

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/343219917>

Industrial Area Air Pollution Due to Odor Causing VOCs and Emerging Trends in Odor Measurement

Poster · November 2014

CITATIONS

0

READS

11

3 authors:



Ashwini Zaware

National Environmental Engineering Research Institute

10 PUBLICATIONS 27 CITATIONS

[SEE PROFILE](#)



Satinder Kaur

National Environmental Engineering Research Institute

13 PUBLICATIONS 23 CITATIONS

[SEE PROFILE](#)



Rakesh Kumar

National Environmental Engineering Research Institute

342 PUBLICATIONS 2,341 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



The Role of Functional Food Security in Global Health 1st Edition [View project](#)



Perfomance Evaluation of Common Effluent Treatment Plant in Maharashtra [View project](#)



INDUSTRIAL AREA AIR POLLUTION DUE TO ODOR CAUSING VOCS AND EMERGING TRENDS IN ODOR MEASUREMENT

(14IA086)



ABSTRACT

- Past studies on odor problems from VOCs is limited to a few major VOCs as well as limited techniques
- Industrial effluent, although a major area source of VOCs has been neglected due to non-awareness
- Traditional methods of VOC sampling have not been coupled to their individual odor potential
- Past methods in existence for odor detection have been studied and novel methods for odor detection, have been devised
- An ideal sampling protocol has been established for odor detection and the quantitative concentrations of the VOCs have been coupled to derive their odor potential

**Ashiwini B. Zaware- Padalkar, S. Kaur
R. Kumar**

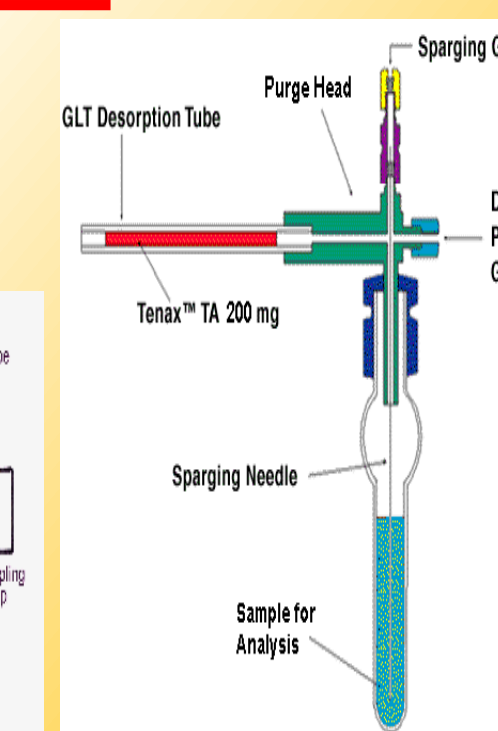
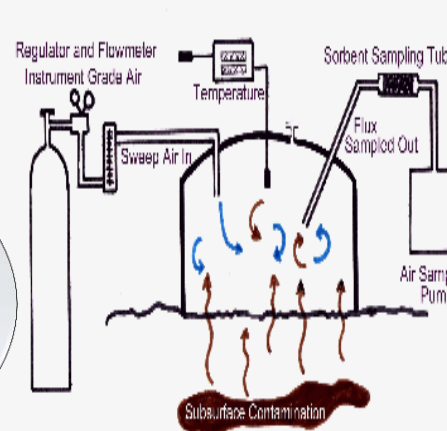
CSIR- National Environmental
Engineering Research Institute (NEERI),
Worli, Mumbai – 400 018, India

INTRODUCTION

- ❑ Past studies on industrial pollution limited to PM, NO_x, SO_x
- ❑ VOCs: emerging pollutants
- ❑ VOCs: adsorbed on solid adsorbents, BP: 50- 250 °C (Source: WHO)
- ❑ Odor pollution from VOCs: novel research area
- ❑ VOCs: high concentrations in industrial areas

METHODS OF SAMPLINGS

1. Air Sampling: USEPA-17A
2. Effluent Sampling USEPA-5030B
3. Mass Transfer Sampling



OBJECTIVES

- ✓ Devising novel methods for odor detection
- ✓ Establishing ideal sampling protocol for study of odor emissions from effluent treatment plants
- ✓ Deriving methods to couple quantitative measurements with odor values

MAJOR VOCS & ODOR POTENTIALS

No	Compounds	CAS number	Molecular weight (g/mole)	BP (°C)	Odor characteristics	Odor threshold (ppm)
1	Benzene	71-432	78.11	80.1	Aromatic	4.68
2	Toluene	108-883	92.14	110.6	Pungent	1.6
3	Ethyl benzene	100-414	106.16	136	Aromatic	140
4	Xylene	1330-207	106.17	138.5	Sweetish	1
5	Styrene	100-42-5	104.14	145.2	Sweetish	0.1
6	Acetone	67-641	58.08	56.2	Fruity	62
7	Cumene	98-828	120.2	152	Sharp aromatic	1.2
8	Methanol	67-561	32.04	64.5	Alcoholic	100
9	Butanol	71-363	74.12	117.7	Vinous	1.2
10	Methyl ethyl ketone	78-933	72.12	79.6	Pungent	0.25

TECHNIQUES USED TILL DATE



- ✓ Sensory measurements
 - Direct
 - ✓ Dynamic olfactometer
 - ✓ Triangular bag method
 - Indirect
 - ✓ Odor intensity assessment
 - ✓ Odor threshold determination



✓ Analytical measurements

- ✓ USEPA TO-15
- ✓ USEPA TO-17

✓ Direct measurements

- ✓ Flux chamber
- ✓ Wind tunnel

LIMITATIONS IN PAST STUDIES

1. Sensory measurements

- ✗ Quantification of individual pollutants difficult
- ✗ No standard sampling methodology
- ✗ Past methods used highly biased

2. Analytical measurements

- ✗ Limited information on combined effect of VOCs on odor
- ✗ Synergistic effect of individual odorants not studied



SCOPE OF WORK

- ✓ Study of past sampling protocols for odor assessment
- ✓ Identification of units of concern with respect to their odor generation potential
- ✓ Selection of a representative sampling protocol for each treatment unit
- ✓ Establishing estimation procedures for VOCs from air and effluent
- ✓ Coupling quantitative results of VOCs with odor values

VOCS AND ODOR PROBLEMS

✗ Physical problems

- Skin, eye, nose irritation
- Headache
- Throat irritation, constriction
- Breathing trouble, suffocation

✗ Psychological problems

- Odor worry and annoyance
- Emotional stress, depression
- Insomnia
- Loss of appetite

✗ Aesthetic problems

- Affecting tourism



CONCLUSION

- A unique sampling protocol was established for assessing odors from the sources.
- Some VOCs with low odor threshold may play a big role in the overall odor formation.
- The area of quantitative measurements of VOCs was expanded to assess their qualitative characteristics.
- Need to study more compounds and to establish their odor potential in different environmental conditions

REFERENCES

1. Tata P., Witherspoon J, Lue-Hing, C. (2003), *VOC Emissions from wastewater treatment plants* (Lewis Publishers).
2. Blames-Vidal V, Hansen M, Adamsen A, Feilberg A, Peterson S, Jensen B (2009), *Characterization of odor released during handling of swine slurry: part 1. Relationship between odorants and perceived odor concentrations*, *Atm. Env*, **43**, 2997-3005.
3. Ramirez N, Marce M, Borrull F (2011), *Determination of volatile organic compounds in industrial wastewater plant air emissions by multi-sorbent adsorption and thermal desorption-gas chromatography-mass spectrometry*, *Int. J. Env. Anal. Chem*, **91**, 911-928.
4. Nagata Y (2003), *Odor Intensity and Odor Threshold Value*, *Env. Sanit. Centre, Japan*, 17-25.

Acknowledgements: UGC for Fellowship and NEERI Mumbai Zonal Lab for all Facilities