

TURBOJET 3000

SEWAGE TREATMENT PLANT SPECIFICATION

1 Construction

The sewage treatment plant (STP) is to be an Icon-Septech Pty Ltd Turbojet 3000 as described below and as shown on the drawings.

2 Design Parameters

Domestic sewage will be collected from the dwelling and flow by gravity to the STP. NO TRADE WASTES of toxic or inorganic nature will be treated by this plant.

Total Maximum Daily Flow to be treated by this plant:	- 3000L
Total Maximum Daily Influent Suspended Solids:	- 500mg/L
Total Maximum Daily Influent Biochemical Oxygen Demand:	- 1200g

Effluent from the STP will be disposed of in accordance with the requirements of the Local Authority.

3 Description of Plant

All wastewater is gravity fed into a Primary Sewage Tank where the waste undergoes settlement and digestion during a retention period of approximately 48 hours. The settled wastewater then flows into the Turbojet Unit. This unit is divided into two distinct chambers – submerged contact aeration (SCA) tank and Humus Tank. During regular time clock intervals, water and air is pumped into the SCA tank by means of strategically placed jets. The jets are positioned so as to cause vigorous turbulence of the tank contents. Effluent entering the SCA chamber is forced into a spiralling flow pattern. A biomass develops within the sludge particles tumbling through the tank. This biomass assimilates nutrients and oxygen from the water leading to gradual reduction of impurities as the effluent passes through the tank (retention period of approximately 40 hours).

The effluent and sludge particles then flow into the humus tank where the sludge particles settle to the floor of the tank and the effluent flows upwards through a plastic media block on which the biomass develops (retention period of approximately 40 hours). This biomass acts as a secondary biological contact interception and removal centre, further reducing the effluent B.O.D. before flowing into the contact sampling pit, where it is further clarified and chlorinated (if necessary).

Settled humus tank sludge is automatically returned to the inlet of the SCA Tank by means of a Vortex lift pump, which in turn is driven by the main SCA circulation pump.

Effluent and sludge particles are also recirculated through the primary sewage tank by means of a 19mm diameter by-pass fed line from the main SCA delivery pump. This has a threefold purpose;

1. Excess sludge is returned to the primary sewage tank for storage and digestion.
2. Clean effluent is recycled through the plant which tends to suppress the activities of micro-organisms which emit odours.
3. By regularly recycling effluent, the circulating biomass in the SCA tank is being fed with stored organics from the primary sewage tank. This keeps the micro organisms at maximum population levels and reduces the problems of treatment plants not being used for extended periods eg: vacations. Consequently, untreated effluent is prevented from being discharged from the unit when persons return suddenly from extended periods of non-use.

4 Pump

240volt – 400 watt submersible pump (refer to pump specifications for further details).

5 Pump Operation

The submersible pump shall be operated and monitored by the Icon-Septech electronic controller. Pump run time will depend on loading but run in accordance to EPA & Health Department Regulations. After 3 months this may be adjusted (increased or decreased) to obtain optimum treatment results.

6 Primary Sewage Tank

Provide one, 1.9 diameter x 2.3 long concrete sewage tank having an effective volume of 4500 litres. Inlet and outlet to be 100mm dropper as per AS1546.1.

**** TOP OF TANK MUST BE INSTALLED LEVEL ****

7 Submerged Contact Aeration Tank

Provide one, 1.9m diameter x 1.3m long concrete SCA tank having and effective volume of 3000 litres and a retention period of 20hours (average).

**** TOP OF TANK MUST BE INSTALLED LEVEL ****

8 Humus Settling Tank

Provide one, 1.9m diameter x 1.0m long concrete Humus Tank having an effective volume of 1500litres. The tank shall meet the following conditions;

- a) Maximum surface overflow rate of 1,000 litres per square metre per hour.
- b) Minimum detention time of 4 hours at average daily flow.
- c) Actual detention time of 15 hours.

9 Contact Stabilisation Block Media

48m² in the aeration chamber and 48m² in the Humus Tank.

10 Contact Tank (Pumpwell)

A contact tank (pumpwell) is required where the depth of the effluent pipe from the Turbojet system exceeds the means of disposal. Note: Where a pumpwell is required, an alarm float switch MUST be installed.

11 Chlorine Contact Tank (where Specified)

Provide one, 1.2 diameter x 2.3 metre deep reinforced concrete Contact Tank having a minimum working volume of 935 litres. The tank is to have a minimum detention time of 1 hour at peak hourly flow of 875 litres/hour.

** Tank Must be Installed PLUMB**

12 Chlorination Equipment

Disinfection by 76mm x 36mm x 30mm bio-guard chlorine product (STINGY STICKS).

13 Noise Pollution

Clause 17 of SEPP N-2 prescribes the noise limit for outdoor venues as 65 dB(A) when measured outdoors or 55 dB(A) when measured indoors. After testing Icon-Septech's Turbojet 2000 noise emissions from a 1m radius the results concluded to fall below 50 dB(A).

14 Materials and Construction

Precast concrete tanks are to be manufactured to AS1546.1 On-site domestic wastewater treatment units – Septic Tanks. Components and their assembly shall be as per AS1546.3 On-site domestic wastewater treatment units – Aerated wastewater treatment systems.

15 Electrical Control Panel & Alarm

Provide one, Icon-Septech Electronic Control Panel. All electrical wiring to the STP location is to be supplied and installed to Australian Standards and to Icon-Septech specifications and drawings.

16 Sewer Depth

This specification is based on a maximum I.L. sewer depth of 1920mm below ground level at the Treatment Plant.

Installation and Commissioning Notes

Septic Tank access manhole to ground level by means of precast concrete saddles and cover.

1. All compartments are to be left free of debris before commissioning of plant.
2. To avoid flotation fill all compartments with water at time of installation.
3. Turbojet to be located level and to the dimensions as shown on drawing.
4. Make sure all tank compartments are full of water before commissioning unit.
5. Clear excess excavated soil from around tank and ensure that the top of the concrete is 75mm above natural ground level to prevent entry of soil, debris and ground water.
6. Install crush proof PVC or steel protection conduit between Primary Sewage Tank and Turbojet Tank. Feed the 19mm diameter flexible recirculation conduit through the protection tube into the inlet of the Primary Sewage Tank.
7. Concrete access Saddles on the Turbojet are to be sealed with an approved product. Top of concrete cover & surround to be located 75mm (min) above natural ground level.
8. Top of Primary Sewage Tank and SCA tank MUST BE INSTALLED LEVEL.
9. If an effluent pumpwell is to be installed after the STP in order to elevate effluent into an approved means of disposal, an alarm warning system MUST be installed (the alarm float is a feature of the Icon-Septech electronic control panel) to warn of any flood situation caused through an effluent pump failure.

WARRANTY

The warranty will be automatically rendered void upon the following:

1. Any of the design parameters of the unit are exceeded.
2. The normal operation of the unit is interfered with by untrained personnel, causing parts of the STP to wear out prematurely.
3. Flotation of tanks occurring through de-sludging of tanks during wet weather or high ground water levels around the outside of tanks.
4. Large amounts of grease, oils or fats to accumulate within the STP consequently leading to stress and/or failure of the mechanical components to occur.
5. Inadequate de-sludging of the unit as determined by Icon-Septech. EPA and Health Department require de-sludging of STP every 3 years.
6. The STP MUST be kept in an operable state at all times during and after the warranty period, otherwise Icon-Septech WILL NOT be held responsible for poor effluent quality through owner's negligence of the unit.

Note: - This STP is to be commissioned ONLY by the staff or authorised representative of Icon-Septech. Any attempt by other persons to commission this STP without Icon-Septech's authority, will render the warranty on this STP null & void. Warranty of this Turbojet STP will also null & void if upon inspection of the STP, it is found that the STP has been installed incorrectly according to the drawings and specifications which can lead to parts or system failure.

REFERENCES:

Engineering Computation Conducted by;

Damien Egan
Bachelor Engineering – Civil
Member Institute Engineers Australia

Use of Reclaimed Waters

- Best Practise Environmental Management Series Publication 464.2 March 2003
EPA

Septic Tanks Code of Practise

- Best Practise Environmental Management Series Publication 891 March 2003
EPA

Code of Practise for Small Treatment Plants

- Best Practise Environmental Management Series Publication 500 June 1997 EPA

Public Health Engineering – Design in Metric WASTEWATER TREATMENT

- Ronald E. Bartlett 1971

Code of Practise – Septic Tanks. On-Site Domestic Wastewater Management.

Best Practise Environmental Management Series Publication 451 March 1996 EPA



TURBOJET 3000 Design Data Sheet		
Hydraulic Loading 3000L / Day		
Organic Loading 1200 g BOD / Day		
Peak to average flow ratio 7 from graph		
Turbojet 3000 Configuration & Dimensions		
Primary S.T.P Tank		
Internal Length of Primary S.T.P 2.100m		
Internal Diameter of Primary S.T.P 1.750m		
Air space in Primary S.T.P (above water level) 0.295m		
Primary S.T.P Volume 4506L		Nominal '4500L' tank
Submerged Contact Aeration Tank & Humus Tank		
Internal Length of S.T.P 2.100m		
Internal Diameter of S.T.P 1.750m		
Submerged Contact Aeration Tank Volume 3002L		Nominal '3000L'
Humus Tank Volume 1503L		Nominal '1500L'
Total Volume 4506L		
Contact Tank		
Internal Height of Clarifier 2.090m		
Internal Diameter of Clarifier 1.040m		
Minimum water height level in Clarifier 1.100m		
Total Volume 935L		Minimum
Turbojet 3000 E.P.A Requirement Calculations		
	E.P.A Requirement	Supplied
Primary S.T.P Tank		
Peak Hourly Flow	875 L/hr	
Primary Sewage Tank	3600 L	4506 L
Turbojet		
BOD Loading after Primary (25% reduction)	960 g BOD remaining	
Aeration Tank Volume	3.6cu.m	4.51cu.m
Air requirement Dissolved Oxygen	> 2.0 mg/L	4 - 9 mg/L*
Retention Time in Turbojet	4.0 hrs	15.0 hrs
Contact Tank		
Surface Area @ 1000L/sq.m/hr	0.9 sq.m	1.2 sq.m
Volume of Clarifiers @ 1.0hr PHF	875 L	1503 L (total)
Maximum daily BOD reduction to be removed 1200 grams		
Primary Sewage Tank	20% reduction =	960 grams remaining
Turbojet	90% reduction =	96 grams remaining
Clarifier	20% reduction =	77 grams remaining
Estimated BOD concentration left in effluent	25.6 mg/L	
Maximum daily SS reduction to be removed 500 mg SS / L		
Primary Sewage Tank	80% reduction =	100 mg SS / L remaining
Turbojet	20% reduction =	80 mg SS / L remaining
Clarifier	80% reduction =	16 mg SS / L remaining
Estimated SS concentration left in effluent	16 mg/L	
*Results obtained under QAS testing 1546.3 - Moss Vale NSW		