



BioCycle Ltd
15 Mexted Place
P O Box 9262
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Technical Design Specifications - BioCycle 8200 *Ecolution* Submerged Aeration Filter Wastewater Treatment System

The **BioCycle 8200 *Ecolution*** Aerated Wastewater Treatment System is designed for the Secondary treatment of all domestic wastewater from residential properties to a level where it can be safely dispersed on site without significant negative effect on the receiving environment.

The concrete precast BioCycle tank is a cost-effective solution for areas where soil composition or ground porosity is at varying ends of the spectrum. On undulating sites where land at lower levels is occupied by buildings or other facilities, the BioCycle system allows for treated effluent to be distributed on a level above the tanks location.

The BioCycle system is designed to comply with all regulated specifications for Secondary AWTS 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 used around the world for many decades in the field of on-site wastewater treatment. By applying excellent tank design and construction principles, high system performance is achieved and thorough field testing of the system in real-world applications has proven the BioCycle 8200 series to be a market leader in final effluent discharge quality.

The **BioCycle 8200 *Ecolution*** tank is designed to treat up to 1,400Litres per day. The large Primary septic chamber allows raw sewage Primary treatment to be achieved, enabling a minimum 20% reduction of solids/BOD's through sedimentation before Secondary processing is commenced.

Tank Construction

The BioCycle 8200 series concrete tanks are constructed of fibre reinforced concrete to a strength of 50Mpa. Tanks are monolithic, with concrete poured into a single cylindrical mould, with partition walls providing five separate chambers for various process functions. The concrete lid is constructed separately and sealed onto the tank walls after internal pipework fit-out.

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

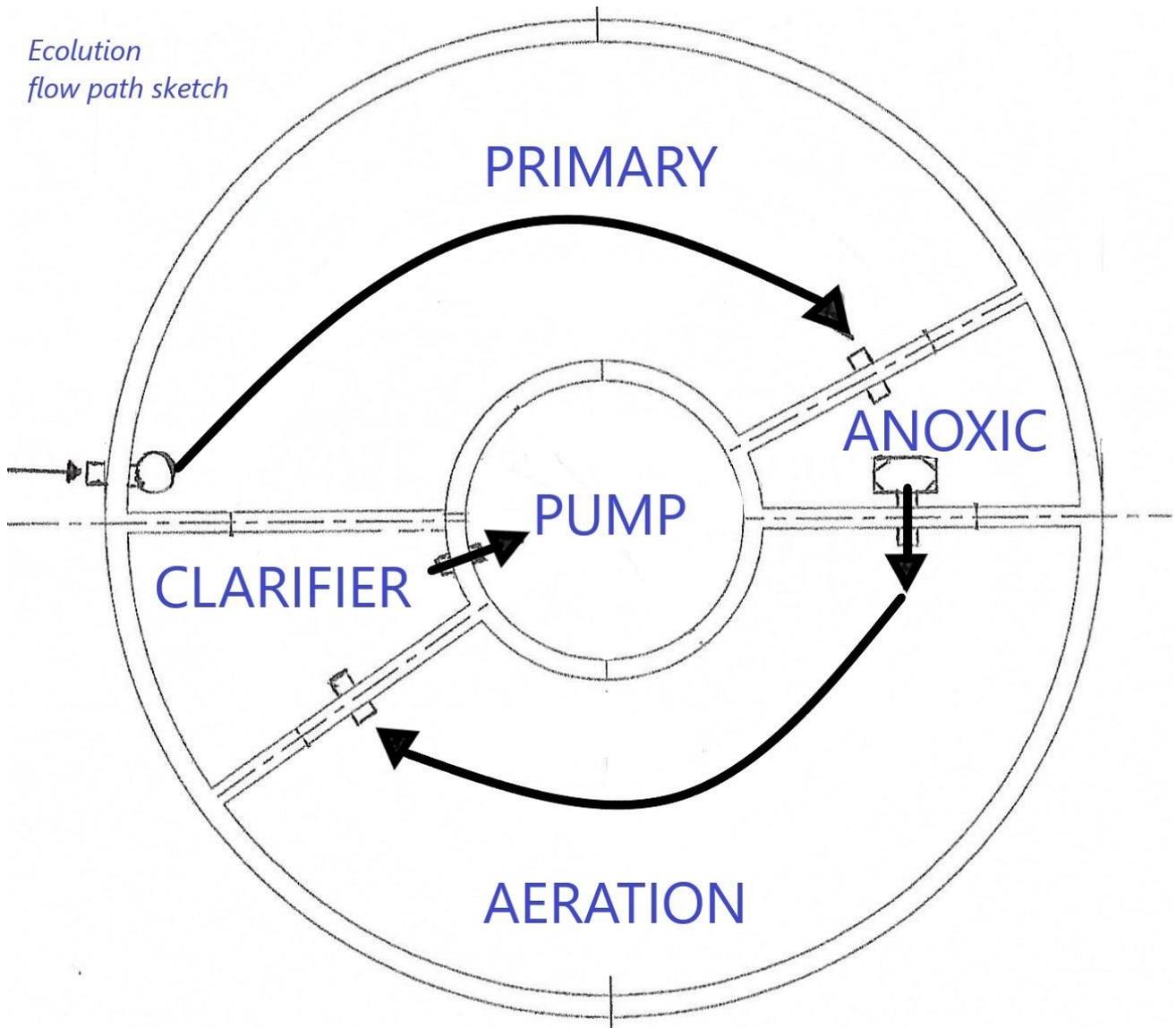
Manhole lids are formed in HDPE and internal components are predominantly PVC pressure pipe.

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. Drainage, irrigation and electrical connections are completed on the destination building site.

Inside the BioCycle 8200 *Evolution* tank

*Evolution
 flow path sketch*



Primary Septic Chamber (2520Litres):

Raw effluent enters the primary tank from the dwelling. The primary tank also receives activated sludge returned from the clarification chamber, providing a stimulant for further breakdown of the influent load. The primary tank allows 24 hours of residence for effluent, ensuring adequate BOD reduction and anaerobic breakdown has occurred.



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Anoxic Chamber (330Litres):

Mid water effluent enters the anoxic chamber from the primary holding via a 100mm DWV pipe. This chamber acts as an additional septic anaerobic zone which also receives recycled activated sludge from the clarification chamber to assist with further removal of nitrates. Following Primary treatment, effluent flows through a Polylok PL-122 1.6mm Bio filter into the Secondary aeration treatment chamber.

Secondary Treatment Aeration Chamber (2160Litres):

Secondary aeration treatment occurs in this chamber which contains submerged HDPE N40 NLOME6.0 growth media (Surface Area = 200m², Depth = 1.05m). This bacterial growth media film is attached to the walls of the tank and allows for even distribution of air throughout the chamber and media.

Air, at a minimum rate of at least 80Litres/minute, is required for adequate oxygenation of the effluent. Air is blown via PVC pipe into the Aeration Chamber and released at the bottom by means of two Environmental Dynamics Flex-Air 9" High Capacity membrane fine air bubble diffuser assemblies.

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

Clarification Chamber (410Litres):

Effluent is further polished within the Clarification Chamber. This chamber is provided to remove remaining solids as they settle, after flow-through from Aeration chamber.

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

Pump Out Chamber (432Litres):

By means of hydraulic displacement, treated effluent enters the final Pump chamber, where it will be automatically pumped out to the irrigation field via a fine 130-micron disc filter. This assists with further removal of fine suspended particles and ensures a long-lasting irrigation field.



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Operating Plant Specifications

Aeration

Thomas AP-80H Air Pump located inside the HDPE enclosure on top of the tank

- 51-watt power rating is single phase
- Exhaust capacity is 80 litres per minute per pump
- Noise level at 1.0m from the tank is approximately 35dB(A)

Irrigation Pump

A Bianco B42A (or 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.

An estimated cost of power consumption used by the Biocycle blower and irrigation pump is around \$160.00 per year, based on around 1.8kWhr/day at 0.25c/kWhr.

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 Pump 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 regular cleaning of their irrigation filter and ensuring the irrigation drip lines and flush valves are not obstructed or broken.

Scheduled Maintenance

Your BioCycle system **MUST be serviced** by an approved BioCycle Ltd Service Agent **every six months** to ensure ongoing performance and to avoid flooding.



Final Effluent Quality

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

Testing of the BioCycle 8200 at the OSET NTP facility in Rotorua (Trial 11) 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.

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	$\geq 100,000$
Energy (kWh/d) (mean)	6.3	1.9	D	0	<1	<2	<5	≥ 5

Ongoing testing on the BioCycle 8200 allows for continuous improvement to exceed the above final effluent quality expectations.



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BioCycle Limited Warranty / Guarantee

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 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.

NOTE: All warranties are void if:

- 1.** Routine maintenance is not carried out at 6-monthly intervals,
- 2.** Harmful chemicals have entered the system causing damage to any components,
- 3.** Tank becomes flooded due to occupants failing to clean discharge filter,
- 4.** Occupants fail to notify Biocycle Ltd or accredited Service Agent within 24 hours of fault