Odor Threshold Determination:
Understanding the assessor response

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Introduction

Over 15 years ago the European standard test method for determination of odor concentration of environmental test samples, EN13725, made significant advancements in the field of olfactometry. Steps were taken to standardize the olfactometer and the assessors. Testing with standard odorant n-butanol allowed laboratories to select assessors and continually monitor their performance with a universally agreed upon metric. This move to standardized assessors allows for running environmental odor threshold tests with a small sample of assessors.



Since its adoption in 2003, a key question continually raised within the odor testing community is:
Is only one standard odorant sufficient for assessor selection and performance monitoring?

A 2009 study conducted by St. Croix Sensory showed assessor responses to a second odorant, hydrogen sulfide, were within a similarly acceptable range of sensitivity. A follow-up study has been conducted to compare third and fourth odorants.

Current Olfactometry Standard Assessor Selection Requirements

N-butanol threshold: 20-80ppb

Rolling average of n=20 with Log std dev. < 2.3

"The assumption made is that the sensitivity for the reference will be a predictor for sensitivity to other substances."

– EN13725, sec 3.3, pg. 18

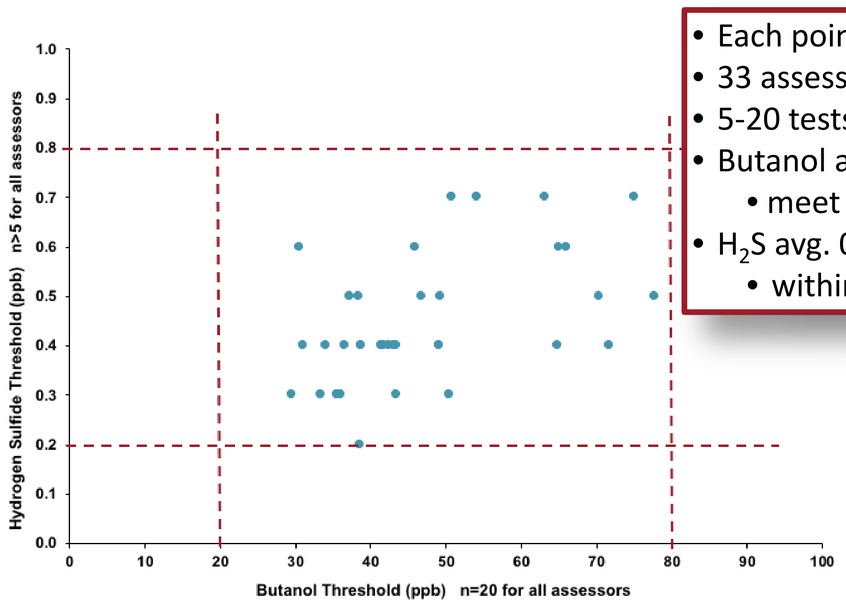
Is this Valid?

Methodology



- 2009 H_2S threshold vs n-butanol
- 2016 Two other environmental odorants
  - Compound A (proprietary work)
  - Dimethyl ether (CAS #115-10-6)
- Certified gas cylinders of single compounds
- AC'SCENT® Olfactometer
  - 20LPM presentation rate
  - 8– 60,000 dilutions (14 levels)
- Panel test sessions of 4-10 assessors
- Evaluate n-butanol and one other compound in each session
- Odorant A: 15 test sessions, 155 individual evaluations from 20 assessors
- Odorant B: 21 test sessions, 488 individual evaluations from 29 assessors

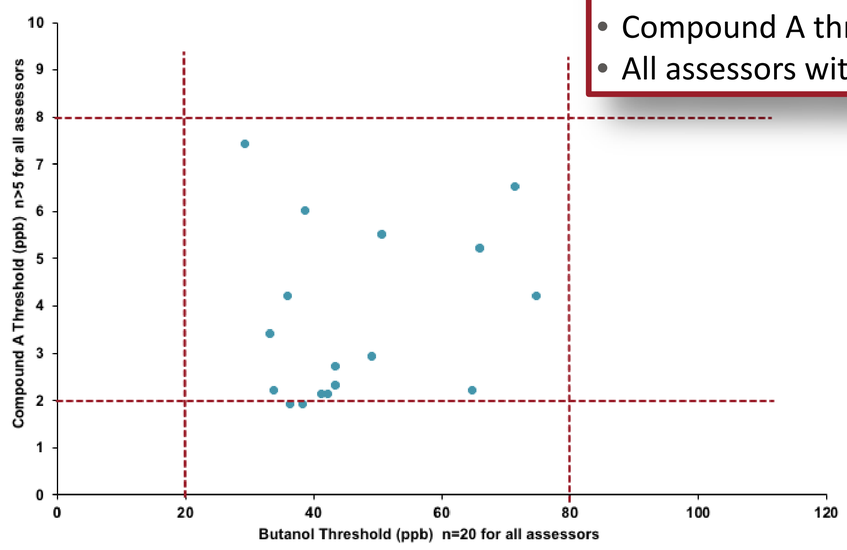
2009 Threshold Study – n-butanol v. hydrogen sulfide



- Each point is an assessor
- 33 assessors
- 5-20 tests/assessor
- Butanol avg. 30-77ppb
  - meet the criteria (40ppb)
- H_2S avg. 0.2 – 0.7
  - within factor of 2 of avg.

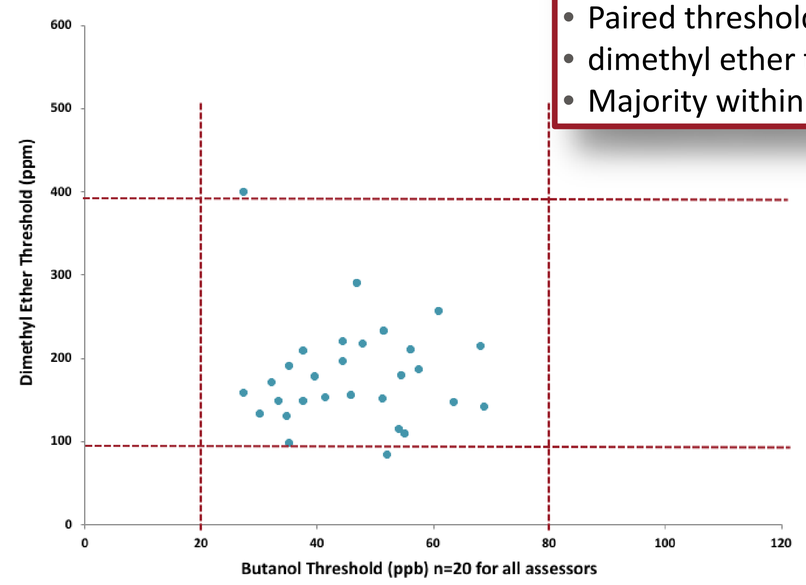
Results

Threshold Testing – Compound A



- Each point is an assessor
- Paired threshold responses
- Compound A threshold = 4ppb
- All assessors within 2-8ppb

Threshold Testing – dimethyl ether



- Each point is an assessor
- Paired threshold responses
- dimethyl ether threshold = 194ppm
- Majority within 97-388ppm

Acknowledgment:
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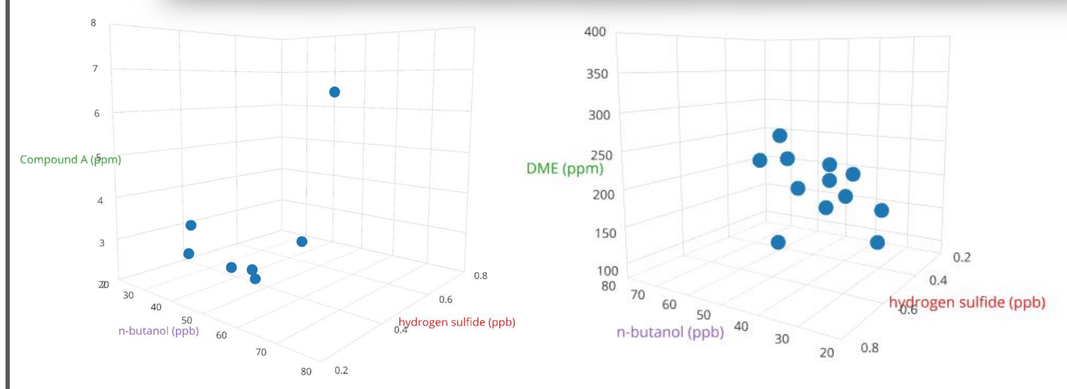
- 7 Assessors evaluated butanol, H_2S, and Compound A
- 12 Assessors evaluated butanol, H_2S, and dimethyl ether
- 3-D plots show relationship of both sets of data
- All data points are within acceptable bounds of threshold ±2x



Conclusions

- ✓ Assessors who conform to EN13725 selection criteria with n-butanol also conform within range of acceptability for other odorants.
- ✓ There was not a direct correlation between an assessor's thresholds to multiple compounds, but they all fell within a range of acceptability.
- ✓ **The panel as a "sensor" responded within a narrow range of acceptability for both odorants and met the EN13725 criteria for accuracy and precision.**