

**Installation
Operation & Maintenance
Temporary Biozone
Treatment Plants**

INSTALLATION, OPERATION AND MAINTENANCE OF HIPAF TBTM'S

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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.22.96. The lids have been tested with a load at 1.0Kn/m² and will withstand accidental passage. **THEY ARE NOT DESIGNED AS PEDESTRIAN WALKWAYS.**

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

1.2. Health

The following is extracted from a health-warning card supplied to all WPL 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 HiPAF. Before carrying out any maintenance work, the equipment must be electrically isolated.

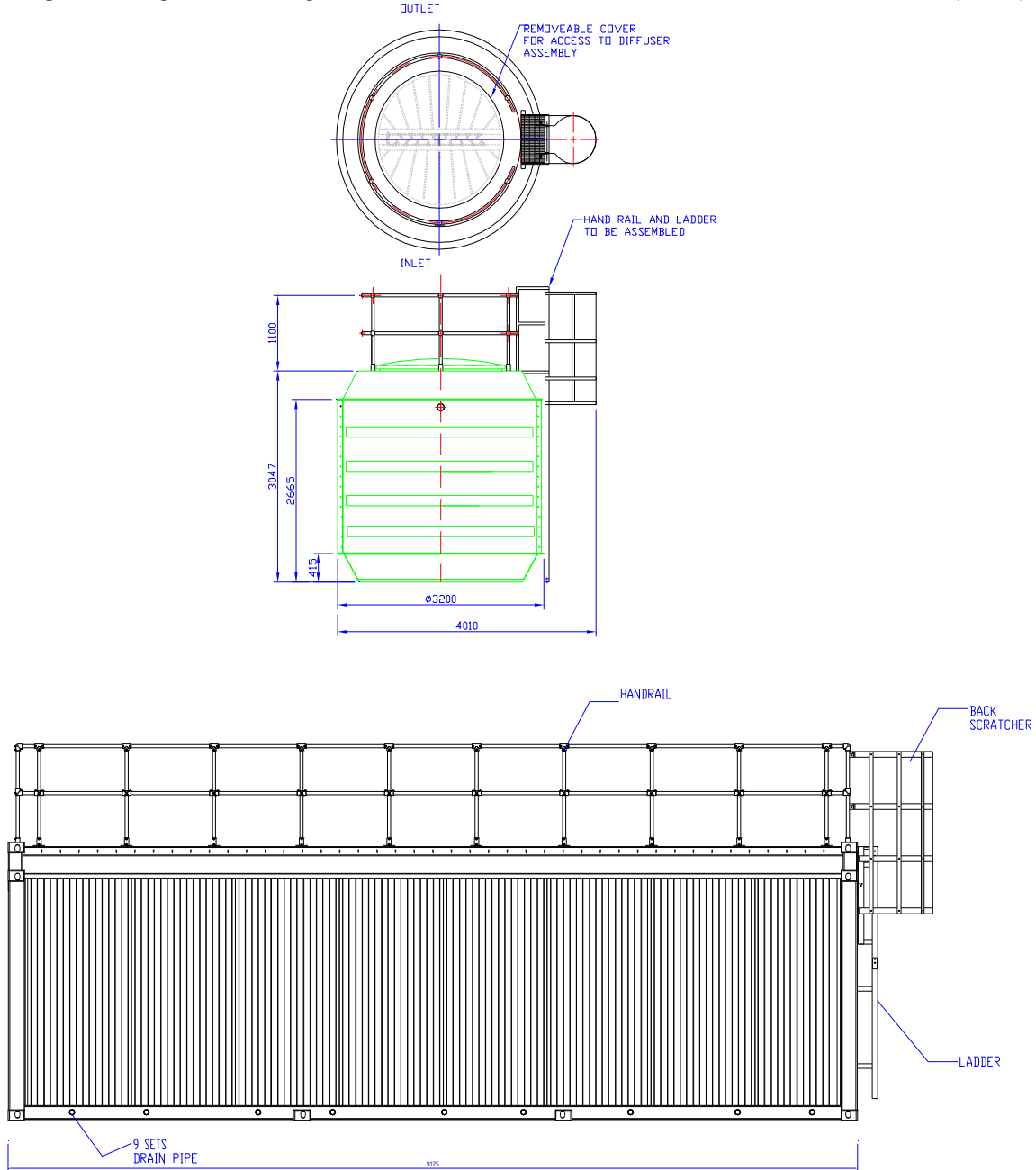
Do not leave covers open longer than necessary. Temporary barriers and warning signs should be erected around any open covers or manholes as appropriate, in particular warning of deep water in the tank.

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

2. INTRODUCTION

The HiPAF TBTM range of high performance aerated filters has been designed to treat the primary settled effluent from sites with population equivalents in the range of 1 up to 1000 persons. The HiPAF 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 HiPAF 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 HiPAF 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 GRP & Steel, 6m ISO and 9m (shown).



3. DELIVERY

Lifting

DO NOT attempt to lift the unit if it contains water.

DO NOT walk on top of the units with muddy boots as this will scratch the surface. (GRP surfaces only)

Lifting eyes are provided around the top flange of the unit for the attachment of suitable strops of equal length. These should create an angle of no less than 60° to the top of the unit to avoid excessive loads on the sides of the structure. When moving across rough ground great care should be taken to avoid increased loads due to sudden movement of the unit.

Steel tanks are lifted using the ISO corners supplied.

WARNING: Care should be taken when attaching lifting equipment as the surface of the unit becomes very slippery when wet.

3.1. 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 WPL 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.

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

3.2. Extent of Supply

See the delivery note for full details. The standard unit comes with the following: a GRP/Steel tank, a blower kiosk with blower and control panel fitted, air hose of 10m length

3.3. Electrical Equipment

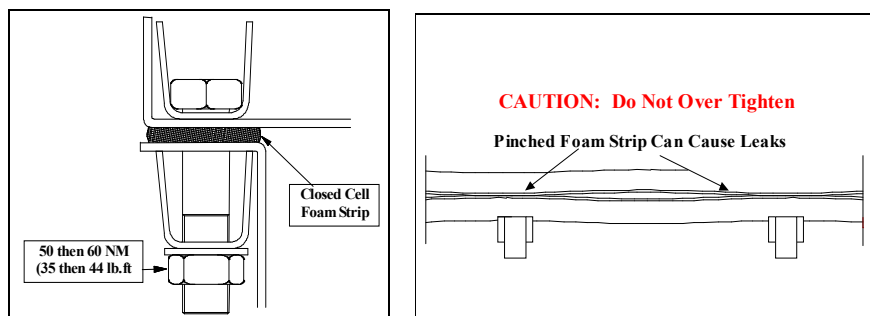
All electrical equipment, including blowers must be stored in clean dry conditions until required for use. If the electrical equipment is fitted into the kiosk, some form of anti-condensation heater will be required if the unit is not to run immediately.

3.4. Bolts and Bolt Strips (GRP only)

Due to the settling of the joints during transportation, the bolts may become loose and need tightening. It is important that the bolt strips are not over tightened as this can cause leaks.

Tighten all bolts in the metal strips to 50 NM to ensure the foam is all compressed then tighten up to a final value of 60 NM.

Silo Bolts (with no metal strips) around the top of the unit should only be tightened to 30 NM.



4. 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.

4.1. 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 30tonnes-GRP, 80tonnes and 102tonnes - Steel)

NB. The base needs to be level, as the GRP units have a 50mm fall from the inlet to the outlet, and Steel units have 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 correct position to suit pipe connections

The TBTM is a self contained biological treatment zone requiring minimal set up, this includes the connection 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

5. 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.

GRP unit

SAH155, 3Kw, 3 phase, 9.2A FLC

Steel Units

6m – SAH 235, 4Kw, 3 phase, 11.0A FLC

9m - SAH 355, 7.5Kw, 3 phase, 17.5A FLC

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)

6. Routine Maintenance

Checks

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

6.1. Weekly

Observe through the grids covering the biozone and confirm that air bubbles are percolating through the media
 Check that the compressor/s are operational.
 Check the fan is working

6.2. 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 that there is an even distribution of air around the filter indicated by an even distribution of bubbles on the surface of the filter section/s.
- Check that the blower air filters are clear and knock off any collected dust or replace if necessary.

6.3. Annually

Carry out the monthly checks plus:

- Thoroughly check all the plant. If there is any scum build up on the sides of the tank or fittings, remover by pressure washing or with a non metallic scraper
- Check the fan, control panel, inlet filter and blower(s) for correct operation. Service and repair replace as necessary
- Check the air distribution over the filter surface, adjust the position and/or clean the air distribution nozzles as required.

Problem solving.

7.1. Poor Effluent

	Refer to 7.3
No Air bubbles in filter chamber	Refer to 7.3
Poor air distribution	Refer to 7.6

7.2. 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.

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

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).

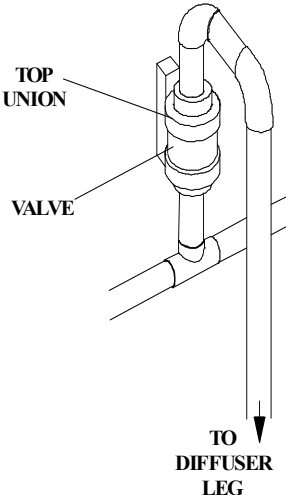
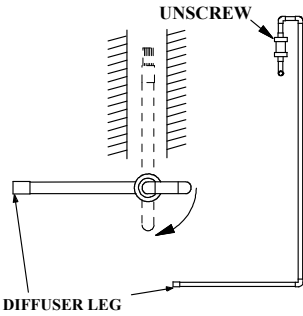
7.4. Blockages

Symptom	Correction
Loss of/reduced air on surface of water	Scouring. Close the main feeder to the diffuser legs adjacent to the problem area. This will force more air down the remaining diffusers, thus providing more scouring air to dislodge excess biomass. Perform this for half an hour per section or until air pattern is regular

7.5. 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

7.6. Poor Air Distribution over the Filter Section

Cause	Correction
<p>Blocked air Diffusers</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>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>
Filter media partially blocked by excessive biomass	This indicates that the plant is overloaded, check design loading and contact WPL for advice.

APPENDIX I - 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.

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 10⁰C or pH below 7. Low temperatures are not normally found in domestic sewage, this will rarely drop below 15⁰C 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: NH₃ (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

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 or the Humus section of 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.

Procedure:-

DO NOT seed the biozone with activated sludge as this will block the media.

Activated sludge should be introduced into the primary (approx 1/3rd volume)

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

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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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.

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.