Applicability of field olfactometry to improve the plume method: potentialities and limitations

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SUMMARY

Sniffing team campaigns were conducted in Flanders (northern Belgium) to evaluate the applicability of field olfactometry to improve the plume method. 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 and promising approach that is one-step closer to standardization in Europe. The new European standard EN-16841 will describe 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 methodology applied and developed by 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 is the basis of the Flemish odour policy. The method 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

Sniffing team campaigns were conducted in Flanders 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 the sniffing field inspection varied from 35 to 55 min. Two commercially available field olfactometers – the Nasal Ranger® (St. Croix Sensory, Inc., USA) and the Scentroid SM110 (IDES Canada Inc., Canada) – 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 additionally assessed with the field olfactometers.

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 consumption of odour-free diluting gas (Scentroid SM110), make difficult to use 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 with the field olfactometers. An overview of the results is shown in **Table 1**.

Table 1. *Synthesis of the results of the field measurements with and without field olfactometer.*

Application to	Nose alone	Nasal Ranger®	Scentroid SM110
Determine odour strength			
• for plotting isopleths of odour concentration within the odour plume	+	–	–
• at specific locations near the odour sources	+	+++	+++
Help in the validation of dispersion modelling results	+	++	+++
Determine plume boundaries and maximum distance of odour perception	+++	–	–

Based on the sniffing team measurements, field olfactometry seems not suitable, in a general manner, for plotting isopleths of ground-level odour concentration within the odour plume. However, it may provide useful information to validate dispersion modelling results (assisting in the back-calculation of odour emission rates from sniffing measurements) by quantifying odour strength at specific locations near the odour sources. 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.

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