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Importance of Odour Monitoring at MSW Processing Plant

By

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  - **Green Building, EC and HRC**
  - **National-international knowledge management**
  - **Policy analysis,**
  - **Training,**
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- Patent writing and filing
- Air and Noise Modelling
- ISO Audits
- Traffic management and modelling
- Corporate Social Responsibility

Wastewater Recycling

Low footprint and ecological STP, ETPs

Solid Waste Management (SWM)

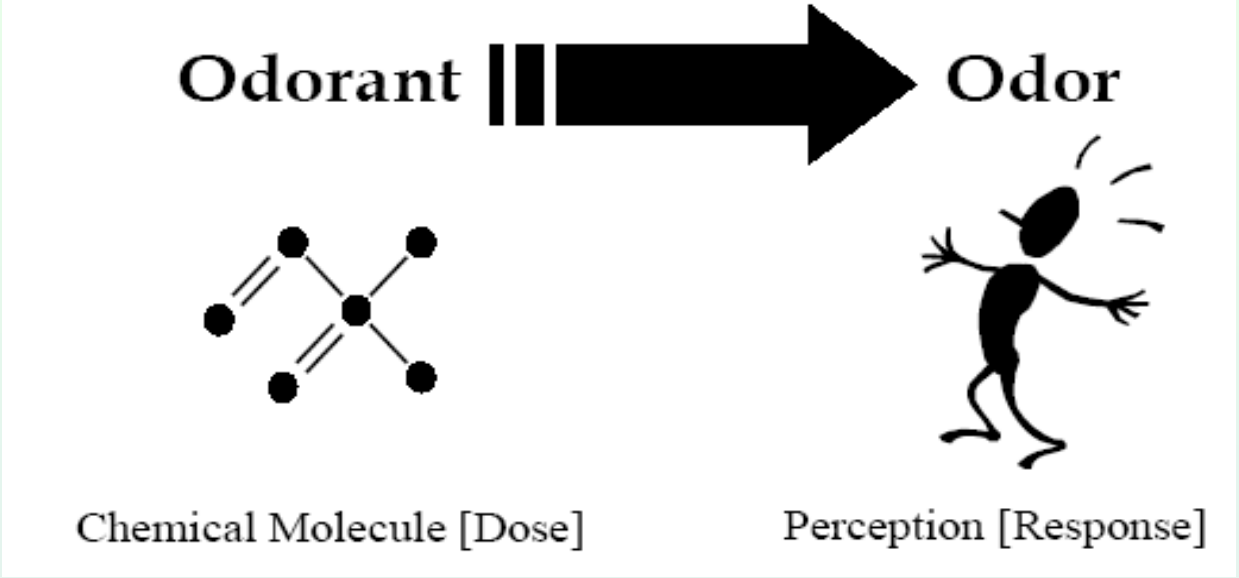
Knowledge Support

- Internship for Students
- Statistical Evaluation
- Interpretation of data
- Awareness Program
- Arranging Workshops, Seminars, Conferences

Current Scenario in India

Current Status of Open Dumping Sites

Defining Odour



Odour Strength	Intensity level
Extremely Strong	6
Very Strong	5
Strong	4
Distinct	3
Weak	2
Very weak	1
Not perceptible	0

***Odour detection threshold*:** It is the lowest odorant concentration necessary for detection by a certain percentage of the population, normally 50%. This concentration is defined as 1 odour unit.

***Odour intensity*:** It is the perceived strength of an odour above its threshold. It is determined by an odour panel and is described in categories which progress from "not perceptible", then "very weak", through to "extremely strong"

Odour gases and Concentration

Chemical	Odour low (mg/m^3)	Odour high (mg/m^3)	Description of odour	Irritating Conc. (mg/m^3)
Hydrogen Sulphide	0.007	0.014	Rotten egg	14.0
Ammonia	0.0266	39.6	Pungent, irritating	72.0
Allyl Mercaptan	0.0002	0.0515	Garlic like	454.50
Amyl mercaptan	0.0001	0.0018		
Benzyl mercaptan	0.0132	0.2028	Unpleasant	22.81
Ethyl mercaptan	3.2×10^{-5}	0.092	Garlic	-
Isobutyl mercaptan	0.002	0.002	-	-
Methyl mercaptan	4.0×10^{-5}	0.082	Sulfidy	-
Dimethyl Sulphide	0.0025	0.0508	Decayed cabbage	-
Benzene	4.5	270.0	Sweet, solventy	9000.0
Trimethyl amine	0.36	1.12	Fishy, amine	200.0
Dimethyl amine	0.0864	0.0864	-	174.6
Diethyl amine	0.06	114.0	Fishy, ammonical	150.0
Toluene	8.0	150.0	Rubbery, mothballs	750.0

Ambient Air Quality Standard

Compound	Jurisdiction	Standard	Averaging time
Ammonia	Alberta	1400 µg/m^3	1 hr
	Ontario, Canada	3600 µg/m^3	24 hrs
	Japan	1 – 5 ppm	
	Korea	2 ppm	Industrial
	Korea	1 ppm	Residential
	India	100 µg/m^3	Annual
	India	400 µg/m^3	24 hrs
Hydrogen Sulphide	Alberta	14 µg/m^3	1 hr
	Alberta	4 µg/m^3	1 hr
	California	60 ppb	3 mins
	California	30 ppb	60 mins
	Idaho	30 ppb	30 mins
	Idaho	10 ppb	24 hrs
	Illinois	10 ppb	8 hrs
	Minnesota	50 ppb	30 mins
	Minnesota	60 ppb	1 hr
	Missouri	144 ppb	
	New Mexico	30 – 100 ppb	30 mins
		10 ppb	1 hr
	New York State	10 ppb	1 hr
		0.7 ppb	1 yr

Ambient Air Quality Standard

Compound	Jurisdiction	Standard	Averaging time
	North Dakota	**50 ppb**	**Instantaneous**
	Pennsylvenia	100 ppb	1 hr
	Pennsylvenia	5 ppb	24 hrs
	Texas	120 ppb	30 mins (Industrial)
	Texas	80 ppb	30 mins (Residential)
	Washington	3 – 7 ppb	
	Ontario, Canada	30 $\mu g/m^3$	30 mins and 1 hr
	New South Wales, Australia	1.38 $\mu g/m^3$	1 sec (Urban area - $\geq$ 2000 people)
	New South Wales, Australia	2.07 $\mu g/m^3$	1 sec (500 to 2000 people)
	New South Wales, Australia	2.67 $\mu g/m^3$	1 sec (125 to 500 people)
	New South Wales, Australia	3.45 $\mu g/m^3$	1 sec (30 to 125 people)
	New South Wales, Australia	4.14 $\mu g/m^3$	1 sec (10 to 30 people)
	New South Wales, Australia	4.83 $\mu g/m^3$	1 sec (less than 2 people)
	Korea	0.06 ppm	Industrial area
	Korea	0.02	Residential area

Ambient Air Quality Standard

Compound	Jurisdiction	Standard	Averaging time
Methyl Mercaptan	**Others in USA**	**2.2 µg/m^3**	
	New South Wales, Australia	0.00042 ppm	3 mins
Dimethyl Disulphide	Ontario, Canada	40 µg/m^3	30 mins
	Ontario, Canada	40 µg/m^3	1 hr
	Japan	0.009 – 0.1 ppm	
	Korea	0.03 ppm	Industrial area
	Korea	0.009 ppm	Residential area
Dimethyl Sulphide	Ontario, Canada	30 µg/m^3	30 mins and 1 hr
	Japan	0.01 – 0.2 ppm	
	Korea	0.05 ppm	Industrial area
	Korea	0.01 ppm	Residential area
Methyl mercaptan	Ontario, Canada	20 µg/m^3	30 mins and 1 hr
	Japan	0.002 – 0.01 ppm	
	Korea	0.004 ppm	Industrial area
	Korea	0.002 ppm	Residential area

What other Country Says

Jurisdiction	Distance (m)	Land use	Source type
Queensland, Australia	2000	Large town (>2000 person)	Land disposal
	1500	Town (100 – 2000 person)	
	1000	Small town (20 – 100 person)	
	750	Rural residential	
	300	Rural farm houses	
	200	Public area	
South Australia	250	Urban residential development	Minor landfill
	500		Major landfill
	200	Highways and arterial roads	Minor landfill
	500		Major landfill
	250	Rural townships	Minor landfill
	500		Major landfill
Germany	300	Residential area	Closed waste composting facility
	500	Residential area	Open waste composting facility
The Netherlands	100 – 200	Capacity 0 – 5000 tons/year	Composting using specialised turning methods
	200 – 400	Capacity 5001 – 10000 tons/year	
	400 – 600	Capacity 10001 – 15000 tons/year	
	600 – 750	Capacity 15001 – 20000 tons/year	
	> 750	Capacity > 20000 tons/year	
	225 – 300	Capacity 0 – 5000 tons/year	Composting using traditional method of turning using grab or loader
	300 – 450	Capacity 5001 – 10000 tons/year	
	400 – 600	Capacity 10001 – 15000 tons/year	
	600 – 750	Capacity 15001 – 20000 tons/year	
	> 750	Capacity > 20000 tons/year	

Techniques of Monitoring

CONVENTIONAL

- Gas Chromatography
- TDLAS
- Luminol chemiluminescence
- Cryogenic trapping
- The LIF technique
- DOAS
- MIESR
- CIMS

SENSOR BASED SYSTEMS

- Catalytic Bead (pellistor)
- Electrochemical
- Infrared
- Metal Oxide Semiconductor
- Thermal Conductivity

Sensor Available

Selection of odour parameters

- ✓ Sensor based technology: Developed with IIT – B, under Indian conditions
- ✓ Tested and trial has been taken at Pune Landfill sites, MCGM landfill sites

Parameters to be Covered

Odourous Compound

- ❖ Ammonia
- ❖ Mercaptans
- ❖ Hydrogen sulphide
- ❖ VOC
- ❖ Isobutane
- ❖ Ethanol
- ❖ Toluene

Non-odourous Compound

- ❖ Carbon Monoxide
- ❖ Methane
- ❖ Hydrogen
- ❖ LPG
- ❖ Ozone
- ❖ Nitrogen Dioxide

Physical Parameters

- ❖ Temperature
- ❖ Humidity
- ❖ Wind rose, wind pattern

Data Transmission

GSM, GPRS, Wi-Fi, Bluetooth

Installation

Pre – Installation Stage

1. INFORMATION GATHERING

- Site activity: processes carried out, planning, site map, etc.
- Emission sources: type, number of sources, etc.
- Site environment: location, registered complaints, etc.

2. ODOUR MEASUREMENT STUDY (if no valid information available)

- Evaluation of odour concentrations
- Identification of the most emissive sources
- Calculation of odour emission rates

3. DISPERSION STUDY (if no valid information available)

- Identification of the most exposed area
- Retroactive annual dispersion maps
- Concentration calculations at receptor sites in the neighborhood

4. OPTIMUM LAYOUT DEFINITION

- Ensures data is truly representative
- Avoids odour interference
- Avoids air dilution phenomena

Installation Stage

1. ON SITE PRE INSTALLATION INSPECTION

- Review of prerequisites
- Check of all technical elements necessary for installation

2. INSTALLATION

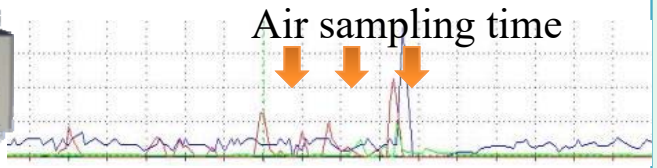
- Installation of equipment and computer tools
- Measuring device and communication system tested

3. USER TRAINING

- On-site training for end users
- Content: architecture, use of software, routine operations

Usage, Training and Hand over

Air Sampling



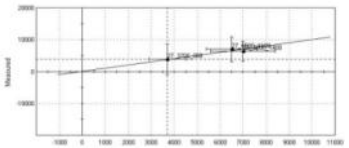
ODOUR MEASUREMENT CAMPAIGN

- Air samples collected at odour sources

- Odour concentration evaluated

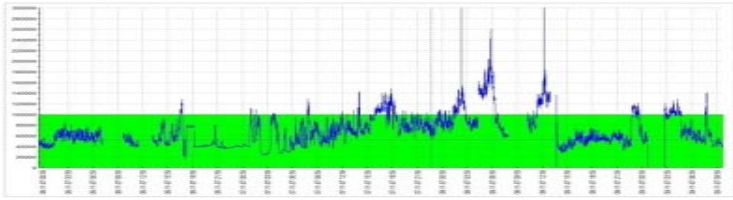
Raw data

MODEL BUILDING



Odour concentrations

ODOUR CONC. MONITORING



Factors Influencing Reading

- Variation upto 3 orders of magnitude: Atmospheric pressure, Soil Type, Moisture, temp., presence of gas extraction, age of landfill
- Sharp drop in air gas will lead to surge of gas
- Atmospheric pressure – Release O_2 from top surface
- Soil Type around landfill site – Industries, Drains etc
- Moisture – Water Clogging – No gas release
- Age of Landfill

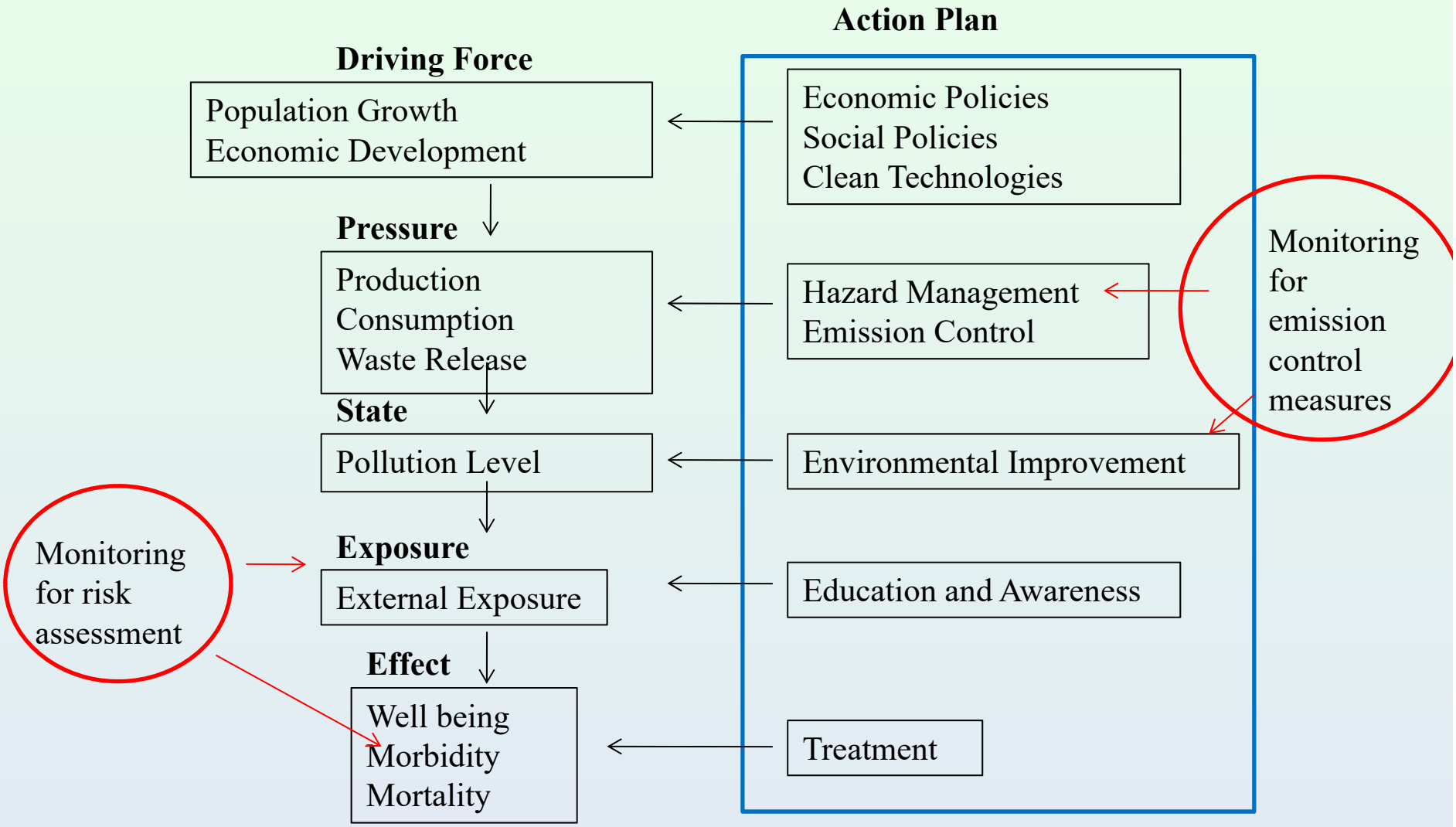
Factors for odour monitoring

Type of land Use	Sensitivity Classification		Reason for classification
	High	Low	
High density residential zone	♠		• People of high sensitivity to odours can be exposed • People can be present at all times of day and night, both indoors and outdoors • Visitors to the area who are unfamiliar with an odour are likely to be getting affected with the problem
Rural residential (low-density residential, minimum property size around 1 ha)	♠	♠	• Lower population density, therefore less opportunity for exposure to odour • People of high sensitivity can be exposed at all times of the day and night • Residents tend to work in cities and return home at night or weekends and may not be desensitised to rural-type odours
Light commercial/ retail/ business/ education/ institutional	♠		• Similar in sensitivity to the high-density residential area, as it affects people of all ages and health status. • Hospitals and schools are more affected where people expect better-than-average air quality

Factors for odour monitoring

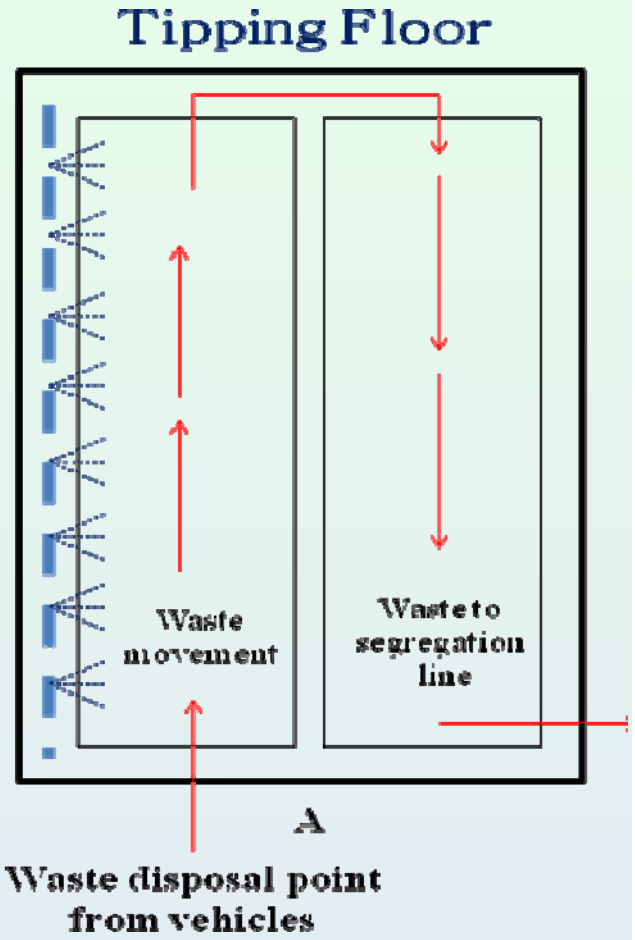
Type of land Use	Sensitivity Classification		Reason for classification
	High	Low	
Open space/ recreational	♠		• **People tend to be more aware of air quality when undertaking outdoor activities and exercise, and sensitivity is heightened** • **People of all ages and health status can be present** • **People are more likely to be present during the day but events can also be held at night** • **People are often visitors from other parts of the city or country who are more likely to be sensitive to odours they are not used to** • **Sports fields may be moderately sensitive and need to be considered on a case-by-case basis.**
Tourist/ conservation area	♠		• Generally have high environmental or spiritual value and a low tolerance to exposure to odours
Public roads		♠	• Generally low sensitivity because people using the roads are only present for a short period of time

Control Measure Framework



(1) Mist sprayer and head bar model
(2) Control unit with timer
(3) Adaptor
(4) Pressurized water accumulator
(5) Sprayer

Mist System



Thank You

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