WCS Environmental Engineering

MARLOWE Environmental Services

WCSEE T1KP HIRE TANK

INSTALLATION, OPERATION & MAINTENANCE MANUAL

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Revision table:

Date	Change description	Owner	Checked	Rev
20/09/2022	Maintenance section updated	TC	BD	I
01/12/2022	Revised layout and timers added	TC	BD	J
18/07/2023	5.2 revised	TC	BD	K
21/08/2024	Scour removed	RT	TC	L
03/03/2026	Amended H&S text	TC	AB	M

WCSEE - T1KP HIRE ASSET

1. SAFETY

It is extremely important that maintenance procedures in this document are followed. Any deviation from this could cause serious injury or have a detrimental effect on its operation.

1.1. Health and safety at work act 1974

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

The user's attention should be drawn to the following:

- All sections of this manual should be read before undertaking work on the equipment.
- Suitably trained personnel must carry out the installation.
- Normal Health and safety precautions must be taken and appropriate procedures observed to avoid accidents.
- Refer to WCSEE Ltd for further technical advice or product information.

1.2. General health and safety

The layout of the WCSEE LTD T1KP tanks have been laid out to ensure that health and safety on site is optimised in line with designer duties specified by the CDM regulations 2015. It will be safe manner, and agrees with comments from the principal designer. Lone working in, and around the plant should be prohibited.

1.3. Leptospirosis

The following is extracted from a health warning card issued to WCSEE LTD staff. It is the client's responsibility to ensure that the relevant Personal Protective Equipment (PPE) is available and used.

There are two types of Leptospirosis that effect people in the UK and they are as follows:

- Weil's disease, which is a serious infection transmitted to humans by contact with soil, water or sewage that has become contaminated with urine from infected rats.
- Hardjo-type Leptospirosis, which is transmitted from cattle to humans.

The typical symptoms for both diseases start with a flu like illness, with a persistent and severe headache, muscle pains and vomiting. Jaundice generally appears on the fourth day of the illness.
The bacteria can enter your body through cuts and scratches or through the lining of the mouth, throat and eyes.

1.4. Sensible Precautions

After working with contaminated fluid or other materials it is important that hands and forearms are washed thoroughly with soap and water. If your clothing or boots become contaminated, then they should also be washed immediately after use.

Immediate action should be taken, so that any cuts scratches or abrasions are washed thoroughly with clean water, prior to applying any protective covering (plaster or bandage).

Do not handle food, drink or smoking material without first washing your hands. If you display any of the symptoms described after coming in to contact with sewage; report to your doctor immediately advising them of the circumstances.

1.5. Vaccinations

To avoid the possibility of illness it is recommended that all site personnel have the following vaccinations. WCSEE Ltd also recommends that you that you consult your doctor for any additional vaccinations that you may require. The general vaccinations WCSEE use for all personnel are as follows:

- Hepatitis A
- Hepatitis B
- Polio
- Tetanus
- Typhoid/cholera – probably carried out as a child.

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. T1KP 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 process used within the WCSEE T1KP 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 T1KP can achieve ammonia standards better than 10mg/l.

4.1. Installation

The T1KP has been designed for above ground installation.

Blowers and controls to provide the air are housed in a kiosk underneath the viewing platform on the plant. The tank is manufactured in mild steel construction which is painted for corrosion resistance and long life.

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 T1KP unit has a 60mm fall from inlet to outlet.

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

**As these units are above ground and generally receiving pumped flows, it is therefore necessary to provide suitable flow control before the effluent is received by the unit.*

The plant should receive Dry Weather Flow as stated in the relevant quotation or design documentation; ensuring adequate hydraulic retention time for the relevant biological processes to take place.

Checks

WCSEE advises the following for lifting practices for the T1KP tanks:

- Inspect all lifting points and tension if required with a suitable tool.
- The unit must be hoisted empty of all material and fluids.
- Test lift the unit to check that the centre of gravity of the unit is in the correct location (See drawing supplied by WCSEE LTD), and that all of the chains are taut. It is critical to ensure a balanced lift, but if in doubt don't lift the tank.

4.2. Weights - T1KP TANK + Kiosk

Weights	New Empty Weight: 14,000KG Used Empty Weight: 20,000KG Operating Weight: 61,000KG

5. SETTING TO WORK

5.1. Inlet & Outlet to Tank

The tank comes equipped with a 8" bauer connection on both the inlet & outlet. (see GA for details). The Bauer connections are situated at low level to mitigate the need for top level access.

5.2. Power Supply

Connecting power to the kiosk, there is a 3-phase, 5pin socket connection mounted on the side of the kiosk to power the blowers and control panel. These require persistent power as the pumps are powered on an interval basis 24/7.

Note:- When supplying power to the kiosk unit via a 32A, 5Pin Socket, it is advised that the power source is protected with an RCBO supply.
If an RCBO is not available, the power cable feeding the kiosk should be hard-wired into the control panel by a qualified electrician.

5.3. Air to Tank

The air supplied to the tank is produced by the duty/standby, 3 phase, side channel 2BH2036 blowers which are situated in a weatherproof enclosure. The air connections which provide the air for biological treatment process within the T1KP tank are all connected and ready for operation. It should be checked that these hose connections are fully secured.

6. PLANT OPERATION

The plant is designed to operate continuously 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. See point 9.2, PLANT START UP.**

The blowers, Rietschle 6.3Kw, 3 phase 2BH2036 side channel for the plant operate continuously to provide air for the biological process in the filter section. The blowers work on a duty /standby configuration and change over every 7 days.

7. ROUTINE MAINTENACE

The tank is equipped with fixed aeration pipework and requires no top level access.

7.1. Weekly

- Check that there is noise coming from the kiosk indicating that the blowers are operational.
- If a warning alarm beacon is fitted, it will flash to indicate a lack of air to the plant.
- A Visual inspection for any signs of corrosion or damage to the tank

7.2. Six Monthly

Carry out the weekly check plus:

- Open the Kiosk and check the extract fan, if fitted, is operating and that the blower and control panel are dry and in good working order.
- Check that the blower air filters are clear and clean off any collected dust or replace filters if necessary.

7.3. Annually

Carry out the monthly checks plus:

- Thoroughly check the plant. If there is any scum or grease build up on the sides of the tanks or fittings this should be removed by pressure washing or removed with a wooden or plastic scraper. DO NOT USE A METAL SCRAPER.

- Check the control panel, fan inlet filters and the blowers for correct operation and service or replace as required.
- Check the air distribution over the filter surface (if required). Safe temporary access will need to be erected.

8. PROBLEM SOLVING

8.1. Poor Effluent

Blower not running	Refer to 8.2
No Air bubbles in filter chamber	Refer to 8.3
Poor air distribution	Refer to 8.6
Poor flow control	Refer to site

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

8.2. 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.

8.3. No air bubbles showing on the surface of the filter section

Symptom	Corrections
Blower not running	Refer to 7.2
Blower running	Check all valves are open in the kiosk and main unit. Check that the airlines are not broken or leaking. Find where the air is escaping from pipe work and repair. Check inlet filter(s).

8.4. Blockages

Symptom	Correction
Level in sections is higher than normal	If the plant has been flooded due to high water level or other cause the 'V' notches may have become blocked these should be cleared of any debris the material should be returned to the primary settlement tank.

8.5. Smell

Symptoms	Corrections
Smell escaping from the covers on the plant	If venting is via the inlet pipework, ensure that the outlet T-vent is closed and the inlet T-vent is open. If venting is via the outlet pipework, ensure that the inlet T-vent is closed and the outlet T-vent is open. Also check the seals around the covers and reposition as necessary.
Smell escaping from the kiosk	Check that any ducts to the plant (holding tank or pump chamber if installed) are sealed with expanding foam.
Plant smells	Check that grease has not entered the treatment plant. Do all the 'Annual Checks'.

8.6. POOR AIR DISTRIBUTION OVER THE FILTER SECTION

Cause	Correction
Blocked air Diffusers	Turn both blower on to try and remove any blockage in the diffusers.
Filter media partially blocked by excessive biomass	This indicates that the plant is overloaded, check design loading and contact WCSEE for advice.
Filter media partially blocked with sludge	This indicates carry over from primary tank, check sludge levels and de-sludge if required. Also check for excessive flow possibly due to ground water ingress into foul sewer.

9. PLANT START UP

For commissioning, carry out the six checks as stated in 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 the ammonia.

9.1. 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 effected by low temperatures or low pH which may be found in soft water areas. The nitrifyers 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 very small.

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 HIPAF

The effluent quality is defined by a group of two or three figures as BOD:SS: NH_3 (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.

9.2. Start Up

It is very important that the air blowers are switched on BEFORE any sewage is allowed to flow into the Aerated filter section

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.

In order to reduce the time to full treatment the plant can be seeded with activated sludge and / or proprietary bacteria, BUT a quantity of normal sewage will also be required.

9.3. Procedure

1. Switch on Blower(s) and check that air distribution is correct are working. ***IMPORTANT:- on blowers with 3 phase motors check for correct rotation BEFORE CONNECTING THE HOSES TO THE BLOWER(S)***

2. Introduce sewage into the tank at the design rate.

3. Check after 12 to 24 hours that:-
    I. Blower(s) are running correctly and not overheating
    II. Air distribution in the Filter section is correct and that foam is being produced

9.4. 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.

9.4.1. 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).

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

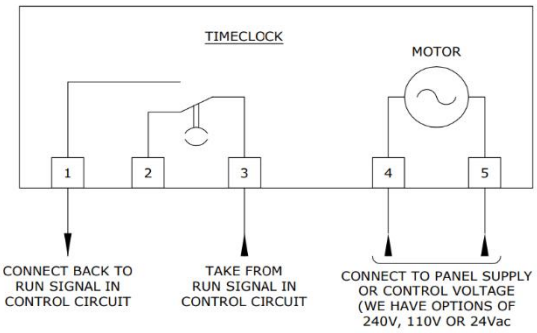
9.4.2. General Requirements

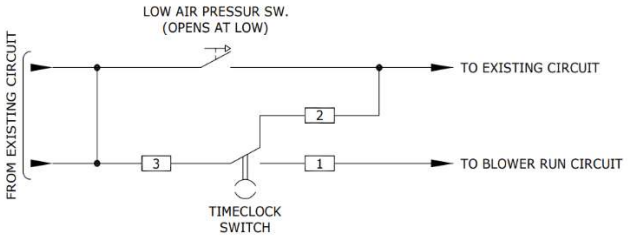
All timers retrofitted in existing panels must be installed by WCS EE, or the process of the sewerage treatment plant will not be guaranteed by WCS EE.

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.

9.4.3. Electrical Connections

Below shows the electrical details of the timer controls.





10. DECOMMISSIONING

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.

1. Disconnect the supply of sewage to the unit.
2. Introduce a supply of fresh water, if available
3. Continue running the blowers
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 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.

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