

The Importance of Proper Sampling when Assessing Odour for Complaint Purposes

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Overview

- ◆ How to Deal with Complaints
- ◆ Introduction to Odour Sampling:

How to Measure Odour?

- ◆ Standards and Guidelines for Odour Sampling
- ◆ Methodology
- ◆ Case Studies
- ◆ Conclusions

How to Deal with Complaints

- ◆ Investigation of Complaints
- ◆ Validation of Complaints by:
 - ◆ Odour Observations
 - ◆ Community Odour Surveys
 - ◆ Ambient Monitoring/Sampling
 - ◆ Or Sampling at the Potential Odour Sources Inside the “In Question Facility” and Predict Off-Site Odour Concentrations at Complaint Areas
(A Common Approach in Ontario-Canada)

Odour Sampling at the Sources

How to Measure Odour?

- Types of Sources:
 - Point – (Stack, Vent)
 - Area – (Lagoon)
 - Fugitive – (Open Doors, Truck Waiting to Load/Unload)
- Collection of Samples at Each Potential Odour Source
- Olfactometry Evaluation for Odour Detection Threshold Values (ODTV)
- Estimation of Odour Emission Rates
- Dispersion Modeling Analysis to Predict Off-Site Odour Concentrations

Standards/Guidelines for Sampling

- ◆ European Standard: *EN:13725:2003*
Air Quality–Determination of Odour Concentration by
Dynamic Olfactometry
- ◆ Australian/New Zealand: *2001* Stationary Source
Emissions. Part 3: Determination of Odour Concentration
by Dynamic Olfactometry
- ◆ German VDI (Verein Deutscher Ingenieure): *VDI 3880:2011*
Olfactometry – Static Sampling;
- ◆ United States of America:
ASTM –679
- ◆ Canada: *Ontario Source Testing Code, Method ON-6*
“Determination of Odour Emissions from
Stationary Sources”

Standards/Guidelines –Comments

- Limited Information Regarding Sampling Methods for Different Sources (European and Australian/New Zealand : Dynamic Dilution, Static Dilution)
- VDI 3880 Discusses Some of the Aspects of Odour Sampling in Greater Detail, Particularly Aspects Overlooked in the EN
- In Canada, in 1989 to 2010 “Draft Source Sampling for Odours” – Requirement to Determine the Optimum Dilution During Sampling (Minimum Loss of Odour)

Standards/Guidelines-Comments

- ◆ Since 2010 new guidelines in Ontario, Canada:
- ◆ Only 3 Samples Collected at the Source at a Dilution that is Calculated Based on the Gas Stack Moisture Content and the Lowest Temperature at Which the Gaseous Sample is Expected to Reach During Transport and Analysis.
- ◆ If the Sample Cools to a Temperature Below the Dew Point, Water Vapour Will Condense.
- ◆ There is No Mention or Consideration of Vapour of Other Compounds, Only Water is Considered.

Methodology Used for Case Studies

- ◆ Six Case Studies:
 - 3 Studies: Samples Collected Diluted and Undiluted
 - 3 Studies: Samples Collected at Different Dilutions
- ◆ Diluted Samples Collected Using Dynamic Dilution Sampler
- ◆ Undiluted Samples Collected Using a Lung Sampler
- ◆ Sampling Time: 10 minutes Per Sample
- ◆ Purging Tedlar Bags Two Times Before Sampling
- ◆ Tedlar Sample Bags Cleaned and Odour Free

Methodology Used for Case Studies

- Samples Covered in Dark Containers to Prevent Any Photochemical Reaction
- Evaluations of Samples by Dynamic Olfactometry and Screened Panelists
- Evaluations According to EN 13725 Standard (*Some Exceptions*) and Ontario ON-6 Guideline
- Evaluations Within 4 Hours From Collection
- Odour Detection Threshold Value (ODTV) Determination

Case Study 1: A Paint Factory

- ◆ High Elevation Source (150 degree Celsius)
- ◆ 3 Samples Collected at 50 Times Dilution
- ◆ Concurrently, 3 Samples Collected – Undiluted
- ◆ Evaluations Within 4 Hours From Collection

Results for Study 1

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	50	620	31,000
Sample 2	50	650	32,500
Sample 3	50	710	35,500
Sample 1	1	2,100	2,100
Sample 2	1	1,900	1,900
Sample 3	1	2,150	2,150

Case Study 2

- ◆ Humid Source
- ◆ Three Samples Collected at 30 Times Dilution
- ◆ Concurrently, 3 Samples Collected – Undiluted
- ◆ Evaluations Within 4 Hours From Collection

Results for Study 2

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	30	45	1,350
Sample 2	30	50	1,500
Sample 3	30	56	1,680
Sample 1	1	120	120
Sample 2	1	118	118
Sample 3	1	110	110

Case Study 3

- ◆ Humid Source
- ◆ 3 Samples Collected at 80 Times Dilution
- ◆ Concurrently, 3 Samples Collected – Undiluted
- ◆ Evaluations Within 4 hours from the collection

Results for Study 3

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	80	120	9,600
Sample 2	80	100	8,000
Sample 3	80	90	7,200
Sample 1	1	1,100	1,100
Sample 2	1	1,400	1,400
Sample 3	1	1,150	1,150

Summary Results for Three Case Studies

When Samples Were Collected Undiluted at Hot or Humid Sources, the Odour Loss is Anywhere Between Nine and Seventeen Times Greater Compared to Diluted Samples

Case Study 4: Different Dilutions

- ◆ Pet Food Facility– At the Inlet to the Control Odour Unit
- ◆ 3 Samples Collected at 60 Times Dilution
- ◆ Concurrently, 3 Samples Collected at 9 Times Dilution
- ◆ Evaluations Within 4 hours From Collection

Results for Study 4

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	60	860	51,600
Sample 2	60	830	49,800
Sample 3	60	1,000	60,000
Sample 1	9	800	7,200
Sample 2	9	750	6,750
Sample 3	9	880	7,920

Case Study 5: Different Dilutions

- ◆ Food Facility
- ◆ 3 Samples Collected at 50 Times Dilution
- ◆ Concurrently, 3 samples Collected at 20 Times Dilution
- ◆ Evaluations Within 4 hours From Collection

Results for Study 5

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	50	120	6,000
Sample 2	50	100	5,000
Sample 3	50	98	4,900
Sample 1	20	90	1,800
Sample 2	20	100	2,000
Sample 3	20	98	1,960

Case Study 6: Different Dilutions

- 💧 Waste Water Treatment Facility
- 💧 3 Samples Collected at 200 Times
- 💧 Concurrently, 3 Samples Collected at 50 Times Dilution
- 💧 Evaluations Within 4 hours From Collection

Results for Study 6

Sample No:	Dilution	Raw ODTV ou	Net ODTV ou
Sample 1	200	120	24,000
Sample 2	200	100	20,000
Sample 3	200	98	19,600
Sample 1	50	110	5,500
Sample 2	50	135	6,750
Sample 3	50	122	6,100

Conclusions

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