



BioCycle Systems Ltd
15 Mexted Place
P O Box 9262
HAMILTON
0800 246 292

Technical Design Specifications - BioCycle MAXI Aerated Treatment Plant

The BioCycle MAXI Aerated Wastewater Treatment System can be used to treat domestic effluent from residential or light commercial properties to a level where it can be safely dispersed on site without any negative effect on the environment.

The modular construction of the BioCycle plant makes it possible to manufacture a system for any flow rate that may be required. It is a cost-effective alternative for areas where ground porosity is at varying ends of the spectrum. On undulating sites where the land at lower levels is consumed by buildings or other facilities the BioCycle system allows effluent to be distributed on a level above the tanks location.

The BioCycle system complies with all specifications for AWTS treatment units in New Zealand providing effective and reliable wastewater treatment over a long period of time. The design parameters have been derived from proven technology in the field of on-site wastewater treatment. This is achieved by application of the specified parameters with excellent design and construction principals, including thorough testing of the system and final effluent.

The BioCycle MAXI system can treat up to 2,600Litres per day. The large 10,000Litre primary septic chamber allows raw sewage a minimum 24 hours of primary treatment to be achieved enabling a minimum 20% reduction of BOD's through sedimentation before secondary processing is commenced.

Inside The BioCycle MAXI system

Septic Tank:

Raw effluent enters the primary tank (10,000L) from the dwelling. The primary tank also receives the return activated sludge from the clarification tank, providing a stimulant for further breakdown of the influent load, and assisting with the removal of nitrates. The capacity of the primary tank allows 24 hours of residence for effluent ensuring sufficient BOD reduction and anaerobic breakdown has occurred.

Anoxic Chamber:

Pre-treated liquor enters the anoxic chamber (2,000L) from the primary holding. This chamber acts as an additional anaerobic zone, without significant turbulence caused by incoming wastewater. Hydraulic displacement causes overflow via a Polylok Zabel A300 biological filter, into a second 10,000Litre tank.



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Aeration Chambers:

Following primary treatment, aeration is provided within two chambers totaling 4,680L, which contain submerged media. This purpose-built media allows even distribution of air through the chambers and media.

Diffused air at a minimum rate of 120Litres/min is required for adequate oxygenation. Air is blown via a pipe into the Aeration Chambers and released at the bottom by way of purpose made fine air bubble diffuser assemblies.

The aeration system is designed to maintain a minimum dissolved oxygen concentration of 2mg/L in the aerobic chamber within the maximum two hourly flow.

Clarification Chamber:

With a capacity of 410 Litres, remaining effluent is further polished within the clarification chamber. This chamber is provided to remove settling and floatable solids passing through from the aerobic chamber.

Provision is made for constant automatic return of settled solids to the anoxic chamber by means of a subsurface sludge mechanism operated by venturi suction off the air supply manifold; this is done so that sufficient nitrified waste is recycled back to the oxygen deficient anoxic stage for denitrification to occur.

Pump Out Chamber:

Treated effluent enters the final 430 Litre chamber where it will be pumped out to the irrigation field via a fine 130-micron disc filter to assist further removal of fine particles and ensuring a long-lasting irrigation field.

Tank Construction

In New Zealand, the BioCycle Systems Ltd standard concrete tank is constructed of steel reinforced concrete to a strength of 40Mpa. Tank walls are monolithic. The lid is constructed separately and sealed to the tanks walls to prevent leakage.

Dart Concrete Ltd manufacture the tank in accordance with the structural requirements of AS/NZS 1546.1.2008.

Manhole lids are formed in HDPE and internal components are PVC pressure pipe.

All electrical box housings and electrical control units are made of HDPE, fastened to the tank lid.

Each system is fitted out prior to leaving the factory. Prerequisite drainage, irrigation and electrical connections are completed on the destination building site.



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Operating Plant Specifications

Aeration

LP150 HN (or AP-120) Air Pump located inside the green polyethylene turret enclosure on top of the tank

- 130-watt power rating is single phase
- Exhaust capacity is 225 litres per minute
- Noise level at 1.0m from the tank is approximately 43dB(A)

Irrigation Pump

A Davey D42A/B, (or similar) submersible pump with a maximum Head of at least 29m is fitted.

Power consumption is subjective and varies with total flow during any day and the type of irrigation system installed.

Monitoring System

All BioCycle units are installed with two alarms as warning devices. An alarm plate (audible/visual) is supplied to be installed in a convenient position inside the house. The alarm plate is commercial grade, similar to a light switch, with two coloured LED lights. A switch plate provides for the alarm to sound and to be switched to 'mute' when heard.

The alarm panel is incorporated into an electrical circuit breaker, located at the Biocycle system or fuse box, as a safeguard against electrical faults.

The two LED lights indicate:

1. High-Water level, designed to sound if water level in the irrigation chamber reaches a critical level. This indicates that the submersible pump is malfunctioning, or the irrigation filter is blocked.
2. Air pressure fault, designed to sound if the blower ceases to operate or there is an air blockage.

The home occupants are responsible for keeping the irrigation filter clean and ensuring the irrigation drip lines and flush valves are not obstructed or broken.



Final Effluent Quality

A properly maintained system produces treated water of a very high quality.

Testing of the BioCycle 8200 at the OSET facility in Rotorua has reported the following:

AS/NZS 1547:2012 Secondary Effluent Quality Requirements

These requirements are that 90% of all test samples must achieve a BOD₅ of $\leq 20 \text{ g/m}^3$ and TSS of $\leq 30 \text{ g/m}^3$ with no one result for BOD₅ being $>30 \text{ g/m}^3$ and no one result for TSS being $>45 \text{ g/m}^3$.

The **BioCycle 8200 system achieved** a performance level of **100%** for BOD₅ and **100%** for TSS based on the full set of 37 test results in weeks 9 to 35, with no results exceeding the maximums. The **BioCycle 8200 system thus meets** the secondary effluent quality requirements of **AS/NZS 1547:2012** at the test flow rate of 1,000 L/day (ie at 70% of the plants advised design capacity).

Benchmark Ratings

The **BioCycle 8200 system achieved** the following effluent quality ratings for the sixteen benchmarking results in weeks 20 to 35.

Indicator Parameters	Median	Std Dev	Rating	Rating System				
				A+	A	B	C	D
BOD (mg/L)	4.5	1.4	A+	<5	<10	<20	<30	≥30
TSS (mg/L)	7.7	3.6	A	<5	<10	<20	<30	≥30
Total Nitrogen (mg/L)	22.1	2.4	B	<5	<15	<25	<30	≥30
NH ₄ - Nitrogen (mg/L)	0.2	0.1	A+	<1	<5	<10	<20	≥20
Total phosphorus (mg/L)	4.4	0.3	B	<1	<2	<5	<7	≥7
Faecal Coliforms (cfu/100mL)	54,000	23,660	C	<10	<200	<10,000	<100,000	≥100,000
Energy (kWh/d) (mean)	6.3	1.9	D	0	<1	<2	<5	≥5

While the BioCycle MAXI has not been through the same test above, we anticipate very similar results for all tested parameters.

BioCycle Guarantee / Warranty

Each BioCycle system is covered by a limited warranty of 10 years on the concrete tank, and two years (24 months from date of installation) on all electrical components within the system.

Within the warranty periods stated above, BioCycle Systems Ltd guarantees to repair or replace any part of the system requiring remedy due to defective manufacture, provided BioCycle is given notice of the problem within 24 hours of the customer being aware of the problem.



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Essential rules for the care of your wastewater system.

All wastewater (toilets, bathrooms, laundry) produced on a rural property is discharged via pipes to an on-site wastewater treatment and land disposal system. The wastewater treatment system is a fragile biological (bacterial) process and therefore requires care by all residents and visitors.

You can help maintain an effective wastewater treatment system on your site by ensuring **no toxic chemicals** are put down sinks or toilets and by using only environmentally friendly cleaning products. Toxic chemicals, drugs (e.g. antibiotics) kill bacteria in the treatment system. These organisms are needed to treat wastewater and if healthy populations are not maintained, the system will fail resulting in poorly treated wastewater discharging into the soil, offensive odour and increased maintenance costs. You should also manage your water use to protect the system from overloading.

DO

- Try to take short showers in preference to baths.
- Use bio-degradable soaps and cleaners.
- Check all your cleaning products to see if they are suitable for septic tanks.
- Use natural soaps (rather than chemicals) for cleaning.
- Scrape all plates and dishes to compost/rubbish, removing as much food/fat as possible.
- Repair/fix all leaking taps as soon as possible.
- Use phosphate free or low phosphorus laundry detergents.

DO NOT

- Do Not pour any toxic/strong chemicals (paint, oil, grease, thinners, pesticides down any drains).
- **Do Not flush any products other than standard toilet paper** down the toilet! This means no tampons, pads, condoms, cigarette butts or 'wet-wipes'.
- Do Not discard any drugs down the toilet or sink.
- Do Not use strong cleaners (bleach, Canesten, Napisan, strong citrus or alcohol base).
- Do Not tip chlorine, anti-**septic**, anti-**bacterial**, or disinfectant type products down drain.
- Do Not use chemical drain cleaning products to clear a blockage – call a plumber.
- Do Not do all your laundry in one day – spread your loads through the week.
- Do Not install sink garbage grinders. If a grinder exists, don't discharge high volumes of scraps, especially carbohydrates, bones or fats & oils into it.
- Do Not put coffee grinds down the sink drain.