



Install ANYWHERE with ease

MODEL C60K

WASTEWATER TREATMENT SYSTEM

**TECHNICAL AND
MAINTENANCE MANUAL**

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1.0 PLANT SPECIFICATIONS

1.1 Hydraulic Load Estimates

The maximum possible wastewater loading is estimated at 60,000 L/day

1.2 Design Loading

Total Flow in any 24 hours	: 60,000 L/day
Maximum BOD ₅ per day	: 20,000 g
Maximum flow in 30 minutes	: 10,000 Litres
Maximum flow in 2 hours	: 20,000 Litres

1.3 Effluent Standards

The BioMAX C60K wastewater treatment system is designed to produce treated effluent of the following quality under standard operating and testing conditions.

Biochemical Oxygen Demand	: ≤ 20 mg/L
Total Suspended Solids	: ≤ 30 mg/L
Faecal Coliforms	: ≤ 10 cfu /100mL
Residual Free Chlorine	: > 0.5 mg/L
pH	: 6.5 – 8.5

2.0 PROCESS DESCRIPTION

The following process description and schematic flow diagram will assist in the understanding of the treatment processes used for the BioMAX Wastewater Treatment Plant.

The Wastewater Treatment Plant is divided into five principal chambers.

- a) Anaerobic chamber-anaerobic treatment
- b) Aerobic chamber-aerobic treatment
- c) Clarification chamber-sludge settlement and removal
- d) Disinfection chamber-contact time with chlorine
- e) Pump-out chamber- discharge to disposal system

2.1 Anaerobic Chamber

Raw wastewater is initially received into the anaerobic chamber. Approximately 30-50% of the suspended solids settle out in this chamber where they undergo anaerobic digestion. The anaerobic digestion process is carried out by micro-organisms that have the ability to feed, grow and multiply in the absence of free oxygen. In addition, settled sludge and skimmed material returned from the clarification chamber are further digested in this chamber. The plant is sized to enable these micro-organisms to maintain a sufficient population naturally without the need for the addition of proprietary biological products.

2.2 Aerobic Chamber

The partially treated wastewater, still containing the colloidal and dissolved solids which represent approximately 65% of the pollution loading, flows from the anaerobic chamber to the aerobic chamber. Air is introduced to the liquid in this chamber by means of an aerator and diffusers, maintaining aerobic (free dissolved oxygen) conditions. The oxygen enriched effluent flows about packs of submerged media having a large surface area on which bacteria and other micro-organisms thrive, forming a biological film. These micro-organisms have a different growth process to those in the anaerobic chamber in that they utilise the dissolved oxygen in the effluent, while consuming the dissolved and colloidal organic matter as food to create new cell growth and stable oxidised products. The air pattern causes the liquid in the chamber to pass through the media in a discreet flow pattern and to have intimate contact with the micro-organisms.

The process differs from ordinary suspended growth systems in that it is more stable and also allows the growth of sub surface anaerobic micro-organisms beneath the surface film of aerobic micro-organisms. This allows anaerobic bacterial action to check the media growth, thereby reducing the biological sludge accumulation. Nevertheless, as the thickening of the material on the media occurs, some sloughing off will take place.

The multiple compartment design of the aerobic chamber ensures that no short circuiting can occur, preventing the possibility of partially treated wastewater passing to the clarification chamber. The diffused aeration system allows the air to be introduced below the media packs.

Basically, the reaction in the aerobic chamber converts the dissolved and non-settleable (colloidal) solids into carbon dioxide and a biological floc, which under quiescent conditions will settle.

2.3 Clarification Chamber

Following aeration effluent flows into a circular, hopper bottomed clarification chamber, where the biological floc (or sludge) settles under quiescent conditions. Settled sludge from the bottom of the chamber and floating material are returned to the anaerobic chamber. From the clarification chamber the effluent is drawn off below surface level and flows through the chlorinator to the disinfection chamber.

This continuous return of sludge to the anaerobic chamber ensures continuous fluid movement in the plant even with zero inflow and keeps the system “live” during periods of extended vacancy.

2.4 Disinfection Chamber

The discharge from the clarification chamber passes through an automatic gravity chlorinator. The chlorinator is calibrated for above normal water usage. Chlorine stocks are provided to cover maximum usage with built in safety factors to cover all foreseeable circumstances between the service periods.

The disinfection chamber is designed to provide a minimum of 30 minutes contact time between the effluent and chlorine to ensure achievement of bacterial die-off.

2.5 Pump-out Chamber

After disinfection, the treated effluent enters the pump out chamber. The centrifugal discharge pump in this chamber is automatically controlled by a level switch to operate and shut down as the level of the effluent rises and falls.

2.6 Alarms

The BioMAX has two mechanical components: side channel air blowers and a duty and stand-by discharge pump. An alarm is provided to warn of failure of either of these components. The plant has an inbuilt emergency storage of approximately two days at normal flow to ensure that any problem can be rectified before overflow occurs.

3.0 PLANT DESCRIPTION

The treatment plant consists of ten (10), tank modules that contain the anaerobic and aerobic bioreactors, the clarification chamber, the disinfection chamber and the pump out chamber.

Major Plant Components

<u>Anaerobic Chamber</u>	Capacity	134,957 Litres
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This is contained in the first five tank modules of the ten tank module unit. The anaerobic chamber has a water depth of 2.00m.

<u>Aeration Chamber</u>	Capacity	84,714 Litres
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Contained in the sixth, seventh and eighth tank modules. Air blowers used: 2 off Busch Model SB0200D2 three phase pumps, designed to pump in 5,000 L/min of air at 125 kPa absolute.

The diffused air aeration system delivers more than the required 2.4kg of oxygen per kg of BOD₅ per day, through the submerged attached growth media packs positioned above the diffusers.

<u>Clarification Chamber</u>	Surface Area	29 m ²
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The clarification chamber is contained in the ninth tank module. The circular chamber has a central conical hopper with 55 degree slope. An automatic sludge/skimmer return mechanism continuously returns the sludge and skimmed material to the primary chamber.

<u>Disinfection Chamber</u>	Capacity	27,351 Litres
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Contained in the tenth tank module. The standard BioMax four-turret gravity flow chlorinator is designed for tablet chlorination using trichloroisocyanuric acid (200g) tablets to disinfect the effluent and to control algae growth in the irrigation system.

Pump-out Tank

Also contained in the tenth tank module is the pump-out tank. It is equipped with a duty and stand-by Grundfos automatic pump controlled by a float switch.

4.0 OPERATION

4.1 Introduction

It is a requirement of the Health Department of Western Australia that these systems be regularly maintained by an approved service contractor. Should an alarm be activated, the approved maintenance provider should be contacted immediately. The plants have in built storage to allow judicious use of wastewater facilities to continue.

The operation and maintenance requirements are not unduly onerous, and it is essential that they be carried out diligently. Inadequate attention can quickly see the system's performance suffer. Keeping the system in a clean condition will ensure that odour and insect nuisances are kept to a minimum and will improve the overall efficiency of the system.

The system has two mechanical components, side channel air blowers and a duty and stand-by centrifugal dispersal pump. An alarm system is installed to detect loss of air pressure (potentially compressor failure) and high water level in the plant (potentially pump failure)

4.2 Operating Requirements

In brief the operating requirements are:-

Daily

Respond to any alarm calls

Quarterly

Comprehensive service- including:
Clean air blower air filter pads:
Check alarm operation:
Check aeration system:
Clean down system:
Replenish chlorine tablets:
Clean effluent filter:

Annually

Service air blowers

Periodically

De-sludge anaerobic chambers

Alarm

The alarm contains a red flashing light. The lighting up of the red warning light indicates malfunctioning of the air system or indicates a high water level in the pump-out chamber.

5.0 MAINTENANCE

5.1 Check list for trouble shooting

Indication	Cause	Action
System not operating	Circuit breaker on main board or electrical control unit tripped.	Check compressors and pump, replace if necessary and reset the circuit breaker.
Water level unusually high in main tank/ clarification tanks.	Blockage or break in outlet pipe work.	Flush out the block through the inspection opening / repair the broken pipe.
Odour from the system	Sludge return not adjusted correctly, causing sludge accumulation in clarification tanks.	Increase the air supply into the sludge return setting.
	Sludge return set too high, causing increased flow into the clarifiers.	Reduce the air supply to the sludge return setting.
WATER and AIR ALARMS		
System not operating	Circuit breaker in electrical control unit tripped.	Check compressors and pump, replace if necessary and reset circuit breaker
AIR ALARM		
Air Blowers not operating	Isolating switch turned off.	Turn on isolating switch.
	Circuit breaker in electrical control unit tripped.	Check compressors, replace if necessary & reset overload.
	Air Blower failure	Repair/replace.
Air Blowers operating	Insufficient water in aerobic chamber to operate pressure sensor.	Fill aerobic chamber to normal operating level.
Air system disconnected or leaking.	Air piping or joint failure.	Rectify & try to guard against a recurrence.
Alarm operating with a satisfactory supply of air to aerobic chamber.	Air tube to pressure sensor kinked, blocked or disconnected.	Reconnect air tube, straighten air tube.
WATER ALARM		
Pump not operating	Isolating switch turned off	Turn on isolating switch
	Overload in pump control box tripped	Check pump, replace if necessary and reset overload
	Pump float switch jammed in "off" position	Reposition pump
	Pump failure	Repair pump

Pump operating	Pump blockage	Clear blockage
	Inflow greater than pump rate	Check plumbing
	Alarm float “hung up” or faulty	Check & replace if necessary
	Filter blocked	Clean filter

5.2 Scheduled Maintenance

Chlorine Level

A free residual chlorine level of 0.5 mg/l is desirable only when the treated effluent is subjected to the use for above-surface (spray) disposal.

- Measure free residual chlorine level of effluent from disinfection chamber during period of heavy usage, using chlorine test kit as per manufacturer's instructions.

Chlorine Supply

- Check chlorine feed. Replenish supply. **Do not mix different types of chlorine**

Clarifier

Sludge return valve should be adjusted to give a continuous return flow to the anaerobic chamber. Service the clarifier as follows while the system is operating:

- If any floating material (scum) is on surface of clarifier, turn sludge return valve to off position and fully open skimmings return valve till all material has been removed.
- Turn skimmings return valve to the off position and fully open sludge return valve. Use scraper blade and gently scrape down sidewalls of clarifier to remove any built up material. Initially this will suspend material in clarifier and for a short time give the effluent a cloudy appearance.
- Leave sludge return on full for five minutes or until returned sludge colour becomes clear again.
- Reset the sludge return valve to approximately half open position to give continuous return flow to anaerobic chamber.

Aeration System

- Check condition of air blowers. Ensure housing and in particular, vents are clean.
- Switch off air blowers. Check and clean air filter pad. Replace air filter pad if necessary. Switch on the air blowers.

- Check air delivery system and adjust valves in aerobic chamber to give an even air pattern over the surface of the chamber. Adjustment should be carried out with all valves initially fully open, gradually throttling individual valves to achieve desired pattern. It will be necessary to also fine tune the sludge and skimmer valves in conjunction with this process.
- Check air alarm is operational by removing the air tube to the pressure sensor on the electrical control unit.

Effluent Disposal System

- Dismantle and clean filter on pumping line
- Check disposal area
- Check air release valves.

5.3 General

- Clean down system by keeping covers clear of soil etc, especially around access openings.
- Hose down tank internals to get rid of solid organic deposits where necessary.

Periodically

- Desludge anaerobic chambers. It is anticipated that this will be required after five to seven years of operation. Desludging requires a Licenced Liquid Waste Contractor to access the anaerobic chambers through the manhole covers and pump out contents.

5.4 Air Blower (refer to Appendix C)

Number of = 2	Model: SB0200D2
Make: Busch	Motor: 3.45 kW, three phase

5.5 Discharge Pump (refer to Appendix D)

Number of = 2	Model: CRi 15-4
Make: Grundfos	Motor: 4 kW, three phase

6.0 CARE OF SYSTEM

The BioMAX, in common with other wastewater treatment systems, uses natural biological processes to carry out the stabilisation of the organic waste matter produced by “domestic type” activity.

The following information is provided so that the optimum operation of the total system is maintained.

The normal use of household cleansing products in accordance with manufacturers’ directions should not affect the biological processes in the system.

DON'TS

- Don't indiscriminately use and dispose of bleaching, disinfecting and caustic cleaning agents in large quantities into the system.
- Don't use the system for the disposal of drugs (i.e. Antibiotics etc) solvents, paints, oil, excessive amounts of grease, or chemicals.
- Don't dispose of non-biodegradable material (i.e. Sanitary napkins etc.) into the system

DO'S

- Do use environment friendly products whenever possible, e.g. Non-toxic cleaning agents, biodegradable low sodium detergents etc.

7.0 CERTIFICATE OF WARRANTY

BioMAX certifies that the BioMAX Model C60K Aerobic Treatment Unit has been designed constructed and installed to conform to the Plant Specifications on page 3 of this manual and the Plant Description on page 6.

BioMAX maintains a limited Parts & Labour Warranty on its equipment as follows:

- Ten (10) years' warranty against structural failure due to faulty materials or workmanship on any concrete/fibreglass/PVC components manufactured or assembled by BioMAX
- Electrical & Mechanical Equipment: The side channel air blowers and the centrifugal discharge pumps that are part of the system will have warranty as offered by the respective manufacturers, which is for a period of twelve months, starting from the month of installation and starting of use of the equipment.

Conditions

- 1 No claim under this warranty shall be deemed to be acceptable unless done so in writing.
- 2 No claim under this warranty shall be valid unless the equipment has been used for the purpose that it was intended, and it is used and maintained strictly in accordance with the manufacturers' instructions and as per the layout provided with the equipment.
- 3 Claims under this warrant shall be directed to: The Managing Director BioMAX Pty Ltd., PO Box 462 Midvale, Western Australia, 6936, AUSTRALIA.
- 4 Only claims notified within seven (7) days of detection will be recognised. Warranty period shall commence from the date of delivery of the equipment.
- 5 BioMAX reserves the right to repair the failed component or provide the purchaser with a replacement component, as it deems necessary.

For BioMAX

