A Note on Odor Problems

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ODOR SCIENCE[1]

1. The human nose and brain are capable of distinguishing roughly 1 trillion scents.[2] Many chemical substances, at concentrations sufficiently large, can be detected by the human nose. Odors are not necessarily related to toxicity; for example, carbon monoxide (CO) is colorless and odorless but can be deadly at concentrations above 150 to 200 ppm.[3]

2. For many chemicals (or odorants), there are available estimates of odor thresholds, i.e., concentration values for either detection or recognition of an odor. The detection threshold is the lowest concentration of odorant that will elicit a sensory response in a human subject without necessarily identification or recognition of the odorant. The recognition threshold is the minimum concentration that is identified or recognized as having a characteristic odor quality. The most widely accepted method to determine odor thresholds is the Dilution to Threshold Method (D/T), in which a panel (typically at least 6 people) is presented with a series of samples increasing in odor concentration, starting below the detection threshold.[4] Typically, an odor threshold is identified when 50% of the panel detects the odor.[5] The bare detection of an odor is generally not

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[1] Diosey, P.G. and M. Buono. 2008. Odor Modeling. Chapter 15B of AIR QUALITY MODELING - Theories, Methodologies, Computational Techniques, and Available Databases and Software. Vol. III – Special Issues (P. Zannetti, Editor). Published by The EnviroComp Institute (http://www.envirocomp.org/) and the Air & Waste Management Association (http://www.awma.org/).

[2] https://www.sciencemag.org/news/2014/03/human-nose-can-detect-trillion-smells

[3] https://www.cpsc.gov/Safety-Education/Safety-Education-Centers/Carbon-Monoxide-Information-Center/Carbon-Monoxide-Questions-and-Answers

[4] American Industrial Hygiene Association (AIHA): Odor Thresholds for Chemicals with Established Occupational Health Standards. Second Edition, 2013. http://cae365.cn/wp-content/uploads/2018/11/Odor-Thresholds-for-Chemicals-with-Established-Occupational-Health-Standards.pdf

[5] D. M. Benforado, W. J. Rotella & D. L. Horton (1969) Development of an Odor Panel for Evaluation of Odor Control Equipment, Journal of the Air Pollution Control Association, 19:2, 101-105,

considered an annoyance. For example, in many cases (see below) odors are considered unpleasant only when a concentration of five to ten times the odor threshold is exceeded.

ODOR REGULATIONS

3. Some examples of odor regulations are listed below:

   a. California's South Coast Air Quality Management District states that at 5 D/T, people become consciously aware of the presence of an odor and at 10 D/T the odors are strong enough to evoke a complaint. From: City of San José, San José/Santa Clara Water Pollution Control Plant Master Plan, TASK NO. 5, PROJECT MEMORANDUM NO. 5, ODOR TREATMENT ALTERNATIVES, FINAL DRAFT, September 2011.[6]

   b. To protect people from unpleasant odors, regulations have been implemented in different states using different D/T levels. For example, in Colorado (7 D/T in urban areas; 15 D/T in rural areas), in Missouri (7 D/T), in Wyoming (7 D/T), in Massachusetts (5 D/T). [From A REVIEW OF NATIONAL AND INTERNATIONAL ODOR POLICY, ODOR MEASUREMENT TECHNOLOGY AND PUBLIC ADMINISTRATION. Prepared by SRF Consulting Group, Inc., February 6, 2004. Pages 46 and 48.[7]

   c. In the San Francisco Bay Area, under Regulation 7, "Odorous Substances," 7-302,[8]: *"A person shall not discharge any odorous substance which causes the ambient air at or beyond the property line of such person to be odorous and to remain odorous after dilution with four parts*[9] *of odor-free air."*

DOI: 10.1080/00022470.1969.10466459.
https://www.tandfonline.com/doi/pdf/10.1080/00022470.1969.10466459

6 https://www.sanjoseca.gov/home/showdocument?id=476

7 https://www.pca.state.mn.us/sites/default/files/p-gen2-02.pdf, p 41

8 https://www.elaw.org/system/files/rg0700.pdf

9 I.e., 4 D/T.

d. An article[10] titled "Measurement and Regulation of Odors in the USA" by Thomas Mahin of the Massachusetts Department of Environmental Protection, presents in Table 2 some examples of state/county off-site (i.e., beyond property line) D/T limits. They typically vary from 4 D/T to 7 D/T.

e. The "Technical Manual 1002 – Guideline on Air Quality Impact Modeling Analysis" of the New Jersey Department of Environmental Protection, Division of Air Quality, Bureau of Technical Services,[11] states in Appendix C, Section C.6 (near the end) that *"… emissions of odor-causing compound(s) from a new, reconstructed, or modified source should have an odor intensity of less than 5 D/T at the sensitive receptor with the highest impact."*

f. An overview of odor regulation throughout North America is also available[12].

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10 http://www.env.go.jp/en/air/odor/measure/02_1_4.pdf

11 http://www.nj.gov/dep/aqpp/downloads/techman/1002.PDF

12 https://olores.org/index.php?option=com_content&view=article&id=369:an-overview-of-odour-regulation-throughout-north-america2&catid=80:content&Itemid=422&lang=en