



A WCS Group Company

WCSEE T1000 STEEL SAF BIOZONE

INSTALLATION, OPERATION & MAINTENANCE MANUAL

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Revision table:

| Date | Change description | Owner | Checked | Rev |
|------------|-----------------------------------|-------|---------|-----|
| 26/09/2015 | First issue | TGH | TGH | A |
| 12/12/2019 | Manual Revised | TC | RT | B |
| 26/05/2020 | Manual Revised | TC | AB | C |
| 03/06/2020 | Weight Revised | TC | RT | D |
| 07/09/2020 | Document Revised | TC | AB | E |
| 11/03/2021 | Blower kW changed from 5.5 to 6.3 | TC | RT | F |
| 30/06/2022 | Revised border | TC | RT | G |
| 22/06/2022 | Revised Warranty notes | TC | MR | H |
| 01/12/2022 | Revised layout and timers added | TC | BD | I |



1. HEALTH AND SAFETY

1.1. United Kingdom Health and Safety at Work Act 1974

Section 6a of this act requires manufacturers to advise their customers on the safety and the handling precautions to be observed when operating, maintaining and servicing their products.

The user's attention is drawn to the following:

- All the sections of this manual must be read before working on the equipment.
- Suitably trained and qualified personnel must carry out installation.
- Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.

The design factors for the lid loads and materials comply with the British Water Code of Practice, BW:COP.18.11.16. The lids have been tested with a load at 1.0Kn/m² and will withstand accidental passage.

Refer to WCSEE Ltd for any further technical advice or product information.

1.2. Health

The following is extracted from a health-warning card supplied to all WCSEE Ltd staff. It is the client's responsibility to ensure that all necessary protective clothing/ equipment is available.

Leptospirosis

There are two types of Leptospirosis affect people in the UK:

Weil's disease. This is a serious infection transmitted to humans by contact with soil, water or sewage that has been contaminated with urine from infected rats.

Hardjo-type Leptospirosis, which is transmitted from cattle to humans.

Typical symptoms?

Both diseases start with flu-like illness with a persistent and severe headache, muscle pains and vomiting. Jaundice appears about the fourth day of illness.

How is it caught?

The bacteria can enter your body through cuts and scratches and through the lining of the mouth, throat and eyes.

1.3. Sensible Precautions

After having worked in sewage or with anything contaminated with sewage, wash your hands and forearms thoroughly with soap and water. If your clothing or boots are contaminated with sewage, wash thoroughly after handling them.

Take immediate action to wash thoroughly with clean water any cut, scratch or abrasion of the skin immediately prior to applying any protective covering.

DO NOT HANDLE FOOD, DRINK OR SMOKING MATERIAL WITHOUT FIRST WASHING YOUR HANDS

IF YOU CONTRACT THE SYMPTOMS DESCRIBED AFTER COMING INTO CONTACT WITH SEWAGE, REPORT TO YOUR DOCTOR IMMEDIATELY AND ADVISE HIM/HER OF THE CIRCUMSTANCES.

1.4. Vaccinations

To avoid illness, it is recommended that site personnel have the following vaccinations. (Your doctor may recommend further).

i. Hepatitis A

ii. Hepatitis B

iii. Polio

iv. Tetanus

v. Typhoid/Cholera (probably carried out as a child).

1.5. Safety

Sewage gases are potentially explosive and toxic. DO NOT enter any of the below ground compartments of the transportable biozone. Before carrying out any maintenance work, the equipment must be electrically isolated.

Do not leave covers open longer than necessary. Temporary barriers and warning signs should be erected around any open covers or manholes as appropriate, in particular warning of deep water in the tank.

Any visiting personnel must report to site office on arrival and fully acquaint themselves with safety regulations applicable.

2. Warranty

WCSEE Ltd will provide the following warranty to the items listed below:

Note: warranty period will be active from the day, from which the tanks are positioned on the base slab, or passes on to the customer's premises/construction site.

2.1. T1000 tank enclosures

WCSEE Ltd will provide a 12-month warranty period for the external & internal structure of the tank.

2.2. M&E installation

WCSEE LTD takes no responsibility for improper storage, or bad installation/maintenance performed by unqualified personnel.

2.3. Warranty limitations and exemptions

WCSEE Ltd shall not be liable for any labor involved for the removal or replacement of its equipment or the subsequent transportation, handling or packaging of any part or parts thereof. In no case will WCSEE Ltd be liable for loss incurred because of interruption of service or for consequential damages, labor or expense required to repair defective units, nor shall this constitute a cause for the cancellation of the contract of purchase and sale. Specifically exempt from this warranty are limited life of consumable components subject to normal wear and tear.

2.4. Chargeable non warranty work

Service charges will be incurred (including parts and labor), due to the following:

- Unauthorized alteration.
- Accidental damage, caused by plant or movement on site outside of WCSEE's control.
- Improper use.
- Abuse.
- Tampering.
- Failure to follow installation instructions or failure to follow operating and maintenance procedures.

The above will not be covered by this warranty. All service visits for non-warranty work are chargeable at the standard engineer day rate plus mobilization. This warranty gives specific additional benefits. Statutory rights are unaffected.

Note: WCSEE LTD will not uphold the guarantee on the purchased equipment if the routine maintenance has not been performed and documented.

- The tanks (and kiosk TK1P) have a 1 year manufacturing defects guarantee
- A visual inspection should be regularly undertaken, signs of rust, chips or damaged paint should be cleaned and re-painted
- A full structural inspection should be under taken every 10 years
- Any galvanised components showing visual signs of corrosion should be treated or replaced

WCSEE LTD strongly recommends that the installation of the purchased product is carried out by a qualified and experienced installer. Dependent on the site a suitably qualified civil engineer may need to be consulted for the construction of suitable base slab to support the imposed load.

3. Risk assessment

3.1. Introduction

This section of the manual is intended as a guide and as such does not cater for every situation encountered on site. WCSEE assumes that the necessary permissions have been granted prior to the installation of the plant. It is also the assumption that working methodology abides by the Health and Safety at work act and that all civil engineering design is undertaken by a chartered Civil Engineer.

Please ensure that due consideration is given to the following:

3.1.1 Installation Design Considerations

- Planning permissions & Building Regulations and other regulating or interested parties.
- Environment Agency consent to discharge.
- The size of the plant relevant to the number and type of people that will be using it, e.g. domestic, light industrial, etc.
- Costs, legal implications and siting in consideration to shared systems.
- The whereabouts of wells, boreholes and springs used as sources of potable water; existing non-mains sewerage systems and soakaways; water courses, ponds and lakes and designated protected areas.
- The whereabouts of other services, pipes, cables and ducting.
- Local ground conditions. Is specialist knowledge of civil engineering required, catering for specific ground condition requirements?
- The water table at the time of installation - specialist knowledge is required when installing in an excavation that allows water to enter.
- The water table in winter - Special consideration should be given to installations that will be subject to high water table pressure or flood conditions. The treatment plant will need to be installed so that it cannot "float" out of the ground and provision made for continued discharge of treated effluent, should the discharge pipework/soakaway be under water.

3.1.2 Installation and positioning

- **Siting** - The plant must be sited within 30m of heavy vehicle access for de-sludging. The plant should, where possible, be sited above the high-water table mark and above or beyond the flood plain. See items above and accompanying note. The plant should be sited as far from the habitable parts of the dwelling as possible. Many local authorities recommend 10m as a minimum, but easements are possible for smaller sites.
- **Electrical supply** – If the plant has been equipped with a pumped de-sludge option, a qualified electrician should only undertake electrical installation. The kiosk supplied equipped with a 3-phase socket. A safe and reliable power supply is required at all times, as the pumps are required to de-sludge at intervals 24/7. Adequate means of power failure indication should be provided. This can be an audible or visual alarm or by regular manual checks.

Note: Due to the health risks associated with raw sewage, WCSEE recommend that the tank treatment plant is not used until the system is complete, commissioned and is operating in a stable manner.

The tank and Kiosk should be grounded to earth before the plant is powered and switched on.

3.1.3 Maintenance

- The legal responsibility for the plant as far as operation and maintenance and on-going discharge is concerned.
- Electrical supply: a qualified electrician should undertake the electrical installation.

A reliable power supply will be required at all times, so an indication of power failure will be required, which can be audible or visual.

- Any visiting personnel should report to the site office and acquaint themselves with the specific site health and safety protocol.
- Before carrying out any maintenance or installation on the equipment it should be electrically isolated, unless a trained electrician is carrying out specific checks under controlled conditions. When performing works of this nature, warning signs should be erected to alert others of the works in progress.
- For all works, risk assessments and method statements will be required to carry out work on site. These should identify the method of work and the risks associated.
- Temporary barriers and warning signs should be erected around any open covers or manholes as appropriate, in particular warning of deep water in the tanks.
- See section 7 for routine maintenance.

4. INTRODUCTION

The T1000 transportable biozone is designed to treat the primary settled effluent from sites with population equivalents in the range of up to 1000 persons. The T1000 is intended to serve remote rural communities, such as housing developments, hotels, camping and caravan sites, or any facility not connected to main sewers or requiring further treatment.

The process used within the T1000 has been developed to meet the more stringent discharge consents now being imposed by the Environment Agency, particularly with reference to low ammonia levels. The T1000 can be designed to achieve a variety of standards up to, and including an ammonia standard level of 5mg/L or better.

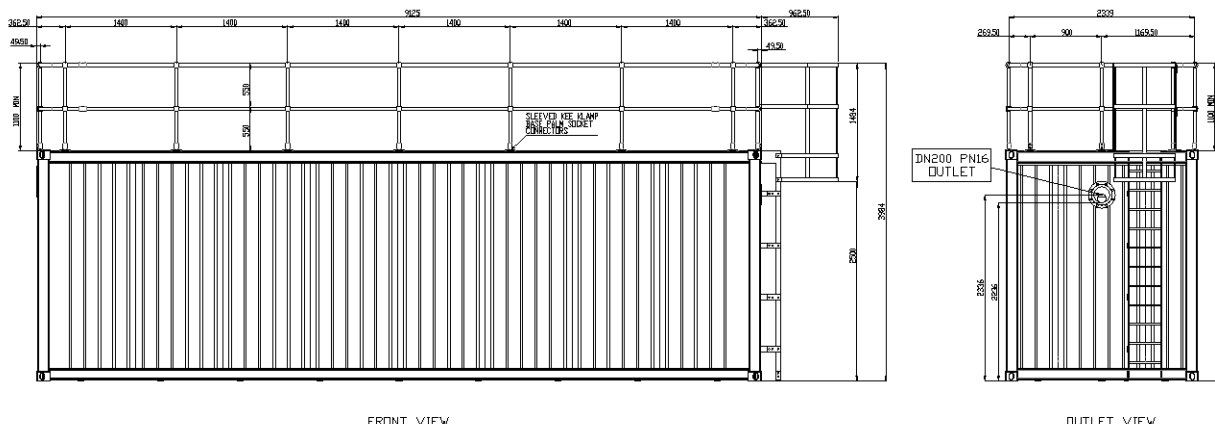
The plant is designed for above ground installation and constructed in Mild Steel, painted in 14C39.

5. WHAT IS SUPPLIED WITH THE T1000

When a T1000 is supplied, you can expect the following equipment: -

5.1. T1000 Tank

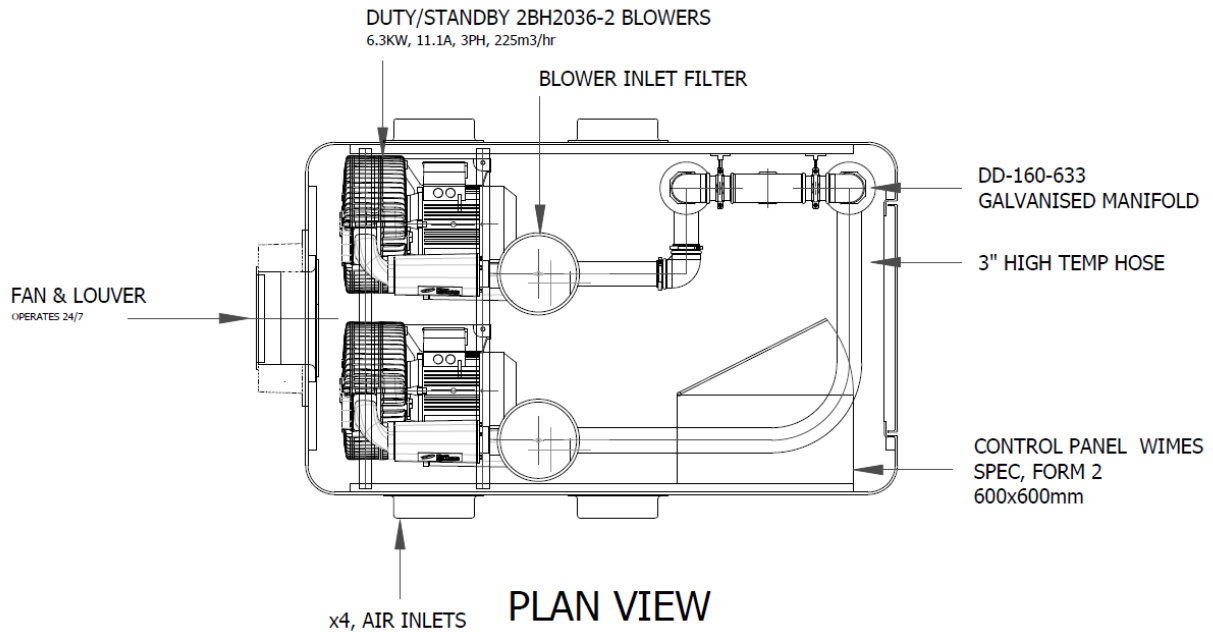
1 off, 9m, Steel T1000 SAF Tank - The T1000 can be supplied with Top level access, which includes a CAT Ladder, handrailing and floor gridding as shown above). This requires assembling once delivered.



5.1. T1000 GRP Kiosk

1 off, Skid mounted GRP Kiosk, with liftable access lid and front door: - c/w Duty Standby Blowers, with a mild steel gavanised manifold, WIMES Spec Form 2, Control Panel, and 10m of high temperature Hose.

All electrical equipment, including blowers must be stored in clean dry conditions until required for use. If the electrical equipment is fitted into the kiosk, some form of anti-condensation heater will be required if the unit is not to run immediately.



6. DELIVERY

6.1. Lifting

Note: - DO NOT attempt to lift the unit if it contains water. There are x8, ballvalves situated on the bottom of the tank to drain each section of the tank down.

The Steel T1000 tank is lifted using the ISO corners supplied.

6.2. Off Loading

The purchaser may be responsible for off-loading at the nearest roadway to site that is suitable for heavy goods vehicles. A minimum height clearance of 16' 6" is required. If there are electrical cables overhead ensure there is a means of turning the power off. For off loading from a lorry mounted HIAB there needs to be a firm area for the stabilisers, the total width being a minimum of 15 feet.

If the nearest road access for a heavy goods vehicle is not adjacent to the site, it is the responsibility of the purchaser to arrange transport from the road to the site. If in doubt, contact WCSEE as soon as possible with any queries.

Inspect the unit for any damage to the base before placing on the ground and then inspect the sides. The unit should only be placed on level ground with no sharp stones, bricks etc. as they may damage the base of the unit.

Note: - The control panel and blowers should be stored in suitable conditions i.e. condensation free.

7. TANK INSTALLATION

All installation procedures should be carried out observing the requirements of the Health and Safety at Work Act and involve good building practice.

Requirements:

- Normal construction equipment and plant
- Concrete base, suitable area. This **MUST** be designed to support the unit for normal operation.
- Pumping equipment and suitable flow control to feed the plant at DWF.
- **All pipe work entering and leaving GRP tanks must be supported to prevent damage to the connections.**

7.1. Installation of Unit.

Cast the concrete base or level suitable area; ensure that the slab/area is designed to support the unit in its normal operation (i.e. full of water, nominal working weight, 63 tonnes).

The base needs to be level TO +/-20mm, as the T1000 unit has a 60mm fall from inlet to outlet.

If multiple units are used in series, the outlet of the preceding unit will need to match the inlet invert of the following unit, ie using a staggered height plinth.

Ensure the surface is free of stones etc. and lower the unit into the correct position to suit pipe connections.

The T1000 is a self contained biological treatment tank requiring minimal set up, this includes the connections of: -

1. Inlet pipe
2. outlet pipe
3. Airline, connected to blower in the kiosk (supplied with manifold and control panel)
4. Suitable 3 phase supply to control panel

8. Plant Operation

The plant is designed to operate automatically with the minimum of maintenance after it has been commissioned. The plant will provide effluent within the designed discharge consent standard after an initial start up period, of 4 to 10 weeks depending on the water temperature and site conditions. It is important that the sewage-input conditions are kept within the plant design criteria.

The blowers for the plant operate continuously, to provide air for the biological process in the filter section on a, Duty/Standby basis.

The blowers change duty every 7 days, with the duty blower remaining on for an adjustable period of time, nominally 1 hour to provide extra scouring air to remove any excess biomass.

Blower Spec: - 2BH20360-2, 6.3kW, 3 phase, 11.1A FLC, providing 225m³/hr of process air.

Influent entering the unit is retained for the hydraulic retention time of two hours, undergoing treatment to the specified standard.

Air to reduce the carbonaceous influent BOD and for nitrification of Ammonia, reaches the biomass from the numerous diffuser legs within the unit.

Each diffuser leg is independently valved to allow adjustment of the air pattern and for maintenance purposes. (Maintenance, see proceeding section).

8.1. TIMER (applicable to 2023 models tanks)

There is a timer positioned inside the control panel on the back side of the door. It is to reduce the power consumption by turning off and on the blower(s) in 15min intervals, during normal operation. (Note:- the Blowers should be running 24/7 for the first 6-8 weeks or until the plant is fully seeded).

Only the site operator should adjust the settings.

8.1.1. Timer Set Up

To set up the timer, follow the below steps:

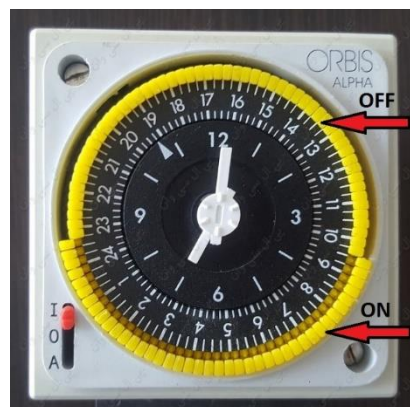
- Selecting the "A" letter on the bottom left of the timer, means the timer is in the "Auto" position. (As indicated in Picture 1 below). This set-up will allow the timer to be in operation.
- When the main switch (located on the front of the control panel) is in the "Auto" position, the low air pressure switch will be automatically inhibited to

OFF for a certain period of time when the blower stops, so the beacon will not flash showing a fault.



Picture 1

- On the Timer, Once the "Auto" mode is selected, select the cycles required for the blower ON/OFF times. This will be done by moving the switches from the circle of yellow tabs to the outwards position for ON and the inwards position for OFF (see Picture 2 below).
- The Initial set-up is for 15min OFF and 15min ON. If the quality of effluent is deteriorating, increase the blower ON time by moving more yellow tabs to the outwards position.



Picture 2

- On the Timer, selecting the letter "I" on the bottom left of the timer mode will run the blower in manual setting, (as indicated in Picture 3 below). It is advisable that once a week to run the blower(s) in manual mode for 4 hours, to scour the media.



Picture 3

- On the Timer, selecting the letter "O" on the bottom left of the timer, will switch the blower OFF and no air will go to the plant, (as indicated in Picture 4 below).



Picture 4

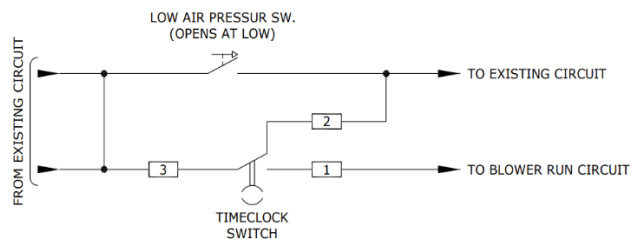
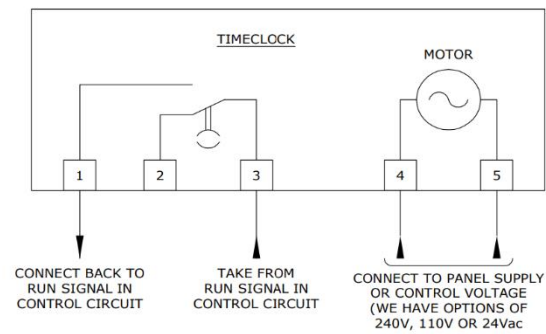
8.1.2. General Requirements

All timers retrofitted in existing panels must be installed by WCS EE, or the process of the sewerage treatment plant will not be guaranteed by WCS EE.

On factory fitted timers, a visit is required after 2 months in operation to check the D.O. (Dissolved Oxygen Levels) and to visually inspect the effluent.

8.1.3. Electrical Connections

Below shows the electrical details of the timer controls.



9. Routine Maintenance Checks

- i. Weekly
- ii. Six Monthly
- iii. Annual

9.1. Weekly

- Check for any unusual odours or excessive foaming.
- Check that the compressor/s are operational.
- Check the fan is working
- A Visual inspection for any signs of corrosion or damage to the tank

9.2. Six Monthly

Carry out the weekly check plus:

- Open the Kiosk and check the extract fan, if fitted, is operating and that the blowers and control panel are in good working order.
- Check connections to and from the plant for any leaks or abrasions.
- Check that the blower air filters are clear and knock off any collected dust or replace if necessary.
- Scour the biozone by running both of the blowers in hand for a period of 2h then return them to auto.

9.3. Annually

Carry out the monthly checks plus:

- Thoroughly check the condition of the plant for any damage.
- Check the outside of the plant for evidence of bacterial foaming or scum on the outside of the plant.
- Check the fan, control panel, inlet filter and blower(s) for correct operation. Service and repair replace as necessary.

Notes:-

- The tank and kiosk have a 1 year manufacturing defects guarantee
- A visual inspection should be regularly undertaken, signs of rust, chips or damaged paint should be cleaned and re-painted
- A full structural inspection should be undertaken every 10 years
- Any galvanised components showing visual signs of corrosion should be treated or replaced.

10. Problem solving.**10.1. Poor Effluent**

| | |
|---------------|--|
| Poor effluent | Scour biozone by running both blowers in hand for a period of 2h and monitor the condition of the effluent. If the plant still exhibits poor effluent then consult WCSEE for more information. |
|---------------|--|

- Check that the flow entering the plant is within WCSEE's process guarantee

10.2. Blower not Running

| Symptoms | Corrections |
|-----------------------------|---|
| Power cut | If temporary (24/48 Hours) do nothing, if extended obtain alternative source of power or tanker sewage away. Important: on power being returned to three phase supplies check for correct rotation of blowers |
| Power supply fault | Switch off blowers check fuses and any RCD breakers, on 3-phase supplies check for correct rotation. Switch blowers to on and the blowers should start. If not switch off and call electrician. |
| Blower overload has tripped | Check for any obvious causes, reset overload and switch to on. Blowers should start, if not switch off and call an electrician. |
| Blower runs intermittently | Check that the cooling fan is running and the air ducts are clear, as overheating in the cabinet will cause the high temperature trip to switch off the power to all but the fan and beacon if fitted. Replace fan if it has failed. Temporary solutions if the weather is fine: leave the kiosk door open but ensure that no one can gain access to electrical or rotating mechanisms. |

10.3. No air delivered to the plant

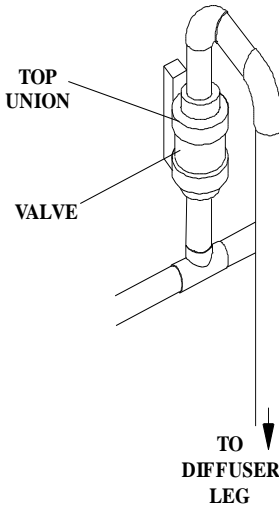
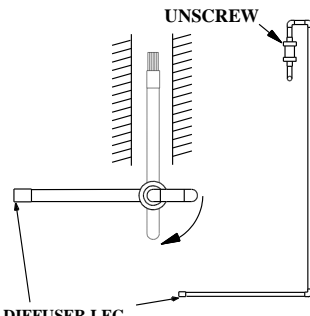
| Symptom | Corrections |
|--------------------|--|
| Blower not running | Check that the blower has not tripped. |
| Blower running | Check all valves are open in the kiosk and main unit. Check that the air lines are not broken or leaking. Find where the air is escaping from pipe work and repair. Check inlet filter(s). |

10.4. Smell

| Symptoms | Corrections |
|---|---|
| Smell escaping from the covers on the plant | Check that grease has not entered the treatment plant. Do all the 'Annual Checks'. Ensure the plant is aerating correctly and there are no signs of toxic shock |

10.5. Poor Air Distribution over the Filter Section

| Cause | Correction |
|-----------------------|---|
| Blocked air Diffusers | Below is a last resort, performed by WCSEE engineers and will be subject to an appropriate risk assessment for gaining access to biological zone: |

| | |
|--|--|
|  <p>TOP UNION</p> <p>VALVE</p> <p>TO DIFFUSER LEG</p> | <p>Turn off all but one of the air diffusers at the valves. Then proceed to check the one that is on for the position of bubbles. The increased pressure should clear any blockage in the diffuser. If not the diffuser can be removed by switching the air supply (blower) off and disconnecting the diffuser tube at the top of valve, turning through 90° and lifting up through the diffuser access slot. On early units the diffuser is screwed into the fitting on the end of the tube and can be removed for cleaning or replacement. Later units have a cap with a 5mm hole in the end. In addition there are also some cross holes on some of the horizontal pipe. Clear all holes.</p>  <p>UNSCREW</p> <p>DIFFUSER LEG</p> <p>Repeat as required for any other suspect blocked diffusers, and then move the air diffusers by angling the tube as required improving air distribution.</p> |
| <p>Filter media partially blocked by excessive biomass</p> | <p>This indicates that the plant is overloaded, check design loading and contact WCSEE for advice.</p> |

11. APPENDIX 1 - Plant Start up

For commissioning, carry out the checks as in section 6.3 "Annual Checks" of this manual. The plant should then be left running as normal. It takes time, depending on the temperature, for the plant to grow a stable biomass when it is first started up. This is 3 to 6 weeks for the process to start reducing the BOD. It then takes another 4 weeks for the process to start reducing ammonia.

11.1. Introduction

The bacteria necessary to provide the biological oxidation are present in normal sewage and will rapidly multiply if given the right conditions. The process breaks down most of the sewage into carbon dioxide and water.

There are two main types of bacteria:-

- a) Carbonaceous bacteria which, as the name suggests will break down the carbon based solids.
- b) Nitrifying bacteria which break down the ammonia to nitrogen and this will be partially converted to nitrogen gas before being discharged.

The carbonaceous bacteria are more prolific and also less prone to damage by chemicals (cleaning agents) than the nitrifying bacteria. Both are adversely affected by low temperatures or low pH which may be found in soft water areas. The nitrifiers are more critical and cease to be effective in temperatures below 10°C or pH below 7.

Low temperatures are not normally found in domestic sewage, this will rarely drop below 15°C unless the pipe runs are very long or the flow is very low.

The right conditions to grow bacteria are to have both oxygen and food available and these conditions are found in the submerged bed aerated filter section of the SAF.

The effluent quality is defined by a group of two or three figures as BOD:SS: NH₄ (Biological Oxygen Demand:Suspended Solids:Ammonia) All figures represent the concentration in ppm (parts per million) and the most usual requirement is 20:30 with no Ammonia standard. If the discharge point is very sensitive the standard may be as tight as 10:10:5.

11.2. Start Up

It is very important that the air blowers are switched on **BEFORE** any sewage is allowed to flow into the plant.

As soon as sewage is introduced into the tank to provide flow, the bacterial action will commence. The carbonaceous break down will start almost immediately which will produce large quantities of foam. Although the process will have started the initial quality of the effluent will initially be poor with little treatment.

As soon as a flow of sewage is introduced into the tank, the bacterial action will commence. The carbonaceous break down will start almost immediately, which will produce large quantities of foam.

Although the process will have started, the quality of the effluent will initially be poor, with little treatment until the biomass has established itself on the media.

The plant should then be left running. It takes time, depending on the temperature, for the plant to grow a stable biomass when it is first started up. This is approximately 3 to 6 weeks for the process to start reducing the BOD, then it takes another 4 weeks for the process to start reducing ammonia.

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11.3. Decommissioning and transportation

The decommissioning of the unit prior to transportation is a critical procedure. **No** attempt should be made to move the unit until decommissioning has taken place.

The following steps **MUST** be followed: -

1. Disconnect the supply of sewage to the unit.
2. Introduce a supply of fresh water, if available.
3. Continue running the blowers through out the hole decommissioning process.
4. During this time the biomass will gradually die off with the fresh water passing through the unit.
5. Continue this operation for a minimum period of one 1 week/ 7 days, to ensure all the biomass is removed from the media.
6. Drain down the unit, ensuring residual faecal matter is cleaned from the exterior of the unit.
7. Continue running the blower for a further 2 days to dry out the media.
8. Turn off the blowers and disconnect associated equipment.

Under no circumstances should the unit be lifted with water in, or before the biomass has been flushed out.

Industrial wastewater treatment

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Sewage treatment

+44 (0) 23 9224 2600

info@wcs-group.co.uk

wcs-group.co.uk/environmental-engineering

Disclaimer

WCS Environmental Engineering (WCSEE) has a policy of continual product development and the above information may be subject to change without notice. WCSEE reserve the right to to change the specification in line with company policy of improvement through research and development. Errors and omissions excepted. Models shown in this manual may include additional cost options that are not part of the standard specification