DESIGN & EVALUATION OF A DEMONSTRATION PEAT BIOFILTER FOR RECYCLING NURSERY RUNOFF

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Abstract

Peat from various sources worldwide has been shown to be an ideal matrix for the removal of pollutants and nutrients from water by biofiltration. Peat matrices work in three ways – by physical filtration, chemical sorption and by biodegradation – and allow the construction of simple yet robust filters that can operate entirely passively with only minimal maintenance for many years.

Bio-Remediation Pty Ltd has been awarded a Smart Water Fund grant to develop a peat biofilter for recycling nursery runoff. Based on an EPA-accredited design for treating septic tank effluent, the demonstration biofilter unit has been designed to enable the absorption and permeability characteristics of a wide range of peat matrices, and a wide range of input effluents.

The biofilter facility was completed in early August 2003, and the focus of initial experiments has been on determining the upper limits of permeability and phosphorus and nitrogen removal in one matrix blend. The data obtained to date, and their implications for the usefulness of peat biofilters in nursery applications, will be presented at the Conference.

Keywords

nursery runoff, nutrient and pollutant removal, peat biofilters,

1 Introduction

1.1 The Smart Water Fund

In September 2002, Melbourne's water businesses, *City West Water, South East Water, Yarra Valley Water* and *Melbourne Water*, with the support of the Victorian Government, established the Smart Water Fund to encourage and support innovative development of water, biosolids recycling and water saving projects within the community. The Fund is intended to support projects that demonstrate the benefits of conserving water in a clear and easy manner to the community, thereby facilitating and encouraging community and industry to adopt improved water resource management practices.

The initial focus of the Smart Water Fund has been to provide seed funding for projects to encourage and support innovative approaches to recycled water, biosolids and water saving projects. The Fund has been applied to projects where the project benefits will result in improved management of resources sourced from the Greater Melbourne metropolitan area. An amount of $4 million will be available in 2002/03 and again in 2003/04 to support sustainable water use projects.

1.2 Addressing Nursery Run-off

Nurseries have long been recognised in the Melbourne metropolitan area as being major users of water, and, with drought conditions looming, both the water authorities and the nursery

industry considered water consumption by the industry to be unacceptably high. While many individual nurseries had made attempts to reuse their run-off, adoption of water recycling by nurseries generally was slow, because of the expense and modest performance of available systems. In particular, disease and nutrient control were considered major problems.

Extrapolating from its work with septic tank effluent biofilters, which in turn was built on the work of Dr Robert Patterson, Bio-Remediation Pty Ltd applied successfully to the Smart Water Fund for support to develop a demonstration and research peat biofilter that would allow nursery run-off to be reused.

Fundamental to the application was the knowledge that *Biogreen*™ reed sedge peat was not only able to absorb nutrients and trace elements from water, but could also remove both phosphorus and plant pathogens such as *Phytophthora cinnamomi*. The application was supported by both the Nursery and Garden Industry Association of Victoria and Olinda Nurseries, one of Melbourne's largest commercial nurseries, and installation of the demonstration and test unit was completed at Olinda Nursery's Falls Road site in mid August 2003.

2 Design Brief

Notwithstanding what was known of the performance of peat biofilter matrices, it was clear that we had, at best, an imperfect or incomplete understanding of

- The parameters determining flow rate for water through the peat matrix;
- The absorption kinetics for key analytes, as a function of flow rate;
- The relationship between peat biofilter blend and both flow rate and absorption

Accordingly, it was considered essential that the biofilter unit be designed so that the following variables could be examined, independently or in combination:

- Peat matrix composition and characteristics;
- Flow rate and loading pressure; and
- Absorption / removal efficiency

It was assumed that the biofilter unit should otherwise operate in an environment that resembled as closely as possible the kinds of settings that would be met in practice. As a result, the unit was sited on an actual nursery, in the open, and was built to operate in all weather.

At the Olinda site, the nursery's run-off is collected into a dam situated some 150 metres downslope from the filter site, with a head of approximately 10 metres. Water to be treated is pumped from the dam to a header tank, and it returns to the dam once it has been through the filter. It was further considered important that the unit could be used to trial treat effluents from different sources, not just nurseries, provided such effluents could be kept strictly quarantined.

Based on these considerations, the unit as installed at Olinda comprises the following:

- 2 x 20,000L plastic header tanks
- 2 x 9 cubic metre (nominal) capacity biofilter units
- 1 x electric supply pump
- 1 x petrol transfer / pressure pump
- Distribution and collection pipework in each biofilter box

- Pipework and valves to interconnect and/or isolate both tanks and both filters
- Outfall monitoring and collection sump
- Inflow and outflow sampling and flow rate measurement ports
- Options for future installation of pH and temperature probes

Figures 1 and 2 show the installed biofilters.

The first loading and flow rate trials of this unit are scheduled to take place in the week of 15 – 19 September 2003. The results obtained, and the initial round of absorption data collected, will be presented at the Conference.

Acknowledgments

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Figure 1. Overview of the installed biofilter system

Figure 2. View of the two biofilter boxes, showing the removable distribution manifolds and the transfer / linking / isolation pipework (at right, between the units)