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SUBJECT: BIOFILTER ODOUR INTENSITY AND HEDONIC TONE RESULTS

Introduction

The Odour Unit (TOU) was commissioned to carry out odour intensity and hedonic tone testing of air samples collected from a biofilter located at Ridley's Narangba Facility in South East Queensland. This plant was selected as a surrogate for a planned fish feed production plant in Tasmania.

The aim of the testing was to understand the correlation between biofilter-treated odour concentration and the actual perceptibility (i.e. intensity) and pleasantness or otherwise (i.e. hedonic tone). It has been hypothesised by some, and accepted by many, that the quality of odour from a treated airstream of a biofilter does not elicit the same response in people typically experienced with other odours. In layman's terms, this equates to a biofilter odour being less perceptible than an untreated odour, at the same odour concentration.

In the case of the proposed Tasmanian plant the Environment Protection Authority has indicated that the plant would need to comply with its Schedule 3 *Environment Protection Policy (Air Quality) 2004* odour performance criterion of 2 odour units (99.5%-ile, 1 hour averaging) at the boundary of the property, regardless of the fact that the only odour emissions from the site will be from the biofilter.

Method

TOU uses a modified version of the methods described in the German Standard *VDI 3882.1 Olfactometry - Determination of Odour Intensity* and *VDI 3882.2 Olfactometry - Determination of Hedonic Odour Tone* to generate odour intensity and hedonic tone results. Odour concentration is determined by finding the point of detection of odour where you can just sense it (i.e. sub-threshold testing). Intensity and hedonic tone is determined by analysing the odour's quality, beyond the point of detection, at concentrations where its character is clearly recognised (i.e. super-threshold testing).

The intensity and hedonic tone score results are graphed against concentration above threshold value. This method offers a different interpretation and clearly shows the relationship between an odour's perceived qualities above threshold.

The German Standard provides scales for ranking odour intensity (**Table 1**) and hedonic tone (**Table 2**).

Table 1

Odour Intensity Score	Description
0	Non-perceptible
1	Very weak
2	Weak
3	Distinct
4	Strong
5	Very Strong
6	Extremely Strong

Table 2

Odour Hedonic Tone Score	Description
4	Extremely Pleasant
3	Very Pleasant
2	Moderately Pleasant
1	Slightly Pleasant
0	Neither Pleasant or Unpleasant
-1	Slightly Unpleasant
-2	Moderately Unpleasant
-3	Very Unpleasant
-4	Extremely Unpleasant

While not directly relevant to the Tasmanian project, the Queensland Department of Environment and Heritage Protection in their guideline *Odour Impact Assessment from Developments* offers an alternative way to assess odour impacts from sources using an odour intensity criterion. Depending on the sensitivity of the receiving environment, the guideline recommends that either a 'weak/Score 2' or 'distinct/Score 3' odour intensity is used as the basis for the calculation of the criterion for the assessment of odour.

Results

A total of four samples were collected from the Ridley Nerangba plant and tested for Intensity and Hedonic Tone in TOU's Brisbane odour laboratory, on 23 June 2017. The results of this testing are summarised below.

Sample Location	TOU ID	Concentration at weak intensity (ou)	Concentration at distinct intensity (ou)	Hedonic tone at weak intensity.	Hedonic tone at distinct intensity.
Biofilter Surface #1	BC17111	4	8.2	Slightly unpleasant	Slightly unpleasant
Biofilter Surface #2	BC17112	3.2	7	Neutral	Slightly unpleasant
Biofilter Surface #3	BC17113	6	12	Slightly unpleasant	Slightly unpleasant
Biofilter Surface #4	BC17114	5.3	11	Neutral	Slightly unpleasant
Average		4.6	9.6		

Discussion

The Tasmanian odour criteria contained within Schedule 3 of the *Environment Protection Policy (Air Quality) 2004* applies to odour from a source if a regulatory authority is satisfied that it is likely to cause an environmental nuisance. The odour criteria for an unknown mixture is 2 odour units (ou), 1-hour averaging, 99.5th percentile at or beyond the boundary of a facility.

Based on the testing results, and having regard to the particular character of the biofilter odour, it could be argued that biofilter odour is unlikely to cause an environmental nuisance based on the neutral to slightly unpleasant hedonic tones at weak and moderate perceived intensities.

Furthermore, it could be argued that the biofilter odour would not illicit an adverse response from sensitive people until the concentration has reached at least 4.6ou, and more likely 9.6ou, depending on the sensitivity of the receiving environment.

These findings support the position that biofilter odours are rarely problematical, and suggests that the Tasmanian odour criterion of 2 ou is too stringent for treated odour from a biofilter source.