

Odor Detection Threshold Study

Description: A study to perform state-of-the-art assessment of population detection and readily detectable thresholds of natural gas odorants

Status: Program being initiated. Olfactometer testing to gather information in controlled conditions designed to represent the full population.

BENEFITS

Odorization of natural gas is considered one of the most significant public health advances of the 20th century and has shown to be the optimal method to warn of a natural gas leak. However, updated odor threshold data can result in more informed decisions about human detectability of gas odorants and potentially provide more information to optimize odorant injection levels.

BACKGROUND

Recent gas quality research projects and the changing sources of natural gas have identified the need to further quantify human variability in detecting mercaptans. Given that need, NYSEARCH sought out experts in olfaction science and have learned that there is new methodology that provides very precise measurements of olfactory detection. These methods have led to a better understanding of the genetic and anatomical variability of odor response in the human population which is relevant to organic sulfur compounds and therefore to thresholds for detection of natural gas odorants.

The gas industry definition for the “threshold detection level” is the concentration of odorant in air where a change in odor is first perceived. Additionally, the “readily detectable threshold level” is the concentration of odorant where recognition of the odor is achieved. These detection levels are important because industry safety standards require that natural gas contains a sufficient level of odorant so that it is readily detectable by a person with a ‘normal sense of smell’ at a level of gas in air of 1/5 the Lower

Explosive Limit (LEL) or approximately 1% gas in air.

TECHNICAL APPROACH

With help from gas company subject matter experts, NYSEARCH Staff issued an RFP that sought a study to quantify the threshold detection and readily detectable levels for 95% of the population for t-butyl Mercaptan (TBM), Tetrahydrothiophene (THT), a blend of TBM/THT and possibly other organosulfur compounds.



Figure 1: Example Setup for Olfactometer Test

After an evaluation, NYSEARCH funders have selected Monell Chemical Senses Center to conduct Phase I of what could become a multi-phase study. The overall objective of the proposed program is to complete a comprehensive literature review of the state-of-the-art methodology to measure natural gas odorant compounds and blends and to update the measurement of detection and readily detectable (recognition) thresholds. Initially, this work is being performed for a

selection of (2) odorant compounds and (1) blend that is being chosen by the funders and is likely to contain TBM and THT based on common uses by those members. The selected compounds and blend are being presented to participants across a wide range of olfactory abilities and demographics.

After solidification of test plans, an extensive olfactory test program is being conducted to achieve statistically significant data for precise concentrations of the two odorant compounds and the odorant blend. Multiple individuals will be tested simultaneously. Data will provide information about the proportion of the population that can detect and recognize the odor at different levels of confidence. With this data acquired in controlled conditions, risk analysis can be performed.

In addition, if the methodology is sound and the funders agree on the plans for the next phases, additional tests are likely to be conducted to examine the odorant threshold in more complex conditions such as in residential and industrial spaces.

PROGRAM STATUS

The program is being initiated and the first deliverable is expected in late summer 2016. Like many NYSEARCH projects, the funders and the NYSEARCH project manager are working closely with the contractor, Monell Chemical Senses Center, on the literature search, test planning and selection of odorant compounds and blends.

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