9th IWA Odour & VOC/Air Emission Conference
26-27 October 2021 Bilbao, Spain

ABSTRACT

IOMS FOR THE REAL-TIME MONITORING OF ODOUR CONCENTRATION AT A MSW LANDFILL

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Electronic noses, or more generically Instrumental Odour Monitoring Systems (IOMS), currently represent the only tool available for the continuous monitoring of odours, enabling the direct assessment of odour impacts, even in case of complex odour sources. These include landfills, for which traditional "hood" sampling methods have been proven ineffective for measuring odour fluxes. In such cases, the capability of IOMS to characterize ambient air without requiring a minute characterization of the odour source becomes particularly useful. An interesting development perspective of IOMS is the possibility of using them for real-time monitoring of emissions at plant fencelines, thereby setting "warning" thresholds to promptly identify plant malfunctions and intervene to limit emissions that might result in odour events at receptors. For this purpose, IOMS must provide a continuous, fast and accurate measurement of the odour concentration.

The most common approach that is currently applied for building quantification models for IOMS involves simplified regression algorithms, which neglect the classification of the detected odours previous to quantification. This results in poor accuracy in the estimation of the odour concentration, since the responses of IOMS to odorous samples having the same odour concentration, but representative of different sources, may differ significantly.

This paper proposes a new approach for the estimation of the odour concentration by IOMS, which is based on specific regression models for each odour source of the plant under examination and involves as first step the classification of unknown samples. To do this, the paper describes a case study related to the monitoring of odours from a MSW landfill, carried out using one electronic nose (Rubix WT1) installed at the plant fenceline. The work focuses on the description of the experimental protocol used for e-nose training and performance verification in the field, and provides a comparison of the new regression model (model "A"), involving classification prior to quantification, with a most commonly applied regression model (model "B") that doesn't involve qualitative classification of the analysed air.

With the new model ("A"), the odour concentration estimated by the instrument for almost all landfill samples fell within the confidence interval of the olfactometric measurement, whereas model "B", involving only one PLS regression, without considering sample classification prior to quantification, generally results in overestimation of the odour concentration, especially for fresh waste samples. These

results highlight the need of using sample classification as input for the construction of effective quantification models.
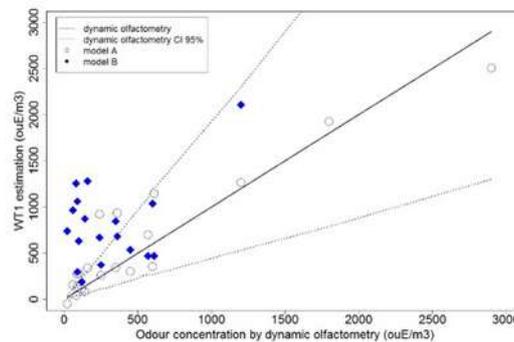
Comparison of quantification models A and B

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