

Our Ref: 00/1628-2

4 June 2003

Mr Ken Carter
Septech Industries Australia Pty Ltd
14 Burgess Road
Bayswater North VIC 3153

Dear Mr Carter,

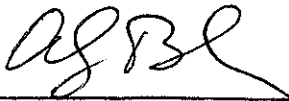
Compliance Monitoring of AWTS 2000/2001

NSW Health has finalised the report relating to the compliance monitoring of the Turbojet 2000 deluxe AWTS, carried out in October 2001, and the report on the overall monitoring of AWTS during 2000/2001. The reports form part of the first year of operation of the compliance monitoring program of AWTS.

The reports have been amended following representation from the AWTS Manufacturers Association Ltd.

Copies of the reports are enclosed for your information.

Yours faithfully,



A.J. Bles
Senior Policy Analyst

cc: Mr Neil Coleman, Septech Purification N.S.W. Pty Ltd

Compliance Monitoring

of

AWTS

(Anniversary Testing)

2000 / 2001

Aerated Wastewater Treatment Systems - 2001 Monitoring

1. Introduction

- 1.1 Aerated Wastewater Treatment Systems (AWTS) receive and treat sewage from single domestic households. The treated effluent is considered suitable for surface and sub-surface irrigation within the boundaries of the premises on which the wastewater was generated. AWTS are primarily installed in unsewered areas. Effluent from AWTS is utilised within the confines of the premises but not for internal household use. Unlike larger scale municipal sewage treatment plants, AWTS once installed are serviced and their performance checked generally only once every three months.
- 1.2 There has always been conjecture that poor performance in AWTS, once installed, are due to householder abuse, caused by household chemicals such as disinfectants or loading with too much wastewater, or unsatisfactory and inappropriate servicing. This conjecture assumes that the AWTS has been installed in exact conformity with the accredited unit. Local councils need to be vigilant to ensure that it is the accredited AWTS that is installed in a good manner. There is little data with which to determine AWTS performance in-situ. Standardised accreditation testing has demonstrated the reliability of AWTS performance over a six month period under normal and stress loading conditions and using standardised raw sewage quality.
- 1.3 Under clause 43 of the Local Government (Approvals) Regulation, 1999, councils must not allow the installation of AWTS unless they are of a type which has been accredited by NSW Health. A condition of accreditation is that AWTS manufacturers are required to independently test a randomly selected number of installed AWTS annually. This report presents the results of the tests performed during 2001. Because AWTS accreditations were re-assessed in 2000, these results correspond to the first year of installation of many of the re-accredited AWTS.

2. Background to the 2001 Monitoring

- 2.1 There are thirteen accredited AWTS models for installation in NSW. To gain accreditation AWTS must be placed under test using sewage drawn from a municipal sewage treatment plant. The sewage must be of a minimum prescribed strength and character. The testing is conducted over six months and the AWTS is sampled over three separate periods of five days. The testing is conducted by an independent agency which must itself be a certification body accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).
- 2.2 The compliance criteria for accreditation is as follows:
- 90% of the samples shall have a **Biochemical Oxygen Demand** ^{5 day} less than or equal to 20 mg/L with no sample greater than 30 mg/L.
 - 90% of the samples shall have total **suspended solids** less than or equal to 30 mg/L with no sample greater than 45 mg/L.
 - 90% of the samples taken on each day shall have a **thermotolerant coliform** count not exceeding 30 cfu/100 mL, with no sample exceeding 100 cfu/100mL.
 - 90% of the samples taken shall have a **Total Kjeldahl Nitrogen** of not more than 20 mg N/L.
 - The **free residual chlorine** concentrations shall be greater than or equal to 0.2 mg/L and less than 2.0 mg/L in all samples taken.
- 2.3 As a condition of accreditation it is required that anniversary testing of AWTS be carried out. That is, each year the AWTS manufacturer, at its own cost, is to engage an independent body to inspect and analyse samples from a randomly selected number of installed AWTS to determine in-situ performance.

2.4 The following standard for grab samples, derived from the accreditation standard was applied.

- BOD₅ less than 30 mg/L
- SS less than 45 mg/L
- Free residual chlorine greater than 0.2 and less than 2.0 mg/L
- Thermotolerant coliforms less than 100 cfu/100 mL

The standard for grab samples was derived from the maximum permissible limits of the accreditation standard.

3. Methodology

3.1 Anniversary testing for the year 2001 was carried out by each manufacturer in accordance with the protocol attached as Annexure 1. Each manufacturer provided a list of AWTS installations for the first year of operation since accreditation was gained. Each installation, by manufacturer, was allocated a consecutive number. The random number generator of Microsoft Excel was used to select the appropriate number of samples for testing as required by the protocol. Two additional installations were selected as alternatives in anticipation that access would be impossible or unreasonable to sample due to distance limitations. The installations selected were advised directly to the independent testing agency which arranged to carry out the tests.

3.2 No objections were raised to the manufacturer or service technician travelling with the independent testing agency provided the premises was not revealed prior to testing and that the manufacturer or service technician took no part.

3.3 The results, when received from the independent assessor, were entered onto a Microsoft Excel spreadsheet and checked for entry errors.

3.4 Limitations of the monitoring include error and bias introduced by:

- the variability of the characteristics and flows of the sewage generated by individual households which can vary markedly depending on the characteristics of the occupants such as the age profile and water usage patterns and the appliances used in the household;
- the variability of the assessment methodology, and equipment used by the independent testing agency and the time at which the samples were taken;
- the dilution rates and reporting mechanisms of the analytical laboratories;
- the difference in the servicing and maintenance characteristics of the AWTS and the period of time since the last service;
- the type of household chemicals, particularly bleaches, which could affect the performance of the AWTS; and
- the method of commissioning and seeding of the AWTS to achieve alkaline fermentation in the first chamber digester.

3.5 The raw data were therefore prepared as follows:

- Thermotolerant coliform results reported at the lower limit of detection of a sample dilution returning a result of "<1000 cfu/100mL" were adjusted to <10 cfu/100mL;
- Values reported as less than the lower detection limit were adjusted to half of that limit, ie <10 cfu became 5 cfu, <2 mg/L free chlorine became 1 mg/L;
- Values reported at greater than the upper detection limit which exceeded the standard value was adjusted to a failure, eg ">2 mg/L free chlorine" was adjusted to "fail."

4. Results

4.1 General

- 4.1.1 Only aggregated results for the whole sampling program are presented in this report. Separate reports containing the raw data will be generated for each AWTS type and compared against the aggregate results, and these reports will not be made available publicly due to commercial-in-confidence reasons. Raw data for all of the AWTS tested are attached as Annexure 2 in the internal report but Annexure 2 has been deliberately omitted in the public report also for commercial-in-confidence reasons.
- 4.1.2 *Statistical Interpretation:* No statistical inference methods have been used. Results are reported as total number, fail number or as a percentage fail of the total number of results for the whole survey.
- 4.1.3 *Abbreviations:* The following abbreviations and units of measurement are used:
- AWTS: Aerated Wastewater Treatment System
 - BOD⁵: Biochemical Oxygen Demand
 - SS: Suspended Solids
 - TC: Thermotolerant coliforms
 - FAC: Free Available Chlorine also known as Free Residual Chlorine
 - UV: Ultra Violet
 - mg/L: milligram per litre equivalent to parts per million (ppm)
 - cfu/100mL: colony forming units per 100 millilitres

4.2 Number Tested

- 4.2.1 Table 1 presents the manufacturer, the brand name or AWTS model and the number of AWTS tested.

Table 1: AWTS Tested in NSW

Manufacturer	AWTS	No. Tested
Everhard Industries	Aqua-Nova 2000	10
BioSeptic	Performa 2000	15
Clearwater Treatment	Biodigester	7
Earthsafe	ES10PC	12
CRS Technologies	Envirocycle 10NR	10
Garden Master	GM7100	16
Pryme Wastewater	BAS *	Nil
Septech Industries	Turbojet 2000 deluxe	6
Septic Solutions	Econocycle	9
Taylex Clearwater	Clearwater 90	12
Tech-Treat	Super Treat	18
UltraClear AWTS	Ultra Clear	5
Suncoast Wastewater	Ozzi Kleen *	Nil
Total	* = not tested 11 tested	120 tested

- 4.2.2 120 AWTS were tested in the first year of AWTS operation after re-accreditation. Pryme Wastewater had not sold or installed any domestic AWTS in NSW and therefore there are no data. Suncoast Wastewater had only recently been accredited and no AWTS were available for testing.

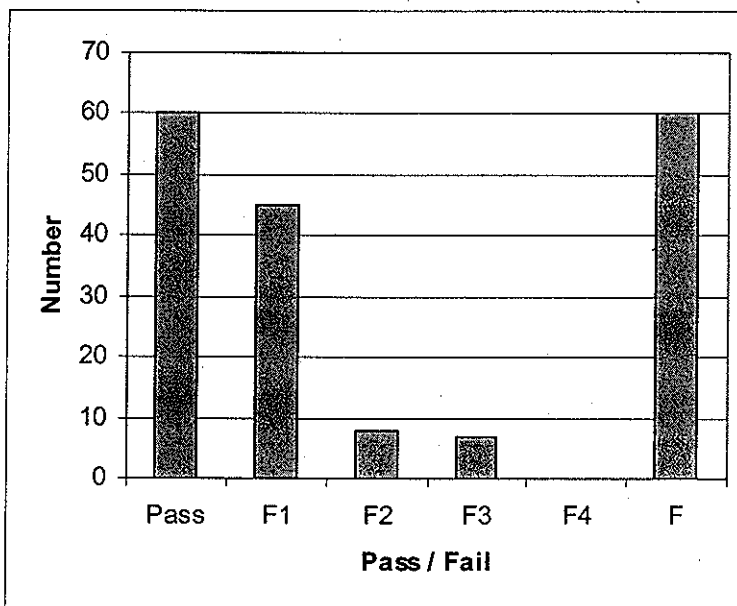
4.3 Overall Pass / Fail Results

4.3.1 All AWTS were tested for four parameters of BOD, SS, TC and FAC. Ten AWTS did not use chlorine for disinfection so FAC results were not available for these units. Of the 120 AWTS tested 60 (50.0%) passed all 4 parameters. There were also 60 failures or 50.0% due to failure of one or more of the four parameters. The following Table 2 and Graph 1 displays the number of passes and failures due to only one, two three or four parameters.

Table 2: Number and Percentage of AWTS Pass / Fail:

Pass / Failure by Number of Parameters	Number	120 (%)
Pass in all Parameters	60	(50.0)
Fail by 1 Parameter only	45	(37.5)
Fail by 2 Parameters only	8	(6.7)
Fail by 3 Parameters only	7	(5.8)
Fail by all 4 Parameters	0	(0.0)
Total Fail	60	(50.0)
Total	120	(100)

Graph 1: Number of AWTS Pass / Fail (total AWTS = 120):



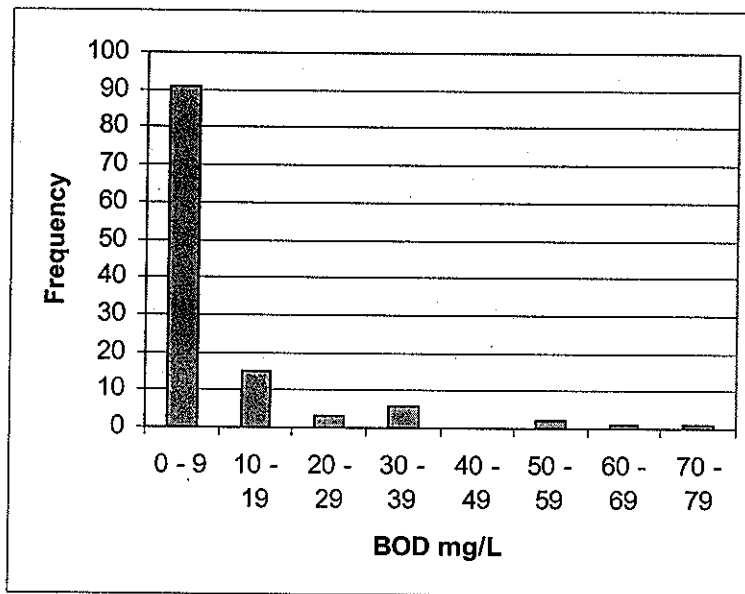
4.4 Biochemical Oxygen Demand (BOD⁵)

4.4.1 The BOD⁵ of domestic raw sewage is variable and usually lies between 150 – 300 mg/L. The grab sample standard is less than 30 mg/L (the accreditation testing standard is 20 mg/L). Of the 120 AWTS tested data are available on 119. Ten AWTS failed (8.4%). The range of adjusted values was 1 mg/L to 71 mg/L. The median was 3 mg/L and the mode 2 mg/L. BOD⁵ results are displayed in the following Table 3 and Graph 2.

Table 3: Frequency and % of BOD⁵ Concentration (Fail \geq 80 mg/L)

BOD ⁵ mg/L	Frequency (%)
1 – 9	91 (76.5)
10 – 19	15 (12.6)
20 – 29	3 (3.4)
30 – 39	6 (5.0)
40 – 49	0 (0)
50 – 59	2 (1.7)
60 – 69	1 (0.8)
70 – 79	1 (0.8)
TOTAL	119 (100)

Graph 2: Frequency of BOD⁵ Concentration



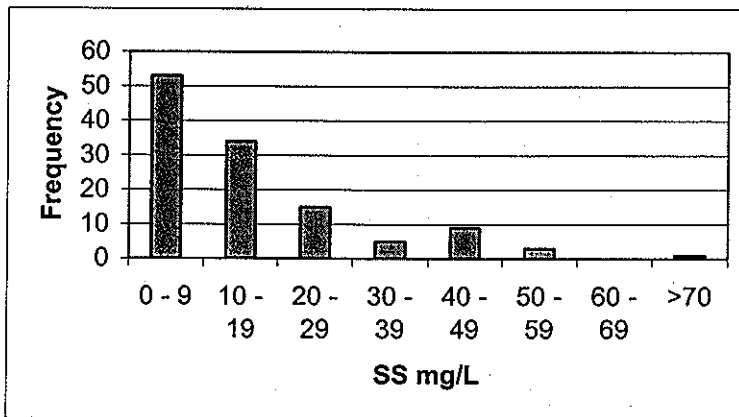
4.5 Suspended Solids (SS)

4.5.1 The SS of raw sewage is variable and usually lies between 150 – 300 mg/L. The grab sample standard is less than 45 mg/L (accreditation testing standard 30 mg/L). Of the 120 AWTS tested six AWTS failed (5.0%). The range of adjusted values was 1 mg/L to 134 mg/L. The median was 11 mg/L and the mode 8 mg/L. SS results are displayed in the following Table 4 and Graph 3.

Table 4: Frequency of SS Concentration (Fail \geq 45 mg/L)

SS mg/L	Frequency (%)
0 – 9	53 (44.2)
10 - 19	34 (28.3)
20 - 29	15 (12.5)
30 - 39	5 (4.2)
40 - 49	9 (7.5)
50 - 59	3 (2.5)
60 - 69	0 (0)
70 - 79	1 (0.8)
TOTAL	120 (100)

Graph 3: Frequency of SS Concentration



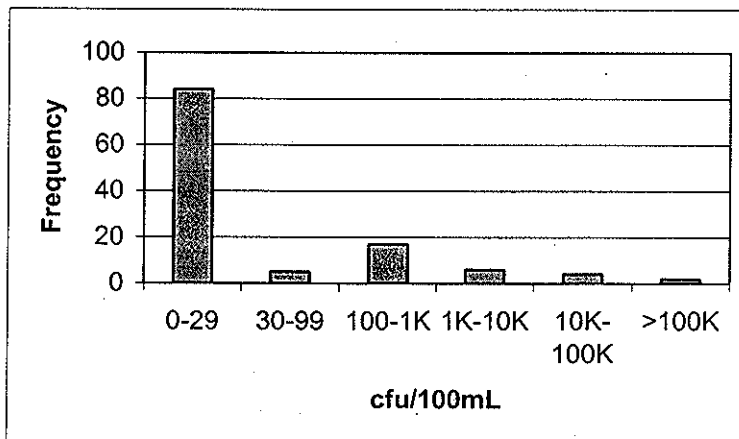
4.6 Thermotolerant Coliforms (TC) colony forming units / 100 millilitres

4.6.1 The thermotolerant coliform level of raw sewage is about 10^6 cfu/100 mL (1000K) and after digestion in the first stage of the AWTS it increases about one order of magnitude to 10^7 cfu/100 mL (10000K). The grab sample standard is less than 100 cfu/100mL (testing standard 30 cfu/100mL). Of the 120 AWTS tested data are available on all 120. 29 AWTS failed (24.2%). The range of adjusted values was 0 mg/L to 430,000 cfu/100mL (due to a structural fault). The median was 10 cfu/100mL and the mode also 10 cfu/100mL. Thermotolerant coliform results are displayed in the following Table 5 and Graph 4.

Table 5: Frequency and % of Thermotolerant coliform (Fail \geq 100 cfu/100mL)

TC mg/L	Frequency (%)
0 – 29	84 (70.0)
30 – 99	5 (4.2)
100 – 1K	17 (14.2)
1K – 10K	6 (5.0)
10K – 100K	4 (3.3)
>100K	2 (1.7)
TOTAL	120 (100)

Graph 4: Frequency of Thermotolerant coliform



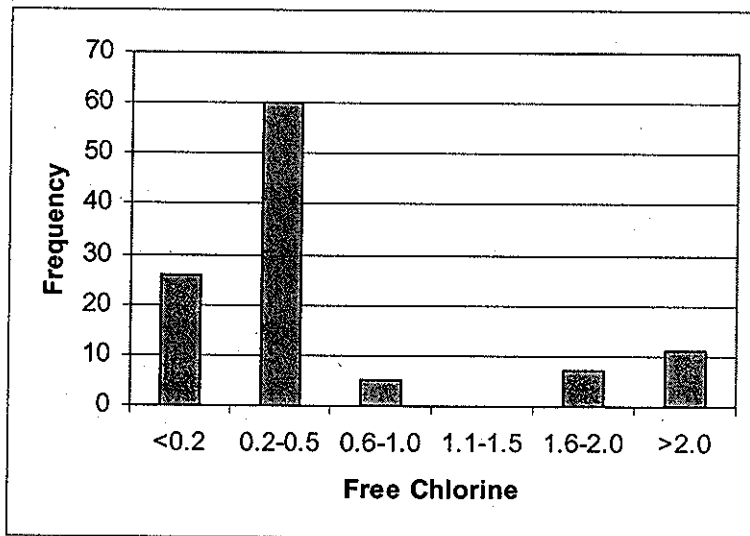
4.7 Free Available Chlorine (Disinfectant)

4.7.1 All except one type of AWTS used chlorine as a disinfectant. The remaining AWTS type used UV light and therefore a residual was not measurable. The grab sample standard for free chlorine was greater than and equal to 0.2 and less than and equal to 2.0 mg/L which is the same for accreditation. Of the 120 systems tested data were available on 109 and 37 AWTS failed (33.9%). The range of adjusted values was 0 mg/L to 5 mg/L. The median was 0.2 and the mode also 0.2 mg/L. Free chlorine residual results are displayed in the following Table 6 and Graph 5.

Table 6: Frequency and % of Free Available Chlorine

Free Available Chlorine	Number (%)
<0.2	26 (23.9)
0.2 - 0.5	60 (55.0)
0.6 - 1.0	5 (4.6)
1.1 - 1.5	0 (0)
1.5 - 2.0	7 (6.4)
> 2.0	11 (10.1)
Total	109 (100)

Graph 5: Frequency of Free Available Chlorine



4.8 Summary of Overall Failure Rates

BOD and SS had much lower failure rates than TC and FAC which had the highest failure rate.

Table 7: Parameter Failure Numbers and Rates

Parameter	Number/ Population (%)
BOD ⁵ mg/L	10/119 (8.4)
SS mg/L	6/120 (5.0)
TC cfu/100mL	29/120 (24.2)
FAC mg/L	37/109 (33.9)

5. Discussion

5.1 Sample Size

- 5.1.1 The sampling protocol adopted in the "Compliance Monitoring for Accredited AWTS" in Appendix 1 (point 3) aims at a sample size of about 10% of the AWTS population but decreases as the number of AWTS installed by each manufacturer exceeds 100. The population of AWTS installed during 2000/01, which actually represents the number of AWTS installed by each manufacturer for the first year of operations after accreditation, has been determined at 2041.
- 5.1.2 Sample AWTS were selected randomly using a random number generator included in Microsoft Excel. In some instances where it was impossible or unreasonable, due to distance limitations, to sample individual AWTS, an alternative individual AWTS installation was randomly selected for sampling.
- 5.1.3 The total number of AWTS sampled was 120 which represent 5.9% of the number installed. There were 6 manufacturers who installed more than 100 AWTS which accounts for the decreased percentage of sample size from 10%.

5.2 Overall Results

- 5.2.1 There were 4 parameters which were measured during the testing. These were:
- Biochemical Oxygen Demand (BOD⁵);
 - Suspended Solids (SS);
 - Thermotolerant coliforms (TC); and
 - Free Available Chlorine (FAC).
- 5.2.2 An overall failure result, due to failure in one or more parameters, of 50.0% is of concern. No AWTS failed all parameters. Over one third of AWTS failed one parameter. The individual parameters, some of which are of direct public health significance, are discussed separately.
- 5.2.3 No attempt has been made to rank the AWTS according to performance because the degree of pass / fail is too difficult to assess due to the limitations mentioned in 3.4. All AWTS passed accreditation and this is the benchmark used for accreditation purposes.

5.3 Biochemical Oxygen Demand (BOD⁵)

- 5.3.1 BOD⁵ is a measure of the oxygen required by micro-organisms to break down organic matter and is measured over a five day period. The accreditation test standard of 20 mg/L is a common design criteria set by environmental agencies for the performance of sewage treatment plants. This standard is considered too stringent for a grab sample of an AWTS and was relaxed to less than 30 mg/L.
- 5.3.2 BOD⁵ does not directly impact on public health but is rather an indication of the performance of the AWTS in treating sewage. Effluent with a high BOD⁵ is polluting, may turn septic with resultant odours and provide attraction for rodents and vermin. Effluent with a high BOD⁵ therefore cannot be utilised by above ground application and must be disposed by sub-soil technologies such as absorption trenches.
- 5.3.3 The failure rate of 10 AWTS from 119 or 8.4% is considered satisfactory. Those AWTS which failed did not exceed the standard of 30 mg/L excessively.

5.3.4 It is therefore concluded that the installed AWTS performed biochemical oxygen demand reduction satisfactorily.

5.4 Suspended Solids (SS)

5.4.1 SS is a measure of discrete organic and inorganic particles suspended in the wastewater and is measured by filtering through a very fine filter paper. The accreditation test standard of 30 mg/L is a common design criteria set by environmental agencies for the performance of sewage treatment plants. This standard is considered too stringent for a grab sample of an AWTS and was relaxed to less than 45 mg/L.

5.4.2 SS may not directly impact on public health but is rather an indication of the performance of the AWTS in treating sewage. However, pathogenic micro-organisms are frequently shielded from disinfectants by adsorption or incorporation into suspended solids. SS may also reduce the effectiveness of UV light as a disinfectant by preventing the light from reaching the micro-organisms.

5.4.3 The failure rate of 6 AWTS from 120 or 5.0% is considered satisfactory. Those AWTS which failed did not exceed the standard of 45 mg/L excessively.

5.4.4 It is therefore concluded that the installed AWTS performed suspended solids reduction satisfactorily.

5.5 Thermotolerant coliforms (TC)

5.5.1 TC is a group of bacteria collectively known as an indicator organism. It is a measure of the number of bacteria associated the gastro-intestinal tract of warm blooded animals. That is, it is an indication of faecal contamination and the therefore a component in the assessment of the likelihood of the transmission of gastro-intestinal disease. The detection of TC in sewage is an indication of human faecal contamination and similarly the likelihood of human gastro-intestinal disease transmission.

5.5.2 When applied to sewage treatment, TC is an indicator of the efficiency of pathogen reduction by both the treatment process and the disinfection process. Raw sewage typically has TC levels of about 10^6 (1,000,000) and septic tank effluent about 10^7 (10,000,000) colony forming units / 100mL. The aeration treatment process followed by settling and clarification typically reduces TC to about 10^4 (10,000) cfu/100mL. The disinfection process, which must be an active process caused by a chemical or UV light, must reduce TC to below 30 cfu/100mL for AWTS accreditation purposes.

5.5.3 The accreditation test standard of 30 cfu/100mL is the design criteria set by NSW Health for accreditation testing of AWTS. This standard is considered too stringent for a grab sample of an AWTS and was relaxed to less than 100 cfu/100mL.

5.5.4 The failure rate of 29 AWTS from 120 or 24.2% is considered unsatisfactory. Those AWTS which failed exceed the standard of 100 cfu/100mL excessively.

5.5.5 It is therefore concluded that while the majority of the installed AWTS performed TC reduction satisfactorily there were sufficient failures and of high magnitude to cause concern. Some of those that did exceed the standard were of such significant as to give rise to potential health risks. TC reduction does not appear to be reliable. The cause is unknown but given that all of these AWTS passed accreditation at a more stringent standard it could be more likely due to lack of adequate servicing, householder abuse, incorrect installation or defects in manufacture.

5.6 Free Available Chlorine

- 5.6.1 There are two forms of chlorine disinfection. Firstly, free available chlorine, also known in aqueous solution as hypochlorous acid. The second form is as combined chlorine where the chlorine is combined with various substrates such as ammonia to form chloramines, or with cyanurates which are commonly found in the chlorine tablets used in the chlorine dispenser. Free available chlorine is about 100 times more powerful in disinfection than combined chlorine.
- 5.6.2 For free chlorine to be effective it must be in contact with the treated effluent at the correct concentration and for the correct length of time. Municipal STP normally chlorinate at 1 mg/L free chlorine with a 30 minute contact time. While AWTS are designed to a 30 minute contact time the free chlorine concentration may vary from 0.2 mg/L to 2.0 mg/L. When AWTS were originally approved some 20 years ago a minimum of 0.5 mg/L was required. However, it was lowered to the current 0.2 mg/L due to concerns of the deleterious effects of higher chlorine levels on irrigated vegetation.
- 5.6.3 The failure rate of 37 AWTS from 109 or 33.9% is considered unsatisfactory. Of these failures there were 11 AWTS which exceeded the 2.0 mg/L standard and would be considered satisfactory if not for the pollutant potential. Therefore in terms of public health it could be considered that there were 26 (23.9%) failures due to insufficient free chlorine.
- 5.6.4 These poor results for free chlorine could be due to a few factors including insufficient contact period, rapid dissipation of the chlorine during the contact period, measurement of total chlorine (free chlorine plus combined chlorine) instead of free chlorine, an excess of organic material in the effluent, inadequate mixing of the chlorine with the effluent and sampling from an inappropriate location.

6. Conclusions

- 6.1 The overall failure rate of 50% was disappointing considering a more relaxed grab sample standard was used and when all of the AWTS has passed the more stringent accreditation standard.
- 6.2 BOD⁵ was generally considered satisfactory with a failure rate of 8.4%.
- 6.3 SS was generally considered satisfactory with a failure rate of 5.0%..
- 6.4 TC was considered to be of concern at a failure rate of 24.2% and is considered to be too unreliable to warrant consideration of the reuse of effluent for toilet flushing, clothes washing and car washing purposes. There was some TC reduction due to the treatment process but the potential for TC at 10³ to 10⁴ remains.
- 6.5 FAC was disappointing at a failure rate of 33.9% and a review of disinfection technology and raising of the lower standard from 0.2 to 0.5 mg/L may be warranted to achieve more consistent TC reduction.
- 6.6 It would be appropriate for AWTS manufacturers and distributors to liaise more closely with local councils in the education of householders in the operation and maintenance of AWTS. Simultaneously, service agents should review current practices to improve disinfection rates from AWTS.

7. Recommendations

- 7.1 A copy of this report is distributed to manufacturers of AWTS and their independent testing agencies together with corresponding individual AWTS reports.
- 7.2 A copy of the report is circulated to Public Health Units for distribution to local councils.
- 7.3 A copy of this report is uploaded to the Department's internet and intranet web sites.
- 7.4 A copy of the report be provided to each member of the Wastewater management Advisory Committee

Neil Shaw
Manager, General Environmental Health Unit
30 May 2003

Compliance Monitoring (Anniversary Testing) for Accredited AWTS

This document sets out the procedures to be followed in the compliance monitoring for accredited AWTS. The sampling and testing of selected AWTS will be carried out on an annual basis. The results obtained during the compliance monitoring over a period of five years will determine if a further accreditation of the AWTS will be granted or existing accreditation withdrawn.

The procedure, as set below, will need to be completed within two months of the anniversary of the accreditation date.

1. The manufacturer nominates the independent JAS/ANZ accredited agency who will organise and supervise the sampling schedule of the selected systems.
2. The manufacturer submits to NSW Health a list of all accredited AWTS installed in NSW since accreditation.
3. From the list, NSW Health will make a random selection of AWTS on the following basis:
 - (a) Where 50 or less AWTS are installed a minimum of 5 AWTS will be selected;
 - (b) Where more than 50 AWTS but less than 100 AWTS are installed 10% of the AWTS will be selected;
 - (c) Where more than 100 AWTS are installed a minimum of 10 AWTS will be selected with an additional 1 AWTS for each additional 100 AWTS or part thereof installed.
4. NSW Health forwards the list of randomly selected AWTS to the nominated independent JAS/ANZ accredited agency.
5. The sampling of the selected systems for BOD₅, SS, free chlorine and Thermotolerant coliforms shall be supervised by the testing agency and shall be directly transported and delivered to a NATA registered laboratory to carry out analyses for the parameters specified. Analyses for disinfectant concentrations, where applicable, shall be tested onsite after sampling.
6. The following standard for grab samples will be applied for each AWTS and a compliance rate determined:

• BOD ₅	less than 30 mg/L
• SS	less than 45 mg/L
• Free residual chlorine	greater than 0.2 and less than 2.0 mg/L
• Thermotolerant coliforms	less than 100 cfu/100 mL
7. The following are to be reported directly to NSW Health by the JAS/ANZ accredited agency:
 - address of premises,
 - date sampled,
 - sample identification number,
 - BOD₅,
 - SS,
 - thermotolerant coliforms,
 - disinfectant concentration,
 - service history, and
 - an indication of the overall condition of the AWTS.

Turbojet 2000 deluxe Aerated Wastewater Treatment Systems Septech Industries Pty Ltd - 2001 Monitoring

1. Introduction

This report is about the 2001 monitoring of the Septech Industries Pty Ltd – Turbojet 2000 deluxe AWTS. Monitoring was conducted in association with all AWTS and a report concerning the overall monitoring has been produced separately. The two reports should be read in conjunction.

2. Background to the 2001 Monitoring

2.1 As a condition of accreditation it is required that anniversary testing of AWTS be carried out. That is, each year the AWTS manufacturer, at its own cost, is to engage an independent body to inspect and analyse samples from a randomly selected number of installed AWTS to determine in-situ performance.

2.2 The following standard for grab samples were applied.

- BOD₅ less than 30 mg/L;
- SS less than 45 mg/L;
- Free residual chlorine greater than 0.2 and less than 2.0 mg/L;
- Thermotolerant coliforms (TC) less than 100 cfu/100 mL.

3. Methodology

3.1 Anniversary testing for the year 2001 was carried out by each manufacturer in accordance with the protocol attached as Annexure 1. Each manufacturer provided a list of AWTS installations for the first year of operation since accreditation was gained. Each installation by manufacturer was allocated a consecutive number. The random number generator of Microsoft Excel was used to select the appropriate number of samples for testing as required by the protocol. Two additional installations were selected as alternatives in anticipation that access would be impossible or unreasonable due to distance limitations. The installations selected were advised directly to the independent testing agency which carried out the tests required by Annexure 1.

3.2 The results, when received from the independent assessor, were entered onto a Microsoft Excel spreadsheet and checked for entry errors. Statistics were generated through the spreadsheet.

4. Results

4.1 Number Installed and Tested

There were 6 Turbojet 2000 deluxe AWTS tested in October 2001. The monitoring population number was 120 and therefore the Turbojet 2000 deluxe sample is 5% of this population.

4.2 Overall Failure Rates

Parameter / Failure Rate	Program Fail / Number (%)	Turbojet Fail / Number (%)
Overall	60/120 (50.0)	4/6 (67.7)
BOD5	10/119 (8.4)	0/6 (0.0)
SS	6/120 (5.0)	0/6 (0.0)
TC	29/120 (24.2)	3/6 (50.0)
FAC	37/109 (33.9)	1/6 (16.6)

5 Discussion

- 5.1 The failures mainly came from thermotolerant coliforms where one of the values was extremely high and are a cause for concern. All of the chlorine values were low with no high values found. The BOD and SS values were satisfactory. Chlorination appears not to be functioning properly or there is contamination of the effluent from the aeration or other chamber. The very high TC readings was from an AWTS commissioned two months previous to sampling. However with low BOD and SS from the AWTS the TC should still be within acceptable limits.
- 5.2 Overall the AWTS does appear to be performing satisfactorily apart from disinfection.

6 Recommendation

Submitted for information of the manufacturer and independent testing agency.

Neil Shaw
Manager, General Environmental Health.
30 May 2003

Compliance Monitoring (Anniversary Testing) for Accredited AWTS

This document sets out the procedures to be followed in the compliance monitoring for accredited AWTS. The sampling and testing of selected AWTS will be carried out on an annual basis. The results obtained during the compliance monitoring over a period of five years will determine if a further accreditation of the AWTS will be granted or existing accreditation withdrawn.

The procedure, as set below, will need to be completed within two months of the anniversary of the accreditation date.

1. The manufacturer nominates the independent JAS/ANZ accredited agency who will organise and supervise the sampling schedule of the selected systems.
2. The manufacturer submits to NSW Health a list of all accredited AWTS installed in NSW since accreditation.
3. From the list, NSW Health will make a random selection of AWTS on the following basis:
 - (a) Where 50 or less AWTS are installed a minimum of 5 AWTS will be selected;
 - (b) Where more than 50 AWTS but less than 100 AWTS are installed 10% of the AWTS will be selected;
 - (c) Where more than 100 AWTS are installed a minimum of 10 AWTS will be selected with an additional 1 AWTS for each additional 100 AWTS or part thereof installed.
4. NSW Health forwards the list of randomly selected AWTS to the nominated independent JAS/ANZ accredited agency.
5. The sampling of the selected systems for BOD₅, SS, free chlorine and Thermotolerant coliforms shall be supervised by the testing agency and shall be directly transported and delivered to a NATA registered laboratory to carry out analyses for the parameters specified. Analyses for disinfectant concentrations, where applicable, shall be tested onsite after sampling.
6. The following standard for grab samples will be applied for each AWTS and a compliance rate determined:

• BOD ₅	less than 30 mg/L
• SS	less than 45 mg/L
• Free residual chlorine	greater than 0.2 and less than 2.0 mg/L
• Thermotolerant coliforms	less than 100 cfu/100 mL
7. The following are to be reported directly to NSW Health by the JAS/ANZ accredited agency:
 - address of premises,
 - date sampled,
 - sample identification number,
 - BOD₅,
 - SS,
 - thermotolerant coliforms,
 - disinfectant concentration,
 - service history, and
 - an indication of the overall condition of the AWTS.

Annexure 2

ID	Name	Address	Town	LGA	System	Comm'd	Sampled	BOD mg/L	SS mg/L	T.coil cfu/100mL	Free Cl mg/L
Septech-1	Hinks	lot2, Jones Rd	Lower Portland	Hawkesbury	Turbojet	07/02/2001	10/10/2001	1	10	120	0.3
Septech-2	Oliverie	28 Shoplands Rd	Annangrove	Baulkham Hills	Turbojet	10/08/2001	10/10/2001	1	5	8,000	0.3
Septech-3	Classic Herbs 2	Freemans Lane	Glenorie	Hornsby	Turbojet	25/08/2000	10/10/2001	3	1	2	0.1
Septech-4	Hall	31 Radnar St	Arcadia	Hornsby	Turbojet	01/04/2001	10/10/2001	1	1	1	0.2
Septech-5	Dean	99 McKanes Fall Rd	Lithgow	Lithgow	Turbojet	08/06/2001	15/10/2001	21	25	5	0.2
Septech-6	Bettridge	lot3, Ivory Curl Cres	Billinudgell	Byron Shire	Turbojet	21/02/2001		2	5	150	N/A