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

## ABSTRACT

## FIELD TEST EVALUATION OF INSTRUMENTAL ODOUR MONITORING SYSTEMS WITH A NOVEL IN-SITU CALIBRATION APPROACH

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Instrumental Odour Monitoring Systems (IOMS) are employed for continuous objectified technical olfaction. However, the standardised reference for odour perception is the human nose, with highly specialised chemosensory cells and complex data processing in the olfactory system, surpassing technology with outstanding sensitivity and selectivity for many compounds. In order to achieve comparable results, IOMS have to fulfil manifold requirements on sensing principle, system integration, processing infrastructure and algorithms. This results in considerable effort in engineering and cost. One-size-fits-all solutions are unlikely to function properly but are nevertheless marketed as the resulting performance is difficult to assess.
In the course of the publicly funded research project SEPEG (sensor networks for the objective perception of odour sources, BMBF FKZ 01IS17087) all aspects of a complete IOMS solution are scrutinized in their respective context. A main focus of the project is on field test evaluation in real installation situations. Two installation sites have been equipped with networks of real-time IOMS devices, forwarding measurement data via LTE to a server for processing and visualisation. Odour information is mainly calculated from the dynamic response of temperature cyclic operated metal oxide sensors. In order to harden the algorithms against general and application specific disturbance and to enable detailed assessment of the overall environmental situation, additional sensors have been included in the measurement: PID sensor (total VOC), hydrogen sensor, optical particle counter (PM1.0/2.5/10) and weather sensors (humidity, temperature, pressure, wind speed and direction, precipitation, insolation).
The key question of comparability to olfactory standards is pursued by a novel method of in-situ calibration with dilution series of source samples, the odour concentration of which has been determined via dynamic olfactometry as per EN 13725. In CEN/TC 264/WG 41, a standard is being developed for the quality assessment of IOMS, suggesting minimum requirements for the declaration and validation of a manufacturers claim. This requires a reference data set with representative variations of source and background. As an even more sophisticated data set is necessary for training, the applied method and its implementation are important to not turn traceable calibration into a main cost driver for IOMS solutions.

Based on raw data collection since March 2020 and three training/validation campaigns, a set of algorithm models have been established, and viable calibration strategies have been evaluated. In the remainder of the SEPEG project (ends July 2021), models shall be improved and learnings regarding interdependencies, sensor-to-sensor comparability and application specific constraints worked out.

Indicate preference of kind of presentation

☒ Oral Communication
☐ Poster

Indicate topic of your work for the conference:

☐ Policy and associated regulations for odour and air quality.
☒ Odour/VOC measurement, monitoring&sensor technologies.
☐ Odour/VOC perception, impact, formation and dispersion.
☐ GHG emissions particulate matter and industrial emissions.
☐ Source characterization and odour/VOC mapping.
☐ Odour/VOC abatement, mitigation and neutralization.
☐ Odour/VOC from waste water, sewer systems and livestock.
☐ Air emissions and sustainable solutions for waste handling
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