Odour Control with Biological Treatment Methods High Efficiencies and Improved Robustness

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Introduction

Odour treatment with conventional biofilters at wastewater treatment plants have design restrictions and different operating problems.

First, the sulfuric acid accumulation in the media reduces the overall odour removal efficiencies over time. Secondly, efficiencies are not stable due to the partial drying out of the media, especially in the inlet part of the biofilters as the airstreams are normally not completely saturated with water. Third, large footprints are required and finally, the media requires replacement after a couple of years of operation.

Problems like acidification, drying out and replacement of the media in the conventional biofilters are solved by the use of multi-layer biotrickling reactors. This comes with a more robust control of the biology even at a much smaller footprint.

This poster shows an example of a full-scale bioreactor installed at a wastewater treatment plant.

Method and Material

A combination of autotrophic organisms and heterotrophic organisms has shown to be a good combination to treat an air stream that contains a mixture of odorous compounds. In the multi-layered bioreactor, each layer contains different micro-organisms that are capable to degrade the different compounds under the optimal environmental conditions for the microorganisms. Autotrophic organisms can treat the H_2S and heterotrophic organisms treat the other odorous compounds like mercaptans separately. The counter-current multi-layer biological air treatment system contains different layers of inert media that support the different micro-organisms.

10 PURSPRING™ type PS10000 bioreactors were installed to treat 126,000 m^3/h. The Western Treatment Plant (WTP) treats about 54 per cent of Melbourne's sewage, averaging 500ML per day (130 MGD), and is located 35 km (20 miles) from Melbourne near Werribee. Raw sewage is

Table 1: Overview results(*) during Process Proving Trial

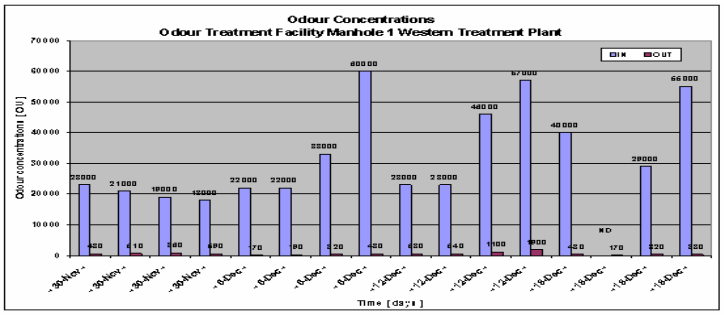
PARAMETER	DESIGN SPECIFICATIONS	RESULTS PROCESS PROVING TRIAL
Inlet Odour Concentration;	6,000 – 76,000 OU	18,000 – 60,000 OU
Inlet H_2S concentration;	6 – 45.9 ppm_v	0 – 41.3 ppm_v
Odour removal effciency **Outlet Odour concentration;**	**96 %** **< 2000 OU**	**98 %** **570 OU** (170-1900 OU)
H_2S removal effciency **Outlet H_2S concentration;**	**99.5 %** **< 0.5 ppm_v**	**99.6 %** **0.010 ppm_v** (0 – 0.080 ppm_v)

delivered to the plant via the Western Trunk Sewer (WTS). A gravity sewer with a diameter of between 4m and 4.5m. Manhole 1 (MH1) is the first manhole upstream of WTP and is located within the plant boundary. The Biological Odour Control Facility was built to reduce odorous compounds in air extracted from the sewer to a level that reduces the risk of odour complaints from the new residential development.

Results

Table 1 shows the design specification for performance as well as the results obtained over a one month proving trail period. Figures 2a and 2b show the odour concentrations and the removals at different inlet concentrations.

The total pressure drop over the reactor system is less than 750 Pascal and the total footprint is approximately 300 m^2.



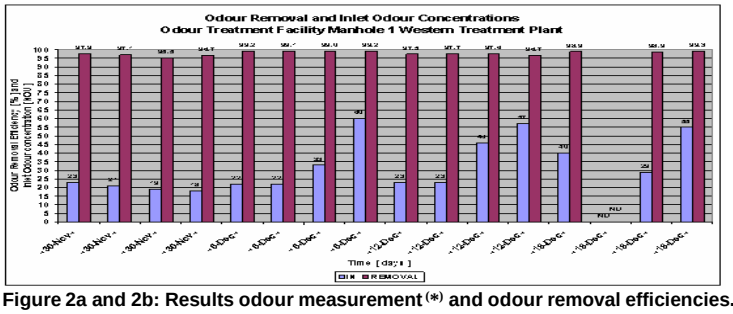


Figure 2a and 2b: Results odour measurement (*) and odour removal efficiencies.

When one bioreactor was taken off-line, the removal efficiency reduces only from 98.0 to 97.4% on average of the four measurements taken at different days.

Conclusions

A full-scale biological odour treatment system was tested during a one month proving trial. The results show high efficiencies and stable robust operation even when 1 reactor was taken off-line.

(*) The Process Proving Trial has been undertaken to establish that the installation performs in conformance with the key design parameters as specified in the contract specification. Among the one month during performance test were the analysis of:
Odours concentrations of the inlet and outlet: Air sampling took place over a 4 week period, with samples taken on a different day of each week (two in the morning and two in the afternoon) during 15 min in Tedlar bags. The samples were taken to the lab for analyses using the international standard method AS/NZS method 4323.3.2001 (equivalent to EN13725) at a representation flow of 20 l/min.
Online inlet and outlet H_2S concentration: Using Odalogs with a range 0-200 ppm_v for the inlet air and 0-2 ppm_v for the outlet air.