WASTEWATER
TREATMENT

A proven and efficient floating
wastewater treatment system

SPEL
waterclean

Executive Summary

Cleaning water of pollutants is an on-going challenge for communities across the globe as the demand for environmental improvements grows in line with the need to find cost-effective and sustainable methods to remove ever-increasing amounts of contaminants from diverse bodies of water.

SPEL Environmental's revolutionary low cost, highly flexible system of **floating treatment media** is meeting this need. This innovative system has strong scientific credentials based on the outcomes of independent trials, is an environmentally-sound process, and meets business requirements for sustainable solutions.

Developed alongside leading international scientists, Waterclean Technologies™ floating treatment media represent a highly technical development that uses, and improves on, a naturally occurring phenomenon.

In short **SPEL Environmental's** modular biological technology, being active suspended media, provide a colossal environment of active surface area for pollutant-digesting microbes and bacteria to bio-remediate water laden with nutrients, heavy metals or suspended solids. They represent an industry breakthrough with scores of benefits that include:

- Cost savings
- Proven effective performance
- Self-cleaning
- Minimal environmental impact
- Flexibility
- Zero land use
- Fluctuating water Levels

The performance of the product that has resulted from our investment over the past 10 years is nothing short of extraordinary: it defies the simplicity of the process and the low costs involved for users, and provides benefits that are well beyond those for traditional water treatment systems.

Today, **value for money** is the number one requirement when organisations invest in improving or replacing assets – local authorities, water agencies, private companies and landowners alike. For many, this priority is closely followed by the need to satisfy environmental issues.

Our innovative floating treatment media technology, as **active suspended media**, is based on more than 10 years' intensive research, combined with a natural process as old as the world itself, enables us to assure you that we can meet and surpass these crucial business needs.

"Root zones offer symbiotic relationships with the microbes and bacteria"

How SPEL Environmental's floating treatment media work

The floating media, which can be used in any water environment requiring treatment, provide a lush and fertile base for plants and vegetation to grow. As the roots spread down through the fibrous structure of the media, an extraordinarily vast activated surface area is created for microbes and bacteria to take on their role of **bio-remediation** - the use of micro-organisms to remove pollutants.

The microbes and bacteria, which do not swim, and are UV sensitive, adhere to the roots and microscopic root hairs of the plants, and within the fibrous structure of the media themselves, secreting sticky extracellular proteins and exist in the environs of biofilms.

It is within these biofilms which microbes and bacteria trap and digest organic matter and nutrients in wastewater, including total suspended solids, biochemical oxygen demand, (BOD) nitrogen and phosphorus.

What makes SPEL Environmental's floating treatment media a unique scientific innovation, with the potential to create a revolution within the water treatment industry, is the massive activated surface area they provide for microbes and bacteria to survive.

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Surface area

The principal of surface area is; the more underwater surface area that is available for pollution-digesting microbes and bacteria to stick to, the cleaner the water. This surface area is called the **Bio-Mediation Quotient (BMQ)**: our floating media and root structure combination has a BMQ in excess of 1,000m² per 1m² of island which means:

- 100m² of planted active suspended media has more than 10ha of surface area
- 1ha of planted active suspended media has more than 1,000ha of surface area

Construction

Waterclean Technologies floating treatment media are made from 100 per cent recycled polyethylene terephthalate, commonly known as PET and used in plastic drink bottles. The recycled plastic is made into a non-woven, non-toxic durable matrix of fibres.

Sheets of fibre matrix are bonded together with foam which provides the buoyancy needed for each specific application. Plants are inserted into the material and grow down into the water hydroponically.

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Maintenance

Maintenance is minimal and simple, low cost and includes tasks such as checking anchors or tethers, and looking after plants with annual harvesting programs.

Self-cleaning: by constantly sloughing redundant biomass down through the roots system, and continuously renewing biofilm and root zones, our system avoids "plugging up."

"Floating Treatment Media are a highly advanced, cutting edge, biological technology"

Planting

The plant species suitable for floating media are selected according to the reserve buoyancy required for the application. Generally, terrestrial species such as wetland sedges, rushes and grasses are the best option as they develop superior root structures within the water to provide for an increased surface area. However, many other planting types are also used. Recommended planting density is three to five plants per square metre.

Anchoring and tethering

The floating treatment media can be secured into position by anchoring or tethering, depending on local climate and water conditions. Techniques we use range from securing to the embankment above the water - in areas where there is no public access - to using concrete sinkers, submerged screw anchors, or piles.

Wastewater biological treatment

Wastewater

Floating treatment media have proven efficient and low-cost enhancements to municipal wastewater treatment plants – retro-fitted to existing facilities or encompassed into the design of new constructions – with extremely low operation costs. Truly environmentally-sound and sustainable, our floating treatment media have a dramatic effect on:

- Anaerobic digestion
- Odour mitigation
- Nitrification processes
- De-nitrification and polishing
- Bio-chemical oxygen demand
- Removal of TSS
- Reduction in faecal coliforms
- Reduction in phosphorus

Independently tested and validated, these systems prove high rate performance in municipal Wastewater treatment plants as retrofitted systems on existing ponds. Many of the Waterclean Technologies floating treatment media are achieving results as per below:

Contaminant	Removal Rates
BOD_5	> 90%
Total suspended solids (TSS)	> 90%
Ammonia (NH_4N)	> 90%
Total nitrogen (TN)	> 90%
Total phosphorus (TP)	> 60%

Wastewater pond - 2010/11

Contaminant	Influent	Effluent	Removal Rates
BOD_5 (g/m3)	265	< 10	> 95%
Total suspended solids (TSS) (g/m3)	265	< 10	> 95%
Ammonia (NH_4N) (g/m3)	45	2 - 5	> 90%
Total nitrogen (TN) (g/m3)	55	< 10	> 85%
Total phosphorus (TP) (g/m3)	10	2 - 3	> 70%
F Coliforms (cfu/100ml)	7,000,000	≈ 100	

Says Adrian (Council Assets Manager) . . .
"this is the best value for money wastewater treatment system in the country!"

Benefits

SPEL Environmental's floating treatment media offer clear benefits to any organisation or individual requiring wastewater treatment including local authorities, private companies, and landowners. These benefits include:

Minimal environmental impact

Using a waste product to bio-remediate waste, our floating treatment media have strong environmental credentials including:

- Satisfying stringent water quality consent requirements
- Eliminating the need for chemical dosing
- Eliminating the need for further high-impact 'concrete and steel' construction
- No energy used in the operation process; low energy in the manufacture process
- Zero-land use requirement (*see below*)
- Manufacture from recycled PET
- Using plants from eco-sourced seeds to harmonise with the natural vegetation

Flexible

Floating treatment media are completely flexible and can:

- Fit any existing space or water body shape
- Operate effectively in all climate and environmental conditions
- Operate in fluctuating water levels
- Maximise retention times for treatment optimisation
- Concentrate on removal of particular pollutants through design adjustments

What this flexibility will mean for you is that, whatever your water treatment issue, the media can be adapted to provide a benefit-loaded solution.

Cost savings

Floating treatment media require low capital investment with minimal operating and maintenance costs, and, there are no operational energy costs. (1) NH_4N requires an input of O2 to nitrify. This is often via mechanical aeration.

Effective

The process is simple, completely natural - and highly effective. You have the assurance of an installation that has been developed to exploit the unsurpassed water cleaning properties of naturally-occurring microbes.

Zero land use

In situations where water treatment demands have outgrown existing assets, the media can be retro-fitted as a low-cost, zero land use alternative to building additional ponds or constructed wetlands. This eliminates the need for costly land purchase and contributes to the minimal environmental impact of the media – saving you money and time-consuming confrontations over land use.

For example, local authority saved $500,000.00 when we retro-fitted floating treatment media on an existing pond instead of purchasing land and constructing an alternative constructed wetland system.

In areas where irrigation schemes are used to dispose of treated water, the efficiency of our media in reducing the nutrients in treated water means less land is required for the disposal fields. Again, money is saved and environmental needs met.

Modular biological system

The Floating treatment media is a modular system therefore can be installed in stages. This proves beneficial where monetary budget constraints restrict the ability to install full systems in one financial year.

Staging also proves beneficial where discharge consents may change in the future while a smaller system meets current demands. A simple additional modular upgrade can be retrofitted at a later stage to future proof the wastewater plant.

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