**Can we combine field olfactometry and plume method measurements?**

Magnun M. Vieira1, 2\*, Jean-Michel Guillot1, Paulo Belli Filho2, Anne-Claude Romain3, Gilles Adam3, Julien Delva4, Maud Baron5, Toon Van Elst5

 1 Laboratory of Industrial Environmental Engineering, École des Mines d’Alès, Alès, France

2 Department of Sanitary and Environmental Engineering, Federal University of Santa Catarina, Brazil

3 Department of Environmental Sciences and Management, University of Liège, Arlon, Belgium

 4 Odometric SA, Arlon, Belgium

 5 Olfascan NV, Ghent, Belgium

\*Corresponding author, e-mail magnun.vieira@mines-ales.fr

# SUMMARY

Field campaigns were conducted, in Flanders (northern Belgium), to evaluate the applicability of field olfactometry to potentially improve the plume method. These field measurements were carried out around five different industrial sites under neutral or slightly unstable weather conditions. Preliminary results show some limitations and possible applications of in-field odour-measuring devices to enhance the method by supplementing bare nose sniff testing observations.

# Keywords: field olfactometer; odour impact; plume measurement.

# Introduction

Odour sampling and dispersion modelling is a widely used approach for odour impact assessment and regulation worldwide. However, this approach may not be appropriate and cost-effective in certain situations, especially when diffuse and discontinuous odour sources are involved. In such cases, field inspection is an interesting approach and is now included in European standardization. The new European standard EN-16841 describes two methods to determine odour in ambient air by using field inspection: the grid method (Part 1) and the plume method (Part 2) (Guillot *et al.*, 2012). The dynamic plume method, described in the EN 16841-2, is partially based on a Belgian methodology applied and developed with Ghent University since 1988. Thus, it brings together more than 20 years’ experience with the method in Belgium (Moortgat *et al.*, 1992; Van Langenhove and Van Broeck, 2001; Nicolas *et al.*, 2006; Van Elst and Delva, 2015). This approach, currently used toregulate odours in some European jurisdictions, has broad applicability in Brazil, due to the characteristics of the country (continental size and reduced number of olfactometry laboratories) and its low cost compared to other methods. This study aims to evaluate the applicability of field olfactometry to improve the plume method by supplementing bare nose sniff testing observations.

# MATERIALS AND METHODS

Field campaigns were conducted, in Flanders (northern Belgium), according to the methodology described by Bilsen *et al.* (2008). Field measurements were carried out, by two qualified panel members, around five different industrial sites, under neutral or slightly unstable weather conditions. The duration of these field inspections varied from 35 to 55 min. Two commercially available field olfactometers – the Nasal Ranger® and the Scentroid SM110 – were assessed for their application in supplementing bare nose sniff testing observations. At each point of observation where odour was perceived by the straightforward sniff test (yes/no), odour strength was assessed with the field olfactometers.. A localization process, with roads maps and a GPS, was used for odour recording observations in the field.

# RESULTS AND CONCLUSIONS

The response time showed to be a critical aspect in the field olfactometry, especially at plume boundaries and far away from the odour sources (intermittent odour). Moreover, panelist fatigue (Nasal Ranger®) and high dilution gas consumption (Scentroid SM110), compromise such in-field odour-measuring devices to determine different odour intensity levels within the odour plume. Nevertheless, near the odour sources (relatively constant odour and steady conditions), measurements could be easily performed and odour strength assessed. An overview of the results is shown in **Table 1**.

***Table 1.*** *Synthesis of the results of the field measurements with or without field olfactometr.*

|  |  |  |  |
| --- | --- | --- | --- |
| Application to | Nose alone | Nasal Ranger® | Scentroid SM110 |
| Determine odour intensity levels * within the global odour plume
* at local points
 | ++ | –++ | –++ |
| Help the validation of dispersion modeling  | + | ++ | +++ |
| Determine plume boundaries and maximum distance of odour perception  | +++ | – | – |

Based on the team measurements, field olfactometry seems not suitable, in a general manner, for determining different odour intensity levels within the global odour plume. However, it may provide useful information to characterize the odour level at few points and then to validate dispersion modeling results (assisting the back-calculation of odour emission rates from sniffing measurements). Furthermore, direct assessment of odours in ambient air with the nose alone remains a practical and effective approach to determine plume boundaries and maximum distance of odour perception.

**ACKNOWLEDGEMENT**

Authors thank CAPES and CNPq (Brazil) for doctoral grant of M. Vieira.

# REFERENCES

Bilsen I., De Fré R. and Bosmans S. (2008). Code van Goede Praktijk: Bepalen van de geurverspreiding door middel van snuffelploegmetingen (Code of Good Practice: Determination of the odour dispersion by means of sniffing team measurements), VITO, Mol, Belgium.

Guillot J.-M., Bilsen I., Both R., Hangartner M., Kost W. J., Kunz W., Nicolas J., Oxbol A., Secanella J., Van Belois H., Van Elst T., Van Harreveld T. and Milan B. (2012), The future European standard to determine odour in ambient air by using field inspection. *Water Sci. and Technol.*, 66(8), 1691–1698.

Moortgat M., Schamp N. and Van Langenhove H. (1992). Assessment of odour nuisance problems in Flanders: a practical approach. A.J. Dragt and J. van Ham (eds.), Biotechniques for Air Pollution Abatement and Odour Control Policies, Elsevier Science Publishers B.V., Studies in Environmental Science 51, 447–452.

Nicolas J., Craffe F. and Romain A.-C. (2006), Estimation of odor emission rate from landfill areas using the sniffing team method. *Waste Manag.*, 26(11), 1259–1269.

Van Elst T. and Delva J. (2015), The European Standard prEN 16841-2: a 20-year review. In: Proc. 6th IWA Conf. on Odours & Air Emissions, Paris, 16-18 November 2015.

Van Langenhove H. and Van Broeck G. (2001), Applicability of sniffing team observations: experience of field measurements. *Water Sci. and Technol.*, 44(9), 65–70.