BrickHouse
TECHNOLOGIES

INTRODUCTION TO AQUAMATS®

ADVANCED MICROBIAL TREATMENT TECHNOLOGY FOR WASTE STABILISATION PONDS

AquaMats® Process technology provides a means to upgrade existing pond systems, improving discharge quality to meet new, higher standards and potentially increasing processing capacity by a factor of up to ten times.

AquaMats® Process for Wastewater Treatment

Introduction

Pond-based technology is one of the most common means of treatment of wastewaters from cities and towns, industry and agriculture. The simplicity, efficiency and effectiveness of a pond treatment system, known by various names such as oxidation pond, facultative pond or sewage lagoon, provides a cost effective solution to the waste treatment needs of the community or organization.

Increasingly, such pond-based systems are being asked to meet higher treatment performance standards frequently in conjunction with increased influent loads.

AquaMats® Process Technology provides a low capital and operating cost solution to the upgrade of an existing pond-based system to meet more stringent treatment needs. The key component of an AquaMats® Process upgrade of a pond system is the addition of an integrated network of AquaMats® biomass support media and associated bottom deployed aeration tubing throughout the pond. This may be combined with other upgrade options such as inlet works or hydraulic retention time optimisation but, in essence, the AquaMats® Process upgrade enables the manipulation of the well-understood critical operational parameters of traditional waste stabilisation ponds, being:

- Biomass nature and quantity
- Nutrient & oxygen supply to this biomass
- Hydraulic residence time in the WSP system.

Installation

AquaMats® are suspended vertically in the body of the pond, typically perpendicular to the flow through the pond, supported from stainless steel cables spanning the pond. Alternating with these rows of AquaMats® will be parallel rows of self-weighted aeration tubing (PDP) laid on the base of the pond. Spacing of these AquaMats®/PDP arrays and aeration rates are determined by an analysis of nutrient removal needs (BOD5, ammonia, nitrate, etc).

The anchoring of the AquaMats® rows and mounting of the air distribution pipework around the pond may be achieved by a variety of means, including direct connection to a suitable waveband or a dedicated post and rail system mounted on the pond waveband.

Typically, the installation of the AquaMats® Process components can be achieved without interruption to the on-going operation of the waste treatment plant.

Biomass

An AquaMats® Process upgrade of a pond system will dramatically increase the available surface area for establishment of biological communities within the treatment pond. Beyond the obvious increased surface area provide by suspending the AquaMats® in the body of the pond water, AquaMats® are fabricated by weaving special porous fibres in a specific pattern to achieve an effective surface area for biological growth of over 100 times their nominal surface area (length x height). The fibre pore size and the structure of the AquaMats® targets the growth of specific beneficial organisms.

Hence, the AquaMats® not only radically increase the overall quantity of biomass within the pond system but, by their selective nature, encourage the growth of particularly desirable species. A further consequence of this targeted approach to maximise attached biomass development is to avoid the recognised problem of wash-out of non-attached biomass, particularly de-nitrification bacteria, from the system during inflow peaks.

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Nutrients and Oxygen Supply

Maximised biological processing of waste within a pond system will be achieved when the biomass, the nutrients and oxygen are all present in the correct proportions and are in intimate contact. The bottom-deployed fine bubble aeration network which is an integral part of the AquaMats® system, fulfils two vital functions.

Firstly, different grades of aeration tubing, spacing and control of air feed rate ensures that the desired Dissolved Oxygen levels, including anoxic requirements for denitrification, are achieved in appropriate zones in the pond.

Secondly, the column of fine air bubbles which rises above each row of tubing carries with it a body of water, stimulating a circulation gyre which continuously sweeps nutrients across the face of the AquaMats®.

Consequently, the biomass attached to the adjacent AquaMats® is continuously exposed to a supply of nutrient-laden, appropriately aerated water, providing optimum conditions for maximised growth and hence nutrient removal.

Hydraulic Residence Time

Short circuiting of influent between the inlet and outlet of a pond-based system is a frequent cause of system inefficiency or ineffectiveness. AquaMats®, in their various forms, provide a very effective means to minimise the potential for short circuiting.

AquaMats® are available in a variety of formats

- Surface-deployed (SDF) in which the fabric has negative buoyancy and hangs vertically down from the surface
- Bottom-deployed (BDF) in which the fabric has positive buoyancy and floats upwards from a weighted base
- Flow Control Mats solely for flow control and without specific biomass development properties.

By strategic placement of an appropriate combination of the various AquaMats® formats throughout the pond, optimal conditions of plug-flow from inlet to outlet can be approached.

References

Four municipal wastewater treatment plants in NZ and one in Australia are currently operating using the AquaMats® Process technology.

The first at Te Kauwhata, approximately 80 km south of Auckland and operated by the Waikato District Council, was commissioned in Sep-06. This plant serves the needs of the local Te Kauwhata township (1,600 p.e.) with a small industrial contribution plus the wastewater treatment needs of the Department of Correction's 600 inmate Springhill facility. The AquaMats® installation was an upgrade of an existing pond-based system. Extensive quantitative performance monitoring data is available for this plant and can be supplied on request. Summarised results appear in Appendix A.

The Raglan Municipal WWTP, also operated by the Waikato District Council, serves a resident population of 2,900 persons, rising to 6,900 at peak holiday times. This plant is a greenfields replacement of a previous pond-based system which was deemed to be beyond viable upgrade. The AquaMats® plant was commissioned in 2007 and summarised performance data appears in Appendix A.

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Numerous international reference sites for AquaMats® exist, dating back to the 1990's. These cover the full spectrum of municipal, industrial, agricultural and leachate applications.

Conclusion

Pond-based systems represent a high proportion of municipal, agricultural and industrial wastewater treatment plants within NZ. Many of these pond systems are currently experiencing, or will experience in the near future, more stringent load handling or treatment performance demands as a result of greater awareness of our impact on the environment.

The AquaMats® Process provides a viable means, both technical and economic, for these plants to meet or exceed these new performance demands. Proven performance of AquaMats® Process installations in NZ and overseas demonstrates the ability of the technology to reach the required technical standard. The low capital, installation and operating costs of the AquaMats® upgraded plant, combined with the continued utilisation of an existing infrastructural asset, means that the AquaMats® Process upgrade of an existing pond-based system is a very cost-effective solution to the wastewater treatment needs of the community or organisation.

Contact Meridian Aquatic Technology Australasia Ltd for a no obligation evaluation of the potential for AquaMats® Process technology to meet your specific wastewater treatment needs.

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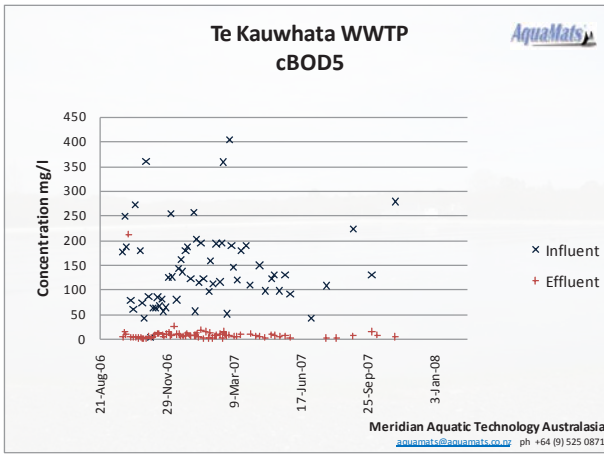
Appendix A:

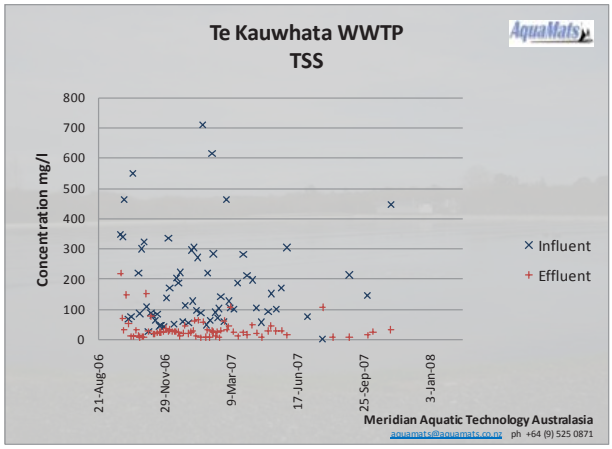
Te Kauwhata Municipal Wastewater Treatment Plant

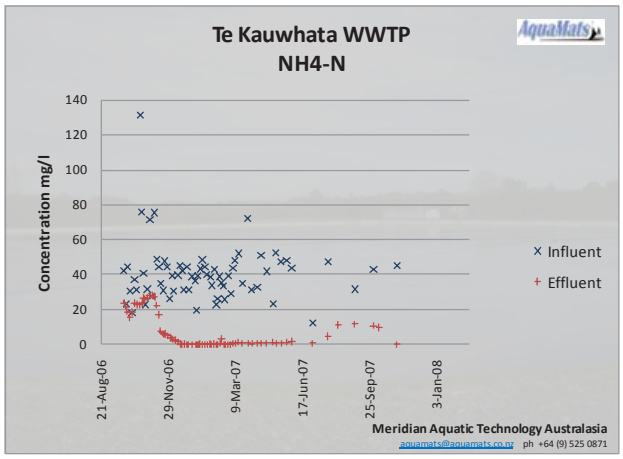
Performance Data for Period Aug-06 – Nov-07



BOD_5	Influent mg/l	Effluent mg/l	% Removal
Average	155.8	7.8	
Median	130.0	7.14	95%
90%ile	247.1	14.2	

TSS	Influent mg/l	Effluent mg/l	% Removal
Average	191.1	28.9	
Median	136.5	24.0	82%
90%ile	348.3	61.1	





NH_4-N	Influent mg/l	Effluent mg/l	% Removal
Average	39.1	2.0	
Median	39.5	0.6	99%
90%ile	49.5	9.8	

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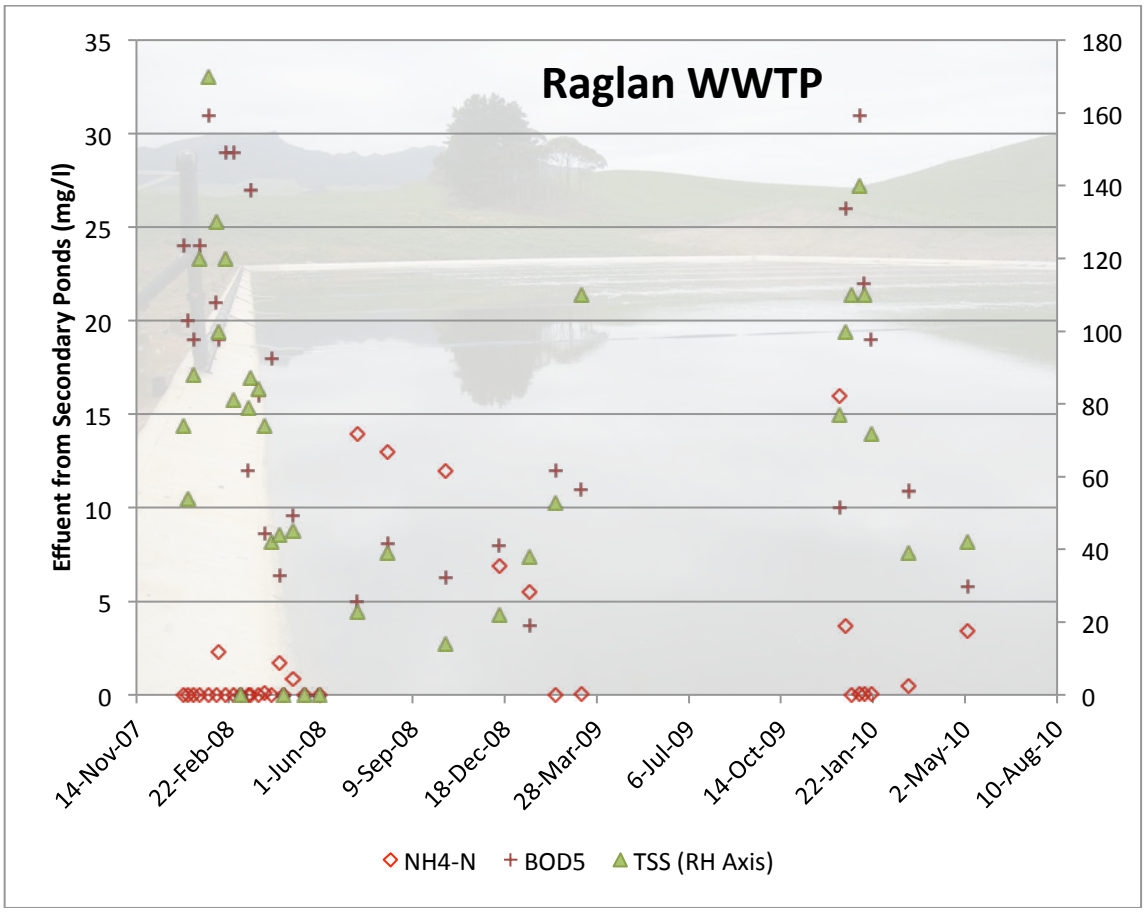
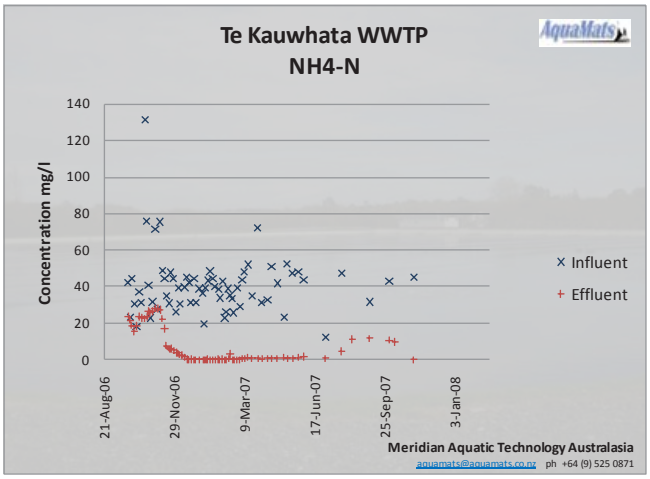
Raglan Municipal Wastewater Treatment Plant

Performance Data for Period Nov-07 – Aug-10





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