WPL HiPAF®

High performance aerated filter packaged wastewater treatment plants

Commercial wastewater treatment for demanding applications

WPL HiPAF Range

Regularly specified by the highly regulated UK water utilities, the WPL HiPAF range meets stringent European environmental discharge consent standards. This makes our products the preferred choice for sensitive locations such as Sites of Special Scientific Interest (SSSI).

With biological treatment, stricter standards can be achieved, meeting Biological Oxygen Demand (BOD^5) 10mg/l; Suspended Solids (SS) 10mg/l; Ammoniacal Nitrogen (NH_4-N) 2mg/l (with tertiary treatment). Higher standards are achievable.

Our packaged plants can be design engineered to operate efficiently based on seasonal variations in loadings often experienced by hotels, caravan parks and cafés. Higher pollution loads and site expansion can be accommodated by adding WPL HiPAF modules.

The WPL HiPAF options depending on application parameters and population size:

- **Compact – 1 to 60 PE**
- **Midi – up to 300 PE**
- **Modular – up to 2,000 PE**
- **Larger bespoke systems available on request**

Each wastewater treatment plant includes primary settlement, biological treatment and final settlement processes, with custom design options available for larger applications. All models are manufactured in glass-reinforced plastic (GRP) which is UV stabilised with an external gel coat finish which extends asset life to 25 years.

The WPL HiPAF systems are installed below-ground, however WPL offer alternative above-ground equipment if required.

WPL Support

All WPL HiPAF solutions are backed by our continued support for the life of the project. With unrivalled specialist capabilities, we supply technical information and drawings; offering any additional assistance if required. This is to ensure a wastewater treatment solution that works effectively and efficiently, with minimal impact on the day to day running of businesses.

Optimum wastewater treatment performance

Features and Benefits:

Ease of installation

- Modular plants enable access and installation at space restricted sites
- Overall compact design minimises excavation required offering small footprint and lower installation costs

Low maintenance

- No internal mechanical or electrical moving parts
- Optional low energy compressors with adjustable timers
- Midi and modular plants have the option of isolating and removing air distribution within the biological section for ease of maintenance
- Tankering made easier because primary sludge and humus are stored together

Ease of access for maintenance

- Midi and modular plants have the option of large access lids for safe, clean, accessible air diffuser system maintenance

Robust process

- Proven WPL technology based on over 25 years empirical data
- Rectangular shape of the midi and modular plants reduces dead zones
- Use of high quality blowers and pumps underpins reliability of the plant

Energy efficiency

- Optional duty-standby blower arrangement is designed to provide process air; additional scour is provided by the secondary blower when required, reducing energy use
- Variable speed drives can be used to optimise power use

Variable flows and loads

- The unique design of the flow balancing in the primary tank means it can cope with variable flows and loads making it ideal for caravan sites and other seasonal venues

Minimal visual impact

- Below ground installation means the plant does not impede views of the landscape
- Discreet for use in tourist and leisure applications

Compliant

- Fully compliant with UK Building Regulations and Environment Agency guidelines
- WPL uses British Water's Code of Practice - Flows & Loads
- The compact plant is designed and manufactured to BS EN 12566-3. The midi and modular plants are designed in accordance with BS EN 12255 – 1/15 and manufactured using BS 4994 as a guide. WPL HiPAF treatment plants are CE marked where applicable

Three-stage system for safer processing

Each WPL HiPAF treatment plant includes a three-stage process - primary settlement, biological treatment (biozone) and final settlement. The segmented biozone process chambers in stage two eliminate the risk of process short-cuts and mitigates risks associated with variable loads.

Stage 1

Primary settlement

- Incoming wastewater enters the primary settlement stage where organic and inorganic matter settles
- The sludge is held in this section until it requires de-sludging
- A unique forward-feed arrangement uses an airlift to deposit wastewater into the biological treatment stage (biozone), which keeps peak flows from entering the system and prevents hydraulic surges

Stage 2

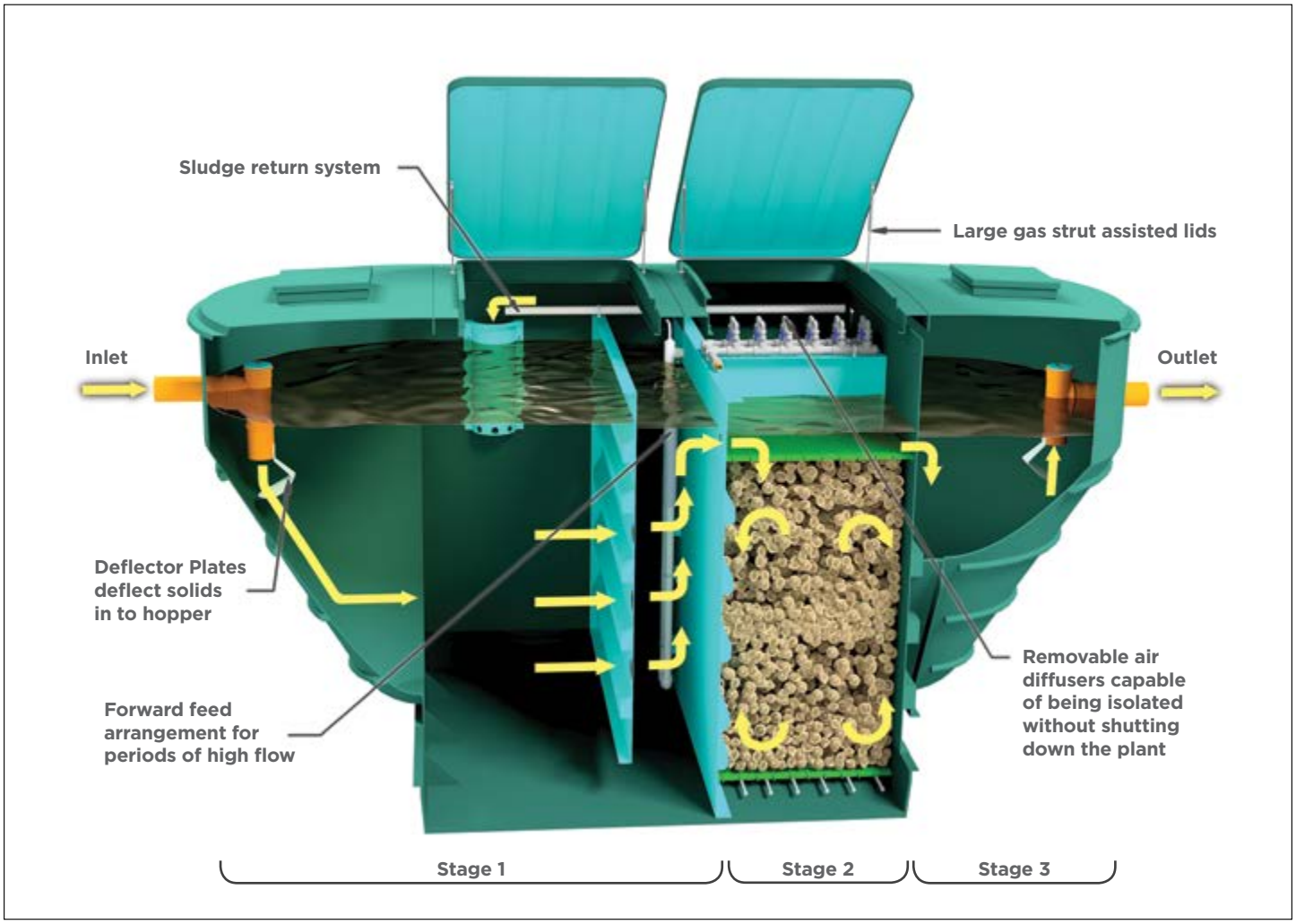
Biological treatment

- Settled liquor enters the biological section either by displacement or via the airlift
- High-voidage plastic media, contained between two floors within the biozone, encourages the growth of bacteria and other organisms which treat the wastewater
- Air required for the treatment process is delivered by air-blowers housed in a weatherproof kiosk
- The air also helps to scour the media bed, preventing the filter from blocking
- A series of diffusers installed beneath the media bed ensure an even distribution of air

Stage 3

Final settlement

- The treated wastewater (final effluent) enters the final settlement section
- Dead biomass (humus sludge) from the process settles out
- An airlift automatically transfers settled humus sludge back to the primary settlement section for co-settlement
- The final effluent is discharged through gravity displacement to either a watercourse or a sub-surface irrigation field



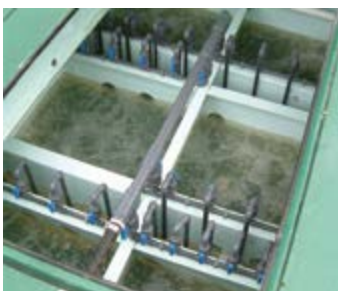
WPL HiPAF midi packaged sewage treatment plant illustration (above)

Internal Configuration

The internal sections of the plant can be accessed from the top of the unit to make servicing, maintenance and de-sludging easier. Plants are fitted-as-standard with large, stainless steel, gas strut assisted lids to give full access to the relevant parts of the plant.

Air is introduced to the WPL HiPAF unit by a series of air diffusers. Each diffuser is capable of being isolated and removed individually without the need to shut down the plant or affect air supply to the rest of the unit.

The complete absence of mechanical and electrical components within the hostile environment provides safe and clean working conditions on site.




Internal air diffusers (left) and large gas strut lids (right)

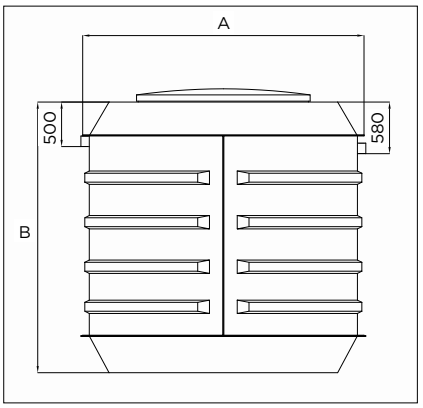
Technical Specification

Use the tables below as an indicative guide to selecting the right packaged treatment plant for your site. For advice on the modular system or more information on the range please contact WPL or a qualified contractor.

WPL HiPAF compact system 1 to 60 PE

Model PE	Standard Consent*	A Diameter (m)	B Height (m)	Inlet Invert (mm)	Outlet Invert (mm)
10	20:30:20	2.29	2.61	500	580
20	20:30:20	2.32	2.86	500	580
30	20:30:20	2.58	2.69	500	580
40	20:30:20	2.86	2.69	500	580
50	20:30:20	3.16	3.00	500	580
60	20:30:20	3.16	3.20	500	580

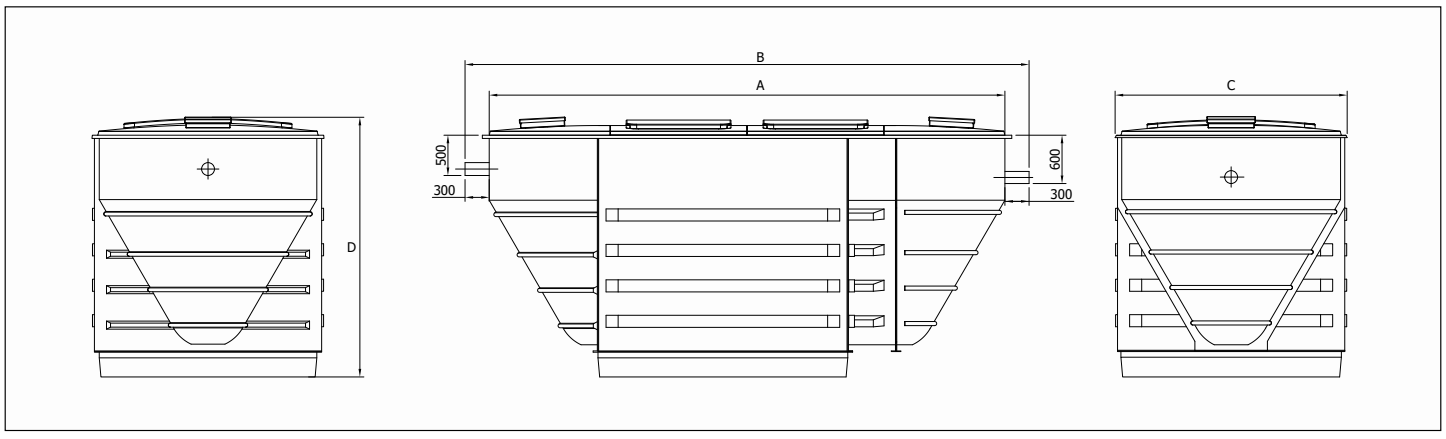
*Typical consent standards shown, tighter consent standards available to meet all requirements specified by the EA



WPL HiPAF midi system 60 to 300 PE

Model PE	Standard Consent**	A Length (m)	B Length w/pipes (m)	C Width (m)	D Height (m)	Inlet Invert (mm)	Outlet Invert (mm)	Weight (Tonne)
70	20:30:20	4.30	4.90	2.88	3.20	500	600	1.60
90	20:30:20	4.80	5.40	2.88	3.20	500	600	1.90
110	20:30:20	5.20	5.80	2.88	3.20	500	600	2.25
130	20:30:20	5.80	6.40	2.88	3.20	500	600	2.50
150	20:30:20	6.40	7.00	2.88	3.20	500	600	2.90
175	20:30:20	7.00	7.60	2.88	3.20	500	600	3.40
200	20:30:20	7.60	8.20	2.88	3.20	500	600	3.90

** Typical consent standards shown – tighter consent standards available to meet all requirements specified by the EA. For options above 200PE please contact WPL.



The tables are an indicative guide only. All applications are specified to comply with the British Water Code of Practice for Flows and Loads. Further technical information can be found on the WPL website, visit www.wplinternational.com.

WPL offers a complete in-house design and specification service. Each packaged treatment plant can be designed to site-specific requirements.

Each system is supplied with an installation manual and an operation and maintenance manual. Civil installation of the units can be arranged through a WPL recommended contractor.

WPL suggests that maintenance should only be undertaken by a reputable service company with British Water accredited service engineers.

Design parameters

Design Criteria	British Water's Flows and Loads 4
Peak flow treatment	Generally 3 dry weather flow
Invert depth	0.5m as standard, other invert depths available up to 1.5m
Discharge standards	The WPL HiPAF will typically attain BOD^5 20mg/l; SS 30mg/l; NH_4-N 20mg/l as standard. With biological treatment, stricter standards can be achieved, meeting BOD^5 10mg/l; SS 10mg/l; NH_4-N 2mg/l (with tertiary treatment). Higher standards are achievable. With the use of additional equipment WPL can produce effluent to meet phosphate standards when required.

Design options

- Inverts up to 1.5m with turret extensions
- Pumped inlet flow control
- Control panels are available to cater for single and three phase electrical supplies
- Alarm beacon for mechanical failure and loss of air pressure
- Duty/standby blowers with automatic changeover to ensure an uninterrupted air supply
- Energy-saving options such as variable speed drive blowers
- GSM telemetry for remote monitoring of the plant
- WPL Sand Filters/WPL Micro-screens can improve final effluent for strict consent requirements

Kiosk Options

Each WPL HiPAF treatment plant comes with a weatherproof kiosk to house the control panel and air blowers on site. The standard issue kiosk, which is acoustically-lined, houses a control panel, which automatically manages the operation of the plant; the air distribution manifold and one or more air blowers as required.

Features include thermostatic cut-off controls and air filtering monitoring which can alert the operator to loss of air pressure. Ten metres of high temperature resistant airline hose is supplied to connect blowers to the treatment plant – extra lengths can be supplied if the kiosk is sited further than 10m from the treatment unit.

Case Studies

Holiday Park treatment tackles seasonal flows

An existing sewage treatment plant located at the foot of the Quantock Hills in Somerset needed replacing. It was important to find a robust and reliable treatment for the static caravans and chalets on-site.

The Environment Agency stipulated the treated effluent quality, which is released into the historic bay of St Audries, should achieve a maximum of 40mg/l biochemical oxygen demand (BOD) and 60mg/l suspended solids (SS).

WPL HiPAF tanks were installed below ground. A two way flow splitter, installed between the HiPAFs and the primary tank separates the effluent into parallel streams, allowing the operators to switch between the two HiPAF systems or to use both at once, subject to load.

As the treatment site was close to a number of static caravans, it was important to create a replacement plant which was low on noise and odour. The Nethercott family, who own the Home Farm Holiday Centre, wanted the installation to take place with as little disruption to the natural environment as possible.

Dibby Nethercott, one of the owners said:

"The new treatment plant fulfils our requirement in that it is quiet when in operation and treats effluent to a high environmental standard."

Population equivalent: 1000
Consent: 40mg/l BOD^5 and 60mg/l SS
Design flow rate: 155.4m^3/day and 5.4l/sec peak flow

Discreet package treatment installed at English whisky distillery

When it came to choosing a package sewage treatment plant for The Lakes Distillery on the banks of Lake Bassenthwaite, it was important to find a model which could blend into the stunning rural setting and also treat wastewater to the highest environmental standards.

WPL HiPAF midi was chosen and fitted as the new distillery was taking shape. Treated water from the plant will be discharged into the River Derwent, which is a site of special scientific interest (SSSI), meaning pollutants have to be thoroughly removed from wastewater to meet statutory regulations.

The below ground WPL HiPAF midi can be controlled in such a way to guarantee removal of organic pollutants and total nitrification to meet surface water discharge consents even in SSSI's.

Managing director of The Lakes Distillery Paul Currie said:

"Our distillery is building a reputation as one of the greenest in the world, so it was important for every part of our renovation and building work to be carried out to the highest possible environmental standards."

The lakes which is at the heart of the Lake District National Park will produce a million bottles of English malt a year and expects to welcome 55,000 visitors annually.

Population equivalent: 177
Consent: 20mg/l BOD^5; 30mg/l SS; 20mg/l NH_4-N
Design flow rate: 10.2m^3/day flow and 0.35 l/sec peak flow

Northumberland National Park visitor centre selects WPL package treatment

A prestigious new visitor centre in the heart of Northumberland National Park has benefitted from a specially designed package plant from WPL. The Sill National Landscape Discovery Centre, a ₸14.2m joint project between the National Park and the Youth Hostel Association, has been built with the help of ₸8m from the Heritage Lottery Fund.

The treated effluent at the site is released into a natural stream while sludge is periodically tankered to an offsite wastewater treatment works. It was very important to supply back-up blowers and to enable the facility to connect a generator in the event of a power failure. The package plant comprises of two modular high performance aerated filter – HiPAF – units, a primary settlement tank to separate solids and a submerged aerated filter (SAF) tank for biological treatment. WPL have also supplied an extra-large, glass-reinforced plastic control kiosk.

Stuart Evans, Sill Project Director of Northumberland National Park said:

"The Sill will be much more than a visitor attraction – it will enable us to reconnect with our landscapes and our heritage. It is important that we seek the highest environmental standards in all our construction and operational activity to minimise disruption to the natural beauty of the area."

Population equivalent: 500
Consent: 20mg/l BOD^5; 30mg/l SS; 10mg/l NH_4-N
Design flow rate: 40m^3/day flow and 1.39 l/sec peak flow

Sewage treatment upgrade at remote historic site

A celebrated historic site on an island in the Orkney archipelago needed to upgrade its wastewater treatment plant; ensuring its replacement was able to cope with wildly fluctuating flows and extreme weather conditions. Whether coping with the impact of thousands of visitors during the summer or surviving the vagaries of the Orkney winter, the new compact treatment plant would be serving visitors to the Neolithic treasure for years to come.

A huge increase in the numbers of cruise ship visitors was one of the main reasons that the original WPL HiPAF system needed to be replaced. The previous plant was installed in 1997 when the Visitor Centre was first built and over the sixteen year time period, gave very few problems - which is why its engineers were happy to install a new WPL system to replace it.

The original plant was re-purposed to create an overflow tank by removing the internal equipment. This tank can now be used for storage should effluent pass a certain level in the event of prolonged power failure in extreme winter weather conditions.

Despite the technical challenges, the compact nature of the plant meant it could be transported and installed with minimum disruption to the daily running of the visitor centre.

Population equivalent: 500
Consent: 20mg/l BOD^5; 30mg/l SS; 20mg/l NH_4-N
Design flow rate: 19.4m^3/day flow and 0.67l/sec peak flow

Case Studies

Premier treatment for Swansea City's New Training Centre

The success of Premier League football team Swansea City on the pitch has been matched by the remarkable transformation of the club's new Fairwood training centre. Modernisation of the facility, which is leased from the University of Swansea, included building eight full-size pitches, changing facilities, offices, seminar rooms, a canteen and specialist medical and physiotherapy rooms.

Importantly, to accommodate the impressive new buildings and a significant increase in activity at the site, extra sewage treatment processing was also required. In view of the prestigious, public nature of the site, the installation needed to be wholly reliable, and discreet. The existing gravity-fed trickling filter plant, while meeting discharge consents, was too basic to accommodate the new demands. Further, the location of the legacy plant, in a wooded area 150m from the facility, also made it difficult to service and maintain.

The WPL HiPAF midi plant suits a usage of 60-300 people and can easily handle the variable pattern of usage to be expected at a state of the art premier league training facility.

Population equivalent: 300
Consent: 20mg/l BOD^5; 30mg/l SS; 20mg/l NH_4-N
Design flow rate: 11.1m^3/day flow and 0.39l/sec peak flow

Yorkshire Water installed WPL HiPAF® in rural village

Yorkshire Water installed a customised sewage treatment plant produced by WPL in the scenic, rural village of Appletreewick, in the Yorkshire Dales. The WPL HiPAF modular packaged treatment plant was used to replace the current system. The customised wastewater treatment system is designed to meet site specific requirements for up to 300 population equivalent and adheres to the Yorkshire Water assets standards.

Due to the aesthetics of both the village and the surroundings, minimal visual impact of the product was required. The WPL HiPAF modular is completely below ground, meaning that it does not impede the scenic views of the Yorkshire Dales and requires only a small excavation. A factor that had to be considered was the site's highly variable flow rate increases due to surface water ingress. At the Appletreewick site, the peak flow can reach levels over 20 times that of the dry weather flow. Flow retention within the primary, SAF (biozone) and humus tanks means that the WPL HiPAF modular "Off-site built" plant can cope with variable flows and loads, a key benefit of this particular system.

Population equivalent: 300
Consent: 40mg/l BOD^5 and 60mg/l SS
Design flow rate: 671m^3/day flow and 7.76l/sec peak flow

About WPL

WPL have been at the forefront of wastewater treatment technology for over 25 years, with international experience of technical design, quality of manufacture and supply of environmental wastewater solutions.

Our high level of expertise means that we offer all of our customers, from the individual home owner to the large municipal communities and industrial markets, robust wastewater treatment process solutions that are environmentally compliant.

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