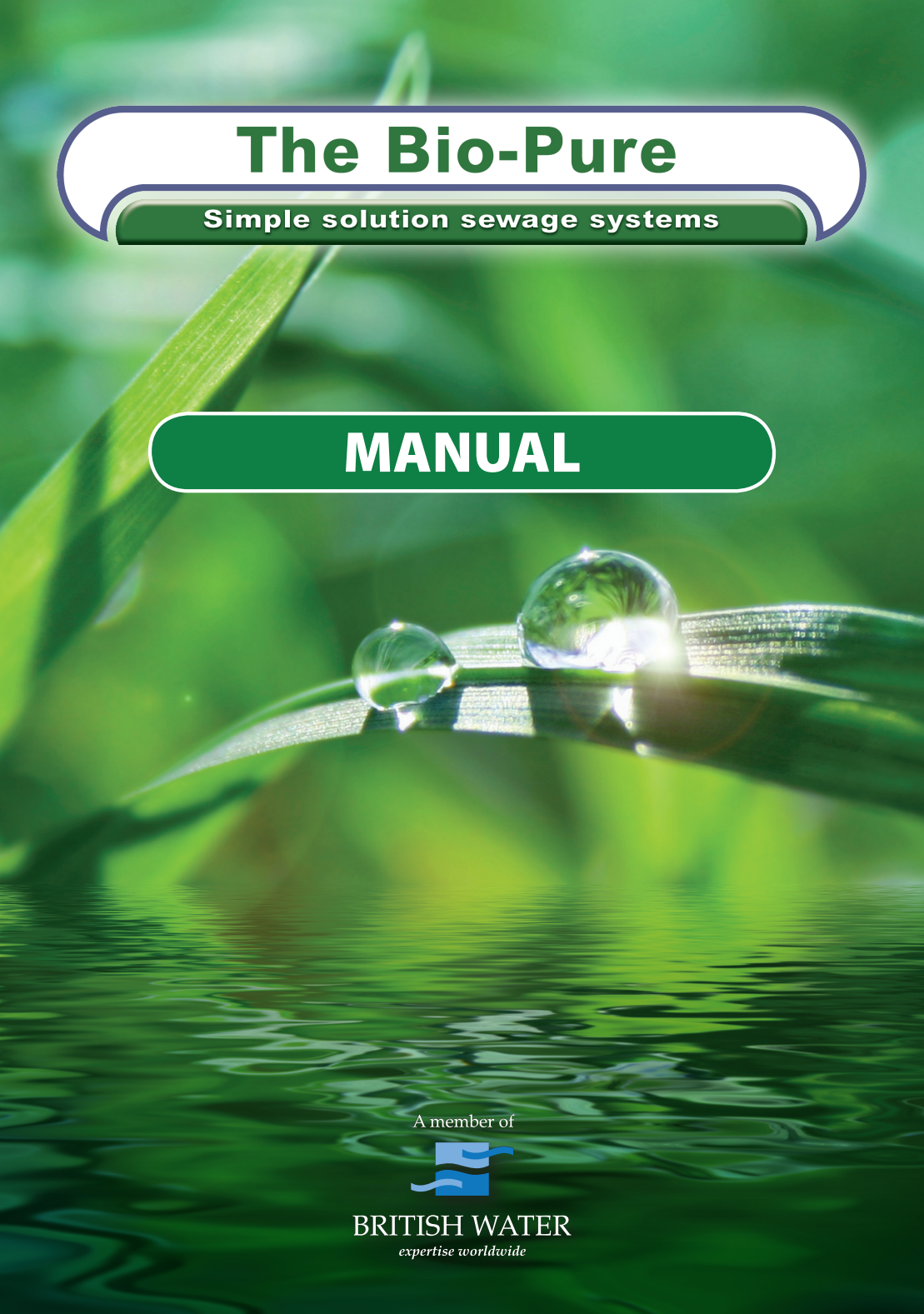
The Bio-Pure

Simple solution sewage systems

MANUAL



A member of

BRITISH WATER

expertise worldwide

PIA
Institute for Wastewater Technology

PERFORMANCE RESULTS

We Build It Ltd
Kingsnordley Farm, Kingsnordley
Nr. Alveley, Bridgnorth, WV15 6EU Shropshire, United Kingdom

EN 12566-3, Annex B
"Small wastewater treatment systems for up to 50 PT"

Small wastewater treatment system Bio-Pure
biological aeration system

Nominal organic daily load	0.26	kg/d	
Nominal hydraulic daily load	0.80	m³/d	
Material	Glass reinforced plastic (GRP)		
Treatment efficiency (nominal sequences)	COD	92.1 %	
	BOD_5	96.2 %	
	SS	94.9 %	
	NH_4-N*	81.4 %	
Electrical consumption	1.3	kWh/d	

** determined for temperatures ≥ 12°C in the bioreactor.*

Performance tested by:
PIA - Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
D-52074 Aachen

Certified according to ISO 9001:2000

Notified Body number: 1739

This document replaces neither the declaration of conformity nor the CE marking.

Prüfinstitut für Abwassertechnik GmbH
geprüft - tested - testé

Elmar Lancé June 2010

Health and Safety

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 following requires the user's attention:

- 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

1.2 Health

It is the client's responsibility to ensure that all necessary protective clothing and equipment is available.

1.2.1 Leptospirosis

There are two types of Leptospirosis which affect people in the UK Weils disease and Hardjo-type Leptospirosis.
Weil's disease 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 is transmitted to humans from cattle.
Both diseases start with a flu-like illness with a persistent and severe headache, muscle pains and vomiting. Jaundice appears about the fourth day of illness.
The disease is caught by entering the body through cuts and scratches and through the lining of the mouth, throat and eyes.

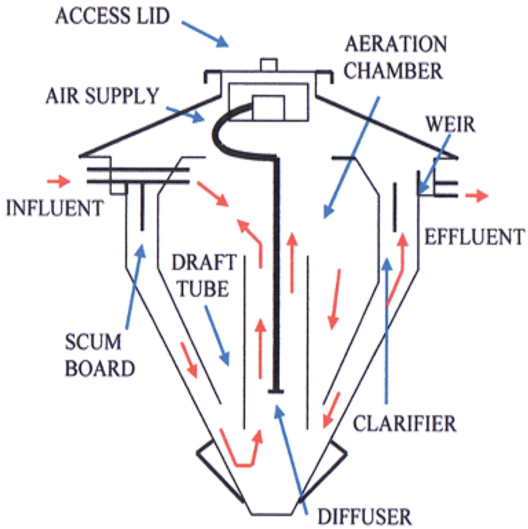
1.2.2 Sensible Precautions

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 above after coming into contact with sewage, report to your doctor immediately advising of the circumstances.

1.3 Safety

Sewage gases are potentially explosive and toxic. Do not enter any of the below ground compartments of the Bio-pure sewage treatment plant.
Before carrying out any maintenance work the equipment must be electrically isolated. Do not leave covers open for any longer than necessary. Temporary barriers and warning signs should be erected around any open covers or manholes as appropriate particularly warning of deep water in the tanks.

Introduction



The Bio-Pure is a fibreglass conical shaped tank containing a circular aeration chamber, a centre draft tube with an air diffuser located in the centre through which air is continuously forced by means of a blower motor.
Raw sewage enters the Bio-Pure through the inlet pipe flowing into the centre aeration chamber. Air released through the diffuser at the bottom of the draft tube causes an upward flow of fluid ensuring continuous combining of oxygen with sewage. This allows for growth of various aerobic organisms that biologically degrade the sewage contaminants.
Any remaining aerated solids settle to the bottom of the tank where they are drawn back up through the draft tube repeatedly until thoroughly cleansed.
As more sewage enters through the inlet and into the aeration chamber it displaces the treated effluent into the outer tank, any remaining solids will settle to the base and return back to the aeration chamber. The treated effluent will flow over the weir and out of the outlet where it can be disposed of through a water course or soak away.
The Bio-Pure is 96% efficient, thus allowing long intervals before de-sludge is required. The waste water is cleaned to a standard of 20 mg/l biological oxygen demand and 30 mg/l suspended solids, meeting the usual discharge level requirement.

Installation Notes

Installation should be carried out observing good working practice and adhering to the Health and Safety at Work Act
NOTE – Specialist advice must be sought when installing in high water table or flood conditions. It is not recommended to install the unit near to trees and shrubs but if this is necessary the unit should be surrounded by a root-proof membrane.

Delivery

The unit is delivered on a pallet and the purchaser is responsible for offloading at the nearest roadway. It is important to inspect the unit for any damage before removing strappings. Ensure the unit is placed onto suitable ground to ensure that damage is not caused.

Air Blower

Air Blower must be stored in clean, dry conditions until required.

Lifting

Ensure that the unit contains no water prior to lifting. The unit can be lifted by means of attaching strappings to the four eye bolts. Care must be taken to avoid sudden movements of the unit when crossing rough ground.

Where to Site the Bio-Pure

When choosing a suitable site for your Bio-Pure certain parameters should be taken into consideration. The Bio-Pure should be sited, where possible, no closer than 7 metres to a habitable dwelling. The site should be easily accessible for maintenance with particular consideration for de-sludging equipment. It is advisable to keep within a 30-35 metre radius for where a de-sludge lorry can park safely. The Bio-Pure should not be subject to car loading unless advice is taken from a Structural Engineer. The Bio-Pure should have a maximum back fill height of 2 metres from invert level using a combination of body and neck extensions. Considerations should be given to areas prone to flooding and suitable anti-floatation measures used. Where possible the site should be free from trees and shrubs. If this is not possible, then a suitable barrier should be used to stop roots growing in and around the unit. Ensure that the air vent is free from obstruction at all times.

Equipment Required for Installation

A JCB (or similar) with sufficient reach to attain depth of excavation
Slings and shackles for lifting
Backfill material
Water to fill tank
Electrical cabling - armoured or ducted -2.5mm twin and earth
IP55 rated outdoor double socket with RCD
Sample chamber

Operation and Maintenance Manual

Bio-Pure Operation

The Bio-Pure is designed to operate automatically with minimum maintenance after it has been commissioned. The unit will provide effluent within the designed discharge consent standard after an initial start up period of 4-10 weeks, all dependent upon the temperature of the water. The sewage input conditions must be kept within the criteria of the plant design.

The air blower runs continuously to aerate the sewage and there are two essential tasks:

1. De-sludging the plant (every 3-5 years)
2. Blower maintenance according to type fitted

Annual Check

Remove air pump chamber and observe the inner chamber (It has been observed on some lightly loaded units, that a thick scum or crust can build up in the clarifying section between the aeration chamber and the scum baffle. Using a scoop or ladle break the scum away and return it to the aeration chamber).

- Check and clean filters on air blower
- Check air leakage at fittings in air supply
- Check moisture or mud accumulation
- Check for presence of septic odour
- Check for colour of aeration chamber contents (see troubleshooting guide for comparison)
- Check for excessive sudsing or foaming
- Check for accumulation of grease balls and non bio-degradable material (if present use a wire skimmer basket, remove and dispose of in a proper manner)
- Check air supply at aeration chamber (air check can be performed by observing the amount of disturbance when air pump is running). If necessary check diffuser for clogging
- Check aeration chamber mixed liquor suspended solids (MLSS) by collecting a sample from the aeration chamber while air pump is running. Observe the rate of settling, volume of settled solids and clarity of clear part
- Check depth of scum layer and remove to aeration chamber as required

De-Sludging

Bacteria and other micro-organisms present in the wastewater use the soluble organic material as a food source and convert it into a non-soluble mass or floc, comprising of living micro-organisms and sewage particles, along with inert non-biodegradable material. This process matures and the number of micro-organisms increases until there is an adequate biomass to digest all the soluble organic material in the incoming sewage. Competition for food (and starvation) leads to the dying of organisms as new organisms are formed, the dying organisms in turn are metabolised and reduce the overall sludge volume. There is a gradual increase in the volume of the solids due to the accumulation of the remains of dead organisms mixed with the non-degradable material in the raw wastewater. As the solids increase the mixed liquor, the contents of the aeration chamber become darker brown in colour and thicker and the excess solids need to be periodically de-sludged from the Bio-Pure in order to ensure that the unit continues to run efficiently.

The frequency in which the solids accumulate in the Bio-Pure and therefore the rate at which these excess solids need to be removed, is dependent upon the total volume and strength (BOD) of the wastewater entering the unit. A guide for a typical residential system will require de-sludging every 3-5 years.

To ensure optimum treatment efficiency and effluent quality the level of aeration solids (MLSS) will need to be maintained within a suitable range. A low level of solids in the aeration chamber (i.e. during start up) reduces the unit's ability to provide adequate treatment during peak operating times. Excessive solids can lead to poor settling during times of hydraulic surges or in development of septic conditions in the unit.

It is therefore necessary to determine when the Bio-Pure requires de-sludging by means of a 30 minute solid settlement test during the 6 monthly check, as follows:-

1. Take a large jar and mark up into 10 equal parts
2. Fill the jar with a sample of the liquid (MLSS) from mid-depth of the aeration chamber, while the compressor is running. Do not collect a sample from within the draft tube
3. Leave sample to settle for 30 minutes. If the sample appears to be settling slowly leave for 24 hours to ensure it has settled completely
4. Observe the volume of the settled sludge as a percentage of the total volume of the sample. Sometimes after leaving the sample to settle, part of the settled sludge may float to the top of the sample, if this is the case add together the volume of settled sludge and volume of floating sludge
5. Check percentage of settled sludge (the volume) to clear liquor. The optimum level of solid settlement is normally somewhere between 5 and 50%. When the volume of sludge is more than 50%, de-sludging of the unit should be carried out

You will need to note the sludge characteristics of the MLSS (mixed liquor suspended solids) sample collected from the aeration chamber.

As the sample settles note the colour, whether the sludge particles clump together in a dense floc that settles rapidly, is the liquid above the settled sludge (supernatant) clear? And does the sample have an odour?

Healthy sludge should have a chocolate brown colour and should form a dense floc that settles rapidly and leaves a clear and odourless supernatant. If the sample has a grey/black colour, is slow settling, has a cloudy supernatant or has a supernatant containing very fine, suspended particles, this is usually a sign of poor treatment plant operation. It is important therefore to compare your findings of the Bio-Pure unit as well as the sample of mixed liquor suspended solids to the conditions to assess whether the unit is operating properly or if any corrective action is required.

To De-Sludge the Bio-Pure

1. Remove access lid by removing the cable ties, remove the 2 screws holding the pump chamber, then lift out and put to one side
2. Lower tanker hose into inner aeration chamber, sliding hose down wall of inner tank until it rests on bottom of outer tank or clarifier. Do not insert hose down draft tube, this will damage diffuser and airline
3. Pump solids from bottom of outer tank, which will lower liquid level in both inner and outer tanks simultaneously
4. As the level of the liquid drops, the scum layer between the inner tank and scum baffle will usually break loose and drop to the bottom where it can be sucked out. With a garden hose flush any remaining scum or residue to the bottom of tank
5. It is not necessary to pump the unit totally dry unless plant is septic or there is an excessive build up of scum. It is advisable to leave a small amount of sludge in the bottom (5-10 gallons/22-45 litres) to reduce the normal start-up period
6. In areas with a high water table refill the tank with clear water immediately to avoid shifting or flotation.

The amount of sludge accumulated depends on the loading of unit. Each site has its own specified characteristics.

Unit		Total Internal Volume – Litres
Bio-Pure 1 & 2	=	**2270**
Bio-Pure 3	=	**3000**
Bio-Pure 4 & 5	=	**3975**
Bio-Pure 6	=	**5610**
Bio-Pure 7	=	**6975**
Bio-Pure 8 & 9	=	**7950**
Bio-Pure 10	=	**11220**

Trouble Shooting

A - PROBLEM	B - CAUSE	C - ACTION TO BE TAKEN
1. Air blower running but little or no turbulence is noted in aeration chamber	Insufficient air supply to aeration chamber due to:	
	1. Blocked air diffuser	1. Disconnect air pipe at union and clean or replace air diffuser
	2. Blocked air hose or pipe	2. Inspect hose and pipe for blockages paying special attention to joints. Unblock as necessary
	3. Leaking hose or pipe joints	3. Inspect all hose and pipe joints and tighten as necessary
	4. Kinked, crushed or split air hose or pipe	4. Inspect and replace as necessary
2. Aeration chamber contents have a greyish (dishwater) appearance	5. As B 1-4	5. As C 1-4
3. Noticeable odour and poor quality of effluent	6. As B 1-4	6. As C 1-4
4. Aeration chamber contents are grey/brown to black, slight to strong septic odour, air blower is running and good turbulence is evident, quality of effluent is poor and grey	7. Heavy hydraulic surge flows from laundry or kitchen activities	7. For commercial applications install a surge tank before the Bio-Pure
		8. For residential applications reduce the frequency of laundry to 1-2 loads per day
5. Aeration chamber has a clear appearance with very few suspended solids (<5%), white suds noted, effluent is clear with no odour	8. Light loading resulting in total digestion of solids	9. No action required if effluent quality is acceptable. Typical of intermittent use
		10. If quality of effluent is unacceptable slow down oxidation by providing a timer on air blower. Contact your supplier for on/off periods
6. Aeration chamber as 5 but with very fine particles in effluent causing it to appear turbid or murky	9. See B 8	11. See C 9-10

Trouble Shooting

A - PROBLEM	B - CAUSE	C - ACTION TO BE TAKEN
7. Aeration chamber contents have grey appearance and slightly septic odour	10. System is slightly loaded and has been in use for less than 3 months	12. Continue start-up regime of minimal laundry and minimal cleaning chemicals 13. See C 1-4
	11. Insufficient organic matter present in influent resulting in slow start-up	14. 'Seed' plant with fresh activated sludge to help initiate start up.
	12. See B 8	15. As Item 5, Action to be taken
8. Aeration chamber contents are grey to black, effluent is grey and has strong septic odour	13. Organic overload due to excessive use of waste disposal unit	16. Refrain from discharging food scraps, grease, oil etc into waste disposal
	14. As B 1-4	17. As C 1-4
9. Grease balls are noted in aeration chamber contents	15. Excessive laundry use	18. As C 4
	16. As B 1-4	19. As C 1-4
	17. Insufficient dissolved oxygen (DO)	20. At the time of a peak flow turn air blower off for 15 minutes and check DO with a meter. If DO is less than 1.0 part per million, contact your supplier for assistance
10. Effluent contains brown suspended solids, more noticeable during peak flow periods	18. Heavy build up of mixed liquor suspended solids (MLSS) due to normal, long term usage	21. De-sludge the Bio-Pure
	19. Excessive (>125mm) of scum has accumulated in the clarifying chamber. The scum is being carried under the scum baffle	22. Remove scum back to aeration chamber with a scoop
11. System requires de-sludging more frequently	20. Excessive use of powdered laundry detergent	23. Use liquid detergents or concentrated powders
12. Effluent contains excessive suspended solids, aeration chamber contents have a normal chocolate brown colour but sludge settles slowly in jar and forms a light floc	21. Overabundance of filamentous bacteria that prevent compaction and settling of the sludge	24. Contact your supplier for specific recommendations

Do's and Don'ts of using the Bio-Pure

The Bio-Pure is designed for modern day living and will cope very well with every day detergents as long as these are used in sensible doses. It is better to use little and often rather than to use a large quantity, as many products are designed to kill 'all known bacteria'. It is good to remember that the unit relies on bacteria to clean the water. By using the correct dose not only will this ensure your Bio-Pure functions correctly, it will also save you a lot of unnecessary expense.

DO

- ✔ **Try to stick to the same brands of cleaning products.** Your unit will become quite tolerant to the brands you use
- ✔ **Use liquids instead of powders.** Liquids are kinder to the bacteria in the unit
- ✔ **Spread out your washing through the week.** Don't have a 'washing day'
- ✔ **Consider washing with 'Ecoballs'.** * They work very well and contain no detergent or phosphates, great for your sewage unit (and for allergies). **www.ecozone.co.uk**
- ✔ **Service your Bio-Pure once a year.** It only takes about 1 hour, and will keep your tank functioning properly
- ✔ **Keep the lid of the Bio-Pure accessible.** It will be easier for servicing and pumping
- ✔ **If you experience a problem, call us or a professional.** Only let experts look after your unit
- ✔ **Fix leaky faucets.** This will cause more water to flow into the system

DON'T

- ✖ **Throw any medicines down the sink/loo.** Antibiotics will kill your unit
- ✖ **Empty large amounts of detergents and bleach down the sink/loo.** Pour the buckets down your outside drains, as these are not connected to the unit
- ✖ **Allow anti-bacterial substances, (hand wash, dettox, etc) to enter the unit.** These will KILL the unit. Wipe your hands first with a paper towel and throw this in the bin, then wash your hands in the sink as this will remove most of the anti-bacteria hand wash before it enters the sewage treatment plant
- ✖ **Pour sterilizing fluids (Milton, etc.) down the sink.** These will KILL the unit
- ✖ **Pour large quantities of milk down the sink.** The BOD of milk is too high and the bacteria will suffer
- ✖ **Put sanitary items, nappy liners, baby wipes, cotton wool, etc. down the toilet.** Cotton wool 'shreds' when wet, is very slow to degrade and blocks everything
- ✖ **Empty cooking oil down the sink.** The oil will smother the friendly bacteria in your unit
- ✖ **Allow a 'hot tub' or 'spa' to discharge into this unit.** The volumes are too great and will flush untreated sewage through your unit. If chlorination is used, this will also KILL the bacteria
- ✖ **Empty home-brew residues down the sink.** Yeasts will take over your unit.
- ✖ **Install a waste disposal unit.** The unit would need to be three times the size to digest the additional organic waste produced

Limited Warranty Information

The Bio-Pure is guaranteed to meet the designed Effluent Discharge Standard for the life of the plant, provided that:

- The advice in the installation manual is adhered to;
- The proper maintenance procedures are adhered to;
- The flows and loads do not exceed those stated in the Table of Loadings in the Code of Practice: Flows and Loads- 2;
- Where nitrification is required, there is sufficient hardness in the water;
- Grease from commercial kitchens is not present in the influent, a suitable grease trap should be used;
- Performance is measured after the process has matured;
- No Biological Inhibitors are present in the influent;
- The pH is 7 to 9.

We Build It Ltd offer a limited warranty on the Bio-Pure units, manufactured by We Build It Ltd. The warranty period is 25 years on all GRP parts of the Bio-Pure unit, and a 2 year warranty on the compressor. The warranty only covers defects in materials and workmanship from normal use and service. We Build It Ltd limit the warranty to repairing or replacing any defective GRP parts and/or the compressor within the specified time limits. If a defect should arise, contact should be made with We Build It Ltd, who will investigate the claim.

We Build It Ltd shall not be liable for any labour costs involved in the removal or replacement of its equipment, or any handling, packaging and transportation costs. We Build It Ltd are in no case liable for loss incurred or damages due to interruption of service. This shall not give cause for cancellation of the contract.

The warranty form must be filled in and sent back to We Build It Ltd (in the stamped addressed envelope provided) within 90 days from the date of purchase. Failure to do so will void the warranty. The warranty is only valid for the person that purchased the unit, at the given address. **The warranty is non-transferable.**

Any of the following will void the manufacturer's warranty:

(1) Any installation or penetration of the Bio-Pure unit not carried out in accordance with the installation instructions.
(2) Any damage to the Bio-Pure unit as a result of failure to carry out the specified checks, as stated in the installation manual.
(3) Any damage to the Bio-Pure unit as a result of failure to comply with the 'Do's and Don'ts of using Sewage Treatment Units', as specified in the installation manual.
(4) Placing the Bio-Pure unit under any unauthorised loading for which it was not designed.
(5) Limited life consumable components subject to normal wear and tear.
(6) Accident, improper use, alteration or tampering with the unit.
(7) Failure to properly fill in and send back the Warranty Form to We Build It Ltd.

This warranty gives specific additional benefits.
Your Statutory Rights are not affected.

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