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# 10 Years Later: British Columbia's EAB Decision and the Frailty of Odour Units as a Compliance Measure

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# Outline

- > 2010 British Columbia Environmental Appeals Board Decision (EAB Decision)
- > Odour Units Usage Today in Canada
- > Review of Recent Odour Science
- > Contrast Odour Units with other common environmental scientific measurements

# EAB Decision

- > In 2010, EAB Decision *West Coast Reduction Ltd. v. Greater Vancouver Regional District* (GVRD nka Metro Vancouver) rescinded amendments imposed by Metro Vancouver in West Coast's permit
- > Main concern: the District Director placed limits on the concentration of odour that can be discharged from the plant as measured in "odour units", and requires monthly odour testing and reporting to determine whether those concentration limits are met

## Analysis

[328] There is no dispute that there are a range of consequences that may result from a permittee's failure to comply with a permit requirement including prosecution for violating the terms of the permit or for causing pollution. The maximum fine for such an offence is \$1,000,000 under the GVRD *Bylaw*.

[329] The decision to adopt a new unit of measurement, particularly when there are significant consequences for failure to comply, must be undertaken after careful consideration of the strengths and weaknesses of the measure.

[330] Although odour units are recognized as standards of the ASTM and the European Committee for Standardization, and, as such, have undergone professional assessment, the Panel does not believe that this fact alone is of sufficient weight to justify its inclusion in a permit to measure compliance. Rather, the Panel must carefully consider whether odour units, used in the context of measuring odour from a rendering plant – an environmental odour, is reasonable and appropriate.

[331] Based on the evidence presented, the Panel finds that the use of odour units in this context is not reasonable and appropriate. The notion that odour units can be used as an indicator of an environmental "smell" is simply too flawed to be used as a method of determining compliance, and is therefore not suitable for determining whether the environment is adequately protected.

[332] To begin with, an odour unit is a dilution ratio. The mathematical definition of "ratio" is dimensionless. Therefore, to give an odour unit a "unit of measure", is already predisposing it to a "mass", which it is not, and is therefore arbitrary.

[333] Further, the dilution ratio is equal to the volume of clean air divided by the volume of diluted air (or the diluted odour). In order to attribute a "measure" of odour units to a sample of air, human panelists are used. The Panel appreciates that this is considered the best, and possibly the only, means of measuring smell.

# EAB Decision

- > Key question EAB Panel sought to answer:  
Is the imposition of odour units in West Coast's permit, to be used as an enforcement tool, reasonable?

[86] It should be noted that West Coast does not object to odour units being used for information purposes. Its argument is that there are inherent flaws in the measurement and calculation of odour units which make it objectionable for compliance and enforcement purposes.

[96] In response to West Coast's focus on issues of accuracy and precision in the measuring of odour units, the District Director argues that this should not be the focus of the Board's inquiry: this question should be left to a proceeding dealing with non-compliance where the case turns on whether the testing produced an accurate result. Instead, the question before the Board should be whether the odour unit limits that he set in the permit are relevant, clear, properly defined, fair and appropriate as performance requirements. He submits that they are.

[97] The District Director submits that odour units are the most appropriate method to evaluate and regulate the environmental problem at stake: odour in the community. In his view, stipulating the maximum allowable quantities of odour in odour units is the best available means of establishing performance requirements that are clear and unambiguous so that the company, and the community, knows the requirements.

[298] The evidence in dispute relates not to the process used to measure odour units, but in relation to whether the outcome, the odour unit measure (OU/m<sup>3</sup> or OU/s), is a reliable and accurate measure of the odour.

[330] Although odour units are recognized as standards of the ASTM and the European Committee for Standardization, and, as such, have undergone professional assessment, the Panel does not believe that this fact alone is of sufficient weight to justify its inclusion in a permit to measure compliance. Rather, the Panel must carefully consider whether odour units, used in the context of measuring odour from a rendering plant – an environmental odour, is reasonable and appropriate.



# EAB Decision - Key Issues

- > Odour unit is a dilution ratio and arbitrary
- > n-butanol, which is used to select panelists, is problematic when it comes to correlation between sensitivity to n-butanol and environmental odours
- > There is no credible support for the assumption that reference materials are transferable to other odorants
- > There is bias and subjectivity present in the collection and analysis of odours
- > Variability of results is not acceptable when the results are used for compliance purposes



# Odour Units - Usage



- > Ministry of Environment, Conservation and Parks (MECP) in Ontario
- > Environmental Compliance Approvals (ECAs) as recent as this year include this language:

## 2. EMISSION CONCENTRATION LIMIT

1. The *Company* shall ensure that the *Equipment* is designed and operated to comply, at all times, with the following performance requirements:

- c. the 10-minute average concentration of odour at the most impacted *Sensitive Receptor*, resulting from the operation of the *Equipment*, calculated in accordance with the procedures outlined in Schedule "E", shall not exceed 1 odour unit under all atmospheric conditions; and

# Odour Units - ECAs



- > Access Environment is a public, searchable database to look up ECAs
- > Reviewed Air and Air/Noise ECAs issued past 5 years (January 1, 2014 through September 30, 2018)
- > Categorized each ECA into its best-fit category:
  - ❖ Odour not mentioned
  - ❖ Odour general conditions
  - ❖ Site-specific odour conditions
  - ❖ Odour point of impingement (POI) limits

Year	ECAs Reviewed	Odour Not Mentioned	Odour General Conditions	Site-Specific Odour Conditions	Odour POI Limits
2018*	327	80	217	21	9
2017	798	167	562	54	15
2016	1,014	249	710	41	14
2015	842	233	573	22	14
2014	918	216	651	34	17
<b>All Years</b>	<b>3,899</b>	<b>945 (24%)</b>	<b>2,557 (70%)</b>	<b>172 (4%)</b>	<b>69 (2%)</b>

\*Through September 30, 2018

# Odour Units - ECAs



- > 1 odour unit (ou) cannot be traced back to a written regulation as a criteria
- > Inclusion in ECA means facility must meet modelled concentration of 1 ou at nearest sensitive receptor (POI)
- > Inclusion is at the discretion of the review engineer and/or unpublished internal MECP policies

# Odour Units - Key Concerns

- > EN 13725:2003 defines precision (repeatability within a single laboratory) of odour units
  - ❖ NOTE 1 indicates this can be out by a factor of 3 and still be “precise”

## 5.3.2.2 Quality criterion for precision (repeatability)

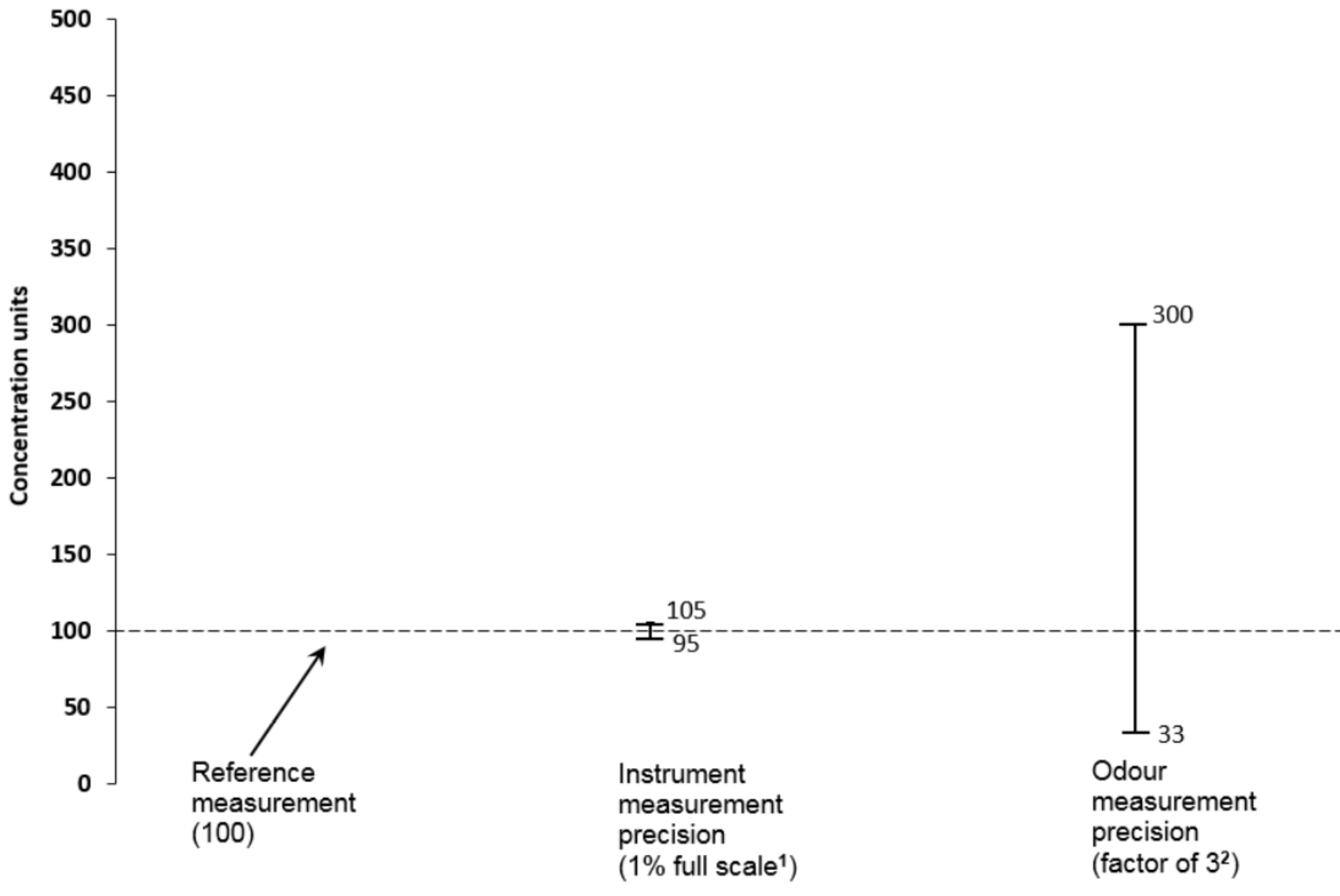
In addition to the overall accuracy criterion, the precision, expressed as repeatability limit, shall comply with:

$$r \leq 0,477$$

This repeatability limit can also be expressed as:

$$10^r \leq 3,0$$

NOTE 1 This requirement implies that the factor that expresses the difference between two consecutive single measurements, performed on the same testing material in one laboratory under repeatability conditions, will not be larger than a factor 3 in 95 % of cases.





# Odour Units - Key Concerns

- > EN 13725:2003 assumes there is transferability of n-butanol to environmental odours
  - ❖ Recent science has indicated this assumption is not valid

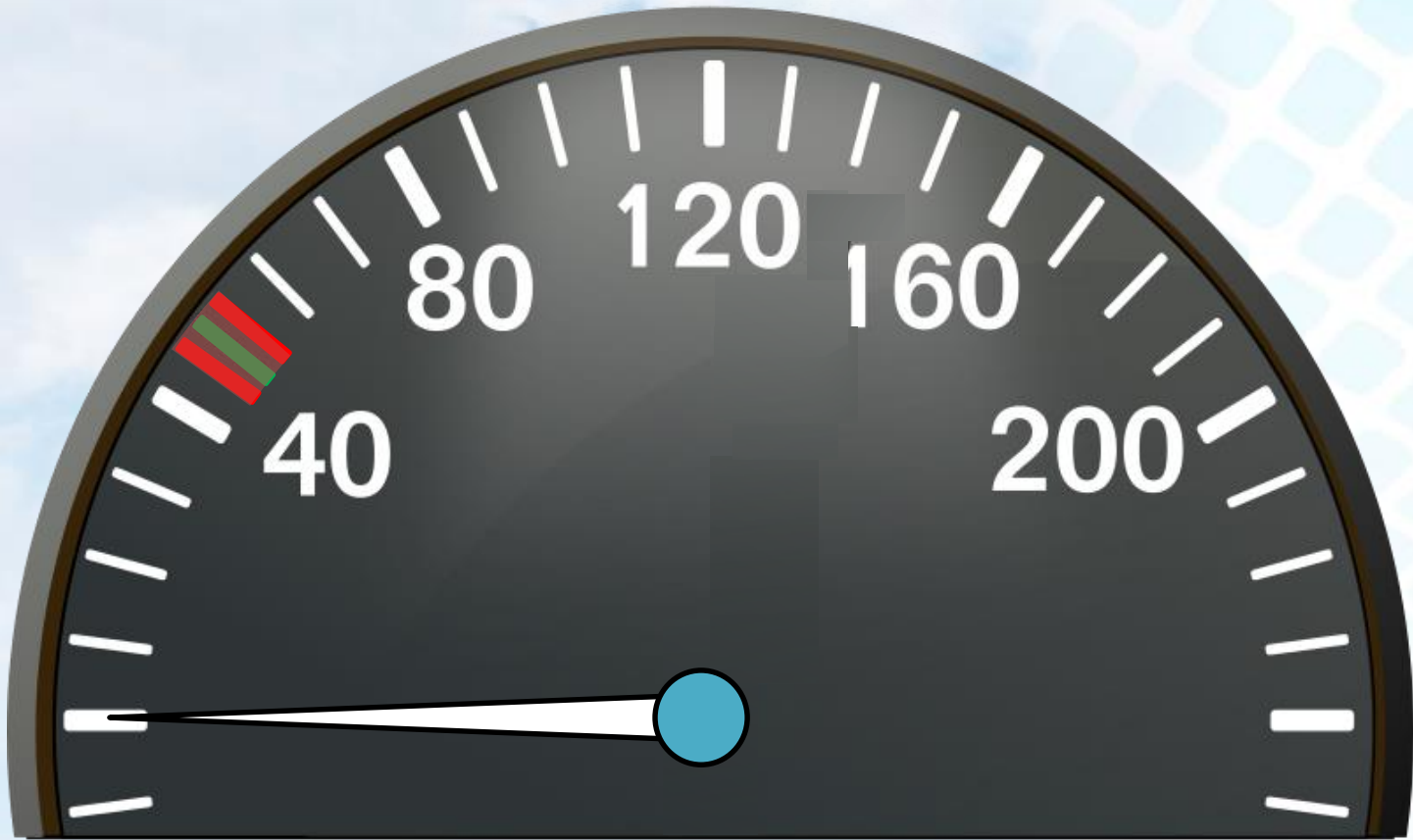
If a laboratory complies with the overall sensory quality criteria for the reference material, this standard assumes that this quality level is transferable to other, environmental, odours (van Harreveld, Heeres 1995, see Bibliography).

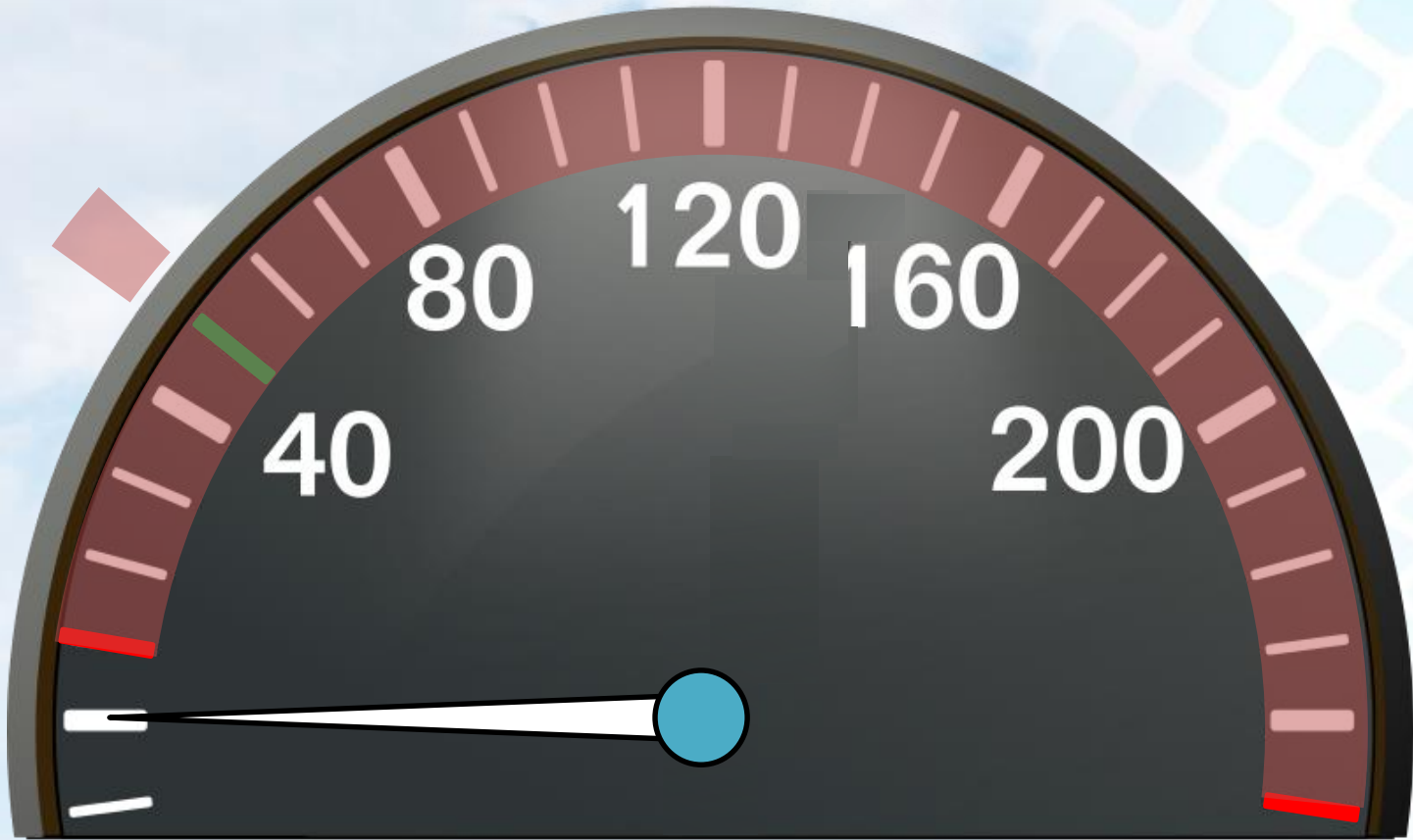
# Papers following EAB Ruling

- > Jonassen, et. al. 2012, “Does the Choice of Olfactometric Laboratory Affect the Efficiency of Odour Abatement Technologies?”
- > Klarenbeek, et. al. 2014, “Odor measurements according to EN 13725: A statistical analysis of variance components”

Paper	Objectives	Statistical Findings	Comparison to EAB Decision
Jonassen, et. al., 2012	<ul style="list-style-type: none"> <li>Investigate whether selection of odour laboratory yields different results</li> <li>Compared odour laboratory results from 3 laboratories (two Danish, one German) to determine odour abatement efficiencies for pig production facilities</li> <li>H<sub>2</sub>S measured simultaneously or immediately after odour samples</li> </ul>	<ul style="list-style-type: none"> <li>Odour reduction efficiency varied between 16% to 80%</li> <li>Presence of H<sub>2</sub>S appeared to have different affects on odour sampling results</li> <li>Danish laboratory more sensitive to H<sub>2</sub>S compared to German laboratory</li> <li>German laboratory panelists screened for n-butanol and H<sub>2</sub>S</li> </ul>	<ul style="list-style-type: none"> <li>n-butanol may be problematic when attempting to relate to environmental odours, especially when H<sub>2</sub>S is known contaminant contributing to odour</li> <li>Transferability of n-butanol sensitivity to other odours is limited and not improved by addition of H<sub>2</sub>S as secondary reference odorant</li> </ul>

Paper	Objectives	Statistical Findings	Comparison to EAB Decision
<p>Klarenbeek, et. al., 2014</p>	<ul style="list-style-type: none"> <li>• Seek to better understand transferability of statistical quality criteria (accuracy and precision) for n-butanol to other environmental odours</li> <li>• Evaluate inter laboratory variance (reproducibility)</li> </ul>	<ul style="list-style-type: none"> <li>• Transferability of n-butanol to other odour mixtures is poor and does not support assumed transferability indicated in EN 13725:2003</li> <li>• For n-butanol odourants, repeatability limit could be reduced from factor of 3 to factor of 2</li> <li>• When testing reproducibility, difference will not be larger than factor of 6.3 in 95% of cases</li> </ul>	<ul style="list-style-type: none"> <li>• n-butanol quality criteria not transferable to other environmental odours</li> <li>• Variability of results between two laboratories will not be larger than factor of 6.3 which is not acceptable when results are used for compliance purposes</li> </ul>





Instrument/Method	Model/ Literature	Precision	Reference
Odour Panel	EN 13725:2003	Factor of 3	Section 5.3.2.2 EN 13725
Sound Level Meter	ANSI Type 1 Sound Meter	+/- 1 dB	ANSI Standard
Sound Level Meter	ANSI Type 2 Sound Meter	+/- 2 dB	ANSI Standard
Pressure Transducer	Omega PX5500	+/- 0.10% FS	Manufacturer
Anemometer	EXTECH AN100	+/- 3%	Manufacturer
pH Meter	Hanna HI98129	+/- 0.05 pH	Manufacturer
Thermocouple	Reotemp Type K (Standard Model)	+/- 0.75%	Manufacturer
Chemical Analysis: H2S	AGAT Laboratories	1.55%	AGAT Reference Standard

# Conclusions

- > Odour units continue to be used within Canadian air permits despite EAB Decision precedent and more recent publications indentifying known scientific limitations
- > Compliance penalties can be severe (\$1,000,000 fine; shutdown) the industry should find it alarming that singular OU metrics continue to be used as compliance measures in legally binding air permits



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