu g/m^3$. The highest concentration was found at the locations between Phase-II and Phase-III.

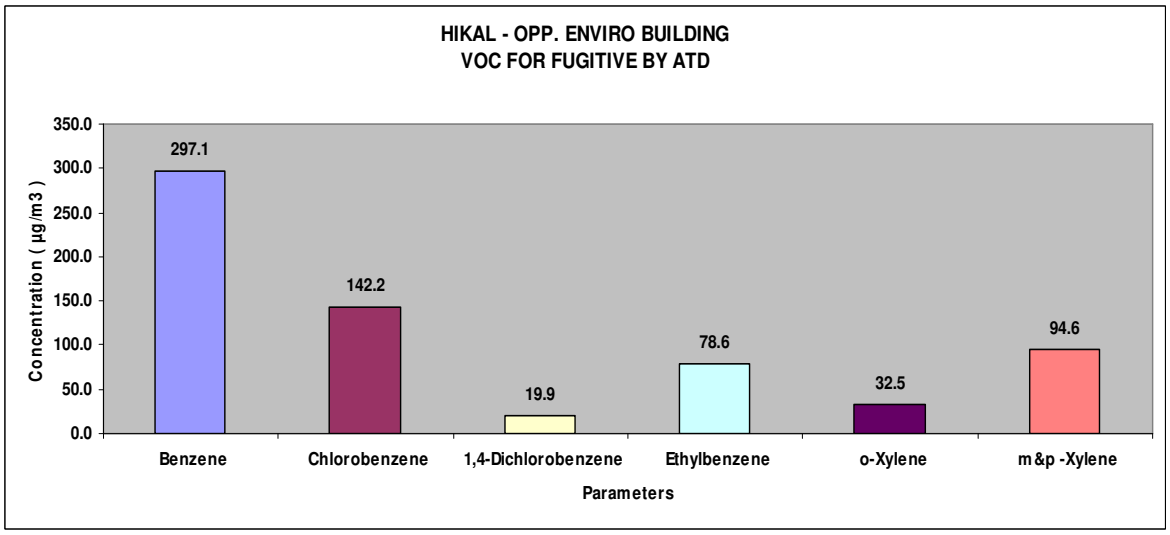
Sampling Area : MIDC , TALOJA		
Sampling Location : MPP - 19m MCB		
Sampling Site : Hikal		
Sampling Date : 25.02.09		
S.No	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	55.2
2	Chlorobenzene	888.7
3	1,2- Dichlorobenzene	13.3
4	1,4-Dichlorobenzene	64.8
5	Ethylbenzene	231.2
6	Propylbenzene	117.0
7	Toluene	156.9
8	1,2,4-Trimethylbenzene	252.4
9	1,3,5-Trimethylbenzene	179.8
10	o-Xylene	250.2
11	m&p –Xylene	254.7
Total VOC =		**2464.2**



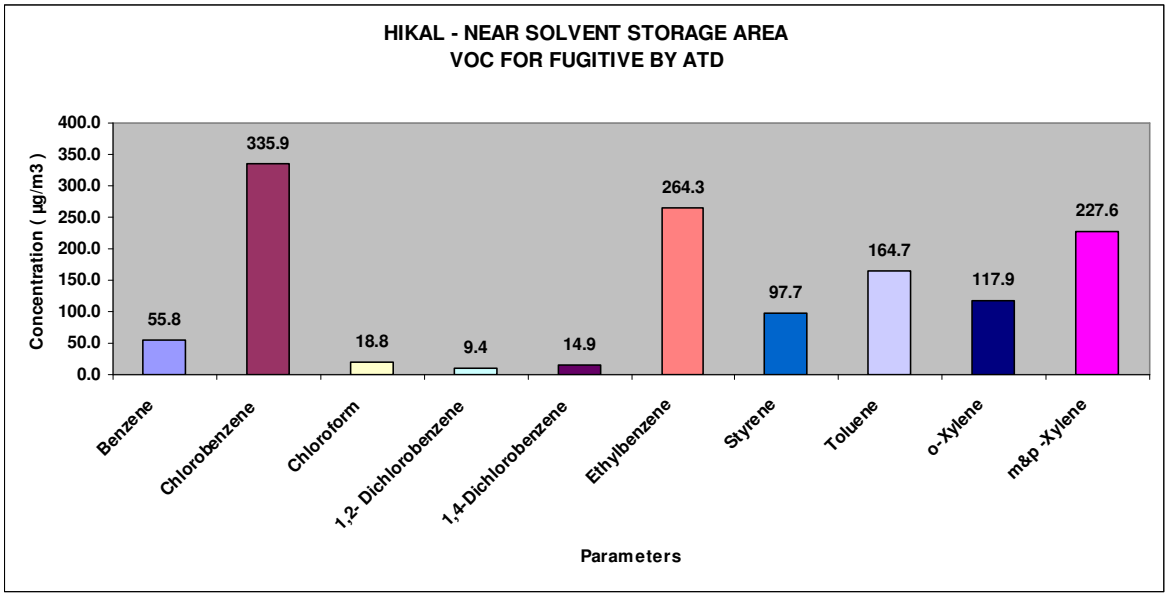
Sampling Area : MIDC , TALOJA		
Sampling Location : Between Phase-II & Phase –III		
Sampling Date : 25.02.09		
S.No	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	1179.8
2	Carbontetrachloride	20.3
3	Chlorobenzene	362.3
4	Chloroform	90.1
5	1,2- Dichlorobenzene	422.9
6	1,2-Dichloropropane	327.1
7	Ethylbenzene	129.6
8	Tetrachloroethene	381.1
9	Toluene	620.9
10	o-Xylene	58.0
11	M&p –Xylene	118.4
12	**Total VOC =**	**3710.5**



Sampling Area : MIDC , TALOJA		
Sampling Location : HIKAL - Opp. Enviro building		
Sampling Date : 25.02.09		
S.No	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	297.1
2	Chlorobenzene	142.2
3	1,4-Dichlorobenzene	19.9
4	Ethylbenzene	78.6
5	o-Xylene	32.5
6	m&p –Xylene	94.6
	Total VOC =	**664.8**



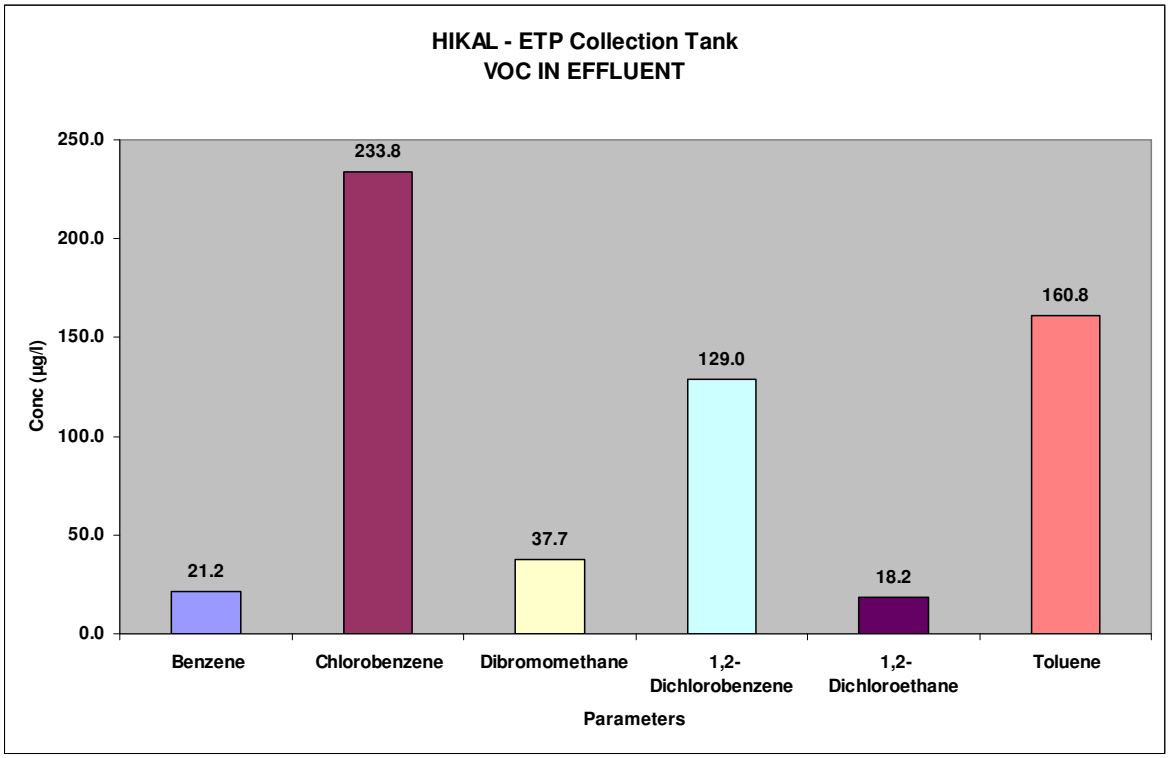
Sampling Area : MIDC,TALOJA		
Sampling Location : Nr.Solvent storage area		
Sampling Site : Hikal		
Sampling Date : 25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	55.8
2	Chlorobenzene	335.9
3	Chloroform	18.8
4	1,2- Dichlorobenzene	9.4
5	1,4-Dichlorobenzene	14.9
6	Ethylbenzene	264.3
7	Styrene	97.7
8	Toluene	164.7
9	o-Xylene	117.9
10	m&p –Xylene	227.6
Total VOC =		**1307.1**



EFFLUENT WATER SAMPLE ANLAYSIS:

The concentration of total VOCs in effluent sample taken from collection tank of ETP was found to be 600.7 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

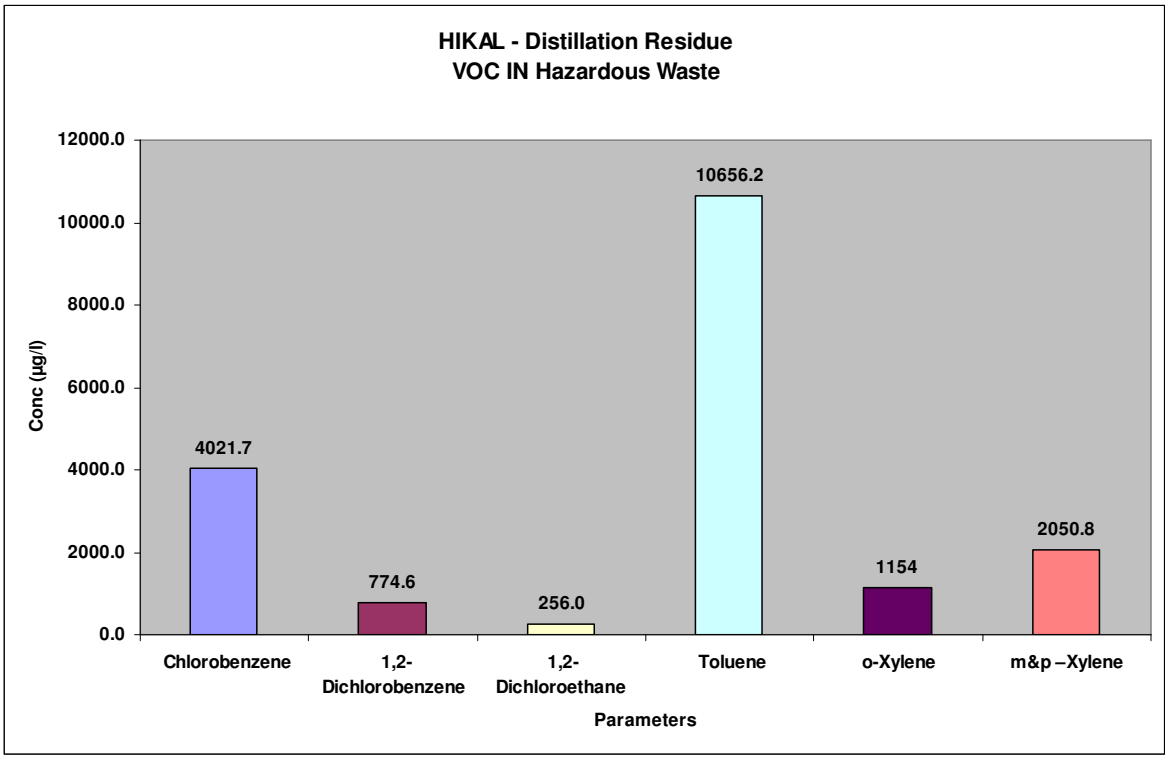
Sampling Area : MIDC, TALOJA		
Sampling Location : ETP collection tank		
Sampling Description : Tank water		
Sampling Site : Hikal		
Sampling date :25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Benzene	21.2
2	Chlorobenzene	233.8
3	Dibromomethane	37.7
4	1,2- Dichlorobenzene	129.0
5	1,2-Dichloroethane	18.2
6	Toluene	160.8
	Total VOC	**600.7**



HAZARDOUS WASTE ANALYSIS:

The concentration of the total VOCs in hazardous waste sample (Distillation residue) was found to be 18913.3 µg/l. The higher concentration reflects the scope for better recover of solvents and plugging the sources of loss.

Sampling Area : MIDC, TALOJA		
Sampling Location : Hazardous waste storage		
Sampling Description : Distillation Residue		
Sampling Site : Hikal		
Sampling date :25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	4021.7
2	1,2- Dichlorobenzene	774.6
3	1,2-Dichloroethane	256.0
4	Toluene	10656.2
5	o-Xylene	1154
6	m&p –Xylene	2050.8
	Total VOC =	**18913.3**



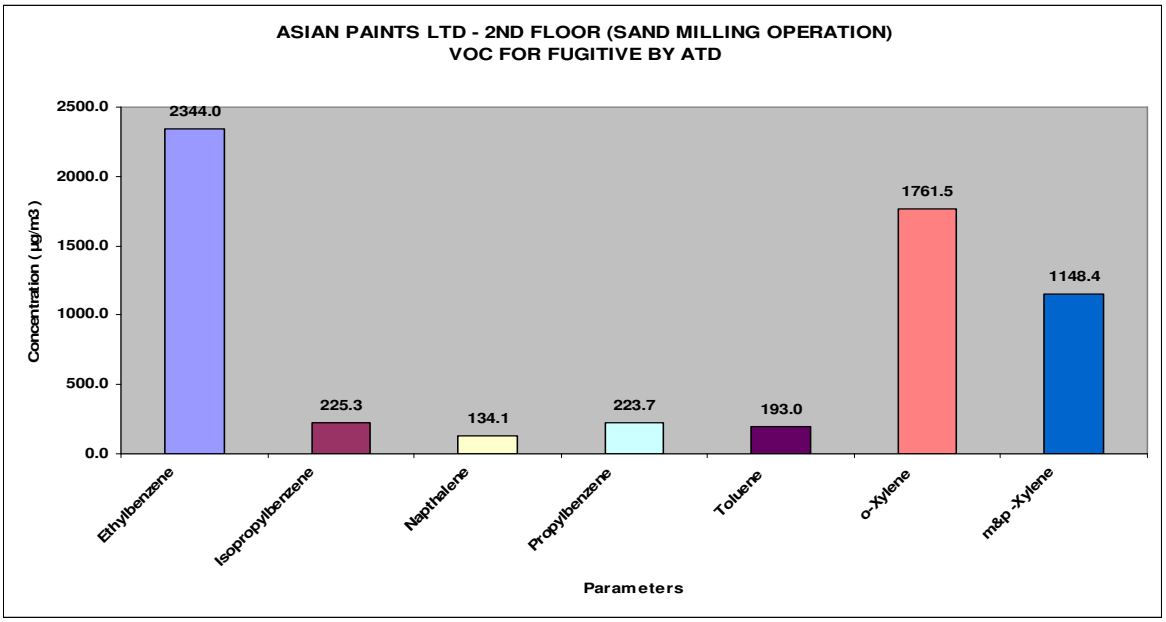
11.2.2 M/s Asian Paints Ltd

- Chemical Industry
- Major Product: Paints
- Major Solvents: Xylene
- Date of Sampling : 25.02.09

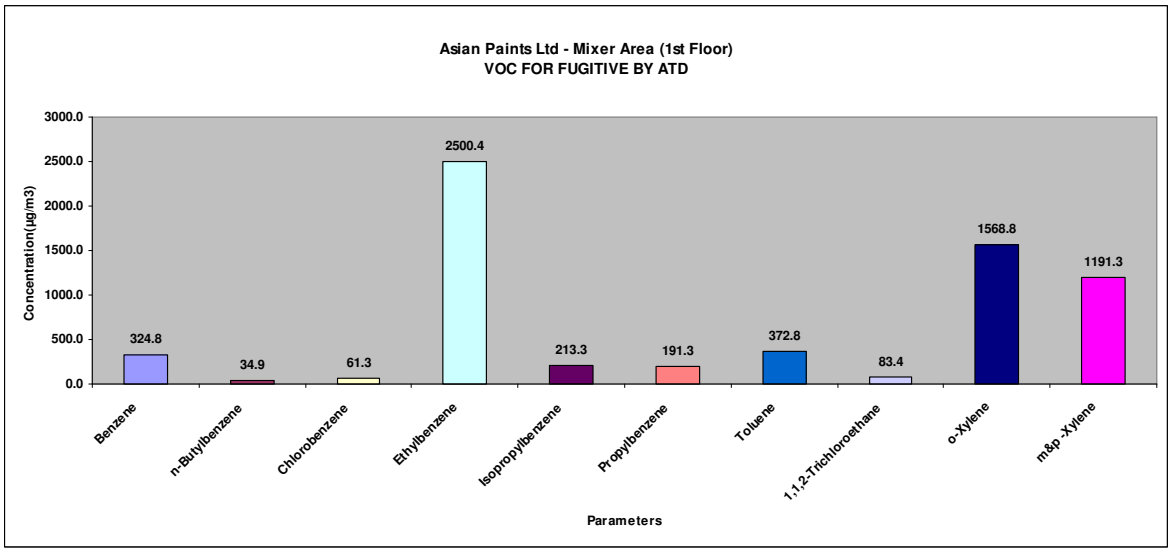
FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed fro VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in the range of 3260.1 to 6030.1 µg/m^3. The highest concentration was found at the Sand milling operation area.

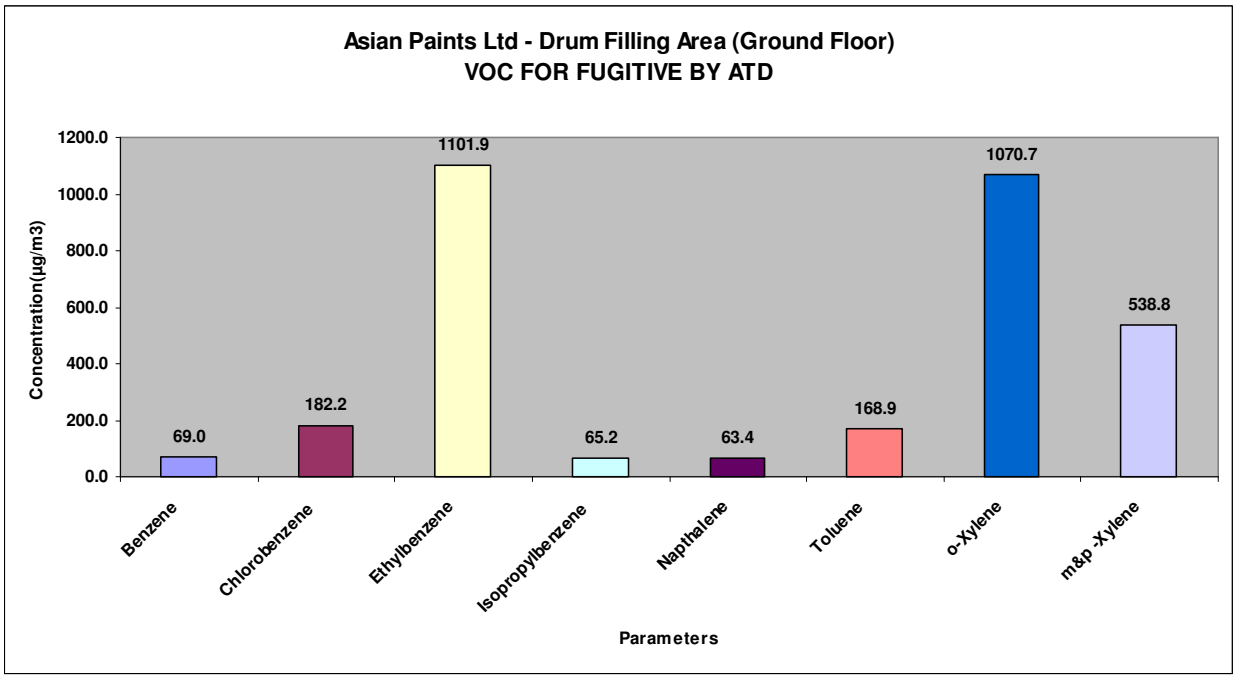
Sampling Location : Sand milling operation second floor		
Sampling Date :25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	Ethylbenzene	2344.0
2	Isopropylbenzene	225.3
3	Napthalene	134.1
4	Propylbenzene	223.7
5	Toluene	193.0
6	o-Xylene	1761.5
7	m&p –Xylene	1148.4
Total VOC =		**6030.1**



Sampling Area : MIDC , TALOJA		
Sampling Location : Mixer area - First floor		
Sampling Site : Asian paints		
Sampling Date :25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	324.8
2	n-Butylbenzene	34.9
3	Chlorobenzene	61.3
4	Ethylbenzene	2500.4
5	Isopropylbenzene	213.3
6	Propylbenzene	191.3
7	Toluene	372.8
8	1,1,2-Trichloroethane	83.4
9	o-Xylene	1568.8
10	M&p –Xylene	1191.3
Total VOC =		**6542.3**



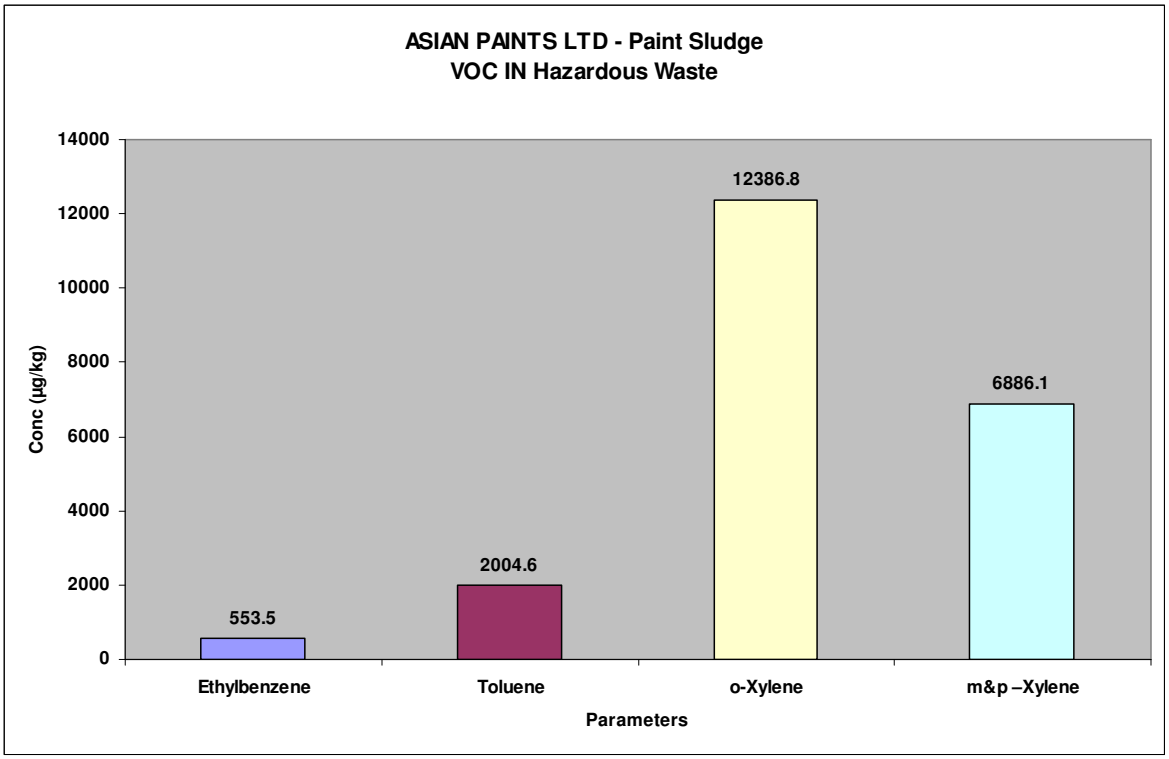
Sampling Area : MIDC, TALOJA		
Sampling Location : Drum filling area-Ground floor		
Sampling Site :Asian paints		
Sampling Date : 25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	Benzene	69.0
2	Chlorobenzene	182.2
3	Ethylbenzene	1101.9
4	Isopropylbenzene	65.2
5	Napthalene	63.4
6	Toluene	168.9
7	o-Xylene	1070.7
8	M&p –Xylene	538.8
	Total VOC =	**3260.1**



HAZARDOUS WASTE ANALYSIS:

The concentration of the total VOCs in hazardous waste sample was found to be 21831.0 µg/kg.

Sampling Area : MIDC, TALOJA		
Sampling Location : Hazardous Waste		
Sampling Description : Paint Sludge		
Sampling Site : Asian Paints Ltd		
Sampling date :25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/kg)**
1	Ethylbenzene	553.5
2	Toluene	2004.6
3	o-Xylene	12386.8
4	m&p –Xylene	6886.1
Total VOC =		**21831.0**

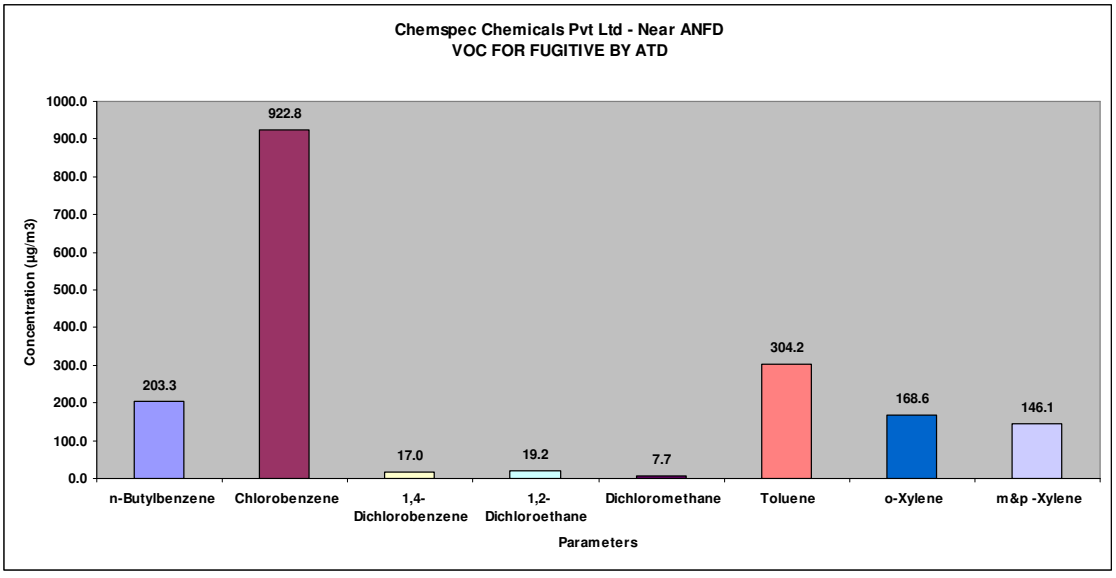


11.2.3 M/s. Chemspec Chemicals Pvt Ltd.,

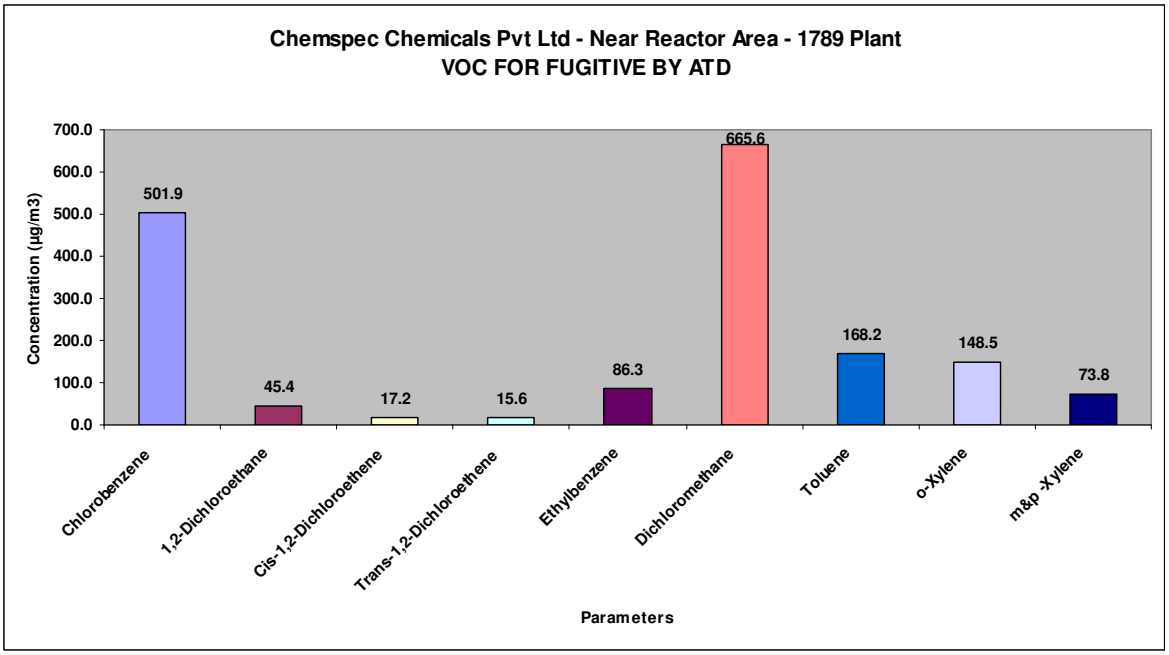
- Dye and Dye Intermediates Industry
- Major Products: TCC
- Major Solvents: Toluene, Monochlorobenzene, Methylene Dichloride, Ethylene Dichloride etc.,
- Date of Sampling : 25.02.09

Samples of fugitive emissions, wastewater and hazardous waste were collected from the unit and analysed for VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be 1788.9 µg/m^3 near ANFD, TCC product area.

Sampling Area : MIDC, TALOJA		
Sampling Site : Chemspec Chemicals (P) Ltd., 1		
Location : TCC Product - Near ANFD		
Sampling Date : 25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	n-Butyl benzene	203.3
2	Chlorobenzene	922.8
3	1,4-Dichlorobenzene	17.0
4	1,2-Dichloroethane	19.2
5	Dichloromethane	7.7
6	Toluene	304.2
7	o-Xylene	168.6
8	M&p –Xylene	146.1
Total VOC =		**1788.9**



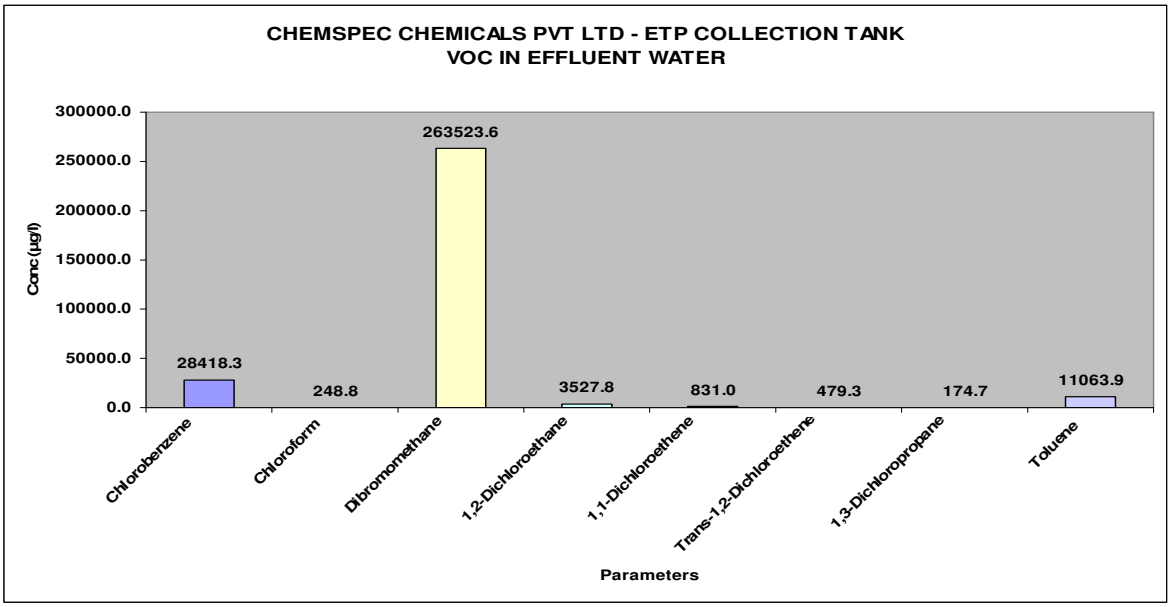
Sampling Area : MIDC , TALOJA		
Sampling Site : Chemspec Chemicals (P) Ltd., 2		
Near Reactor Area - 1789 Plant		
Sampling Date : 25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/m3)**
1	Chlorobenzene	501.9
2	1,2-Dichloroethane	45.4
3	Cis-1,2-Dichloroethene	17.2
4	Trans-1,2-Dichloroethene	15.6
5	Ethylbenzene	86.3
6	Dichloromethane	665.6
7	Toluene	168.2
8	o-Xylene	148.5
9	m&p –Xylene	73.8
Total VOC =		**1722.5**



EFFLUENT SAMPLE ANALYSIS:

The concentration of total VOCs in effluent sample taken from equalization tank of ETP was found to be 308267.4 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

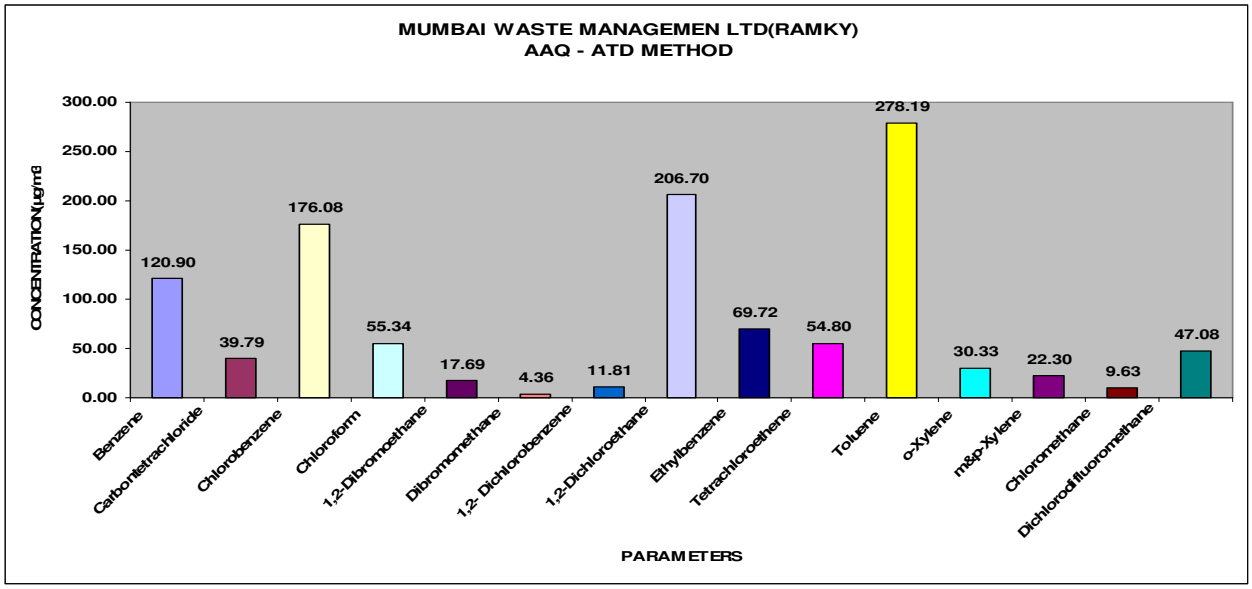
Sampling Area : MIDC , TALOJA		
Sampling Location : ETP Collection tank- Aeration		
Sampling Site: Chemspec Chemicals (P) Ltd.		
Sampling Description : Organic layer sump collection water		
Sampling Date : 25.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	28418.3
2	Chloroform	248.8
3	Dibromomethane	263523.6
4	1,2-Dichloroethane	3527.8
5	1,1-Dichloroethene	831.0
6	Trans-1,2-Dichloroethene	479.3
7	1,3-Dichloropropane	174.7
8	Toluene	11063.9
Total VOC =		**308267.4**



11.2.4 M/s. Mumbai Waste Management Ltd (Ramky)

Samples of fugitive emissions and wastewater were collected from the unit and analysed for individual VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be 1144.7 µg/m^3 near hazardous waste storage area.

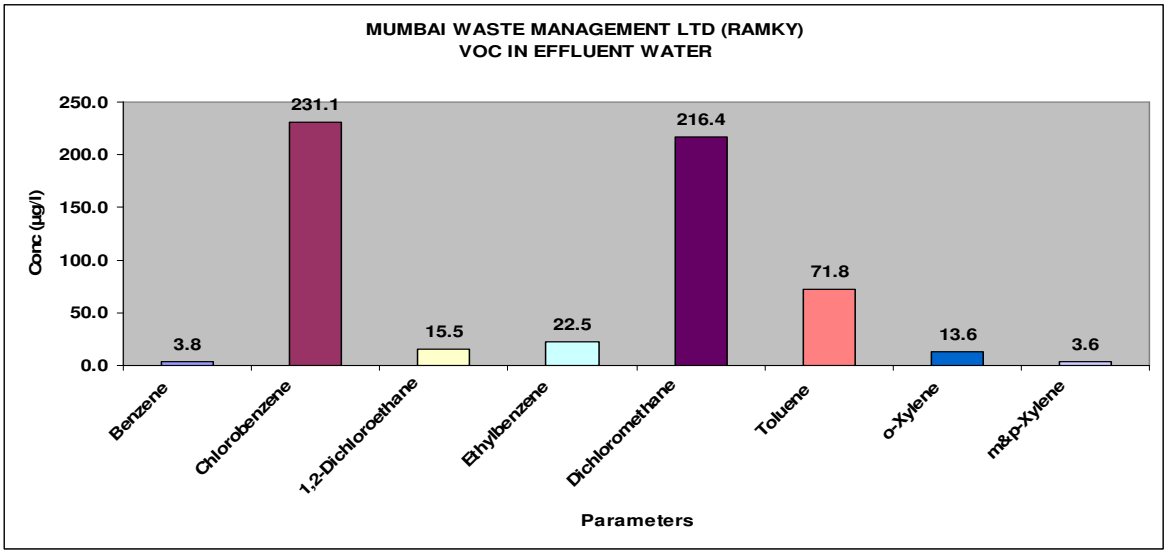
SAMPLING AREA : TALOJA		
SAMPLING SITE : MUMBAI WASTE MANAGEMENT LTD(RAMKY)		
SAMPLLING LOCATION: NEAR HAZARDOUS WASTE STORAGE YARD		
DATE OF SAMPLING :24.02.09 - 25.02.09		
S.NO	**PARAMETERS**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	120.90
2	Carbontetrachloride	39.79
3	Chlorobenzene	176.08
4	Chloroform	55.34
5	1,2-Dibromoethane	17.69
6	Dibromomethane	4.36
7	1,2- Dichlorobenzene	11.81
8	1,2-Dichloroethane	206.70
9	Ethylbenzene	69.72
10	Tetrachloroethene	54.80
11	Toluene	278.19
12	o-Xylene	30.33
13	m&p-Xylene	22.30
14	Chloromethane	9.63
15	Dichlorodifluoromethane	47.08
	Total VOC =	**1144.72**



EFFLUENT SAMPLE ANALYSIS:

The concentration of VOCs in effluent sample taken from equalization tank of ETP was found to be 578.3 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

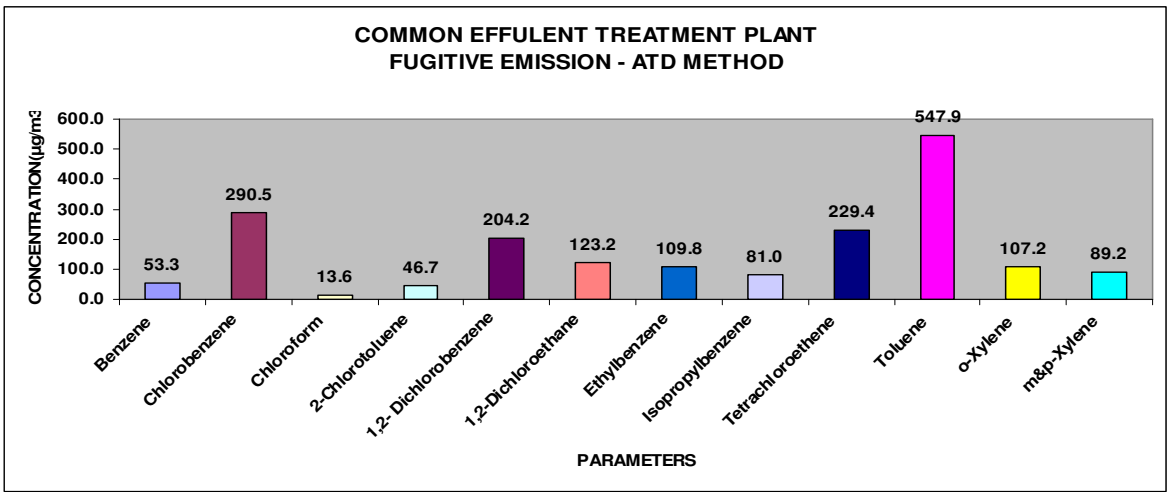
Sampling Area : MIDC, TALOJA		
Sampling Location : Leachate water pond		
Sample Description : Leachate collection tank water		
Sampling Date : 24.02.09		
Sampling Site: Mumbai Waste Management Ltd (Ramky)		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Benzene	3.8
2	Chlorobenzene	231.1
3	1,2-Dichloroethane	15.5
4	Ethylbenzene	22.5
5	Dichloromethane	216.4
6	Toluene	71.8
7	o-Xylene	13.6
8	m&p-Xylene	3.6
	Total VOC =	**578.3**



11.2.5 Common Effluent Treatment Plant

Samples of fugitive emission was collected from the unit and analyzed for VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be 1895.9 µg/m^3 near aeration tank.

SAMPLING AREA : TALOJA		
SAMPLING SITE: COMMON EFFULENT TREATMENT PLANT		
SAMPLLING LOCATION: CENTRE OF AREATION TANK		
S.NO	**PARAMETERS**	**AVERAGE RESULTS(µg/m3)**
1	Benzene	53.3
2	Chlorobenzene	290.5
3	Chloroform	13.6
4	2-Chlorotoluene	46.7
5	1,2- Dichlorobenzene	204.2
6	1,2-Dichloroethane	123.2
7	Ethylbenzene	109.8
8	Isopropylbenzene	81.0
9	Tetrachloroethene	229.4
10	Toluene	547.9
11	o-Xylene	107.2
12	m&p-Xylene	89.2
	Total VOC =	**1895.9**



INDUSTRIES MONITORING AND ANALYSIS - MAHAD

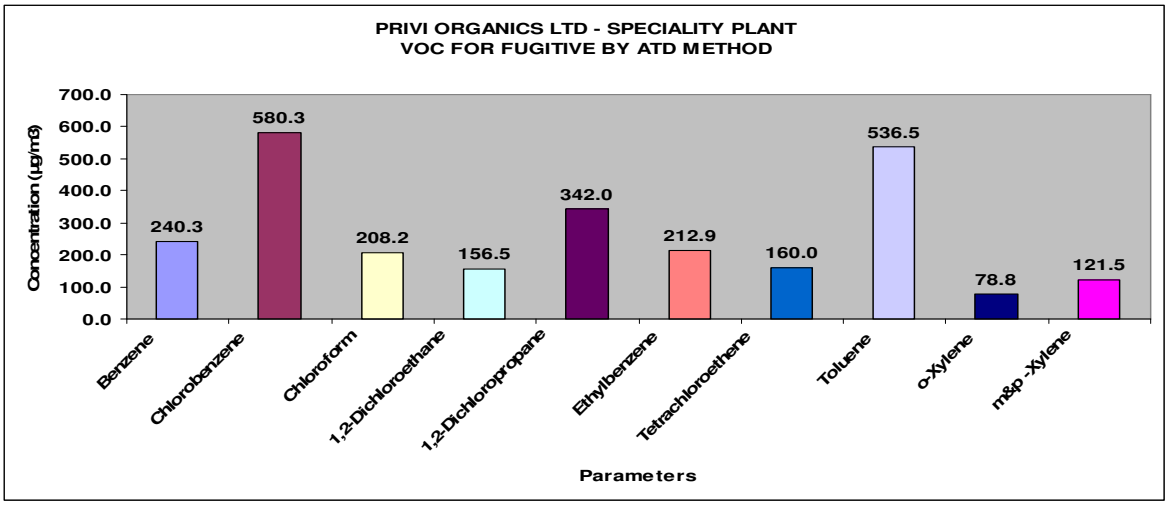
11.3.1 M/s Privi Organics Ltd

- Chemical Industry
- Major Product: Esters, Alcohols, Nitriles and Ionones
- Major Solvents: Toluene, Methanol etc
- Date of Sampling : 27.02.09

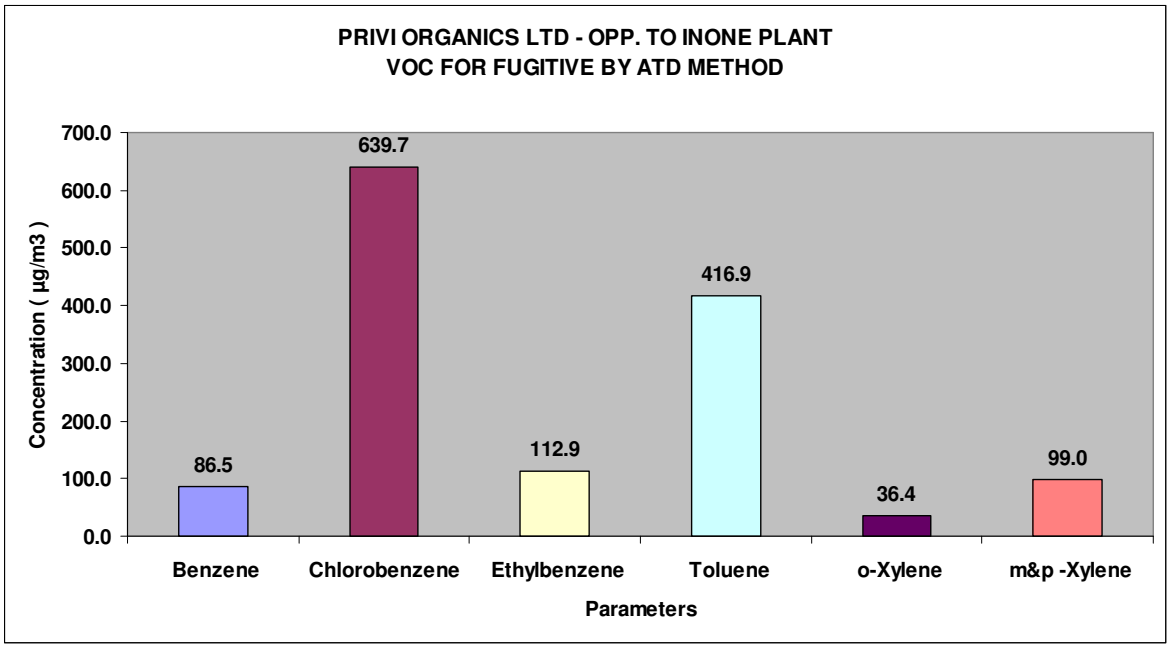
FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed fro VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in the range of 1391.5 to 2637 µg/m^3. The highest concentration was found at the speciality plant area.

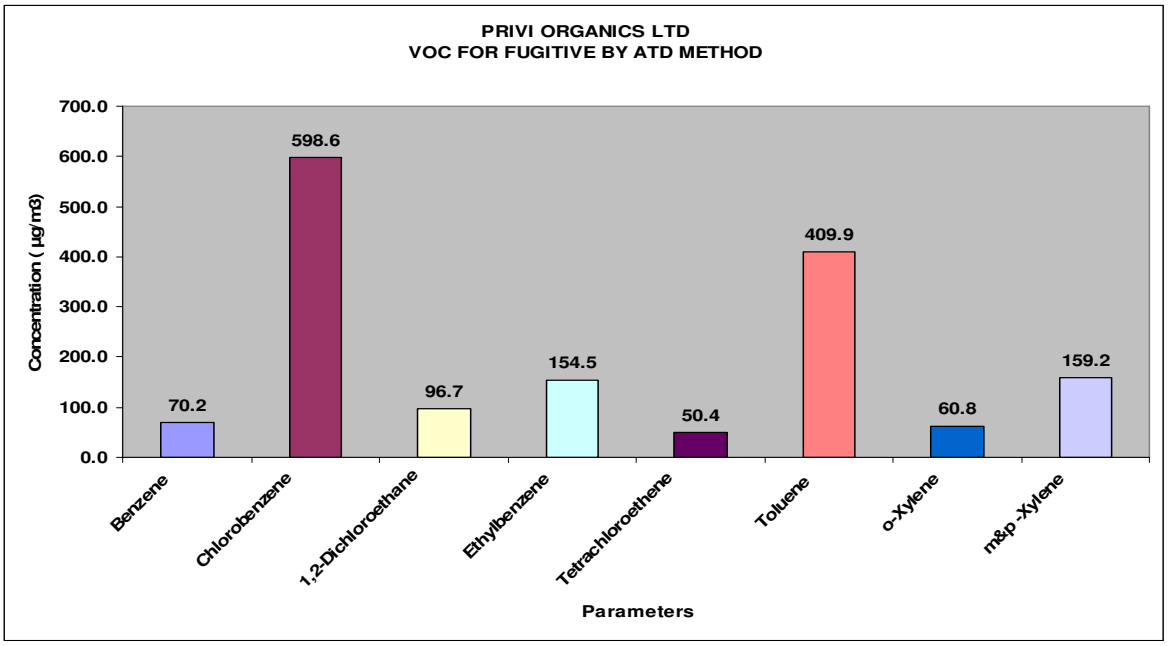
Sampling Area: MIDC , MAHAD	
Sampling Location : Speciality plant	
Sampling Site : Privi Organics Ltd.	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	240.3
Chlorobenzene	580.3
Chloroform	208.2
1,2-Dichloroethane	156.5
1,2-Dichloropropane	342.0
Ethylbenzene	212.9
Tetrachloroethene	160.0
Toluene	536.5
o-Xylene	78.8
m&p –Xylene	121.5
Total VOC	**2637.0**



Sampling Area : MIDC , MAHAD	
Sampling Location : Opp, Inone Plant	
Sampling Site : Privi Organics Ltd.	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	86.5
Chlorobenzene	639.7
Ethylbenzene	112.9
Toluene	416.9
o-Xylene	36.4
m&p –Xylene	99.0
Total VOC	**1391.5**



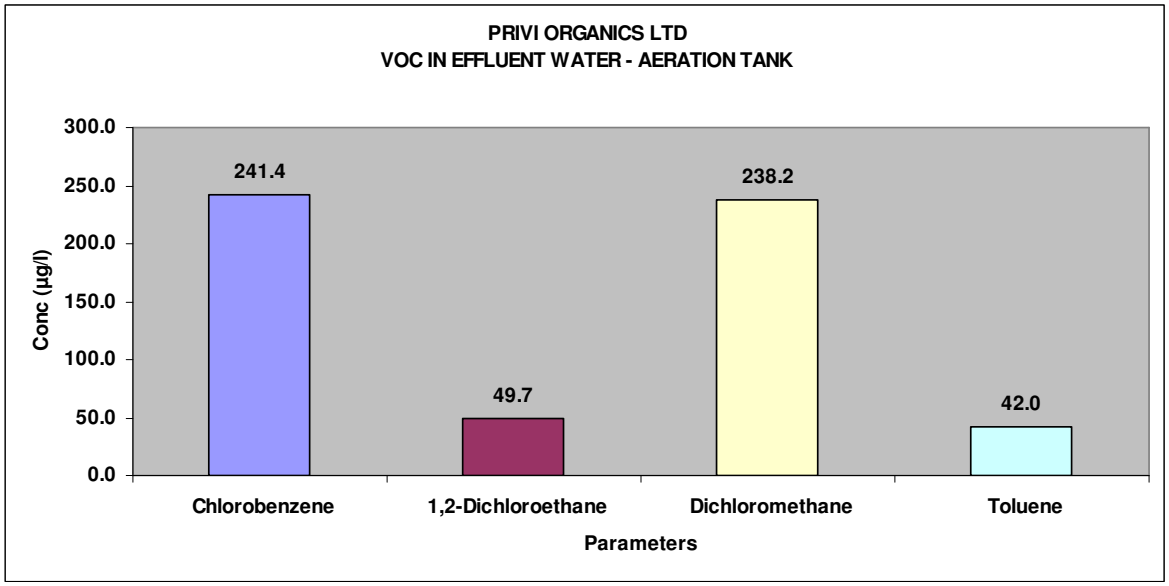
Sampling Area : MIDC , MAHAD	
Sampling Location : Near Security gate	
Sampling Site : Privi Organics Ltd.	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	70.2
Chlorobenzene	598.6
1,2-Dichloroethane	96.7
Ethylbenzene	154.5
Tetrachloroethene	50.4
Toluene	409.9
o-Xylene	60.8
m&p –Xylene	159.2
Total VOC	**1600.3**



EFFLUENT SAMPLE ANALYSIS:

The concentration of total VOCs in effluent sample taken from aeration tank of ETP was found to be 571.3 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

Sampling Area : MIDC, MAHAD		
Sampling Location : ETP		
Sampling Site : Privi Organics Ltd.		
Sample Description : Aeration tank water		
Sampling Date: 27.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	241.4
2	1,2-Dichloroethane	49.7
3	Dichloromethane	238.2
4	Toluene	42.0
	Total VOC =	**571.3**



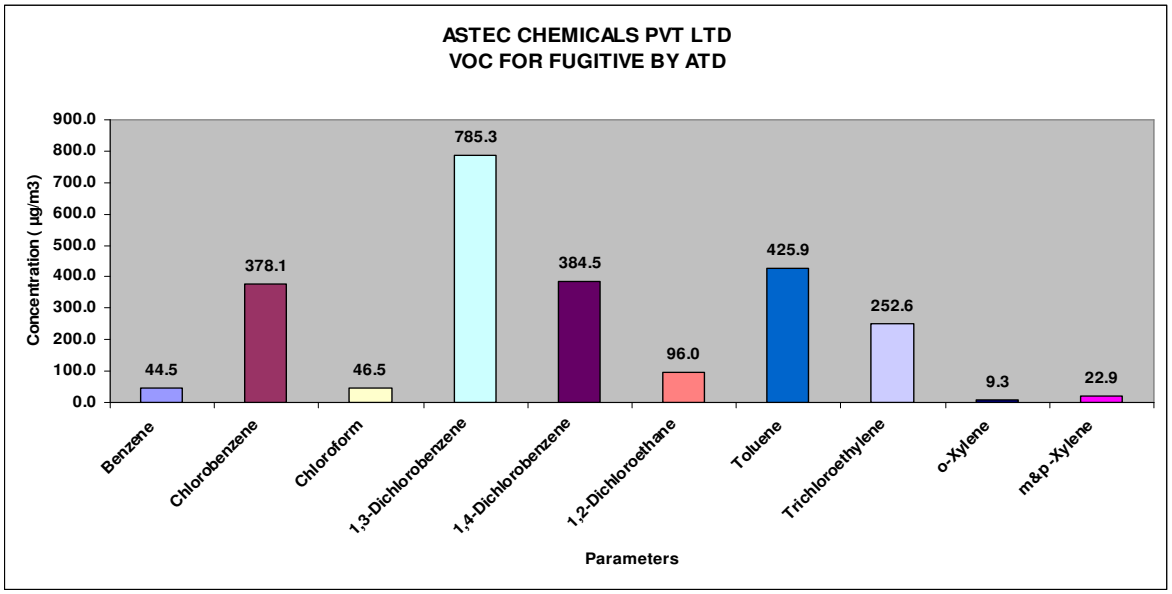
11.3.2 M/s Astec Chemicals Pvt Ltd

- Chemical Industry
- Major Product: No Manufacturing activity and only storage of petroleum products.
- Major Solvents: Toluene, Methanol, Hexane, Cyclohexane etc
- Date of Sampling : 27.02.09

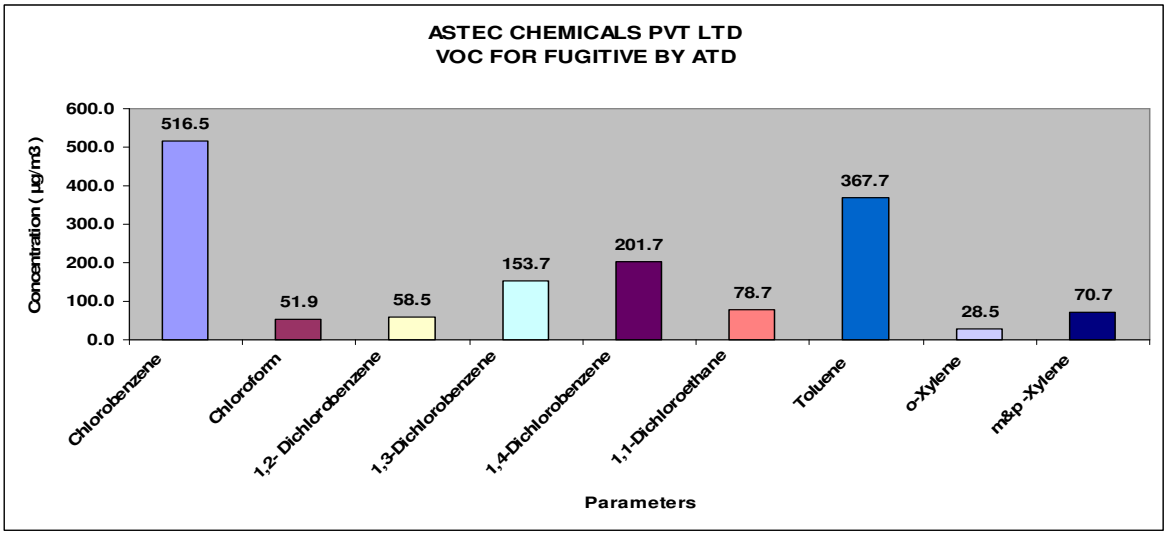
FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed fro VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in the range of 1528.1 to 2445.5 µg/m^3. The highest concentration was found at the Sand milling operation area.

Sampling Area : MIDC , MAHAD	
Sampling Location : Process plant B-16 First floor	
Sampling Site : Astec	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	44.5
Chlorobenzene	378.1
Chloroform	46.5
1,3-Dichlorobenzene	785.3
1,4-Dichlorobenzene	384.5
1,2-Dichloroethane	96.0
Toluene	425.9
Trichloroethylene	252.6
o-Xylene	9.3
M&p –Xylene	22.9
Total VOC	**2445.5**



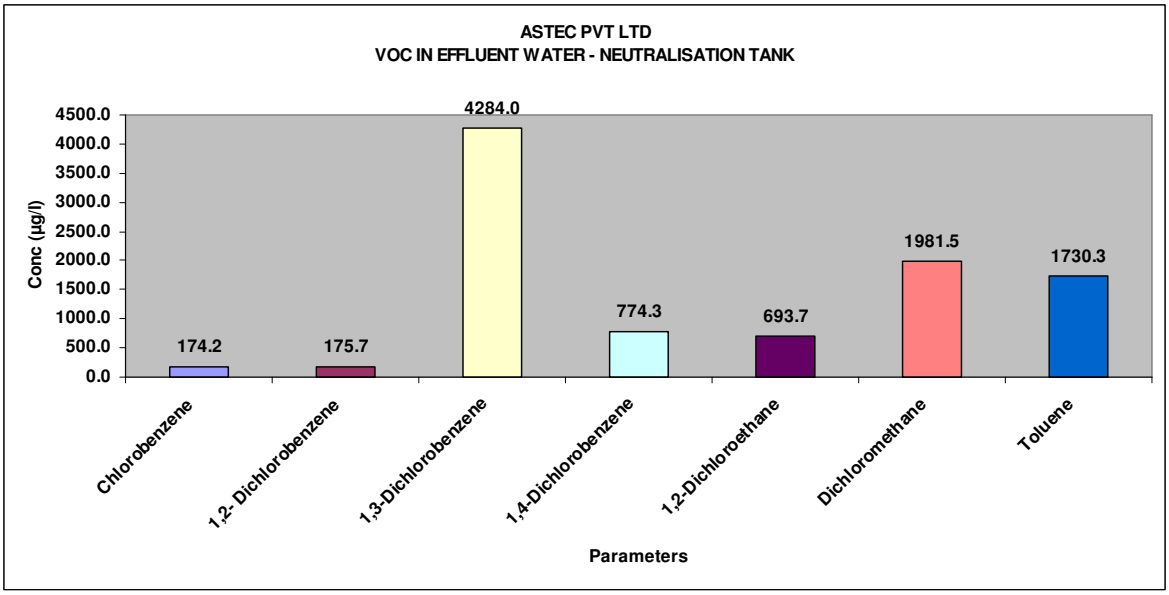
Sampling Area : MIDC , MAHAD	
Sampling Location : Process plant B-17 Ground floor	
Sampling Site : Astec	
PARAMETERS	**RESULTS (µg/m3)**
Chlorobenzene	516.5
Chloroform	51.9
1,2- Dichlorobenzene	58.5
1,3-Dichlorobenzene	153.7
1,4-Dichlorobenzene	201.7
1,1-Dichloroethane	78.7
Toluene	367.7
o-Xylene	28.5
M&p –Xylene	70.7
Total VOC	**1528.1**



EFFLUENT SAMPLE ANALYSIS:

The concentration of total VOCs in effluent sample taken from equalization tank of ETP was found to be 9813.7 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

Sampling Area : MIDC , MAHAD		
Sampling Location : ETP		
Sampling Site : Astec		
Sampling Description : Neutralization tank		
Sampling date : 27.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	174.2
2	1,2- Dichlorobenzene	175.7
3	1,3-Dichlorobenzene	4284.0
4	1,4-Dichlorobenzene	774.3
5	1,2-Dichloroethane	693.7
6	Dichloromethane	1981.5
7	Toluene	1730.3
	Total VOC =	**9813.7**



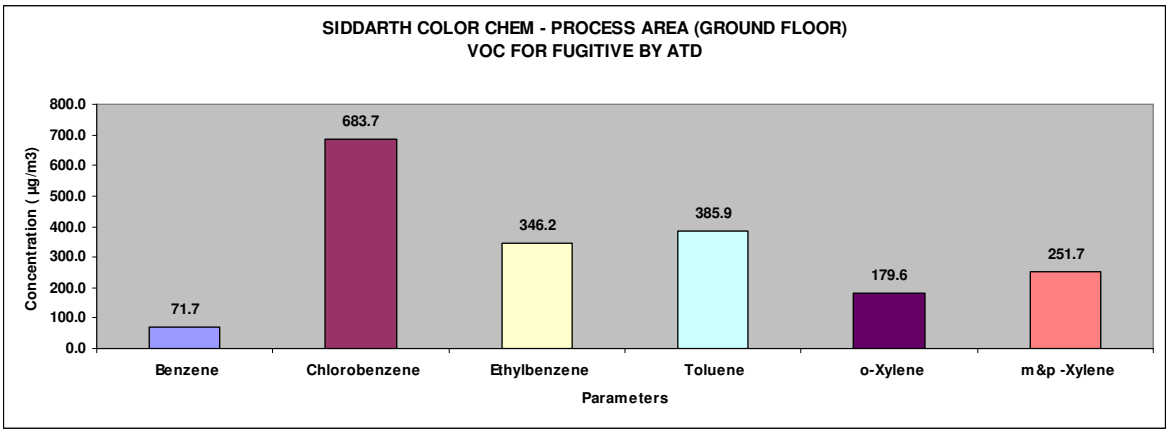
11.3.3 M/s Siddarth Color Chem Ltd

- Dye and Dye Intermediates Industry
- Major Product: Dyes
- Major Solvents: Toluene, Chlorobenzen and Xylene
- Date of Sampling : 27.02.09

FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed fro VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in 1918.8 µg/m^3.

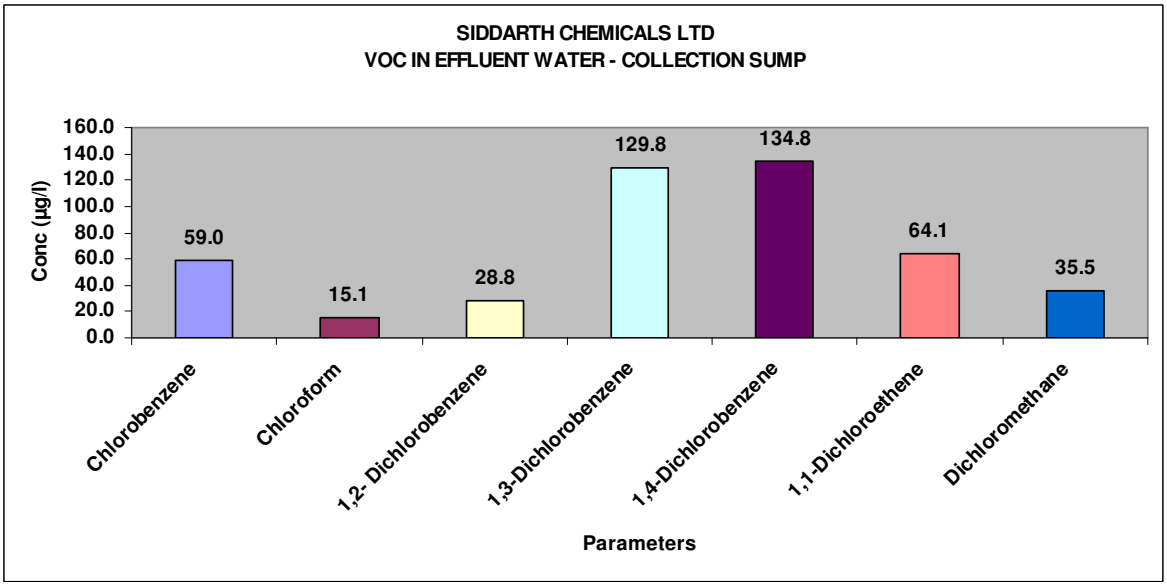
Sampling Area : MIDC , MAHAD	
Sampling Site : Siddarth	
Sampling Location : Process Area (Ground Floor)	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	71.7
Chlorobenzene	683.7
Ethylbenzene	346.2
Toluene	385.9
o-Xylene	179.6
m&p –Xylene	251.7
Total VOC	**1918.8**



EFFLUENT SAMPLE ANALYSIS:

The concentration of total VOCs in effluent sample taken from equalization tank of ETP was found to be 467.1 µg/l.

Sampling Location : ETP	
Sampling Site : Siddarth Color Chem	
Sample Description : Collection sump	
Sampling date: 27.02.09	
PARAMETERS	**RESULTS (µg/l)**
Chlorobenzene	59.0
Chloroform	15.1
1,2- Dichlorobenzene	28.8
1,3-Dichlorobenzene	129.8
1,4-Dichlorobenzene	134.8
1,1-Dichloroethene	64.1
Dichloromethane	35.5
Total VOC	**467.1**



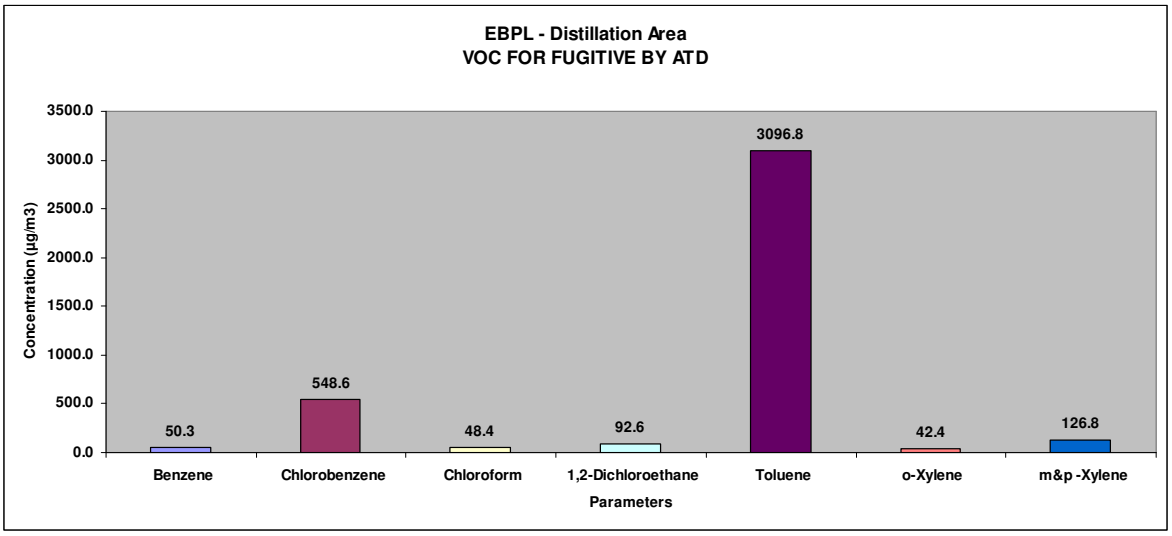
11.3.4 M/s Emmellen Biotech Pharmaceuticals Ltd

- Bulk Drug Industry
- Major Product: Ephedrine HCl, Pseudo Ephedrine HCl
- Major Solvents: Toluene, Acetone etc
- Date of Sampling : 27.02.09

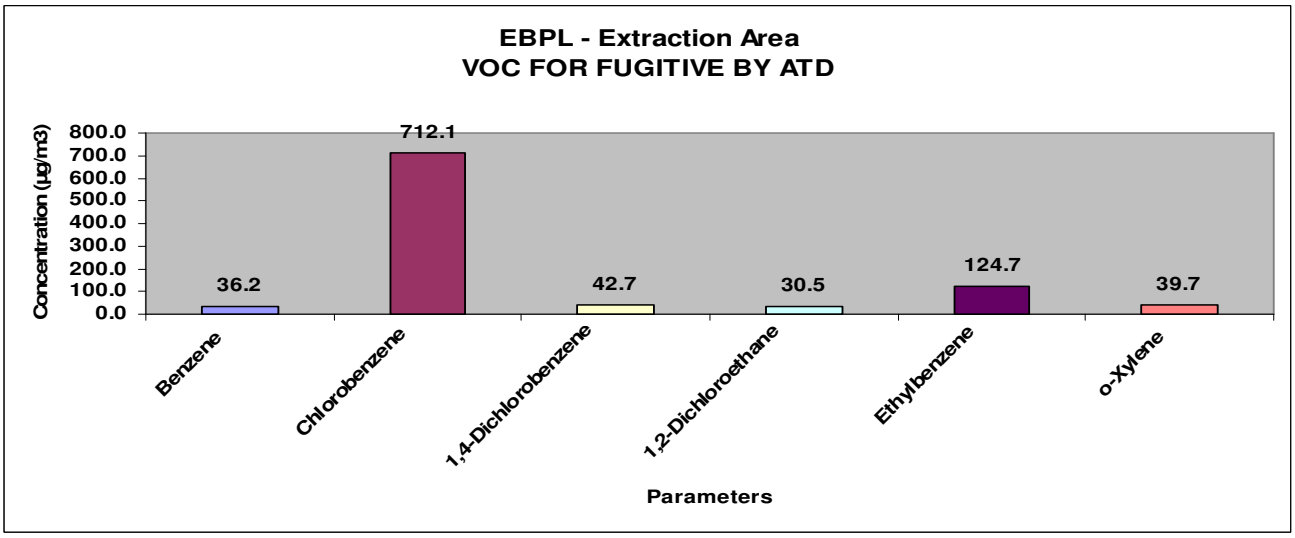
FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed fro VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found to be in the range of 1110.9 to 4005.8 µg/m^3. The highest concentration was found at the distillation area.

Sampling Area : MIDC, MAHAD	
Sampling Site : EBPL 2	
Sampling Location : Distillation Area	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	50.3
Chlorobenzene	548.6
Chloroform	48.4
1,2-Dichloroethane	92.6
Toluene	3096.8
o-Xylene	42.4
m&p –Xylene	126.8
Total VOC	**4005.8**



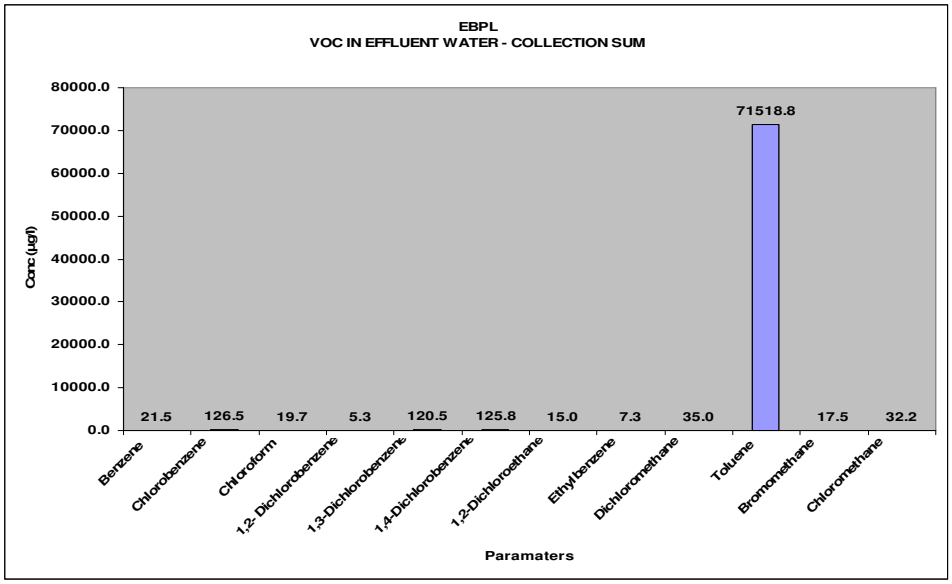
Sampling Area : MIDc , MAHAD	
Sampling Site : EBPL 1	
Sampling Location : Extraction Area	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	36.2
Chlorobenzene	712.1
1,4-Dichlorobenzene	42.7
1,2-Dichloroethane	30.5
Ethylbenzene	124.7
o-Xylene	39.7
m&p -Xylene	124.9
Total VOC	**1110.9**



EFFLUENT SAMPLE ANALYSIS:

The concentration of total VOCs in effluent sample taken from equalization tank of ETP was found to be 72045.1 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

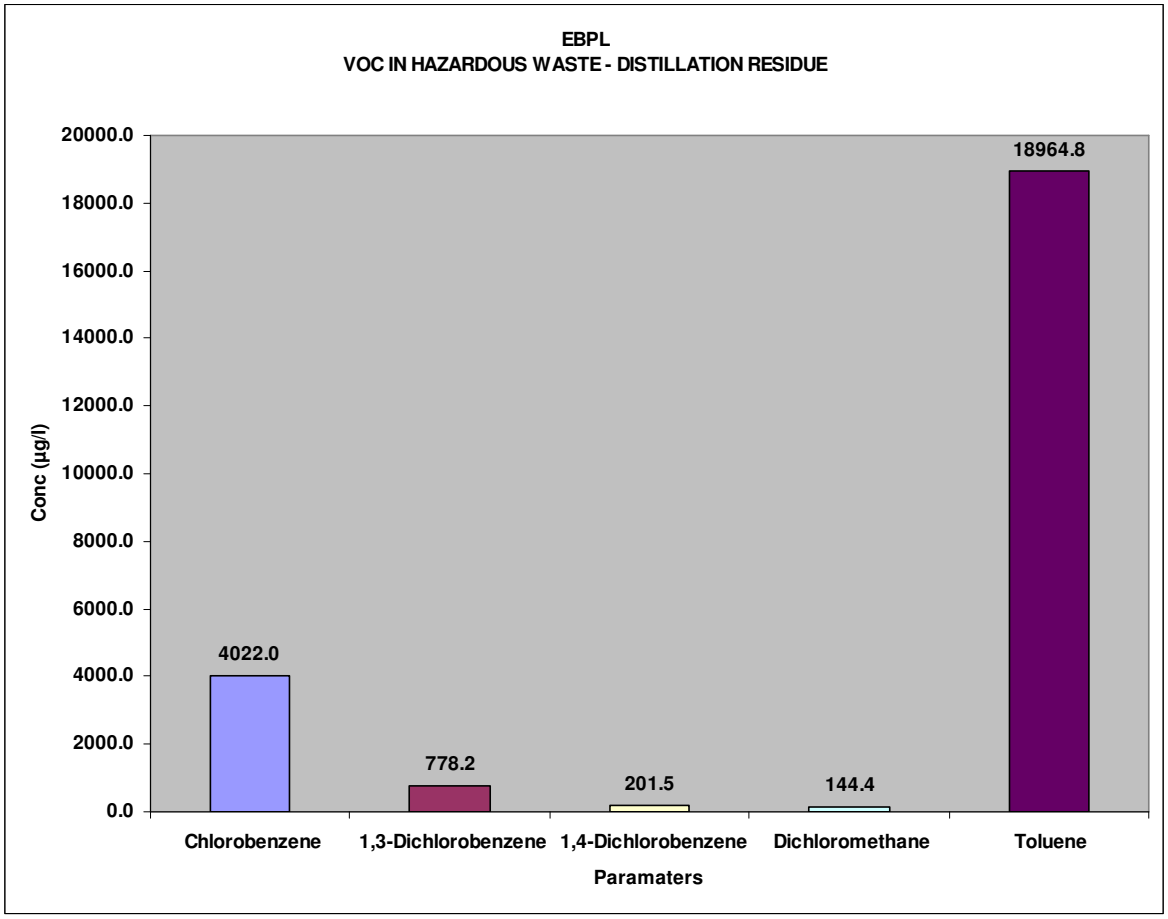
Sampling Area : MIDC , MAHAD		
Sampling Location : ETP		
Sampling Site : EBPL		
Sample Description : Collection Sump		
Sampling date: 27.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Benzene	21.5
2	Chlorobenzene	126.5
3	Chloroform	19.7
4	1,2- Dichlorobenzene	5.3
5	1,3-Dichlorobenzene	120.5
6	1,4-Dichlorobenzene	125.8
7	1,2-Dichloroethane	15.0
8	Ethylbenzene	7.3
9	Dichloromethane	35.0
10	Toluene	71518.8
11	Bromomethane	17.5
12	Chloromethane	32.2
	Total VOC	**72045.1**



HAZARDOUS WASTE ANALYSIS:

The concentration of the total VOCs in hazardous waste sample was found to be 24110.9.0 µg/l.

Sampling Area : MIDC , MAHAD		
Sampling Location : Hazardous Waste		
Sampling Site : EBPL		
Sample Description : Distillation Residue		
Sampling date: 27.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	4022.0
2	1,3-Dichlorobenzene	778.2
3	1,4-Dichlorobenzene	201.5
4	Dichloromethane	144.4
5	Toluene	18964.8
	Total VOC	**24110.9**



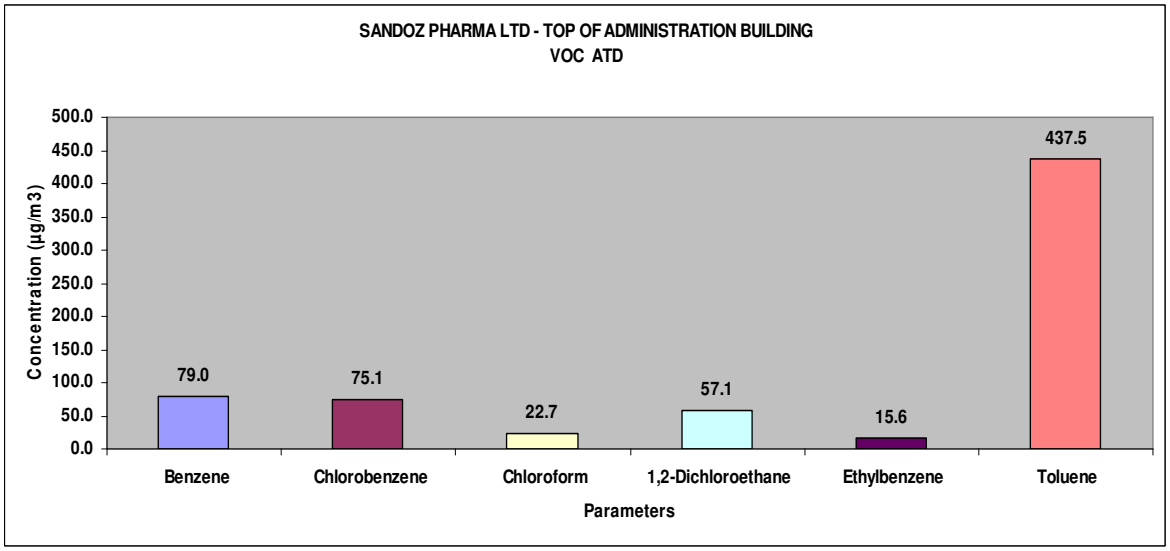
11.3.5 M/s SANDOZ PHARMA VOC MONITORING RESULTS:

- Bulk Drug Industry
- Product : FMPC
- Solvents : Chloroform, Methanol etc
- Date of Sampling : 27.02.09

FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed for VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found in 687.0 µg/m^3.

Sampling Area : MIDC , MAHAD	
Sampling Location : Top of Admin Building	
Sampling Site : Sandoz	
PARAMETERS	**RESULTS (µg/m3)**
Benzene	79.0
Chlorobenzene	75.1
Chloroform	22.7
1,2-Dichloroethane	57.1
Ethylbenzene	15.6
Toluene	437.5
Total VOC =	**687.0**



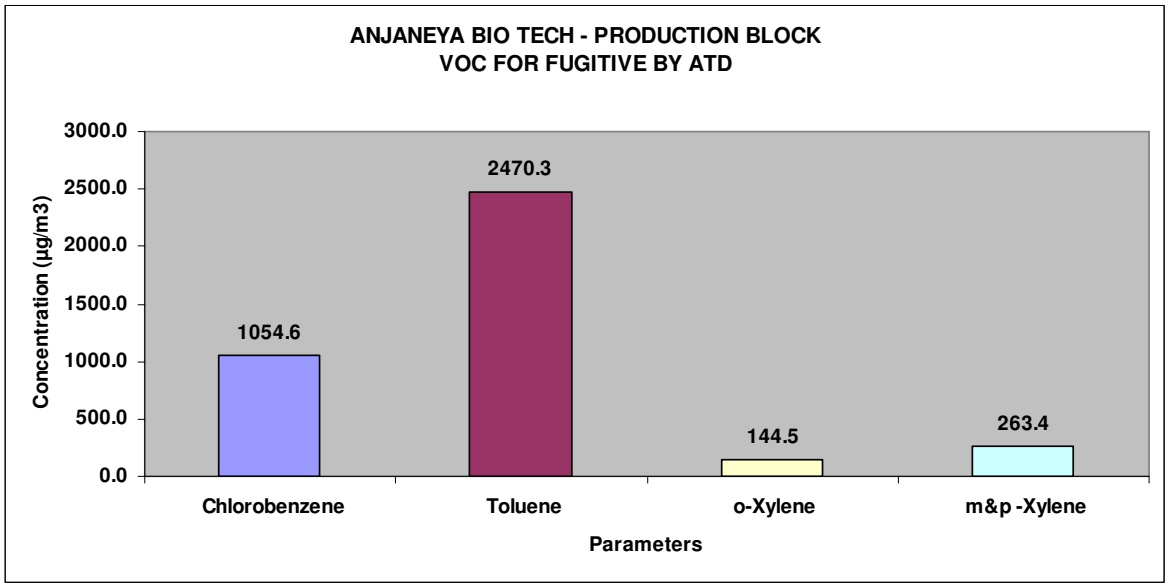
11.3.6 M/s Anjanaya Bio-Tech Ltd.,

- Bulk Drug Industry (Herbal Drug)
- Product : Quinine Sulphate
- Solvents : Toluene, Methanol etc
- Date of Sampling : 27.02.09

FUGITIVE EMISSION MONITORING :

Samples of fugitive emissions and hazardous waste were collected from the unit and analysed for VOCs. The concentration of total VOCs in fugitive emission monitoring sample was found in 3932.9µg/m^3

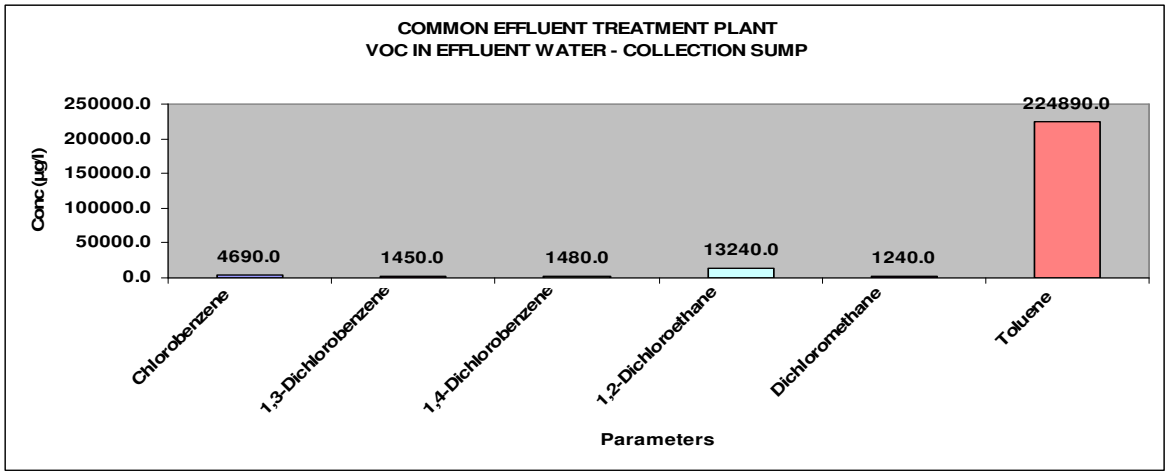
Sampling Area : MIDC , MAHAD	
Sampling Location: Production Block	
Sampling Site : Anjanaya	
PARAMETERS	**RESULTS (µg/m3)**
Chlorobenzene	1054.6
Toluene	2470.3
o-Xylene	144.5
m&p -Xylene	263.4
Total VOC	**3932.9**



CETP SAMPLE ANALYSIS AT MAHAD:

The concentration of total VOCs in effluent sample taken from equalization tank of ETP was found to be 246990 µg/l. The higher concentration may be due to improper separation of intermediate/solvents/products at different process stages, which also affects the treatment efficiency of the ETP.

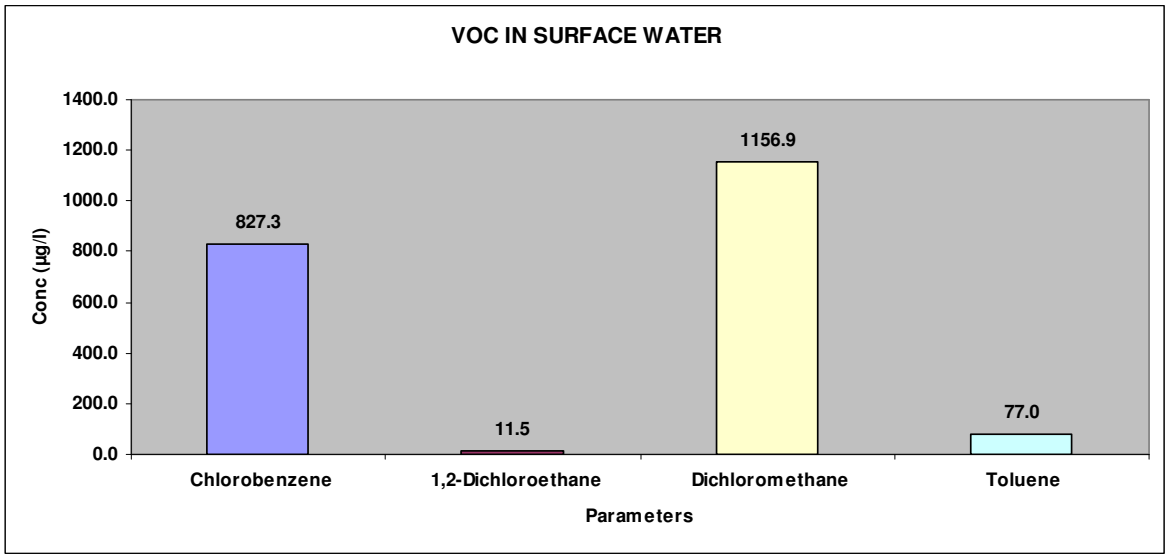
Sampling Area : MIDC, MAHAD		
Sampling Location : ETP		
Sampling Site : CETP		
Sample Description : Collection sump		
Sampling date: 27.02.09		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	4690.0
2	1,3-Dichlorobenzene	1450.0
3	1,4-Dichlorobenzene	1480.0
4	1,2-Dichloroethane	13240.0
5	Dichloromethane	1240.0
6	Toluene	224890.0
	Total VOC	**246990.0**



11.3 Results of Monitoring at Surface Water Taloja:

The concentration of total VOCs in sample collected from CETP's equalization tank was found to be 2072.7 The concentrations of Dichloromethane, Chlorobenzene and Toluene were found to be very high as compared to other VOCs present. Total 4 VOCs detected in the sample.

Sampling Area : MIDC , TALOJA		
Sampling Location : Surface water-MIDC		
Sampling Description : Surface water		
Sampling Date : 25.02.09		
Sampling Site : Taloja Surface water		
S.NO	**PARAMETERS**	**RESULTS (µg/l)**
1	Chlorobenzene	827.3
2	1,2-Dichloroethane	11.5
3	Dichloromethane	1156.9
4	Toluene	77.0
Total VOC =		**2072.7**



12.0 Observation and Findings

- The order of the pollutant in Ambient Air is Benzene, Chlorobenzenes, Toluene,Xylene and chlorinated alkanes etc.
- Presence of Benzene, Chlorobenzenes, Chlorinated Alkanes, Toluene and Xylene was observed at almost all the monitored locations.
- Concentration of Chlorobenzene, xylene. Dichloromethane, Dichloroethane and Toluene observed to be more in almost all the locations.
- The probable places of loss of VOCs are Centrifuging, filtration, glands, charging material into the reactors, solvent storage area, distillation and ETP area.
- Total 15 VOCs including highly toxic and suspected carcinogenic compounds are found during monitoring at Taloja and Mahad. The VOCs found are Benzene, Chlorobenzene, Chloroform, Dichloromethane, 1,2-dichloroethane, 1,2-Dibromoethane, Carbontetrachloride, 1,2-Dichlorobenzene, 1,3Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichloroethane, Ethylbenzene, Toluene, o-Xylene, m&p –Xylene.
- ATD method found to have reported many compounds which are relevant to the industries used solvents and some have no relevance to solvents used in industries, because of may be the impurities in their used solvents.
- Mostly the concentration of VOCs found to be more in wastewater samples against the samples collected for fugitive emission and hazardous waste. The reasons for comparatively less concentration of fugitive & Hazardous waste could be fast dispersion/dilution of fugitive emissions and loss of VOCs due to evaporation in stored hazardous waste.
- The presence of solvents (VOCs) in the wastewater samples may be due to improper separation of intermediates/products/solvents at different unit process operations, which result in to high organic load in wastewater and difficulty in treatment.
- Generation of Hazardous waste can be minimized by better operating methods and systems as well as solvent recovery with effective condensation with which the concentration of VOC dispersing to atmosphere can be reduced.

- Normally the wastewater generated by the industries contains high VOCs and the industries are doing only primary treatment. During these processes some percentage of VOCs are dispersed into the atmosphere. After primary treatment the industries are pumping their effluent to CETP for further treatments. In CETP during aeration process, most of the VOCs are vaporized and dispersed into the atmosphere. These VOCs are directly impacting the Ambient VOCs concentration.
- Few Industries are following Zero effluents discharge.
- Chlorinated compounds escape at the higher rate in to the atmosphere which may increase the ground level ozone concentration.
- Companies change the products with respect to demand in the market accordingly the solvent type and quantity will also vary. Due to these variations the concentrations of VOC in AAQ, Fugitive, wastewater and solid waste may vary.
- Presence of VOCs in wastewater affects the ambient air quality, efficiency of the effluent treatment system and the quality of the final receiving body. VOCs (Solvents) are emitted in to the environment during various treatment unit operations particularly during aeration in equalization tanks and aeration tanks.
- In case of CETP at Mahad, the concentrations of Dichloroethane, Dichlorobenzene and Toluene were found to be very high as compared to other VOCs present in the influent.

14.0 CONCLUSIONS

Following conclusions are drawn from the field observations, monitoring results and above discussions:

- There is escape of VOCs from industries through fugitive emissions, effluent discharge and hazardous waste generation but units normally pay least attention to identify & quantify such losses & discharge of VOCs. Limited available analysis facility, absence of emission/discharge standards, no mandatory LDAR programme and cost involved in assessment & control are the major factors on part of the emissions of VOCs from industrial units.

- The Solvents used by the industries are matching with detected in samples. The probable reasons for escape of solvent in to atmosphere are:
    - Inadequate storage facilities for material. (e.g. leakages from store.
    - Use of small carboys for temporary storages of solvents and residues.
    - Inadequate closure of reactor vessels.
    - Crude temperature control methods for process.
    - Evaporation from filtration, centrifuge, layer separation due to improper equipment specifications.
    - Improper maintenance of pumps, flanges, valves, compressors, condensers, coolers.
    - Limited efficiency of reflux condensers.
    - Lack of awareness among labors/workers is also responsible on part of escape of VOCs in atmosphere due to human error or negligence.
    - Fume extraction systems of all the possible emission sources and that can be treated.

For developing the standard protocol, standards and guidelines for control of VOCs in ambient environment, it is required to generate data-base for substantial time-span in different industrial regions by similar type of studies.

Annexure-1

List of 60 Volatile Organic Compounds (VOC s)

S.NO	VOC	S.NO	VOC
1	Benzene	31	Trans-1,3-Dichloropropene
2	Bromobenzene	32	Ethyl Benzene
3	Bromochloromethane	33	Hexachloro-1,3-butadiene
4	Bromodichloromethane	34	Isopropylbenzene
5	Chloroform	35	Para-Isopropyltoluene
6	Bromoform	36	Methylenechloride
7	n-Butylbenzene	37	Naphthalene
8	Sec-Butylbenzene	38	2-Propylbenzene
9	Ter-Butylbenzene	39	Styrene
10	Carbon Tetra chloride	40	1,1,1,2-Tetrachloroethane
11	Chlorobenzene	41	1,1,2,2-Tetrachloroethane
12	2-Chlorotoluene	42	Tetrachloroethene
13	4-Chlorotoluene	43	Toluene
14	Dibromochloromethane	44	1,2,3-Trichlorobenzene
15	1,2-Dibromo-3-chloropropane	45	1,2,4-Trichlorobenzene
16	1,2-Dibromoethane	46	1,1,1-Trichloroethane
17	Dibromomethane	47	1,1,2-Trichloroethane
18	1,2-Dichlorobenzene	48	Trichloroethylene
19	1,3-Dichlorobenzene	49	1,2,3-Trichloropropane
20	1,4-Dichlorobenzene	50	1,2,4-Trimethylbenzene
21	1,1-Dichloroethane	51	1,3,5-Trimethylbenzene
22	1,2-Dichloroethane	52	Xylene
23	1,1-Dichloroethene	53	Meta-Xylene
24	Cis-1,2-Dichloroethene	54	Para-Xylene
25	Trians-1,2-Dichloroethene	55	Chloroethane
26	1,2-Dichloropropane	56	Chloromethane
27	1,3-Dichloropropane	57	Trichlorofluoromethane
28	2,2-Dichloropropane	58	Bromomethane
29	1,1-Dichloropropene	59	Vinyl Chloride
30	Cis-1,3-Dichloropropene	60	Dichlorofluoromethane

Annexure-II

S.No.	Name of VOC	Mol.Wt.	Solubility water. At 20 (ml /100 ml)	Boiling Point ▫C
1	**Dichlorofluoromethane Name: Fluorodichloromethane Formula: CHCl2F MW: 102**	102		
2	**Chloromethane Name: Methane, chloro- Formula: CH3Cl MW: 50**	50	303 (Slightly soluble)	-23.7
3	**Vinyl chloride Name: Ethene, chloro- Formula: C2H3Cl MW: 62**	62	Slightly soluble	-13.37
4	**Bromomethane Name: Methane, bromo- Formula: CH3Br MW: 94**	94	1.75 g / 100 g water	3.56
5	**Ethylchloride Name: Ethyl Chloride Formula: C2H5Cl MW: 64**	64	0.574 g / 100 ml	12.3
6	**Name: Trichloromonofluoromethane Formula: CCl3F MW: 136**	136	insol. In water	23.7
7	**Name: Ethene, 1,1-dichloro- Formula: C2H2Cl2 MW: 96**	96	Practically insoluble in water.	31.7
8	**Name: Methylene Chloride Formula: CH2Cl2 MW: 84**	84	~ 50 parts water.	39.75
9	**Trans 1,2 Dichloroethene Name: Ethene, 1,2-dichloro-, (E)- Formula: C2H2Cl2 MW: 96**	96	Insol. In water.	59.6
10	**1,1 Dichloroethane Name: Ethane, 1,1-dichloro- Formula: C2H4Cl2 MW: 98**	98	Soluble in about 200 parts water.	57.3
11	**Cis 1,2 – Dichloroethene Name: Ethene, 1,2-dichloro-, (Z)- Formula: C2H2Cl2 MW: 96**	96	insol.in water.	59.6
12	**Bromochloromethane Name: Methane, bromochloro-**	128		

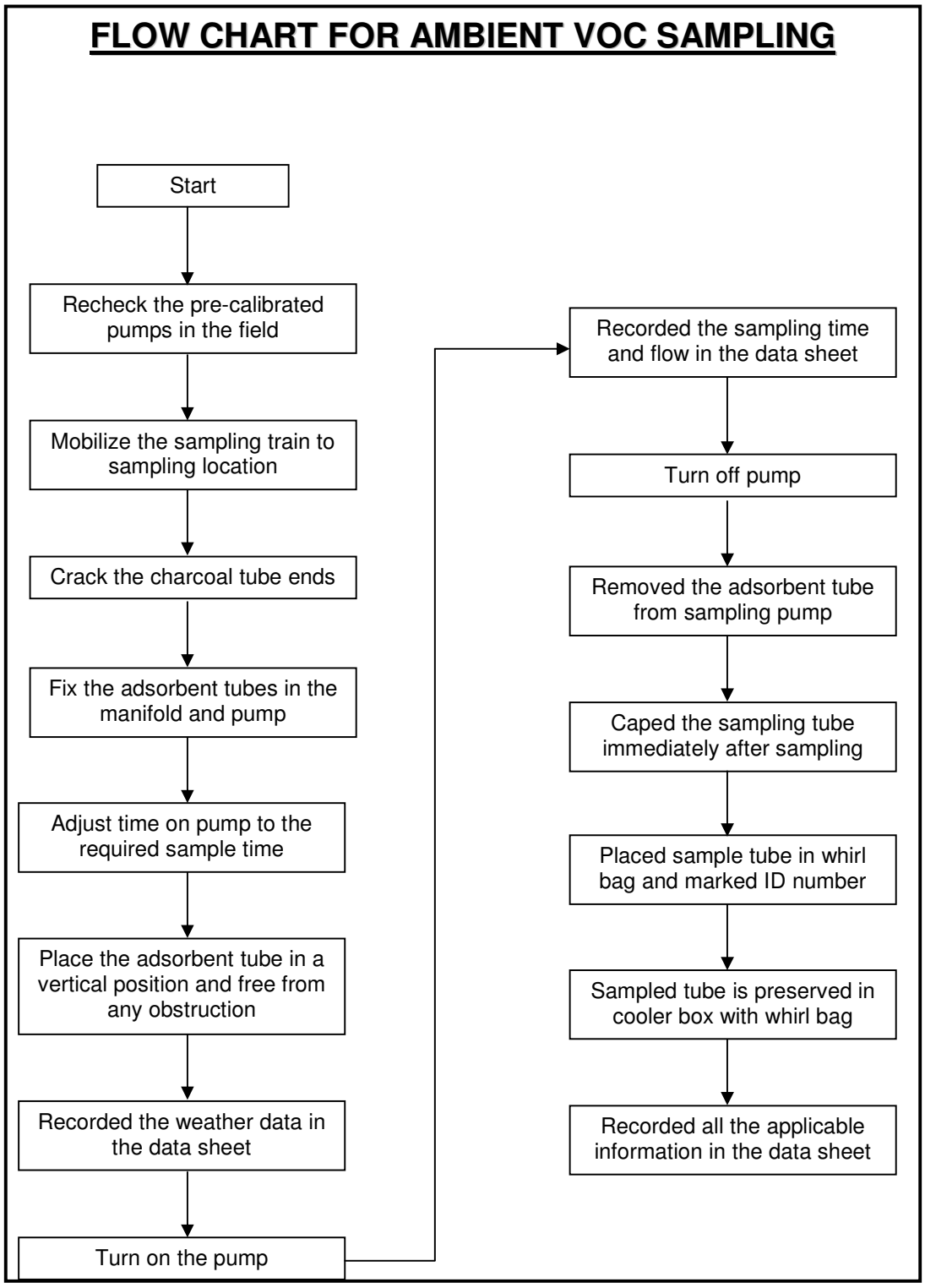
	Formula: CH2BrCl **MW: 128**			
13	**Chloroform** **Name: Trichloromethane** **Formula: CHCl3** **MW: 118**	118	1 ml / 200 ml water	61-62
14	**Name: Propane, 2,2-dichloro-** **Formula: C3H6Cl2** **MW: 112**	112	Slightly sol. In water	95-96
15	**Name: Ethane, 1,2-dichloro-** **Formula: C2H4Cl2** **MW: 98**	98	sol. In 120 parts water	83-84
16	**Name: Ethane, 1,1,1-trichloro-** **Formula: C2H3Cl3** **MW: 132**	132	insol. In water	74.1
17	**Name: 1-Propene, 1,1-dichloro-** **Formula: C3H4Cl2** **MW: 110**	110	--	108
18	**Carbon Tetrachloride** **Name: Carbon Tetrachloride** **Formula: CCl4** **MW: 152**	152	1 ml / 2000 ml water	76.7
19	**Name: Benzene** **Formula: C6H6** **MW: 78**	78	0.188%	80.1
20	**Name: Methane, dibromo-** **Formula: CH2Br2** **MW: 172**	172	11.93 g / 1000g water	97
21	**1,2 dichloropropane** **Name: Propane, 1,2-dichloro-** **Formula: C3H6Cl2** **MW: 112**	112	Slightly soluble in water.	95 – 96
22	**Trichloroethylene** **Name: Trichloroethylene** **Formula: C2HCl3** **MW: 130**	130	0.11 g / 100 g.	86.9
23	**Bromodichloromethane** **Name: Methane, bromodichloro-** **Formula: CHBrCl2** **MW: 162**	162	--	91-92
24	**1,3 dichloropropene** **Name: 1-Propene, 1,3-dichloro-** **Formula: C3H4Cl2** **MW: 110**	110	--	108
25	**Trans 1,3 dichloropropene** **Name: 1-Propene, 1,3-dichloro-, (E)-** **Formula: C3H4Cl2** **MW: 110**	110	--	112

26	**1,1,2-Trichloroethane** **Name: Ethane, 1,1,2-trichloro-** **Formula: C2H3Cl3** **MW: 132**	132	in soluble in water	113-114
27	**Name: Toluene** **Formula: C7H8** **MW: 92**	92	0.067% very slightly sol. in water.	110.6
28	**Name: Propane, 1,3-dichloro-** **Formula: C3H6Cl2** **MW: 112**	112		
29	**Dibromochloromethane** **Name: Methane, dibromochloro-** **Formula: CHBr2Cl** **MW: 206**	206	--	121.3-121.8
30	**1,2 Dibromomethane** **Name: Ethane, 1,2-dibromo-** **Formula: C2H4Br2** **MW: 186**	186	11.93 g / 1000 g water	97
31	**Tetrachloroethylene** **Name: Tetrachloroethylene** **Formula: C2Cl4** **MW: 164**	164	10000 vol water	121
32	**1,1,1,2-Tetrachloroethane** **Name: Ethane, 1,1,1,2-tetrachloro-** **Formula: C2H2Cl4** **MW: 166**	166	1 g in 350 ml water (sparingly sol. In water)	146.5
33	**Chlorobenzene** **Name: Benzene, chloro-** **Formula: C6H5Cl** **MW: 112**	112	Insol. In water.	131-132
34	**Ethyl Benzene** **Name: Ethylbenzene** **Formula: C8H10** **MW: 106**	106	Practically insoluble in water.	136.25
35	**Bromoform** **Name: Methane, tribromo-** **Formula: CHBr3** **MW: 250**	250	sol. In about 800 parts water.	149-150
36	**p-Xylene** **Name: p-Xylene** **Formula: C8H10** **MW: 106**	106	insol. In water.	137-138
37	**M-Xylene** **Name: Benzene, 1,3-dimethyl-** **Formula: C8H10** **MW: 106**	106	insol. In water.	139.3
38	**Styrene** **Name: Styrene**	104		

	Formula: C8H8 **MW: 104**			
39	**Name: Ethane, 1,1,2,2-tetrachloro-** **Formula: C2H2Cl4** **MW: 166**	166	1 g / 350 ml water. (sparingly soluble)	146.5
40	**O – Xylene** **Name: o-Xylene** **Formula: C8H10** **MW: 106**	106	insol. In water.	144
41	**1,2,3-Trichloropropane** **Name: Propane, 1,2,3-trichloro-** **Formula: C3H5Cl3** **MW: 146**	146		
42	**Isopropylbenzene** **Name: Benzene, (1-methylethyl)-** **Formula: C9H12** **MW: 120**	120	Insol. In water.	152-153
43	**Bromobenzene** **Name: Benzene, bromo-** **Formula: C6H5Br** **MW: 156**	156	0.045 g / 100 g water Practically insoluble in water.	156.2
44	**n-Propylbenzene** **Name: Benzene, propyl-** **Formula: C9H12** **MW: 120**	120	0.06 g / L water Very slightly sol. in water.	159.2
45	**2-chlorotoluene** **Name: Benzene, 1-chloro-2-methyl-** **Formula: C7H7Cl** **MW: 126**	126	Slighly sol. In water	158.97
46	**4-chlorotoluene** **Name: Benzene, 1-chloro-4-methyl-** **Formula: C7H7Cl** **MW: 126**	126	Slightly sol.In water	161.75
47	**1,3,5-Trimethylbenzene** **Name: Benzene, 1,3,5-trimethyl-** **Formula: C9H12** **MW: 120**	120	0.002 g / 100g water Practically insoluble in water.	164.7
48	**Tert-butyl benzene** **Name: Benzene, tert-butyl-** **Formula: C10H14** **MW: 134**	134	insoluble in water.	168.5
49	**1,2,4 – Trimethylbenzene** **Name: Benzene, 1,2,4-trimethyl-** **Formula: C9H12** **MW: 120**	120	Practically insoluble in water.	169-171
50	**Sec-Butylbenzene** **Name: Benzene, (1-methylpropyl)-** **Formula: C10H14**	134	Insolu. In water.	173.5

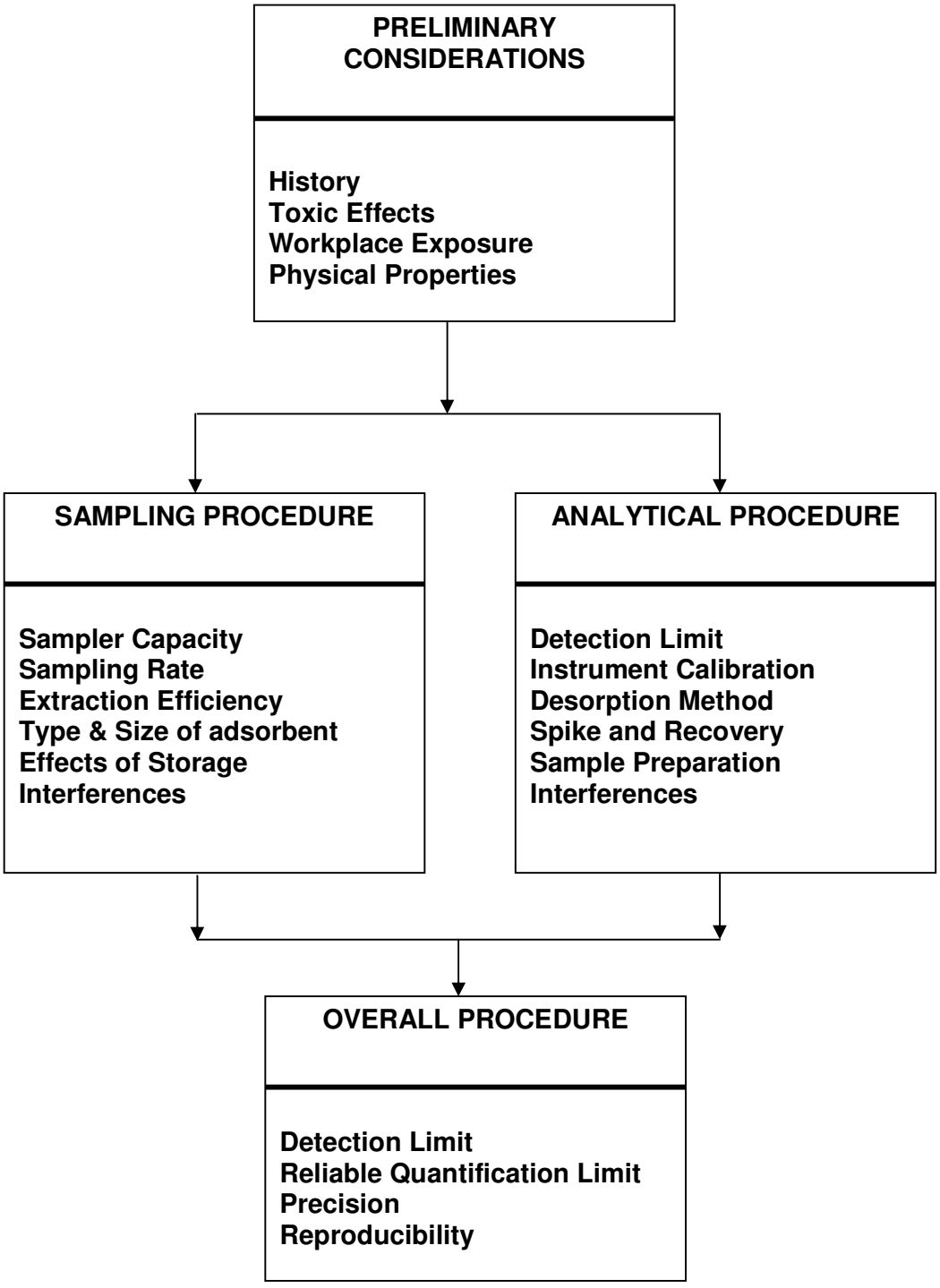
	MW: 134			
51	**1,3-Dichlorobenzene** **Name: Benzene, 1,3-dichloro-** **Formula: C6H4Cl2** **MW: 146**	146	Practically insoluble in water.	173
52	**1,4-Dichlorobenzene** **Name: Benzene, 1,4-dichloro-** **Formula: C6H4Cl2** **MW: 146**	146	Practically insoluble in water.	174.12
53	**4-Isopropyltoluene** **Name: Benzene, 1-methyl-4-(1-methylethyl)-** **Formula: C10H14** **MW: 134**	134	Practically insoluble in water.	175.14
54	**1,2-Dichlorobenzene** **Name: Benzene, 1,2-dichloro-** **Formula: C6H4Cl2** **MW: 146**	146	Practically insoluble in water.	180.5
55	**Name: Benzene, butyl-** **Formula: C10H14** **MW: 134**	134	Insol. In water.	183.1
56	**1,2-dibromo 3, chloropropane** **Name: Propane, 1,2-dibromo-3-chloro-** **Formula: C3H5Br2Cl** **MW: 234**	234	slightly sol. In water.	196
57	**1,2,4-trichlorobenzene** **Name: Benzene, 1,2,4-trichloro-** **Formula: C6H3Cl3** **MW: 180**	180	insol. In water.	213
58	**Naphthalene** **Name: Naphthalene** **Formula: C10H8** **MW: 128**	128	Insol. In water	217.9
59	**Hexachlorobutadiene** **Name: 1,3-Butadiene, 1,1,2,3,4,4-hexachloro-** **Formula: C4Cl6** **MW: 258**	258		
60	**1,2,3-trichlorobenzene** **Name: Benzene, 1,2,3-trichloro-** **Formula: C6H3Cl3; MW: 180**	180	Insol. In water.	221

Annexure - III A



Annexure - III B

EVALUATION SCHEME FOR VOC MONITORING AND ANALYSIS



Annexure-IV

Meteorological Data for 24th February 2009

DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	0	0.6	0.3	0.8	0	57	76	24	24	24.4	23.8	45.2	43.7	45.5	41.8	0	0
24	2	2009	0	0	0.1	0.6	0	71	67	23.6	23.6	24	23.6	47.6	47.4	49.3	45.5	0	0
24	2	2009	0	0	0	0	0	71	71	23.2	23.3	23.6	23.2	48.5	48.9	51.4	47.3	0	0
24	2	2009	0	0	0	0.2	0	36	44	22.9	22.9	23.2	22.8	49.8	49.5	50.9	48.2	0	0
24	2	2009	0	0	0	0	0	20	23	22.7	22.7	22.8	22.7	52.6	51	52.6	49.7	0	0
24	2	2009	0	0	0	0	0	11	13	22.4	22.5	22.7	22.4	54.4	53.3	54.5	52.5	0	0
24	2	2009	0	0.6	0.2	0.7	0	361	1	22.1	22.3	22.5	22.1	50.9	54.4	56.5	50.9	0	0
24	2	2009	0	0.6	0.6	1	0.3	9	1	21.8	22	22.3	21.8	55.5	53.6	55.5	50.8	0	0
24	2	2009	0	0	0.2	0.7	0	356	2	21.8	21.8	22	21.7	54.8	53.9	55.3	51.5	0	0
24	2	2009	0	0	0	0.4	0	342	355	21.9	21.9	22.1	21.8	57.5	55.5	57.5	54.5	0	0
24	2	2009	0	0.8	0.3	0.8	0	340	342	21.8	21.8	22	21.6	54.9	56.2	57.9	54.9	0	0
24	2	2009	0	0.3	0.3	0.8	0	350	346	21.6	21.5	21.8	21.3	55.5	55.1	55.8	54.3	0	0
24	2	2009	1	0.4	0.1	0.5	0	319	339	21.2	21.3	21.6	21.2	53.5	54.4	56	53.4	0	0
24	2	2009	1	0.2	0.2	0.7	0	361	334	21.3	21.2	21.5	21	56.2	53.9	56.2	52.4	0	0
24	2	2009	1	0.6	0.4	1	0	2	354	20.6	20.9	21.3	20.6	53.9	55.7	57.4	53.7	0	0
24	2	2009	1	1.1	0.9	1.5	0.5	348	356	20.5	20.5	20.9	20.3	53.6	52.6	54.1	51.7	0	0
24	2	2009	1	0.5	1.2	2.1	0.5	7	359	20.8	20.7	21.2	20.4	55.3	54.4	55.8	53.5	0	0
24	2	2009	1	0.4	0.8	1.5	0.2	29	22	21.3	21.1	21.6	20.7	56.7	56.1	57.2	55	0	0
24	2	2009	1	1.2	0.6	1.2	0.1	172	145	21.1	21.3	21.6	20.9	60	57.6	60	56.2	0	0
24	2	2009	1	0.4	0.8	1.4	0.4	146	162	20.5	20.5	21	20.3	61.3	61.3	62.2	59.6	0	0
24	2	2009	1	0	0	0.5	0	95	115	20.6	20.5	20.7	20.3	61.4	61.1	61.6	60.8	0	0
24	2	2009	1	0	0	0	0	22	90	21.3	21	21.3	20.7	59.7	60.3	61.7	59.6	0	0
24	2	2009	1	0	0	0	0	244	325	21.4	21.4	21.6	21.2	59.3	59.1	59.7	58.8	0	0
24	2	2009	1	0.5	0.5	0.9	0	206	212	21.6	21.5	22.1	21.3	57.9	58.9	59.7	57.9	0	0
24	2	2009	2	0	0.4	0.7	0	174	180	21.6	21.6	22.1	21.3	58.4	58.3	59.2	57.6	0	0
24	2	2009	2	0.2	0.3	0.9	0	98	78	20.7	21.2	21.7	20.5	64	60.8	64	58.4	0	0
24	2	2009	2	0.2	0	0.3	0	175	110	20.5	20.5	20.8	20.5	63.7	63.8	64.4	63.5	0	0
24	2	2009	2	0.3	0	0.6	0	100	111	20.8	20.5	20.8	20.2	63.7	64	64.9	63.5	0	0
24	2	2009	2	0	0	0.4	0	84	109	20.9	20.9	21.2	20.7	62.4	62.4	63.8	62.1	0	0
24	2	2009	2	0	0	0.3	0	212	183	20.8	20.7	21.1	12.4	65.9	64	66.1	62.5	0	0
24	2	2009	2	0.3	0.4	0.9	0	2	335	20.3	20.4	21.2	12.4	65.1	65.1	67	56	0	0
24	2	2009	2	0.5	0.3	1.2	0	227	281	19.6	19.9	20.8	11.6	67.9	66	67.9	56.3	0	0
24	2	2009	2	0.7	0.2	0.8	0	31	277	19.8	19.6	20.1	19.2	67.7	67.9	68.4	65.2	0	0
24	2	2009	2	0	0.3	0.9	0	360	308	19.4	18.6	19.7	10.9	68.1	68.1	69.2	60	0	0
24	2	2009	2	0.3	0.5	1.3	0	192	212	19.2	19.2	19.8	18.8	66.4	67.5	68.8	63.2	0	0
24	2	2009	2	0	0	0.2	0	199	198	11	15.7	19.4	11	65.6	64.4	66.5	61.2	0	0
24	2	2009	3	0.3	0.1	0.4	0	259	33	19.2	19.2	19.5	19	67.6	66	67.6	57.6	0	0
24	2	2009	3	0	0.2	0.7	0	230	233	19.3	19.1	19.6	10.8	67.4	67.3	68.8	64.2	0	0
24	2	2009	3	0.5	0.4	1	0	260	246	19.1	18.5	19.5	10.8	66	67.2	67.9	65.3	0	0
24	2	2009	3	0	0	0.4	0	341	309	19.5	19.2	19.5	11.1	65.6	65.9	67.1	65.3	0	0
24	2	2009	3	0.5	0	0.5	0	246	336	19.5	18.6	19.6	11.1	65.2	65.5	66	64.8	0	0
24	2	2009	3	0	0.1	0.5	0	278	266	19.2	19.3	19.7	19.2	65.8	65.5	66.2	63	0	0

Meteorological Data for 24"' February 2009

DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	3	0.8	0.1	1	0	6	331	19.2	18.9	19.4	10.8	66.9	65.9	66.9	65.2	0	0
24	2	2009	3	1	0.4	1	0	266	272	18.9	18.7	19.5	10.6	67.9	67.8	68.6	66.5	0	0
24	2	2009	3	0.7	0.5	1	0	43	355	18.4	18.3	19	10.3	70.1	68.1	70.5	59.8	0	0
24	2	2009	3	0	0	0.7	0	271	310	18.4	18	18.7	10.1	70.7	70.5	71	68	0	0
24	2	2009	3	0.9	0.4	1	0	77	42	18.1	18	18.5	10.1	63.7	71.4	72.5	62.8	0	0
24	2	2009	3	0.3	0.5	0.8	0.2	45	72	18.5	18	18.6	9.8	68.9	69.9	72.3	60.5	0	0
24	2	2009	4	0	0.4	0.8	0	79	74	19.1	18.2	19.2	10.4	64.5	65.2	68.7	57.3	0	0
24	2	2009	4	0	0	0	0	71	71	19.4	18.9	19.4	10.7	60.2	61.7	64.4	54.2	0	0
24	2	2009	4	0	0	0	0	92	90	20	19.1	20	10.9	59.2	60.3	61.3	55.4	0	0
24	2	2009	4	0.5	0.4	0.8	0	51	63	19.6	18.1	20.1	11.1	60.8	57.5	61.4	50.7	0	0
24	2	2009	4	0	0.1	0.5	0	21	31	19.5	19.1	19.7	11	60.7	60	62.1	52.1	0	0
24	2	2009	4	0	0	0.3	0	17	32	19.4	18.8	19.5	10.9	57.4	58.6	60.6	51.7	0	0
24	2	2009	4	0	0	0	0	7	10	19.4	19.2	19.4	10.9	61.9	59.8	62.3	51	0	0
24	2	2009	4	0	0	0	0	12	343	19.1	18.5	19.4	10.7	62.8	61	63.2	52.4	0	0
24	2	2009	4	0	0	0	0	14	12	18.7	18.4	19	10.5	64.2	63.3	65.1	55.2	0	0
24	2	2009	4	0	0	0	0	44	28	10.1	18.1	18.7	10.1	61.5	61.9	64.5	53.8	0	0
24	2	2009	4	0.2	0	0.5	0	362	332	18.5	17.9	18.7	10.1	62.2	62.6	65.1	53.5	0	0
24	2	2009	4	0.4	0.1	0.4	0	54	35	10.2	17.5	18.6	10.1	54.9	61.2	63.8	53.7	0	0
24	2	2009	5	0.6	0.4	0.8	0.2	51	48	18.3	16.3	18.6	10	60.6	58.8	63	52.7	0	0
24	2	2009	5	0	0.2	0.6	0	39	36	18.2	17.3	18.7	9.9	61.7	59.7	62.1	52.7	0	0
24	2	2009	5	0.2	0.2	0.6	0	61	54	18.1	16.5	18.5	9.8	61.1	59.5	63.1	53.4	0	0
24	2	2009	5	0.6	0.4	0.6	0.2	52	59	18	17	18.3	9.7	61.8	61.1	63	54.2	0	0
24	2	2009	5	0.3	0.5	0.7	0.3	3	41	17.8	16.9	18.3	9.6	53.7	61	63.1	52.5	0	0
24	2	2009	5	0.1	0.4	0.7	0	362	310	18.2	17.1	18.4	9.8	63.1	62.2	64.6	53.1	0	0
24	2	2009	5	0	0	0.4	0	357	351	18.1	16.7	18.4	9.8	64.3	64.1	65.2	63.2	0	0
24	2	2009	5	0	0	0	0	357	357	18.1	17.4	18.1	9.8	65.9	65.3	66.5	64.4	0	0
24	2	2009	5	0	0	0	0	355	357	9.8	17.3	18.1	9.8	66.7	66.3	67.1	65.9	0	0
24	2	2009	5	0	0	0	0	352	352	18	16.3	18.2	9.7	67.6	67.1	67.9	66.5	0	0
24	2	2009	5	0	0	0	0	352	352	9.6	16.8	18.1	9.6	68.8	67.9	68.9	67.5	0	0
24	2	2009	5	0	0	0	0	351	352	9.7	16.1	18	9.6	69.6	69	69.6	68.8	0	0
24	2	2009	6	0	0	0.4	0	347	354	17.5	16	17.9	9.4	70.2	69.7	70.2	69.3	0	0
24	2	2009	6	0.7	0.3	0.7	0	38	11	16.8	15.1	17.6	8.7	73.1	70.2	73.2	59.9	0	0
24	2	2009	6	0.6	0.7	0.9	0.5	27	29	16.2	15.2	17	8.1	74.1	72.6	75.3	63.5	0	0
24	2	2009	6	0	0.4	1.1	0	334	359	8.4	14.7	16.7	8	70.8	71.5	74.3	63.7	0	0
24	2	2009	6	0.2	0.1	0.6	0	332	328	17.1	15.8	17.1	8.6	68	69	70.8	67.5	0	0
24	2	2009	6	0	0.3	0.7	0	329	335	17.5	14.9	17.7	9	67.7	67.4	67.9	66.9	0	0
24	2	2009	6	0	0	0.1	0	319	328	17.5	16.4	17.6	9.3	66.5	67	67.9	65.7	0	0
24	2	2009	6	0	0.1	0.4	0	302	314	17.4	15.9	17.7	9.2	66.4	66.2	67.2	64.6	0	0
24	2	2009	6	0.3	0.2	0.7	0	228	262	8.9	15.5	17.4	8.9	67.7	65.9	67.7	63.8	0	0
24	2	2009	6	0.6	0.2	0.6	0	305	270	16.6	14.5	17	8.6	3.3	57.8	68.7	3.3	0	0
24	2	2009	6	0.3	0.3	0.9	0	348	334	16.9	14.4	17	8.5	66.7	27.6	66.7	3.3	0	0
24	2	2009	6	0	0	0.3	0	355	356	17.1	14.1	17.2	8.8	7.2	4.5	7.3	3	0	0

Meteorological Data for 24th February 2009

DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	7	0	0	0	0	305	337	8.9	13.8	17.1	8.7	1.5	4.1	8.1	1.5	0	0
24	2	2009	7	0.4	0	0.4	0	326	317	16.9	14.8	17.1	8.8	8.2	4.3	8.9	1.1	0	0
24	2	2009	7	0.2	0.2	0.7	0	360	341	16.9	14	17.2	8.8	0.2	4.6	12.2	0.1	0	0
24	2	2009	7	0.4	0.5	0.9	0.2	338	344	16.5	14.2	17	8.4	6.1	3.4	12.5	0.1	0	0
24	2	2009	7	0.3	0.4	1.1	0	321	331	8.4	12.8	16.7	8.2	6	4.6	13.1	0.2	0	0
24	2	2009	7	0.1	0.4	0.6	0.1	22	18	8.3	14	16.8	8.3	4.6	3	4.7	0.3	0	0
24	2	2009	7	0	0.2	0.6	0	351	4	16.6	13.9	16.8	8.4	4.7	3.6	13.9	0.3	0	0
24	2	2009	7	0	0.3	1	0	7	359	16.8	14.1	17	8.4	3.6	3.5	13.9	0.1	0	0
24	2	2009	7	0.4	0.3	0.6	0	43	33	16.9	14.3	17	8.3	2.8	2.8	5.1	0.1	0	0
24	2	2009	7	0	0.3	0.7	0	19	35	16.8	14.7	16.8	8.4	4.6	2.8	4.9	0.2	0	0
24	2	2009	7	0	0	0	0	333	2	17.1	13.3	17.1	8.5	3.5	3.8	6.7	2.5	0	0
24	2	2009	7	0	0	0	0	325	326	9.2	14.4	17.4	8.9	6.3	4.7	6.4	3.5	0	0
24	2	2009	8	0	0	0	0	334	340	17.8	14.6	17.8	9.2	6.6	4.7	6.9	3.4	0	0
24	2	2009	8	0	0	0	0	321	324	18.3	15.9	18.3	9.5	3.4	4.2	6.6	3.4	0	0
24	2	2009	8	0	0	0	0	21	15	10.2	15.9	18.7	9.9	60.8	10.7	61.7	0.4	0	0
24	2	2009	8	0	0	0	0	70	61	19	17.6	19	10.2	60.2	59.3	60.9	52.5	0	0
24	2	2009	8	0	0	0	0	41	46	19.3	16.7	19.3	10.6	57.8	57.8	60.6	50.2	0	0
24	2	2009	8	0	0	0	0	37	39	19.8	18.7	19.8	10.8	56.7	56.2	58.1	49.3	0	0
24	2	2009	8	0	0	0	0	21	350	20.2	19.1	20.2	11.3	56.4	56.3	57.8	49.4	0	0
24	2	2009	8	0	0	0	0	43	19	20.7	19.6	20.8	11.5	56.5	56	57.1	48.5	0	0
24	2	2009	8	0	0	0	0	305	5	21	20.8	21	20.7	55.6	55.3	56.5	54.4	0	0
24	2	2009	8	0	0	0	0	353	338	21.3	21	21.3	21	54.1	55.1	56	53.2	0	0
24	2	2009	8	0.6	0.3	0.8	0	342	348	21.5	21.3	22	20.9	53.3	53.9	54.7	53.3	0	0
24	2	2009	8	0.3	0.4	0.8	0	353	341	21.7	21.5	22	21	51.9	53.1	54.1	51.9	0	0
24	2	2009	9	0.3	0.2	0.8	0	310	258	22.5	22	22.8	21.3	50.4	50.7	52.1	49.6	0	0
24	2	2009	9	0.3	0.4	0.7	0.1	360	347	22.8	22.6	23.1	22.1	47.7	48.9	50.5	47.7	0	0
24	2	2009	9	0.6	0.1	0.8	0	10	342	23.5	23.1	23.5	22.8	48.3	47.8	48.3	47.1	0	0
24	2	2009	9	0	0.2	0.7	0	311	327	24	23.6	24	23.4	47.9	48.1	48.9	47.4	0	0
24	2	2009	9	0	0	0.1	0	337	322	24.9	24.3	24.9	23.9	44.5	46.5	48.2	44.4	0	0
24	2	2009	9	0.1	0	0.2	0	360	355	25.7	25.2	25.7	24.8	43.7	44	44.4	43.3	0	0
24	2	2009	9	0	0.1	0.5	0	244	279	25.8	25.7	26	25.5	43.2	43.3	44.5	42.6	0	0
24	2	2009	9	0	0.1	0.6	0	281	271	26.3	26	26.3	25.8	41.7	42.4	43.3	41.5	0	0
24	2	2009	9	0	0	0.5	0	345	295	26.7	26.4	26.9	26.2	41.3	41.9	42.8	41.3	0	0
24	2	2009	9	0	0.2	0.9	0	353	18	27.2	26.8	27.2	26.7	40.3	40.6	41.4	40.1	0	0
24	2	2009	9	0	0.1	0.6	0	303	19	27.5	27.1	27.5	26.9	37.8	39	40.8	37.7	0	0
24	2	2009	9	0.6	0	0.8	0	39	287	28	27.5	28	27.3	35.8	37.5	38.4	35.8	0	0
24	2	2009	10	0.6	0.4	1.2	0	307	15	28.2	27.9	28.2	27.7	36.2	36.5	37.2	35.7	0	0
24	2	2009	10	0	0.5	1.2	0	9	346	28.2	28.1	28.4	28	35.4	36.1	37.3	35.4	0	0
24	2	2009	10	0.9	0.4	1.1	0	342	323	29.1	28.7	29.1	28.2	34.9	35.2	36.1	34.5	0	0
24	2	2009	10	0.7	1.1	2.3	0	25	22	29	28.8	29.1	28.7	33.9	34	35	33.3	0	0
24	2	2009	10	1.1	0.5	1.6	0	23	357	29.1	29	29.4	28.8	32.2	33.6	35.3	32.1	0	0
24	2	2009	10	1	1	1.8	0.4	4	28	29.6	29.4	29.7	29.1	32.2	32.8	34.4	31.8	0	0

Meteorological Data for 24th February 2009

DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	10	0.3	0.6	1.8	0	291	344	30.1	29.7	30.1	29.4	31.9	31.8	32.5	31.1	0	0
24	2	2009	10	0.6	0.3	1	0	47	17	30.5	30.2	30.7	30	29.5	30.7	32.4	29.5	0	0
24	2	2009	10	0.6	0.6	1.7	0	323	333	30.7	30.6	31	30.5	29.1	29.2	29.9	28.5	0	0
24	2	2009	10	0.8	0.8	2.1	0	38	358	31	30.9	31.2	30.8	29.9	29.5	30.7	28.7	0	0
24	2	2009	10	0.5	0.7	1.8	0	28	36	31.3	31	31.3	30.8	26.2	28.1	29.8	25.7	0	0
24	2	2009	10	2.2	1.3	3.3	0.4	37	27	31.4	31.3	31.7	31.1	23.1	24.8	26.9	22.6	0	0
24	2	2009	11	1.2	1.7	3.8	0.5	339	16	31.7	31.4	31.7	31.2	23.5	23.5	24.6	22.9	0	0
24	2	2009	11	1.8	1.2	2.4	0.4	321	330	32.2	31.8	32.2	31.5	22.1	22.9	23.9	21.9	0	0
24	2	2009	11	1.5	1.3	2.9	0.6	63	353	32.1	32.1	32.4	32	22.1	22.4	23.3	21.8	0	0
24	2	2009	11	1.9	2	3.6	0.4	321	2	32.3	32.2	32.5	32	22.2	22	22.9	21.4	0	0
24	2	2009	11	0.9	1	2.2	0.1	93	343	32.6	32.5	32.8	32.3	21.6	21.9	22.9	21.2	0	0
24	2	2009	11	1.4	1	1.9	0.2	342	350	32.9	32.8	33.1	32.6	21.3	21.4	22.3	20.8	0	0
24	2	2009	11	1.1	2	4.1	1.1	355	314	32.7	32.8	33.2	32.5	19.8	20.1	21.4	19.4	0	0
24	2	2009	11	1.3	1.6	4.7	0.5	358	325	32.8	32.7	33.1	32.5	20.2	20.2	20.9	19.9	0	0
24	2	2009	11	1.3	1.7	3.8	0.5	322	308	32.9	32.9	33.2	32.7	19.9	20	20.9	19.4	0	0
24	2	2009	11	2.8	1.5	3.8	0.2	344	308	33.4	33.2	33.6	33	19.4	20.1	21.2	19.4	0	0
24	2	2009	11	2.8	2.4	4.3	0.9	301	317	32.9	32.9	33.3	32.8	20.1	19.4	20.2	18.9	0	0
24	2	2009	11	1	1.7	3.3	0.8	350	320	32.9	32.9	33.2	32.7	19.9	19.9	20.5	19.5	0	0
24	2	2009	12	1.9	2.7	4.8	1	285	329	33	32.7	33.1	32.6	20.7	20.1	20.7	19.7	0	0
24	2	2009	12	1	1.8	3.7	0.6	21	319	33.2	33	33.4	32.7	20.1	20.1	20.9	19.2	0	0
24	2	2009	12	2.5	1.8	3.3	0.6	314	346	33	33.3	33.6	32.9	20.3	19.8	20.4	19.3	0	0
24	2	2009	12	1	1.9	4	0.6	337	333	33.2	33	33.3	32.9	20.1	20	20.6	19.6	0	0
24	2	2009	12	2.6	2	4	0.8	6	340	33.1	33.2	33.5	33	20.2	20.6	21.5	20	0	0
24	2	2009	12	1.5	1.8	3	0.4	8	354	33.3	33.3	33.6	33.1	20.6	20.7	21.5	20	0	0
24	2	2009	12	2	1.4	2.5	0.4	312	289	33.8	33.7	34.1	33.3	20.4	20.9	23.1	19.9	0	0
24	2	2009	12	0.2	1.7	3.3	0.2	62	14	33.5	33.5	33.9	33.4	20.5	20.7	21.8	20.2	0	0
24	2	2009	12	1.9	1.5	4.2	0	284	306	34.2	33.9	34.4	33.5	20.2	20.1	21.1	19.7	0	0
24	2	2009	12	0.4	1.8	3.8	0.4	329	271	34	34.1	34.4	34	20.1	20.1	21	19.4	0	0
24	2	2009	12	0.7	1.4	3.4	0.1	268	316	34.2	34.2	34.5	34	20.3	19.9	20.5	19.5	0	0
24	2	2009	12	1.4	0.7	2.2	0	72	277	34.9	34.5	35	34.2	18.8	19.8	21.6	18.7	0	0
24	2	2009	13	0.4	1.1	2.9	0.1	286	53	34.5	34.5	34.9	34.3	18.4	19.3	20.6	18.3	0	0
24	2	2009	13	1.4	1.8	3.8	0.1	285	280	34.6	34.6	34.9	34.4	19.9	19.7	21	18.3	0	0
24	2	2009	13	1	0.8	2.5	0	253	279	34.9	34.6	35.1	34.3	20	20.3	21.3	19.4	0	0
24	2	2009	13	1.9	1.1	2.4	0.4	312	339	34.9	35	35.3	34.8	19.8	19.7	20.5	19.2	0	0
24	2	2009	13	2.7	2.2	3.5	1.2	8	345	34	34.4	35	34	20.3	19.9	20.7	19.1	0	0
24	2	2009	13	2	2.6	4.8	0.7	343	1	34.1	33.9	34.2	33.7	20.2	20.3	20.9	20	0	0
24	2	2009	13	1	1.2	2.1	0.3	329	353	34.7	34.3	34.7	34	20.1	20.2	21.4	19.4	0	0
24	2	2009	13	1.9	1.3	2.8	0.4	245	289	35	34.8	35.2	34.5	20.6	19.6	21.1	18.9	0	0
24	2	2009	13	3	1.5	3.5	0.2	277	249	35.3	35.2	35.5	35	19.4	19.5	21.2	18.4	0	0
24	2	2009	13	2.7	2.3	4.1	0.6	309	263	35.5	35.2	35.5	35.1	19.3	19.5	20.4	18.9	0	0
24	2	2009	13	2.8	2.1	4.5	0.2	237	252	35.2	35.1	35.5	35	20.7	19.6	20.8	18.7	0	0
24	2	2009	13	2.1	2.3	5.5	0.9	253	255	35.4	35.3	35.6	35.1	21.5	20.8	21.5	20.2	0	0

Meteorological Data for 24th February 2009

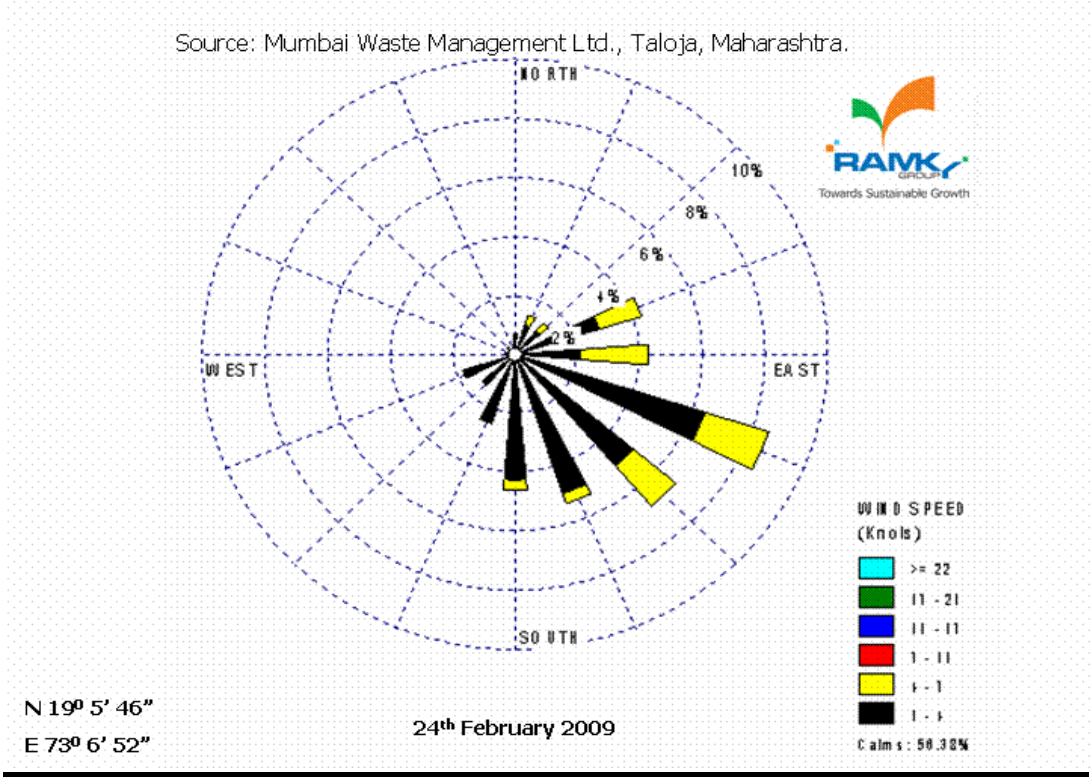
DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	14	0.9	1.8	3.9	0.5	284	256	35.6	35.3	35.6	35.1	20.7	20.3	21.3	19.4	0	0
24	2	2009	14	1.4	1.9	4.2	0.2	301	266	35.4	35.4	35.7	35.3	20.4	20	20.8	19.2	0	0
24	2	2009	14	1.3	1.6	4.5	0.2	221	247	35.8	35.7	36	35.5	20	20.2	21	19.2	0	0
24	2	2009	14	3.9	2.1	4.3	0.4	270	251	35.4	35.6	36	35.3	19.8	19.5	20.7	18.8	0	0
24	2	2009	14	2.9	2.1	4.4	0.8	220	246	35.6	35.5	35.8	35.4	19.8	19.9	20.7	19.2	0	0
24	2	2009	14	1.6	1.6	3.4	0.1	293	249	36.1	35.8	36.2	35.6	20.1	20.2	22.1	19.1	0	0
24	2	2009	14	2.6	2.5	4.2	0.9	203	258	35.7	35.8	36.2	35.4	21.4	20.5	21.4	19.8	0	0
24	2	2009	14	2.3	1.9	3.7	0.4	188	271	36	35.6	36	35.4	21.2	20.9	22.1	20	0	0
24	2	2009	14	3	2.2	4.3	0.4	264	269	35.6	35.9	36.2	35.6	21.9	21.5	22.5	20.6	0	0
24	2	2009	14	2.9	2.1	4	0.6	231	270	35.6	35.6	35.9	35.4	23.4	22.2	23.5	21	0	0
24	2	2009	14	3.3	2.8	5.1	1.1	259	264	35	35.2	35.6	35	22.9	22.8	23.6	22.3	0	0
24	2	2009	14	2.7	2.2	4.1	0.4	249	257	35.3	35.2	35.5	35	23.2	23.2	24.4	22.1	0	0
24	2	2009	15	1	1.7	3.9	0.4	248	240	35.5	35.4	35.7	35.2	22.6	22.9	23.6	21.8	0	0
24	2	2009	15	3.1	2.5	5.4	0.7	323	273	35.3	35.5	35.8	35.2	22.9	23	23.8	22.5	0	0
24	2	2009	15	1.6	1.8	4.3	0.5	243	275	35.9	35.5	35.9	35.2	23	23.3	24.5	22.5	0	0
24	2	2009	15	2.6	2.4	5.9	0.7	281	270	35.2	35.5	35.9	35	24.8	22.9	25	22	0	0
24	2	2009	15	1.8	2.2	4.5	0.5	324	278	35.4	35	35.4	34.9	23	23.8	25	22.5	0	0
24	2	2009	15	2.4	2.2	4.9	0.7	253	281	35.3	35.2	35.5	35	24.5	23.4	24.6	21.9	0	0
24	2	2009	15	1.5	2.2	4.7	0.5	225	260	35	35.1	35.4	35	23.8	24.2	25.4	22.9	0	0
24	2	2009	15	2.3	2.2	4.4	0.8	278	264	35.1	35	35.3	34.8	25.3	24.7	25.4	23.9	0	0
24	2	2009	15	1.4	2.2	4.8	0.5	282	266	34.8	34.9	35.2	34.7	25.6	25.1	25.8	24.1	0	0
24	2	2009	15	2	2.5	4.5	0.8	267	258	34.6	34.6	35	34.4	22.8	24.6	25.9	22.7	0	0
24	2	2009	15	2.2	2.4	5.1	0.4	257	271	34.6	34.4	34.7	34.2	24.8	24.2	25.2	22.9	0	0
24	2	2009	15	3.9	2.6	4.9	0.9	304	282	34.2	34.5	34.8	34.2	24.6	24.4	25.4	22.6	0	0
24	2	2009	16	3.2	2.1	5	0.4	269	276	34.4	34.2	34.5	34.1	24.4	23.9	24.9	23	0	0
24	2	2009	16	0.7	2	4.9	0.4	337	266	34.8	34.5	34.8	34.3	23	23.5	24.4	22.6	0	0
24	2	2009	16	2.5	2.7	5.3	0.8	284	277	34.2	34.4	34.8	34.1	24	22.9	24.4	21.4	0	0
24	2	2009	16	1.7	2.5	4.5	0.4	281	289	34	34.2	34.5	34	23	22.9	23.9	22	0	0
24	2	2009	16	3.1	2.2	3.8	0.4	295	274	34.2	34.2	34.5	34	22.4	22.8	23.8	22	0	0
24	2	2009	16	2.5	2	3.8	0.5	304	288	34.3	34.2	34.4	34	22.2	22.7	24.5	21.9	0	0
24	2	2009	16	2.5	1.9	4.3	0.8	268	266	34.2	34.2	34.4	34.1	23	22.6	23.7	21.9	0	0
24	2	2009	16	1.5	2.4	4.5	0.8	284	270	33.8	34	34.4	33.8	24.1	23.6	24.9	22.6	0	0
24	2	2009	16	1.2	1.9	3.8	0.6	201	259	33.7	33.8	34.1	33.7	23.6	23.9	24.8	22.8	0	0
24	2	2009	16	1.6	1.5	3.6	0.2	252	249	33.9	33.8	34.1	33.7	22.3	22.8	23.9	21.9	0	0
24	2	2009	16	2	1.3	3.2	0.2	301	258	34.2	34	34.2	33.8	23.5	23.3	24	22.5	0	0
24	2	2009	16	2	1.8	3	0.3	285	276	33.8	33.7	34.1	33.5	25.5	24.6	26.1	23.5	0	0
24	2	2009	17	2.3	1.9	3.4	0.5	254	299	33.2	33.5	33.7	33.2	25.7	23.8	25.7	22.3	0	0
24	2	2009	17	1.1	2.1	3.8	0.5	320	296	33.4	33.3	33.5	33.1	22	22.6	25.7	20.8	0	0
24	2	2009	17	2.3	2.1	4.1	0.8	286	299	33.3	33.1	33.3	33	20.5	21	23.3	20.4	0	0
24	2	2009	17	3	2	3.6	1.1	321	314	32.8	33	33.4	32.8	20	20.6	21.2	20	0	0
24	2	2009	17	2.3	1.8	2.9	0.8	294	323	32.7	32.7	33	32.6	20.8	20.1	21.1	19.6	0	0
24	2	2009	17	2.2	2.2	3.3	1.1	317	306	32.9	32.7	32.9	32.6	20.5	20.7	21.4	20.4	0	0

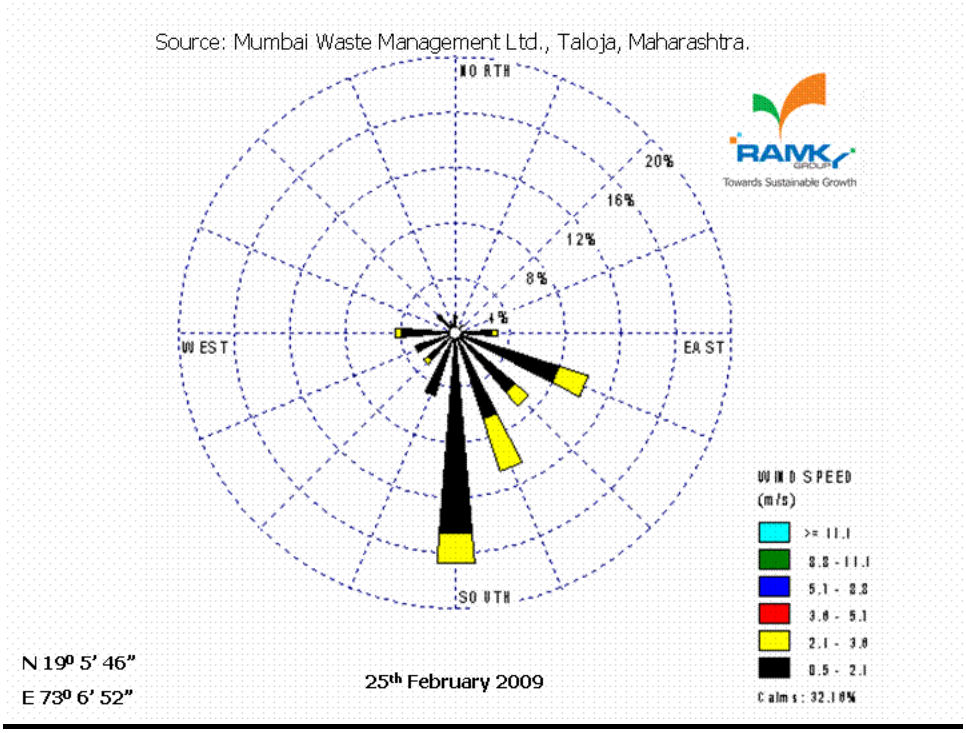
Meteorological Data for 24th February 2009

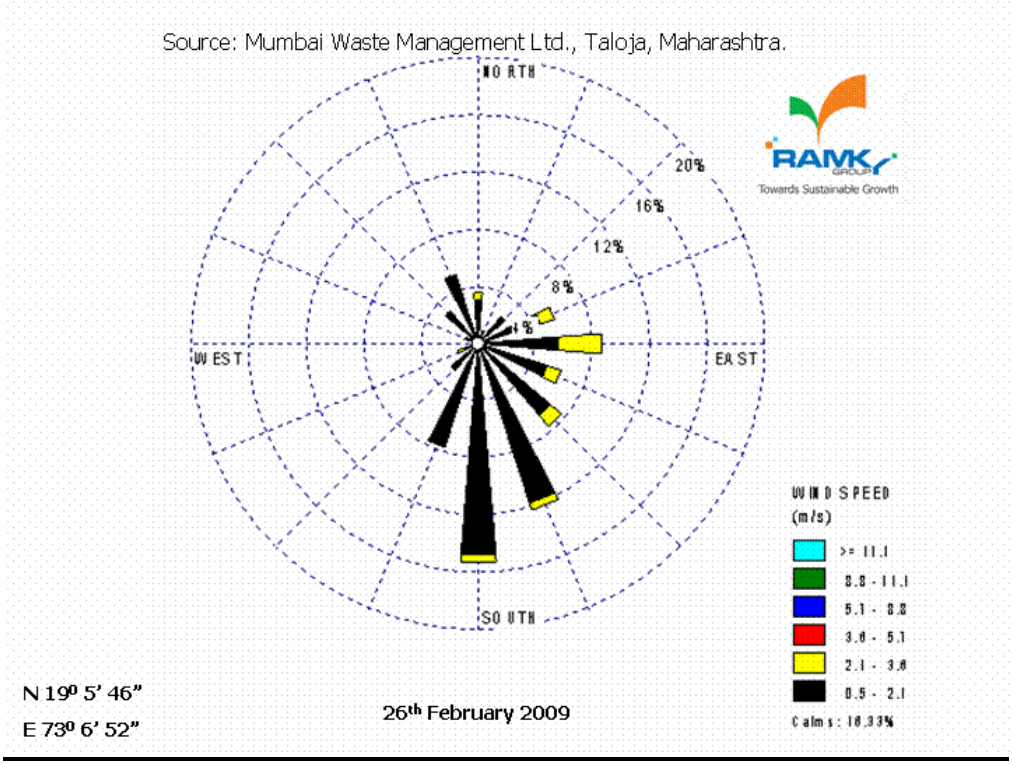
DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	17	1.8	1.7	3	0.5	286	316	32.6	32.6	32.9	32.4	20.2	20.4	20.9	20.1	0	0
24	2	2009	17	1.5	1.7	3.1	0.8	336	321	32.4	32.3	32.7	32.2	20.1	20.2	20.6	20	0	0
24	2	2009	17	3.2	2.1	3.3	0.7	315	307	32.3	32.3	32.7	32.2	20.8	20.4	20.8	19.8	0	0
24	2	2009	17	2.6	1.9	3.3	0.5	295	302	32.1	32.1	32.4	32	20.5	20.7	21.1	20.4	0	0
24	2	2009	17	1.7	1.4	3.9	0.5	302	311	32.2	32.1	32.3	31.9	20.4	20.5	20.8	20.1	0	0
24	2	2009	17	2.2	1.6	3.2	0.5	311	309	31.8	31.8	32.2	31.7	20.8	20.7	21	20.5	0	0
24	2	2009	18	2.1	1.8	3.5	0.8	296	299	31.6	31.6	32	31.4	24	22.1	24	20.7	0	0
24	2	2009	18	1.2	1.3	2.2	0.6	342	302	31.2	31.3	31.7	31.1	25.2	24.9	25.7	24	0	0
24	2	2009	18	0.7	1.5	3.1	0.3	239	285	30.9	31	31.4	30.8	25.9	25.5	26.4	24.9	0	0
24	2	2009	18	0.4	0.8	1.6	0.2	316	273	30.9	30.8	31.1	30.7	26	26.3	27.2	26	0	0
24	2	2009	18	0.3	0.5	1.6	0	276	278	30.9	30.7	30.9	30.6	26.9	26.3	27.1	25.5	0	0
24	2	2009	18	1.2	0.6	1.4	0	332	303	30.4	30.6	30.8	30.4	24.1	25.7	27.4	23.9	0	0
24	2	2009	18	1.6	0.9	1.7	0.3	303	308	30.2	30.2	30.6	30	25.7	25	25.9	23.9	0	0
24	2	2009	18	1.2	1	2.3	0.3	339	313	29.7	29.9	30.2	29.7	24.5	25.4	26	24.3	0	0
24	2	2009	18	1.7	1.1	2.3	0.5	289	310	29.3	29.5	29.9	29.3	23.9	24.4	25	23.9	0	0
24	2	2009	18	0.7	1.1	2.2	0.1	348	307	29	29.2	29.6	29	24.4	24.2	24.6	23.9	0	0
24	2	2009	18	0.5	0.6	1.6	0	293	303	28.8	28.9	29.2	28.8	24.9	24.7	25.1	24.5	0	0
24	2	2009	18	0.2	0.5	1.3	0	320	303	28.7	28.6	29	28.5	25.5	25.1	25.5	24.8	0	0
24	2	2009	19	0.2	0.1	0.6	0	303	331	28.3	28.4	28.7	28.2	25.6	25.7	26.4	25.3	0	0
24	2	2009	19	0	0	0.6	0	324	328	28.1	28.1	28.4	28.1	27	26.3	27.4	25.6	0	0
24	2	2009	19	0	0	0.1	0	358	346	27.8	27.9	28.1	27.8	28.2	27.5	28.3	26.8	0	0
24	2	2009	19	0	0	0	0	357	358	27.3	27.5	27.8	27.3	29.1	27.9	29.3	26.8	0	0
24	2	2009	19	0	0	0	0	357	357	27.1	27.1	27.3	27.1	28.9	28.4	29	28.1	0	0
24	2	2009	19	0.2	0	0.3	0	357	357	26.7	26.9	27.1	26.7	31	29.6	31	29	0	0
24	2	2009	19	0.6	0.2	0.6	0	62	11	26.7	26.7	27	26.5	30.7	30.3	31.4	29.1	0	0
24	2	2009	19	0.2	0.3	0.6	0	52	57	26.5	26.5	26.7	26.3	32.1	31.3	32.2	30.7	0	0
24	2	2009	19	0.5	0.4	0.8	0	31	44	26.3	26.2	26.5	26	33	32.9	34	32.1	0	0
24	2	2009	19	0.5	0.6	0.9	0.4	27	29	26.1	26.1	26.3	26	33.6	33.7	34.2	32.9	0	0
24	2	2009	19	0.4	0.7	1.2	0.3	350	20	26	26.1	26.3	26	34	33.8	34.4	33.5	0	0
24	2	2009	19	0.6	0.6	0.9	0.3	355	1	26.1	25.9	26.2	25.9	34	34	34.3	33.7	0	0
24	2	2009	20	0	0.4	1	0	11	356	26	25.9	26.2	25.8	34.1	34.2	34.6	33.9	0	0
24	2	2009	20	0	0.1	0.6	0	330	336	25.9	25.9	26.1	25.8	34.8	34.2	35.1	33.8	0	0
24	2	2009	20	0	0.2	0.7	0	350	340	25.9	25.9	26.1	25.8	36.1	34.9	36.1	33.9	0	0
24	2	2009	20	0	0.1	0.6	0	329	344	25.5	25.7	26	25.5	37.6	36.9	38.2	35.7	0	0
24	2	2009	20	0	0	0	0	329	329	25.1	25.3	25.7	25.1	40.3	39	40.3	37.3	0	0
24	2	2009	20	0	0	0.3	0	354	348	24.5	24.8	25.1	24.5	39.3	40.8	42	39.3	0	0
24	2	2009	20	0.1	0	0.1	0	357	355	24.2	24.3	24.5	24.2	38.9	40.4	42	38.6	0	0
24	2	2009	20	0.4	0.5	0.7	0.2	64	58	24.2	24.2	24.4	24.1	37.9	38.4	39.2	37.6	0	0
24	2	2009	20	0.3	0.4	0.6	0.3	55	62	24.4	24.3	24.6	24.2	36.2	36.6	38	35.9	0	0
24	2	2009	20	0.3	0.4	0.6	0.3	56	50	24.5	24.5	24.7	24.4	38.2	36.7	39.1	35.9	0	0
24	2	2009	20	0	0.1	0.6	0	79	73	24.2	24.2	24.5	24.2	36.3	37.3	39.6	36.3	0	0
24	2	2009	20	0	0	0	0	100	88	24.4	24.2	24.4	24.2	36.2	36.6	37.6	35.8	0	0

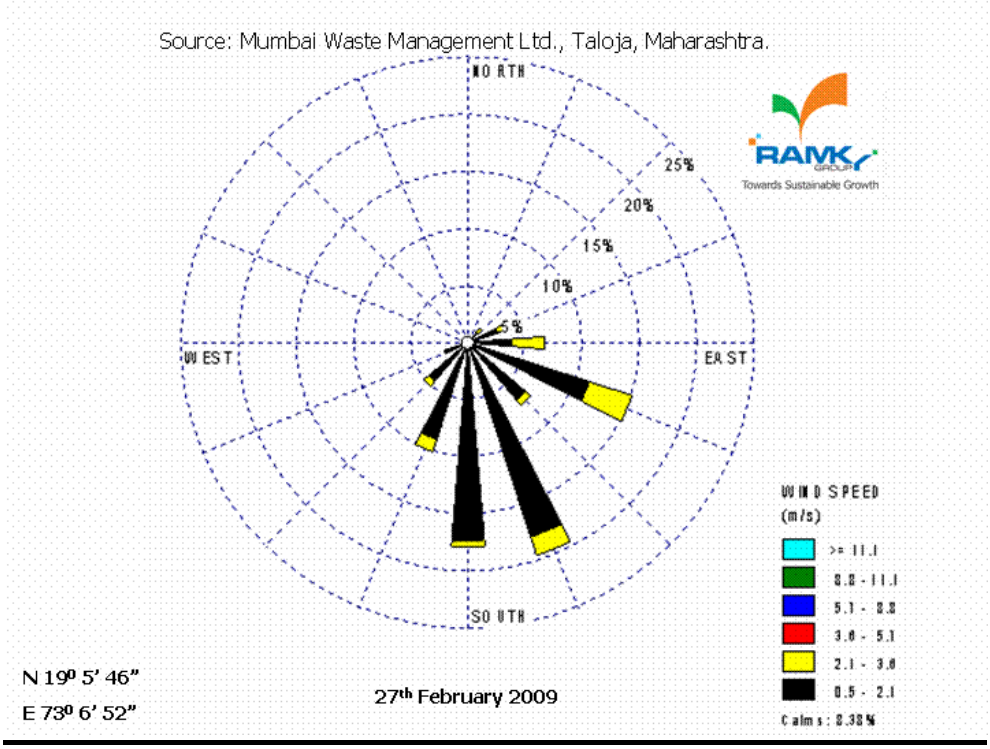
Meteorological Data for 24th February 2009

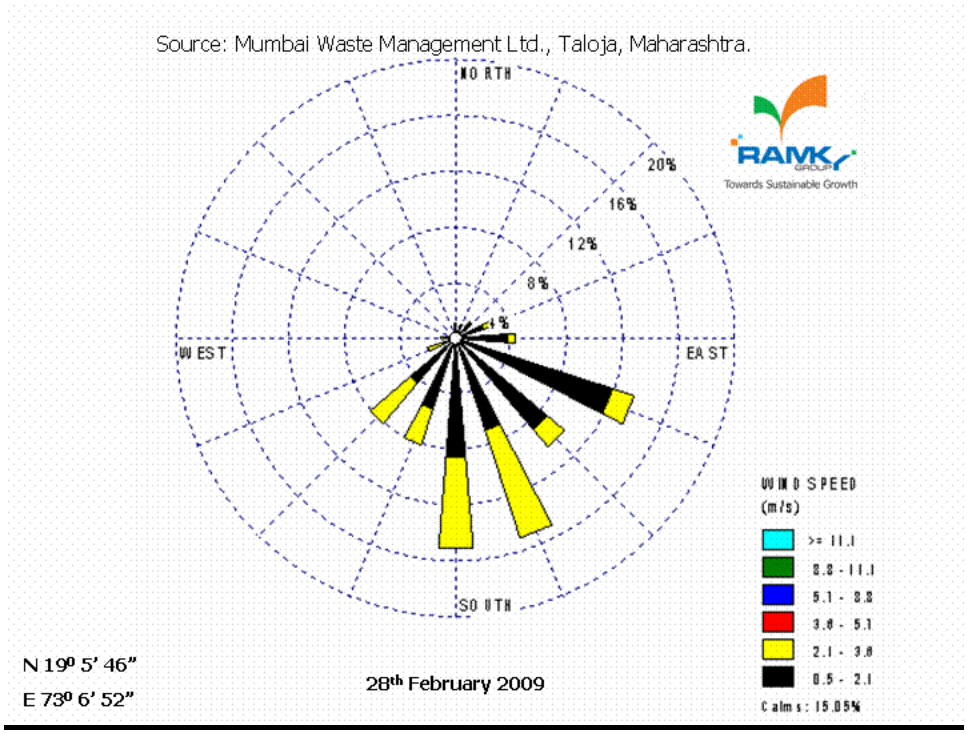
DATE				W. SPEED m/s				W. DRN DEG		AIR TEMP DEG C				R. HUMIDITY %				R. FALL mm	
DD	MM	YY	TIME	CUR	AVG	MAX	MIN	CUR	AVG	CUR	AVG	MAX	MIN	CUR	AVG	MAX	MIN	CUR	TOTAL
24	2	2009	21	0	0	0	0	99	98	24.6	24.5	24.7	24.4	36.1	36.1	36.7	35.9	0	0
24	2	2009	21	0	0	0	0	99	98	24.4	24.5	24.6	24.4	38.6	38.6	40.5	36	0	0
24	2	2009	21	0	0	0	0	99	98	24.1	24.2	24.4	24.1	41.8	40.8	42.1	38.7	0	0
24	2	2009	21	0	0	0	0	47	72	23.3	23.7	24.1	23.3	44	42.9	44	41.7	0	0
24	2	2009	21	0.4	0.2	0.8	0	97	75	23	23	23.3	22.9	43	44.4	45.6	43	0	0
24	2	2009	21	0	0.1	0.5	0	88	93	22.8	22.9	23.2	22.8	43.9	43.1	43.9	42.4	0	0
24	2	2009	21	0.1	0	0.4	0	188	127	22.9	22.8	23	22.8	46.5	45.2	46.5	43.9	0	0
24	2	2009	21	0	0.2	0.7	0	202	204	22.5	22.6	23	22.5	50.6	51.2	54.1	47.2	0	0
24	2	2009	21	0.1	0	0.4	0	171	192	22.4	22.5	22.7	22.3	47.7	51.1	51.8	47.7	0	0
24	2	2009	21	0	0.2	0.6	0	198	173	22.7	22.6	22.9	22.4	51.8	48.2	51.9	45	0	0
24	2	2009	21	0	0	0	0	173	178	22.6	22.7	22.9	22.6	51.5	50.8	52.1	49.2	0	0
24	2	2009	21	0	0	0	0	172	173	22.6	22.5	22.6	22.5	48.6	49.9	51.5	48.6	0	0
24	2	2009	22	0	0	0	0	172	172	22.6	22.5	22.6	22.5	49.8	48.5	49.8	47.7	0	0
24	2	2009	22	0	0	0.4	0	138	91	22.4	22.5	22.7	22.3	48.3	49.1	51	47.4	0	0
24	2	2009	22	0	0	0	0	138	138	22.2	22.2	22.4	22.2	53.9	50.7	53.9	48.1	0	0
24	2	2009	22	0	0	0	0	187	162	22	22.1	22.2	22	49.1	52.1	58.5	48.8	0	0
24	2	2009	22	0	0	0	0	187	187	22	22	22.1	22	55.2	52.8	56.4	49.3	0	0
24	2	2009	22	0	0	0	0	169	175	21.8	21.8	22	21.8	51.9	52.2	55.2	51.3	0	0
24	2	2009	22	0	0	0	0	164	168	21.9	21.8	21.9	21.8	53.7	53	53.8	51.8	0	0
24	2	2009	22	0	0	0	0	149	161	21.8	21.8	21.9	21.8	54.8	54	54.9	53.6	0	0
24	2	2009	22	0	0	0	0	20	24	21.3	21.6	21.8	21.3	54.4	54.3	54.9	53.7	0	0
24	2	2009	22	0	0	0	0	20	20	21	21.1	21.3	21	55.7	55.2	55.9	54.5	0	0
24	2	2009	22	0	0	0	0	39	24	20.9	20.9	21	20.9	55.1	56.2	57.2	55.1	0	0
24	2	2009	22	0	0	0	0	62	57	20.9	20.8	20.9	20.8	53.8	54.7	55.5	53.7	0	0
24	2	2009	23	0	0	0	0	69	66	20.9	20.9	21	20.9	56.1	55	56.2	53.7	0	0
24	2	2009	23	0	0	0	0	18	48	20.8	20.8	21	20.7	53.1	52.9	56.1	50.6	0	0
24	2	2009	23	0.3	0	0.5	0	359	12	20.7	20.7	20.8	20.6	56.3	55	56.5	53.1	0	0
24	2	2009	23	0.3	0.4	0.7	0.2	26	26	20.2	20.3	20.7	20.1	53.9	55.8	57.4	52.9	0	0
24	2	2009	23	0.1	0.4	0.8	0	89	75	20.4	20.3	20.6	20.2	51.4	52	55.1	50.7	0	0
24	2	2009	23	0.4	0	0.4	0	91	90	20.5	20.5	20.7	20.4	51.7	50.3	51.7	49.5	0	0
24	2	2009	23	0.1	0.3	0.5	0.1	59	68	20.8	20.6	20.8	20.6	48.9	49.1	52.3	48.1	0	0
24	2	2009	23	0.4	0	0.4	0	72	43	20.7	20.5	20.7	20.5	50.1	49.8	50.3	48.9	0	0
24	2	2009	23	0.5	0.1	0.6	0	53	55	20.4	20.3	20.6	20.1	50.7	51.1	52.8	50.1	0	0
24	2	2009	23	0.4	0.6	0.9	0.3	76	64	19.8	19.9	20.3	19.7	51.4	50.7	51.7	50.2	0	0
24	2	2009	23	0.5	0.3	0.7	0	41	64	19.5	19.6	20	19.4	53	51.4	53	50.5	0	0
24	2	2009	23	0.4	0.4	1	0.1	361	50	19.2	19.2	19.8	19	53.8	52.9	53.8	52.4	0	0


Source: Mumbai Waste Management Ltd., Taloja, Maharashtra.
NORTH
10%
8%
6%
4%
2%
WEST
EAST
SOUTH
RAMKY GROUP
Towards Sustainable Growth
WIND SPEED
(Knots)
>= 22
11 - 21
11 - 11
1 - 11
1 - 1
< 1
Calms : 50.38%
N 19° 5' 46"
E 73° 6' 52"
24th February 2009


Source: Mumbai Waste Management Ltd., Taloja, Maharashtra.
NORTH
20%
16%
12%
8%
4%
WEST
EAST
SOUTH
RAMKY GROUP
Towards Sustainable Growth
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.1 - 8.8
3.6 - 5.1
2.1 - 3.6
0.5 - 2.1
Calms : 32.16%
N 19° 5' 46"
E 73° 6' 52"
25th February 2009


Source: Mumbai Waste Management Ltd., Taloja, Maharashtra.
NORTH
20%
16%
12%
8%
4%
WEST
EAST
SOUTH
RAMKY GROUP
Towards Sustainable Growth
WIND SPEED (m/s)
>= 11.1
8.8 - 11.1
5.1 - 8.8
3.6 - 5.1
2.1 - 3.6
0.5 - 2.1
Calms : 10.33%
N 19° 5' 46"
E 73° 6' 52"
26th February 2009


Source: Mumbai Waste Management Ltd., Taloja, Maharashtra.
NORTH
25%
20%
15%
10%
5%
WEST
EAST
SOUTH
RAMKY GROUP
Towards Sustainable Growth
WIND SPEED (m/s)
>= 11.1
8.8 - 11.1
5.1 - 8.8
3.6 - 5.1
2.1 - 3.6
0.5 - 2.1
Calms : 8.38%
N 19° 5' 46"
E 73° 6' 52"
27th February 2009


Source: Mumbai Waste Management Ltd., Taloja, Maharashtra.
NORTH
20%
16%
12%
8%
4%
WEST
EAST
SOUTH
RAMKY GROUP
Towards Sustainable Growth
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.1 - 8.8
3.6 - 5.1
2.1 - 3.6
0.5 - 2.1
Calms: 15.05%
N 19° 5' 46"
E 73° 6' 52"
28th February 2009

Annexure-VI A

VOC Sampling Details – Taloja						
S.No	**Date of Sampling**	**Time of Sampling**	**Sampling Location**	**Flow rate**	**Sampling Duration**	**Volume of air Sampled**
Ambient Air Quality Monitoring - 1 Round						
1	24.02.09	10.40am - 04.40pm	Sanghi Organisation	500ml/min	6 hours	180Litres
2	24.02.09	11.40am - 05.40pm	Sindhu Organics (p) Ltd.,	500ml/min	6 hours	180Litres
3	24.02.09	11.50am - 05.50pm	Common Facility Centre	500ml/min	6 hours	180Litres
4	24.02.09	12.40pm - 06.40pm	Nike sea foods	500ml/min	6 hours	180Litres
5	24.02.09	01.15pm - 07.15pm	Titan organic	500ml/min	6 hours	180Litres
Ambient Air Quality Monitoring – 2 Round						
1	24.02.09 - 25.02.09	09.00pm - 03.00am	Sanghi Organisation	500ml/min	6 hours	180Litres
2	24.02.09 - 25.02.09	09.10pm - 03.10am	Sindhu Organics (p) Ltd.,	500ml/min	6 hours	180Litres
3	24.02.09 - 25.02.09	09.20pm - 03.20am	Common Facility Centre	500ml/min	6 hours	180Litres
4	24.02.09 - 25.02.09	09.30pm - 03.30am	Nike sea foods	500ml/min	6 hours	180Litres
5	24.02.09 - 25.02.09	09.40pm - 03.40am	Titan organic	500ml/min	6 hours	180Litres
Ambient Air Quality Monitoring – 3 Round						
1	25.02.09	03.10am - 09.10am	Sanghi Organisation	500ml/min	6 hours	180Litres
2	25.02.09	03.20am - 09.20am	Sindhu Organics (p) Ltd.,	500ml/min	6 hours	180Litres
3	25.02.09	03.30am - 09.30am	Common Facility Centre	500ml/min	6 hours	180Litres
4	25.02.09	03.40am - 09.40am	Nike sea foods	500ml/min	6 hours	180Litres
5	25.02.09	03.50am - 09.50am	Titan organic	500ml/min	6 hours	180Litres

Annexure-VI B

VOC Sampling Details – Mahad						
S.No	**Date of Sampling**	**Time of Sampling**	**Sampling Location**	**Flow rate**	**Sampling Duration**	**Volume of air Sampled**
Ambient Air Quality Monitoring - 1 Round						
1	26.02.09	11.30am - 05.30pm	Titan Laboratories ltd.,	500ml/min	6 hours	180Litres
2	26.02.09	11.50AM - 05.50PM	Pearl Polymers Ltd	500ml/min	6 hours	180Litres
3	26.02.09	12.30Ppm - 06.30pm	Common Effluent Treatment Plant	500ml/min	6 hours	180Litres
4	26.02.09	12.50PM - 06.50PM	Perfect Protein (p) Ltd.,	500ml/min	6 hours	180Litres
5	26.02.09	01.50PM - 07.50PM	Konkan Guest House	500ml/min	6 hours	180Litres
Ambient Air Quality Monitoring – 2 Round						
1	26.02.09 - 27.02.09	08.30PM - 02.30AM	Titan Laboratories ltd.,	500ml/min	6 hours	180Litres
2	26.02.09 - 27.02.09	08.40PM - 02.40am	Pearl Polymers Ltd	500ml/min	6 hours	180Litres
3	26.02.09 - 27.02.09	08.50pm - 02.50am	Common Effluent Treatment Plant	500ml/min	6 hours	180Litres
4	26.02.09 - 27.02.09	09.00pm - 03.00am	Perfect Protein (p) Ltd.,	500ml/min	6 hours	180Litres
5	26.02.09 - 27.02.09	09.10pm - 03.10am	Konkan Guest House	500ml/min	6 hours	180Litres
Ambient Air Quality Monitoring – 3 Round						
1	27.02.09	02.40am - 08.40am	Titan Laboratories ltd.,	500ml/min	6 hours	180Litres
2	27.02.09	02.50am - 08.50am	Pearl Polymers Ltd	500ml/min	6 hours	180Litres
3	27.02.09	03.00am - 09.00 am	Common Effluent Treatment Plant	500ml/min	6 hours	180Litres
4	27.02.09	03.10am - 09.10am	Perfect Protein (p) Ltd.,	500ml/min	6 hours	180Litres
5	27.02.09	03.20am - 09.20am	Konkan Guest House	500ml/min	6 hours	180Litres

Annexure - VII

METHOD OF ANALYSIS

Ambient Air Quality & Fugitive Emission Samples

Method – EPA TO – 17

Method Validation Document

CONTENTS

1.0 OBJECTIVE

To validate the method for the determination of "VOCs collected in chromosorb and tennax tube with Active Thermal Desorption as per method EPA TO - 17.

2.0 SCOPE & APPLICATION

The following performance parameters were assessed during the validation.

1. Accuracy
2. Linearity
3. Limit of Detection
4. Limit of Quantification
5. Recovery

2.1 Application

This procedure is applicable for the determination of VOCs collected in Chromosorb + Tenax tube using GC-MSD with Active Thermal Desorption system.

3.0 PROCEDURE

Details of GC/MS Method :

Instrument Details: Model Used:- 6890 GC-MSD (Make:- Agilent Technologies Ltd.)

4.0 GC conditions:-

Oven

Initial Temperature : 40 °C (On) Maximum Temp : 260°C
Initial Time : 3.00 Min. Equilibrium Time : 0.50 min.
Ramps:

#	Rate	Final Temp.	Final Time
1	10	100	0.00
2	25	225	3.00
3	0.0 (off)		

Post Temp : 0 °C
Post Time : 0.00 min.
Run Time : 17.00 min.

Front Inlet (Split / Split less)

Mode : Split
Inlet Temp : 250 °C (On)
Pressure : 23.20 psi (On)
Split : 50:1
Split flow : 49.6 mL / min.
Total flow : 53.1 mL / min.
Gas saver : ON
Gas Type : Helium

Column 1
Capillary Column
Model Number: J&W US5270225H
DB-VRX,20m x 0.18mm x 1µm
Intial flow : 1.0mL/min
Inlet : Front Inlet
Outlet : MSD
Outlet pressure : vacuum

Column 2
Capillary Column
Model No.: J&W US5215021H
DB-624,60m x 0.25mm x 1.4µm
Intial flow : 1.5mL/min
Inlet : Back
Outlet : MSD
Outlet pressure : Vaccum

Thermal Aux 2 (Transfer line)

Use : MSD Transfer Line Heater
Initial temp : 260 °C
Initial time : 0.00 min.

MS Acquisition Parameters

General Information

Tune File : atune.u
Acquisition Mode : Scan

Name	Quantification ion
Dichlorodifluoromethane	85
Chloromethane	50
Vinyl chloride	62
Bromomethane	94
Ethylchloride	64
Trichloromonofluoromethane	101
1,1-dichloroethene	96
Methylene chloride	84
Trans-1,2-Dichloroethene	96
1,1-dichloroethane	63
Cis-1,2-Dichloroethene	96
Bromochloromethane	128
Chloroform	83
2,2-dichloropropane	77
1,2-dichloroethane	62
1,1,1-Trichloroethane	97
1,1-dichloropropene	75
Carbon Tetrachloride	117
Benzene	78
Dibromomethane	93
1,2-dichloropropane	63
Trichloroethylene	95
Bromodichloromethane	83
1,3-dichloropropene	75
Trans-1,3-dichloropropene	75
1,1,2-Trichloroethane	83
Toluene	91
1,3-Dichloropropane	76
Dibromochloromethane	129
1,2-Dibromoethane	107
Tetrachloroethylene	166
1,1,1,2-Tetrachloroethane	131
Chlorobenzene	112
Ethylbenzene	91
Bromoform	173
m & p - Xylene	106
Styrene	104
1,1,2,2-Tetrachloroethane	83
O-Xylene	106

1,2,3-Trichloropropane	75
Isopropyl benzene	105
Bromobenzene	156
n-Propylbenzene	91
2-Chlorotoluene	91
4-Chlorotoluene	91
1,3,5-trimethylbenzene	105
Tert-Butylbenzene	119
1,2,4-trimethylbenzene	105
Sec-Butylbenzene	105
1,3-dichlorobenzene	146
1,4-dichlorobenzene	146
4-isopropyltoluene	119
1,2-dichlorobenzene	146
Butylbenzene	91
1,2-dibromo-3,-chloropropane	75
1,2,4-trichlorobenzene	118
Naphthalene	128
Hexachlorobutadiene	225
1,2,3-trichlorobenzene	180

4.1 Thermal Desorption Conditions: Unity Thermal Desorber method

Thermal desorption is a simple extension of the technique of gas chromatography (GC) and is most commonly used in combination with a GC analyzer.In the process of thermal desorption, heat and a flow of inert gas are used to extract volatile and semi-volatile organics retained in a sample matrix or on a sorbent bed. The analytes desorb into the gas stream and are transferred into an analytical system in a small, concentrated volume of vapour.

Unity Thermal desorber Conditions :

Desorption temp : 275°C

Desorption time : 5 min

Cold trap packing : Tennax TA

Cold trap focusing temp : -10°C

Cold trap (secondary) desorption temp : 300°C

Secondary desorption time	3 min
Flow path temp :	120°C
Desorb flow :	4ml/min
Inlet split :	52ml/min
Outlet split :	50ml/min

5.0 Validation Parameters:

5.1 Accuracy: The accuracy of an analytical method is the extent to which test results generated by the method and the true value agree.The true value for accuracy assessment can be obtained by comparing the measured value with the true value.

5.2 Linearity: The linearity of an analytical method is its ability to elicit test results that are directly, or by means of well defined mathematical transformations, proportional to the concentrations of anlytes in samples within a given range. Linearity is determined by a series of injections of standards at about five different concentrations that span 50-150% of the expected working range assay. The response should be linearly related to the concentrations of standards. A linear regression equation applied to the results should have an intercept not significantly different from zero.

5.3 Limit of Detection : The limit of detection is the point at which a measured value is larger than the uncertainty associated with it. It is the lowest concentration of analyte in a sample that can be detected, but not necessarily quantified.

5.4 Limit of Quantification: The limit of quantification is the injected amount, which results in a reproducible measurement of peak heights are typically required to be about 10-20 times higher than the base line noise.

5.5 Recovery: A known concentration of standard was spiked into the sample and injected into the instrument. And recovery was calculated as follows

Calculation:

Recovery % = Obtained conc (µg/L)./spiked conc.(µg/L) X 100

6.0 Results:

Linearity : Linearity is plotted using five point calibration curve and it is found to be satisfactory having a linear regression of 0.99. Data are enclosed

Limit of Quantification : The limit of quantification with this method is 1µg/L

Limit of Detection : The limit of detection with is method is 0.5µg/L

Recovery : The recovery with this method is 65-115%

The data are enclosed

7.0 Conclusion : It is concluded that the method is applicable to determine the volatile organic compounds collected on Chromosorb + Tenax tube using GC-MSD with ATD technique. This method is rugged, stable and reproducible

ANNEXURE - VIII

METHOD OF ANALYSIS
Soil and Waste samples
Method – EPA 5035A /8260B

1. Scope

1.1 This Method describes a closed –System purge-and-trap process for the analysis of Volatile Organic Compounds (VOC's) in solid materials (eg., Soils, Sediments, and soild waste).

1.2 While the method is designed for use on samples containing low levels of VOC's, procedures are also provided for collecting an preparing solid samples containing high concentrations of VOC's and oily wastes.

1.3 The above samples are analysed with the help of GC-MS (Purge & Trap, Make Teledyne Tekmar – Velocity XPT Purge & Trap, Sample collector) method.

2. Methodology

2.1 This method EPA 5035A for most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile, water-soluble compounds can be included in this analytical technique. However, quantitation limits are significantly higher because of poor purging efficiency. The purging efficiency can be improved for water soluble analytes eg., ketones and alcohols, when purging at an elevated temperature of 80°C as compared to 20° or 40°C.

3. Materials and Reagents (for In-house)

3.1 Conical Flask – Capacity 250ml / 100 ml.

Activated Charcoal tube – Spike has been done earlier in Lab, Keep it in Freezer @ - 10° C.

3.2 Methanol:- Merck GR grade or equivalent.

3.3 Water – Millipore, with reference to the specification of Water for Laboratory ISO3696:1987 Electrical conductivity and TOC are within the specifications)

3.4 A1 Filter paper. – for filtration.

4. Experiments (In-house)

a. Low concentration soil method – generally applicable to soils and other soilid samples with VOC concentrations in the range of 0.5 to 200 µg / kg.

b. Volatile organic compounds (VOCs) are determined by collecting samples and shipping to the laboratory or appropriate analysis site by the various methods outlined in Appendix A of 5035A. To ensure minimal loss of volatile constituents prior to analysis the entire sample vial is placed, uncapped with septum, into the instrument, auto sampler device. Before analysis, organic – free reagent water, surrogates and internal standards (if applicable) are automatically added without opening the sample vial. The vial containing the sample is heated to 40°C and the volatiles purged into an appropriate trap using an inert gas (He) and the sample is agitated. Purged components travel via a transfer line to a trap. When purging is complete, the trap is heated and back flushed with Helium to desorb the trapped sample components into a gas chromatograph for analysis by an appropriate determinative method.

c. High Concentration method – generally applicable to soils and other solid samples with VOC concentrations greater than 200 µg / kg. The sample introduction technique, particularly those containing high concentrations (generally greater than 200 µg / Kg) of VOCs which may overload either the volatile trapping material or exceed the working range of the determinative instrument system (e., GC/MS, GC/FID, GC/ELCD etc.,).

In such instances this method describes two sample collection options and the corresponding sample purging procedures.

d. The first option is to collect an appropriate sample volume in a pre-weighed vial with a septum-sealed screw-cap that contains a water miscible organic solvent (methanol – 5 ml). At the time of analysis, an aliquot of the solvent is removed from the vial and diluted into water(organic free water) along with the internal standards and surrogates, then purged and analysed by an appropriate determinative method. If required do sonication and filter and the sample with short span of time and immediately give it for analysis.

5. Instrumentation & conditions:-

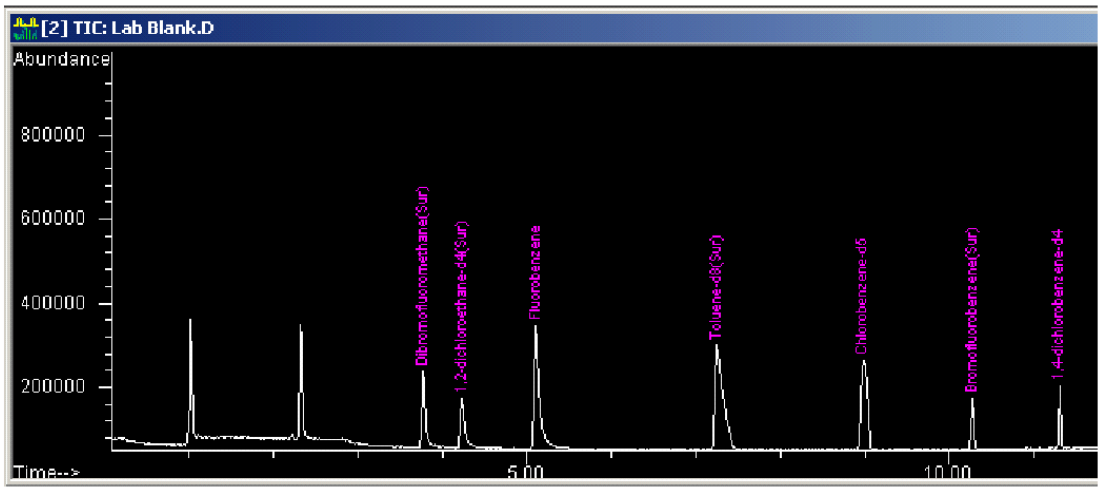
Similar conditions has been maintained for Solid waste and Effluent also.

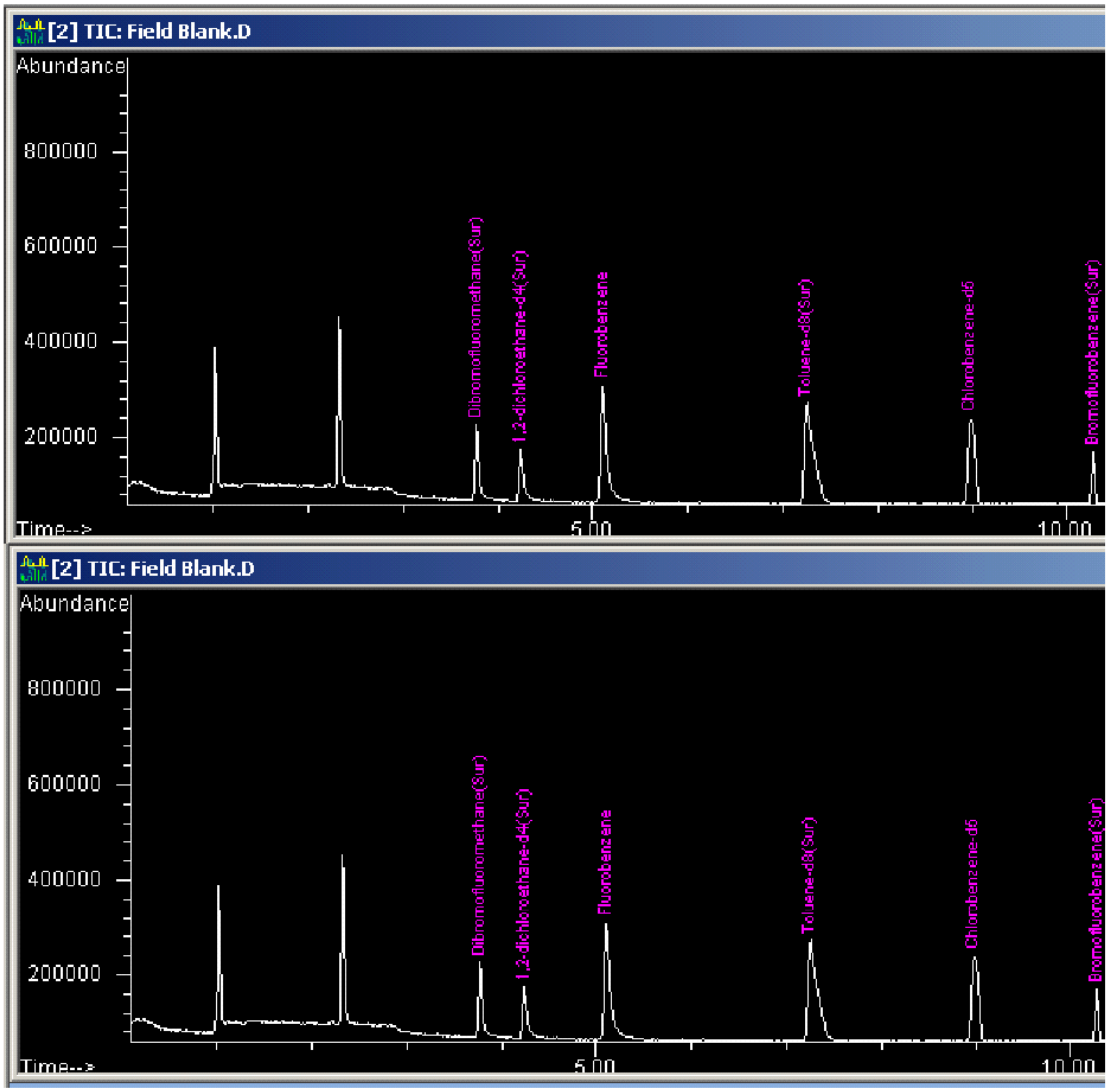
6.1 Purge & Trap Conditions:- Velocity XPT (with AQUATEK 70) method

Variable	Value	Variable	Value
Valve Oven Temp.	150ºC	Dry Purge Temp.	40ºC
Transfer Line Temp.	150ºC	Dry Purge Flow	200 mL / min.
Sample Mount Temp.	90ºC	GC Start	Start of Desorb
Purge Ready Temp.	45ºC	Desorb Preheat Temp.	245ºC
Dry Flow Standby Temp.	175ºC	Desorb Drain	On
Standby Flow	10 mL / min.	Desorb Time	1.00 min.
Pressurize Time	0.25 min.	Desorb Temp.	250ºC
Fill I.S. Time	0.00 min.	Desorb Flow	200 mL / min.
Sample Transfer Time	0.25 min.	Bake Rinse	On
Pre-purge Time	0.00 min.	Number of Bake Rinses	3
Pre-Purge Flow	40 mL / min.	Bake Drain Time	0.50 min.
Sample Heater	Off	Bake Drain Flow	400 mL / min.
Sample Preheat Time	1.00 min.	Bake Time	3.00 min.
Preheat Temp.	40ºC	Bake Temp.	270ºC
Purge Time.	11.00 min.	Dry Flow Bake Temp.	175ºC
Purge Temp.	0ºC	Bake Flow	400 mL / min.
Purge Flow	40 mL/min.	Focus Temp.	-150ºC
Purge Rinse Time	0.25 min.	Inject Time	1 min.
Purge Line Time	0.25 min.	Inject Temp.	180ºC
Dry Purge Time	0.00 min.	Standby Temp.	100ºC

ANNEXURE - IX

CHROMATORGRAMS

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200000
Time-->
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10.00
Dibromofluoromethane(Sur)
1,2-dichloroethane-d4(Sur)
Fluorobenzene
Toluene-d8(Sur)
Chlorobenzene-d5
Bromofluorobenzene(Sur)
[2] TIC: Field Blank.D
Abundance
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600000
400000
200000
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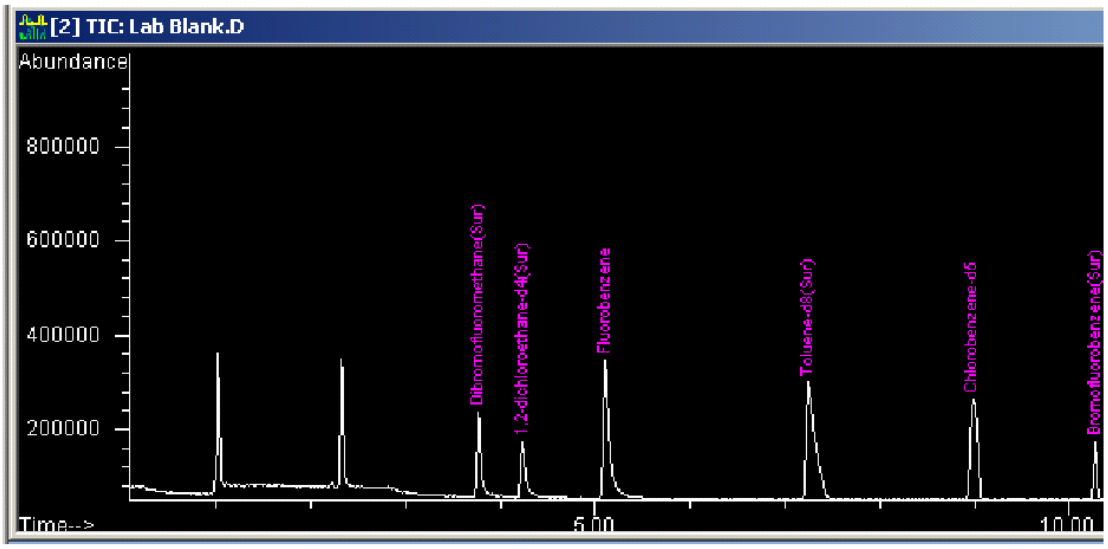
10.00
Dibromofluoromethane(Sur)
1,2-dichloroethane-d4(Sur)
Fluorobenzene
Toluene-d8(Sur)
Chlorobenzene-d5
Bromofluorobenzene(Sur)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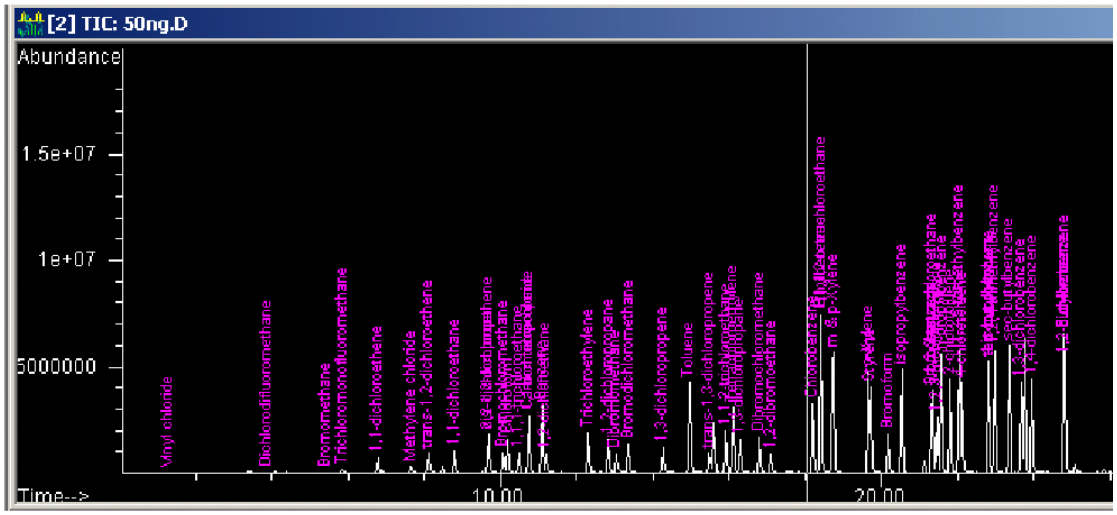
Dibromofluoromethane(Sur)
1,2-dichloroethane-d4(Sur)
Fluorobenzene
Toluene-d8(Sur)
Chlorobenzene-d5
Bromofluorobenzene(Sur)

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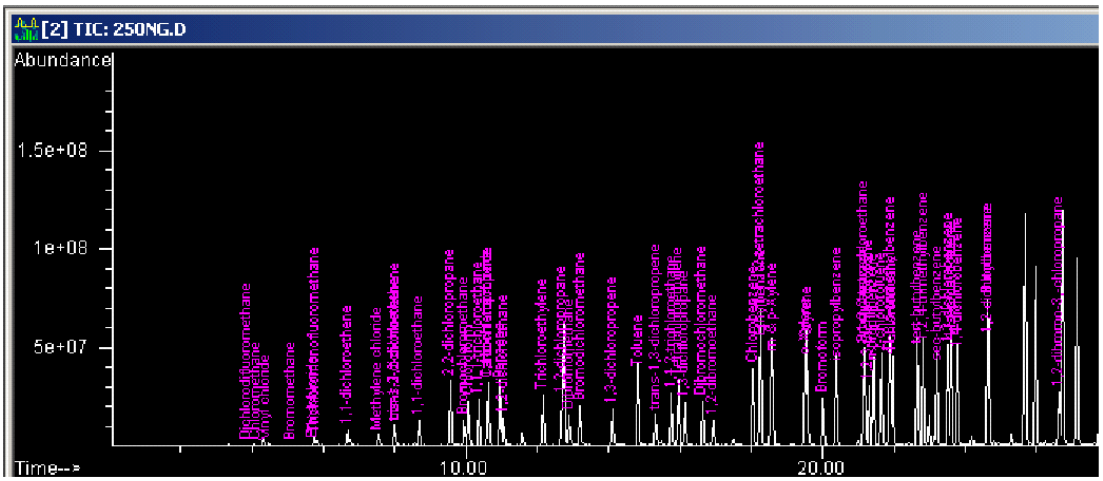
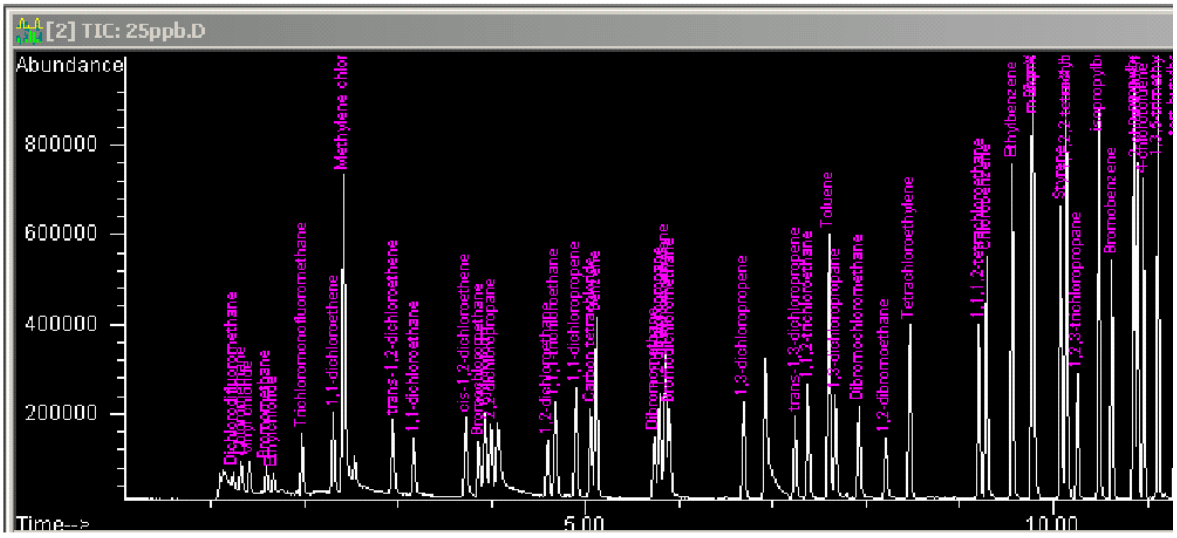
Sample    : Spike_50ng
Misc      :
ALS Vial  : 1   Sample Multiplier: 1
Quant Method : C:\MSDCHEM\1\METHODS\VOC 60_VF.M
Quant Title  : VOCs using
Response via : Initial Calibration
```

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
Target Compounds							Qvalue
7) 1,1-dichloroethene	6.79	61	5949860	31.74	ng		98
8) Methylene chloride	7.66	84	1712456	26.56	ng	#	62
9) trans-1,2-dichloroethene	8.11	61	5833606	38.39	ng		92
10) 1,1-dichloroethane	8.80	63	12850550	36.65	ng		98
11) cis-1,2-dichloroethene	9.69	61	8795658	42.39	ng		95
12) Bromochloromethane	10.08	130	4321137	46.90	ng	#	78
13) Chloroform	10.20	83	14391961	43.35	ng		98
14) 2,2-dichloropropane	9.69	77	4045900	1.79	ng		95
15) 1,2-dichloroethane	11.19	62	8268715	48.71	ng	#	95
16) 1,1,1-trichloroethane	10.48	97	8631478	8.45	ng		98
17) 1,1-dichloropropene	10.74	75	10945893	43.30	ng		97
18) Carbon tetrachloride	10.75	117	8943613	13.47	ng		99
19) Benzene	11.09	78	37581724	38.15	ng		99
20) Dibromomethane	13.05	174	3543532	55.67	ng	#	82
21) 1,2-dichloropropane	12.84	63	8697441	43.53	ng	#	90
22) Trichloroethylene	12.31	130	9844597	47.96	ng		100
23) Bromodichloromethane	13.35	83	12503210	48.36	ng		98
24) 1,3-dichloropropene	14.26	75	9327502	48.03	ng		92

25) trans-1,3-dichloropropene	15.48	75	7349537	55.41 ng	#	93
26) 1,1,2-trichloroethane	15.92	97	9717275	48.26 ng		97
27) Toluene	14.98	91	48639048	37.65 ng		99
28) 1,3-dichloropropane	16.29	76	12533676	46.87 ng	#	85
29) Dibromochloromethane	16.79	129	14142249	49.24 ng		100
30) 1,2-dibromoethane	17.09	107	8959810	48.96 ng		100
31) Tetrachloroethylene	16.11	166	16040440	48.38 ng		100
32) 1,1,1,2-tetrachloroethane	18.40	131	6810835	80.28 ng	#	79
33) Chlorobenzene	18.20	112	30334684	45.41 ng		99
34) Ethylbenzene	18.41	91	56118963	32.87 ng		99
35) Bromoform	20.17	173	14319746	48.93 ng		98
36) m & p-Xylene	18.73	91	85998810	30.18 ng		96
37) Styrene	19.71	104	31202414	41.68 ng		99
38) 1,1,2,2-tetrachloroethane	21.31	83	19890105	43.02 ng	#	60
39) o-Xylene	19.65	91	46602297	38.58 ng	#	96
40) 1,2,3-trichloropropane	21.46	75	17579510	46.66 ng		90
41) isopropylbenzene	20.54	105	57248541	32.99 ng		99
42) Bromobenzene	21.34	77	18642781	43.40 ng		96
43) n-propylbenzene	21.57	91	72723735	27.42 ng		99
44) 2-chlorotoluene	21.80	91	41880739	40.24 ng		99
45) 4-chlorotoluene	22.11	91	33859513	43.88 ng	#	87
46) 1,3,5-trimethylbenzene	22.03	105	53666335	33.76 ng		95
47) tert-butylbenzene	22.80	119	47134924	37.51 ng		99
48) 1,2,4-trimethylbenzene	22.96	105	55217963	33.94 ng		96
49) sec-butylbenzene	23.36	105	73015274	29.04 ng		98
50) 1,3-dichlorobenzene	23.67	146	33146961	42.65 ng		99
51) 1,4-dichlorobenzene	23.94	146	34266172	41.99 ng		99
52) 4-isopropyltoluene	22.80	119	47062010	37.95 ng	#	59
53) 1,2-dichlorobenzene	24.82	146	34009240	41.65 ng		100
54) Butylbenzene	24.78	91	56126349	32.93 ng		98
55) 1,2-dibromo-3,-chloropropa	26.80	157	13181730	46.59 ng		97
56) 1,2,4-trichlorobenzene	28.85	180	32371735	43.92 ng		100
57) Naphthalene	29.51	128	85189117	17.99 ng		99
58) Hexachlorobutadiene	29.20	225	22559567	47.36 ng		99
59) 1,2,3-trichlorobenzene	30.05	180	32758876	44.02 ng		99

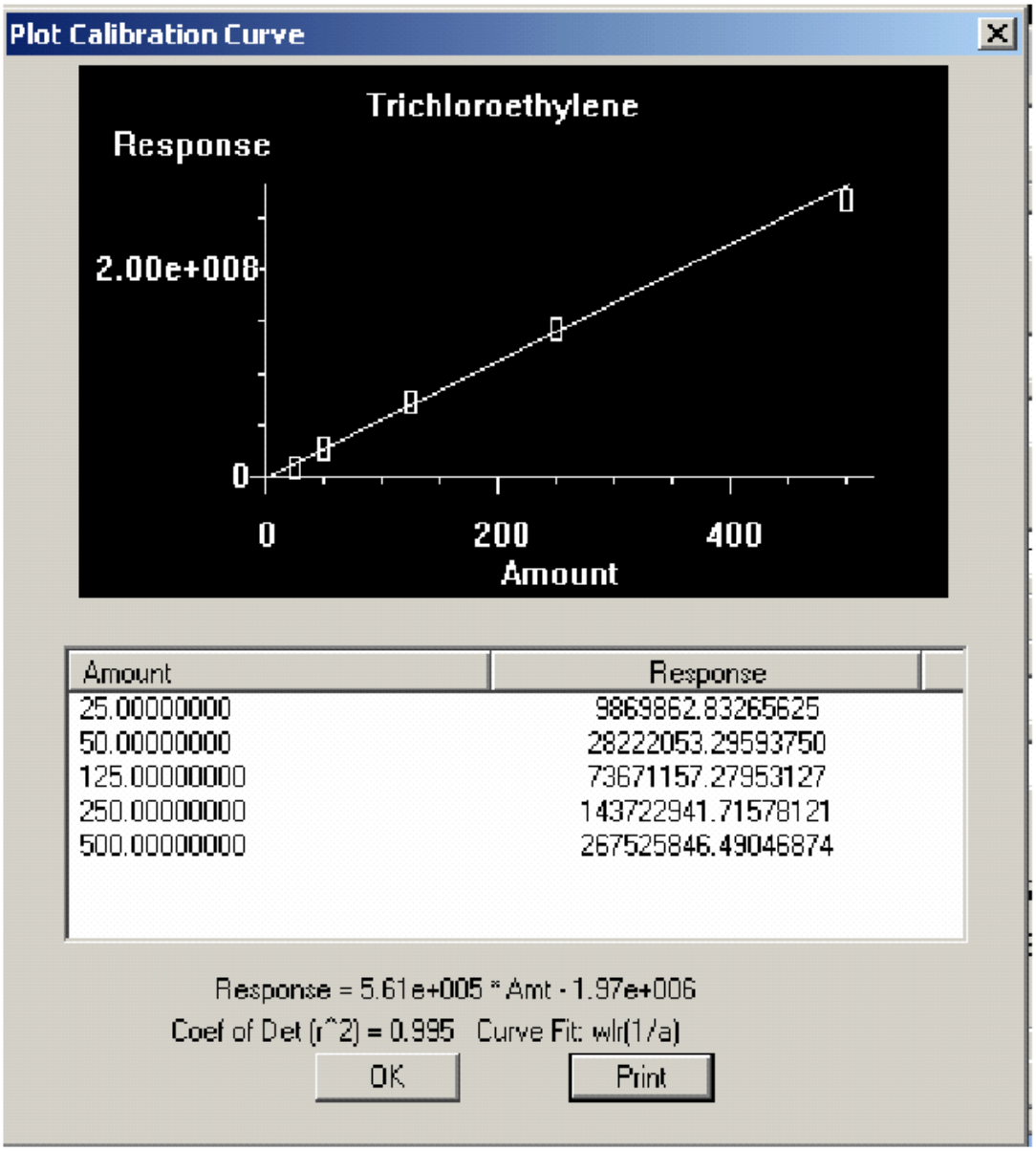


Purge & Trap
Standards Chromatorgram



Target Compounds					Qvalue
1) Dichlorodifluoromethane	1.24	85	232437	25.00 ppb #	90
2) Chloromethane	1.33	50	623604	25.00 ppb	98
3) Vinyl chloride	1.41	62	648982	25.00 ppb	98
4) Bromomethane	1.60	94	335606	25.00 ppb	98
5) Ethylchloride	1.67	64	380961	25.00 ppb	96
6) Trichloromonofluoromethane	1.98	101	1020462	25.00 ppb	99
7) 1,1-dichloroethene	2.31	61	933441	25.00 ppb	93
8) Methylene chloride	2.42	84	3590396	25.00 ppb	87
9) trans-1,2-dichloroethene	2.95	61	920569	25.00 ppb	96
10) 1,1-dichloroethane	3.17	63	1213830	25.00 ppb	99
11) cis-1,2-dichloroethene	3.72	61	943271	25.00 ppb	98
12) Bromochloromethane	3.87	130	572656	25.00 ppb	95
13) Chloroform	3.94	83	1454437	25.00 ppb	99
14) 2,2-dichloropropane	4.00	77	1137315	25.00 ppb	100
15) 1,2-dichloroethane	4.60	62	978747	25.00 ppb #	97
16) 1,1,1-trichloroethane	4.68	97	1488332	25.00 ppb	99
17) 1,1-dichloropropene	4.90	75	1157281	25.00 ppb	98
18) Carbon tetrachloride	5.06	117	1312235	25.00 ppb	100
19) Benzene	5.12	78	3634300	25.00 ppb	98
20) Dibromomethane	5.74	174	694924	25.00 ppb	98
21) 1,2-dichloropropane	5.80	63	882160	25.00 ppb #	83
22) Trichloroethylene	5.85	130	1228441	25.00 ppb	96
23) Bromodichloromethane	5.90	83	1285890	25.00 ppb	97
24) 1,3-dichloropropene	6.70	75	1321419	25.00 ppb	100
25) trans-1,3-dichloropropene	7.24	75	1060345	25.00 ppb	99
26) 1,1,2-trichloroethane	7.38	97	942313	25.00 ppb	98
27) Toluene	7.61	91	4711599	25.00 ppb	98
28) 1,3-dichloropropane	7.68	76	1439678	25.00 ppb	98
29) Dibromochloromethane	7.93	129	1149877	25.00 ppb	95
30) 1,2-dibromoethane	8.21	107	971232	25.00 ppb	98
31) Tetrachloroethylene	8.47	166	1416086	25.00 ppb	98
32) 1,1,1,2-tetrachloroethane	9.21	131	1244471	25.00 ppb	97

32)	1,1,1,2-tetrachloroethane	9.21	131	1244471	25.00 ppb		97
33)	Chlorobenzene	9.28	112	3234335	25.00 ppb		96
34)	Ethylbenzene	9.56	91	4999416	25.00 ppb		96
35)	Bromoform	9.77	173	985282	25.00 ppb		99
36)	m & p-Xylene	9.78	91	7798300	25.00 ppb		96
37)	Styrene	10.08	104	3107516	25.00 ppb		92
38)	1,1,2,2-tetrachloroethane	10.13	83	1204739	25.00 ppb	#	1
39)	o-Xylene	10.14	91	4011127	25.00 ppb		96
40)	1,2,3-trichloropropane	10.26	75	978833	25.00 ppb		93
41)	isopropylbenzene	10.48	105	4780510	25.00 ppb		97
42)	Bromobenzene	10.62	77	1682413	25.00 ppb		95
43)	n-propylbenzene	10.86	91	5348606	25.00 ppb		97
44)	2-chlorotoluene	10.89	91	3345521	25.00 ppb		99
45)	4-chlorotoluene	10.96	91	4159907	25.00 ppb		88
46)	1,3,5-trimethylbenzene	11.12	105	4081684	25.00 ppb		91
47)	tert-butylbenzene	11.30	119	4045879	25.00 ppb		95
48)	1,2,4-trimethylbenzene	11.40	105	4125834	25.00 ppb		93
49)	sec-butylbenzene	11.47	105	5247423	25.00 ppb		99
50)	1,3-dichlorobenzene	11.48	146	2519084	25.00 ppb		98
51)	1,4-dichlorobenzene	11.53	146	2533620	25.00 ppb		98
52)	4-isopropyltoluene	11.62	119	4440105	25.00 ppb		97
53)	1,2-dichlorobenzene	11.78	146	2562461	25.00 ppb		99
54)	Butylbenzene	11.91	91	3268215	25.00 ppb		99
55)	1,2-dibromo-3,-chloropropa	12.10	157	319144	25.00 ppb		92
56)	1,2,4-trichlorobenzene	13.00	180	1660739	25.00 ppb		98
57)	Naphthalene	13.15	128	3632620	25.00 ppb		98
58)	Hexachlorobutadiene	13.21	225	910080	25.00 ppb		99
59)	1,2,3-trichlorobenzene	13.27	180	1603228	25.00 ppb		99



Amount	Response
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125.00000000	73671157.27953127
250.00000000	143722941.71578121
500.00000000	267525846.49046874

Response = 5.61e+005 * Amt - 1.97e+006

Coef of Det (r^2) = 0.995 Curve Fit: wlr(1/a)

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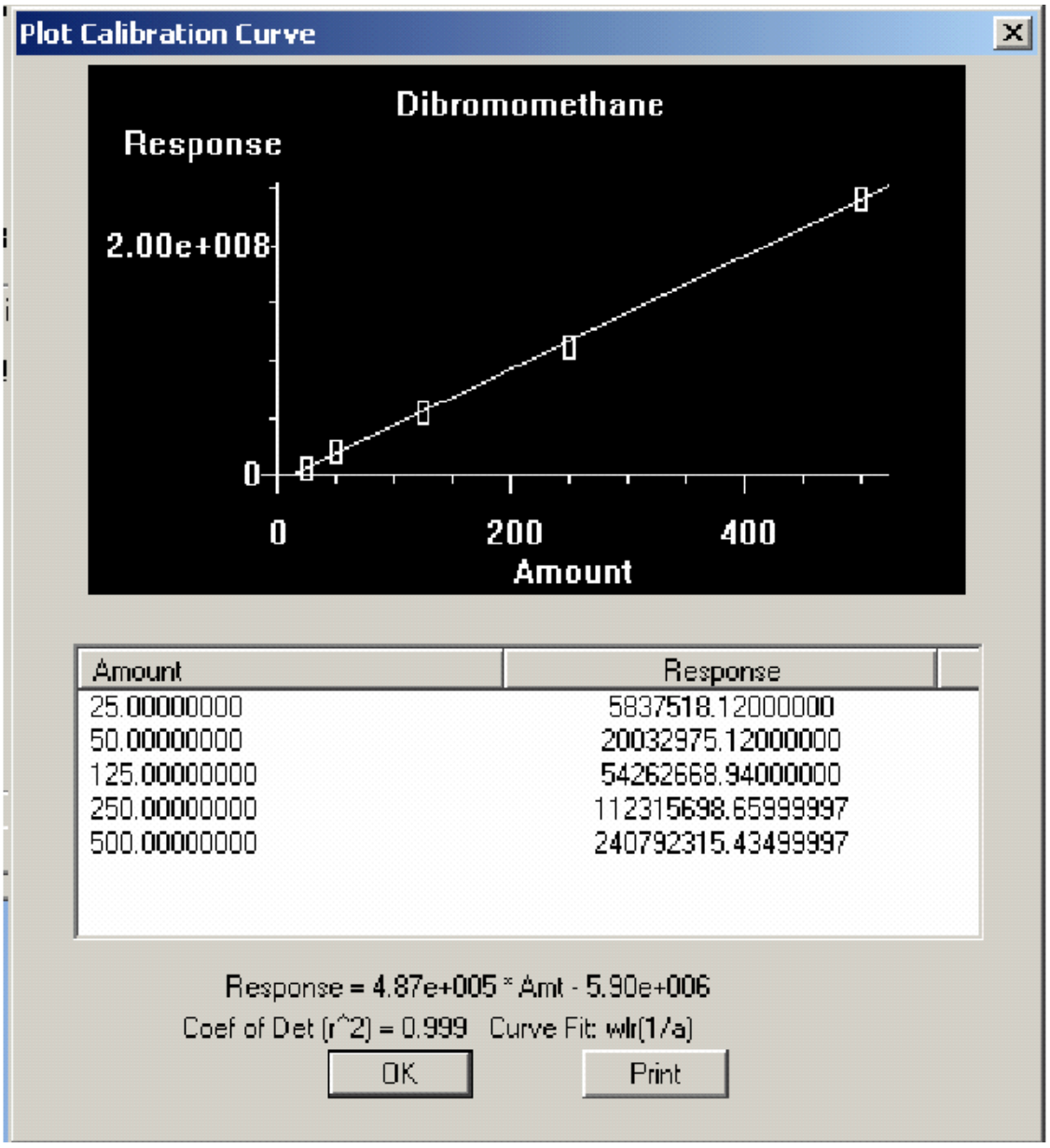

Amount	Response
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Response = 4.87e+005 * Amt - 5.90e+006
Coef of Det (r^2) = 0.999 Curve Fit: wlr(1/a)

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Annexure-X

PROFILE OF THE CHEMICALS

Source: National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, February 2004

Sr. No.	Name of Chemical	Odour	Symptoms	Target organs	Carcinogen
01	Hydrogen sulphide	Rotten eggs	Irritation of eyes, respiratory system, coma, convulsion, conjunctivitis, eye pain, tears to eyes, dizziness, headache, weakness and exhaustion, insomnia, gastrointestinal disturbance	Eyes, respiratory system, Central Nervous System	No
02	Disagreeable odour like garlic or rotten cabbage	Irritation eyes, skin respiratory system	Irritation eyes, skin, respiratory system; convulsion	Eyes, skin, respiratory system, central Nervous System, blood	No
03	Dimethyl Sulphide	NA	Irritation, eyes, skin, respiratory system	Eyes, skin, respiratory system, central nervous system	No
04	Ethanol	Characteristic suffocating odour	Irritation eyes, skin, nose, headache, drowsiness, weakness, exhaustion, cough, liver damage, anemia, reproductive effects.	Eyes, skin, respiratory system, central nervous system, liver, blood, reproductive system	No
05	Methylene Chloride	Faint sweet odour	Irritation eyes, skin, weakness, exhaustion, drowsiness, dizziness, numbness, tingle limbs, nausea [potential occupational carcinogen]	Eyes, respiratory system, cancer site: [in animals: lung, liver, salivary& mammary gland tumours]	Yes
06	Trichloroethane	Chloroform like odour	Irritation eyes, skin, nose, headache, drowsiness, weakness, exhaustion, cough, liver damage, anemia, reproductive effects.	Eyes, skin respiratory system, heart, liver, kidneys cancer site: [in animals: liver and kidney cancer]	Yes
07	Toluene	Sweet pungent benzene like odour	Irritation eyes, nose, weakness, and exhaustion, confusion, dizziness, headache, dilated pupils, tears to eyes, anxiety, muscle fatigue, insomnia dermatitis, liver injury, kidney damage	Eyes, skin, respiratory system, central nervous system liver and kidney	No
08	Dimethyl Disulphide	NA	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system, central nervous system blood	No
09	Acetone	Fragrant mint like odour	Irritation eyes, nose, throat, headache, dizziness, central nervous system depression, dermatitis	Eyes, skin, respiratory system, central nervous system	No
10	Isopropyl Alchohol	Odour of rubbing	Irritation eyes, nose, throat, drowsiness, dizziness, headache, dry cracking skin, alcohol	Eyes, skin, respiratory system	No
11	n-Hexane	Gasoline like odour	Irritation of eyes, nose, nausea, headache, peripheral neuropathy, numbness, extremities muscle weakness, dermatitis, dizziness, chemical pneumonia	Eyes, skin, respiratory system, central nervous system	No

Sr. No.	Name of Chemical	Odour	Symptoms	Target organs	Carcinogen
12	Chloroform	Pleasant odour	Irritation of eyes, skin, dizziness, mental dullness, nausea, confusion; headache, weakness, exhaustion, enlarged liver [potential carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system cancer site: [in animals; liver and kidney cancer]	Yes
13	Carbon Tetrachloride	Characteristic either like odour	Irritation of eyes, skin, CNS depression, nausea, vomiting, liver, kidney injury, drowsiness, dizziness	Eyes. Respiratory system, lungs, liver kinder, skin cancer site: [in animals: liver cancer]	Yes
14	Benzene	An aromatic odour	Irritation eyes, skin, skin, nose, dizziness, headache, nauseam exhaustion, bone marrow depression [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system bone marrow Cancer Site [leukaemia]	Yes
15	2-Butanone (Methyk Ethyl Ketone)	A moderately sharp, fragrant, mint- or acetone like odour	Irritation eyes, skin, nose, headache, dizziness, vomiting, dermatitis	Eyes, skin respiratory system blood, central nervous system	No
16	Carbon Disulphide	A sweet ether like odour	Dizziness, headache, poor sleep, weakness, exhaustion, anxiety, weight loss, gastritis, kidneys, liver injury, eyes burns, dermatitis, reproductive effects	Central nervous system, peripheral nervous system, cardiovascular system, eyes kidneys, liver, skin, reproductive system	No
17	Ethylbenzene	An aromatic odour	Irritation eyes, skin, mucous membrane, headache, coma.	Eyes, skin respiratory system, central nervous system	No
18	m,p Xylenes	An aromatic odour	Irritation eyes, skin, nose, throat, dizziness, excitement, drowsiness, incoordination, staggering, gait, nausea, vomiting, abdominal pain, dermatitis	Eyes, skin, respiratory system, central nervous system gastrointestinal tract, blood, liver, kidneys	No
19	Acetonitrile	An aromatic odour	Irritation nose, throat, nausea, vomiting, chest pain, weakness, exhaustion, convulsion, in animal: liver, kidneys damage	Respiratory system, cardiovascular system, central nervous system, liver, kindneys	No
20	Acrylomitrile	An unpleasant odour	Irritation eyes, skin, headache, sneezing, nausea, vomiting, weakness, exhaustion, dizziness, skin [potential occupational carcinogen]	Eyes, skin, cardiovascular system, liver, kidneys, central nervous system Cancer Site [brain tumours lung & bowel cancer]	Yes
21	1,2-Dichloroethane	Chloroform-like odour	Irritation eyes, central nervous system depression; nausea, vomiting, dermatitis; liver, kidneys, cardiovascular system damage [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system Cancer Site [in animals: forestomach, mammary gland and circulatory system cancer]	Yes
22	Vinyl chloride	Pleasant odour at high concentration	Weakness, exhaustion, abdominal pain, gastrointestinal bleeding, enlarged liver [potential occupational carcinogen]	Liver, Central Nervous System, blood, respiratory system, lymphatic system	Yes
23	I,I Dichlorochane	Chloroform like	Irritation skin, central nervous system depression,	Skin, liver, kidneys, lungs, central	No

		odour	liver, kidneys, lung damage	nervous system	
24	1,1,2-Trichlorothane	Sweet, chloroform like odour	Irritation eyes, nose, central nervous system depression, liver, kidney damage [potential occupational carcinogen]	Eyes, respiratory system, central nervous system liver, kidneys Cancer Site: [in animal liver cancer]	Yes
25	Clorobenzene	Almond like odour	Irritation eyes, skin, nose, drowsiness, incordination, central nervous system depression; in animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, blood.	No
26	o-Xylene	Aromatic odour	Irritation eyes, skin, nose, throat, dizziness, excitement, drowsiness, incordination, anorexia, nausea, vomiting, abdominal pain, dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	No
27	1,2,4-Trimethylbenzene		Irritation eyes, skin, nose, throat, respiratory system, bronchitis, headache, drowsiness, fatigue, dizziness, nausea, incordination, vomiting, confusion, chemical pneumonitis	Eyes, skin respiratory system, central nervous system, blood	No
28	Alpha-pinene	A characteristic odour	Irritation eyes, skin, nose, throat, headache, dizziness, convulsion, blood in the urine, kidney damage, abdominal pain, nausea	Eyes, skin respiratory system, central nervous system, kidneys	No
29	d-Limonene	Characteristic citrus odour	Irritation of eyes, nose, lungs, lightness of head, difficulty in breathing, skin irritation, liver injury, kidney damage	Eyes, skin, respiratory system, liver and kidney	No
30	1,3 Butadiene	Mild aromatic and gasoline like odour	Irritation eyes, nose, throat, drosiness, dizziness, reproductive damages, [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, reproductive system Cancer Site [blood cancer]	Yes
31	Acrolin	A piercing disagreeable odour	Irritation eyes, skin, mucous membrane, chronic respiratory disease	Eyes, skin, respiratory system, heart	No
32	Methyl tert-Butyl Ether	NA	NA	NA	NA
33	Styrene	A sweet, floral odour	Irritation eyes, nose, respiratory system, headache, weakness, exhaustion, dissiness, confusion, drowsiness, unsteady gait, possible liver injury, reproductive effects	Eyes, skin, respiratory system, central nervous system, liver, reproductive system	No
34	Nonane	A gasoline like odour	Irritation eyes, skin, nose, throat, headache, drowsiness, dizziness, confusion, nausea, tremor	Eyes. Skin, respiratory system, central nervous	No system
35	Chloromethane	A faint sweet odour	Dizziness, nausea, vomiting, visual, disturbance, stagger, slurred speech, convulsion, coma, liver, kidney damage reproductive [potential occupational carcinogen]	Central nervous system, liver, kidneys, reproductive system Cancer Site [in animals; lungs, kidney & forestomach tumours]	No
36	N-Butyl Acetate	A mild turpentine like odour	Irritation eyes, skin, upper respiratory system, headache, drowsiness	Eyes, skin, respiratory system, central nervous system	No

37	Hexachlorobutadiene	A mild, turpentine like odour	In animals, irritation eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, kidneys Cancer Site [in animals: kidney tumours]	Yes
38	Carbony Sulphide	NA	NA	NA	NA
39	Chloroethane	A pungent ether-like odour	Incordination abdominal cramps, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	No
40	Triclorofluoromethane	Odourless liquid	Incordination, tremor, dermatitis, cardiac arrest	Skin, respiratory system, cardiovascular system	No
41	4-Methyl-2-Pentanone	A mild odour	Irritation eyes, skin, headache, drowsiness, dermatitis	Eyes, skin central nervous system	No
42	Cumene	A sharp, penentrating aromatic odour	Irritation eyes, skin, mucous membrane; dermatitis, headache, coma	Eyes, skin, respiratory system, central nervous system	No
43	1,3,5-Trimethyl benzene	A distinctive aromatic odour	Irritation eyes, skin, nose, throat, respiratory system, bronchitis, headache, drosiness, fatigue, dizziness, nausea, incordination, vomiting, confusion, chemical pneumonits	Eyes, skin, respiratory system, central nervous system, blood	No
44	Bromomethane	A chloroform like odour at high temperature	Irritation eyes, skin, respiratory system, central Nervous System depression; liver, kidney disease cardiac arrest [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, blood	No
45	Vinyl Acetate	A pleasant fruit odour	Irritation eyes, skin, nose, throat, hoarseness cough, loss of smell; eye burns, skin blisters	Eyes, skin respiratory system	No

Annexure - XI

INTERNATIONAL STANDARDS OF SOME VOC COMPOUNDS.

Name of the chemicals	EPA Region levels (µg/m3)	Texas Effects screening levels short term (µg/m3)	Texas Effects screening levels long term (µg/m3)	North Carolina Annual Standards (µg/m3)	North Carolina 24-Hr Standards (µg/m3)	North Carolina I-hr standards (irritants (µg/m3)	California EPA Rfc* µg/m3 (health numbers)#
Hydrogen Sulphide	1.00	1.00	-	-	-	330	-
Methyl mercaptan	2.10	2.00	0.200	-	-	50	-
Dimethyl sulphide	-	-	3.00	-	-	-	-
Ethanol	-	18800	1880	-	-	-	-
Methylene chloride	4.09	260	26.0	24.0	-	-	3000
Trichloroethane	1.10	1350	135	59	-	-	600
Toluene	400	1880	188	-	-	4700	400
Dimethyl Disulphide	-	-	-	-	-	-	-
Acetone	370	5900	590	-	-	-	-
Isopropyl Alcohol	-	7850	785	-	-	-	-
n-Hexane	210	1760	172	-	1100	-	-
Chloroform	0.0840	98.0	9.80	4.30	-	-	300
Carbon tetrachloride	0.130	126	13.0	6.70	-	-	40
Benzene	0.250	12.0	3.00	0.120	-	-	60
2- Butanone (methyl ethyl ketone)		1000	3900	390		3700	1000
Carbon disulphide	730	30.0	3.00	-	186	-	-
Ethyl benzene	1100	2000	200	-	-	-	1000
m,p xylene	-	2070	208	-	-	-	60
Acetonitrile	62.0	340	34.0	-	-	-	2
Acrylonitrile	0.0280	43.0	4.30	0.15	-	-	2
1,2-Dichloroethane	0.0740	16.0	4.00	3.80	-	-	400
Vinyl chloride	0.220	130	13.0	0.380			10
1,1 Dichloroethane	520	4000	400				500
1,1,2-trichloroethane							
Chlorobenzene	0.120	550	55				400
o-xylene	730	-	-				-
1,2,4- trimethyl benzene	6.20	1250	125				-

ANNEXURE - XII

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