User's Guide

to BubbleBead™ Filters

Models 1.5, 3, 5, 7,9

CONTENTS

Your New BubbleBead™ Filter

Congratulations on the purchase of your new filter.

GREAT WATER QUALITY

BubbleBead filters are ideally suited to koi ponds, ornamental fish tanks, fish holding systems and aquaculture facilities. They give excellent water clarity whilst at the same time working as an efficient biological filter, breaking down fish wastes. A correctly sized unit can achieve this clean and clear water quality on its own, or it can be used in conjunction with other filter equipment.

EASY CLEANING

The BubbleBead's major advantage is the ease with which it can be cleaned. On the automatic models this simply involves turning off the pump to start the patented backwash process.... no wet hands! Trapped dirt is flushed to waste by the ingenious patented valve system. By carrying out this backwash regularly, fish wastes can be removed from the system before they have fully broken down. This greatly reduces the nutrient loading on your system and further improves water quality for the fish. The whole process can even be **fully automated** by simply wiring the pump to an appropriate timer.

ADAPTABLE AND VERSATILE

Use the unit as a standalone filter, or use it to boost an existing filter system. Fit the BubbleBead filter near your existing pond, or at a distance. Site it at the pond edge or well above the pond. Hide it behind a bush or fence, or even in a shed or garage. The unit takes up a fraction of the space of some other types of filter, and no labour intensive excavation is necessary to site it.

STRAIGHTFORWARD TO FIT AND USE

BubbleBead filters require no additional blowers or multiport valve operations to run or backwash. But as with any equipment, the filter will function at its best if it is fitted and maintained correctly. Please take a short while to look through this guide before you get going, so that you can get the very best from your new filter system.

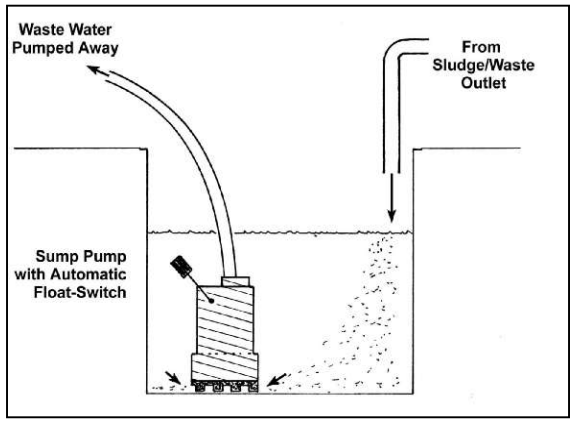
Siting the filter

Before you start to assemble your filter, think carefully about where it is to be sited. Choosing the wrong site may cause the filter to function less well or make it awkward to carry out maintenance in the future. The filter can be some distance from the pond, but a more powerful pump may be required to overcome the friction loss in the longer pipework.

CHOOSE A SITE CLOSE TO A DRAIN FOR THE WASTE WATER

When you clean the filter, dirty water flows from waste outlet. In most cases this water can be piped to a convenient nearby drain. As it is nutrient rich, the waste water can also be used for irrigation in gardens (provided that treatments and salt have not been used in the pond).

The drain or sump area must be below the filter's waste outlet. If this is not possible, either the filter can be raised up higher, or a sump tank can be sited below the filter containing a sump pump that will automatically pump the waste water away. In some cases it is possible to plumb the filter waste outlet directly to a pump, to pump water from the filter.



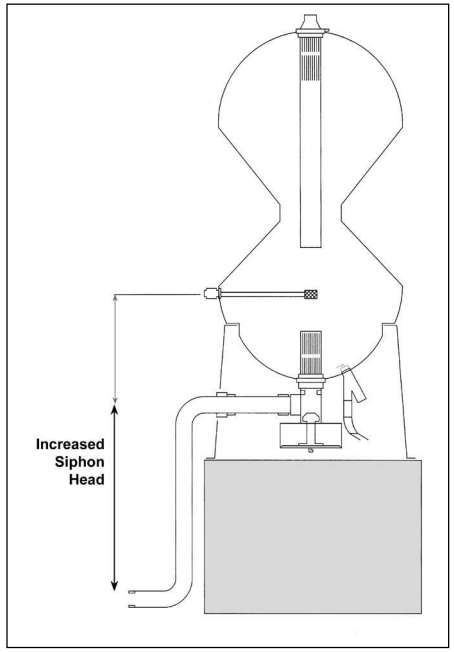
Using a separate sump and sump pump to dispose of waste water.

This is an ideal option for sites set below local drainage, or where waste water is to be pumped to irrigation pipes.

Waste water is often high in solids and organic waste and must not be emptied directly into natural water bodies. You may need permission to direct this waste into public sewers.

For the bead media to be cleaned vigorously, waste water needs to drain rapidly and forcefully from the waste outlet (Check that your drains or soakaway can cope with this surge!). Rapid draining is simply achieved by using suitably large bore hose and ensuring that there is some siphon head to help pull water from the filter (see next page). As the water drains, air is sucked into the filter to help clean the bead media.

THE SIPHON HEAD



The siphon head (see diagram) is the distance between the filter waste outlet and the air strainer inlet to the filter.

This distance is over 30 cm on the filters as supplied, which is adequate in most circumstances. However, by simply raising the filter on a plinth (built from one or two courses of standard building blocks topped with a paving slab) and adding an extension pipe, the siphon head is increased and the efficiency of backwash **greatly improved**.

We recommend that this increased siphon head be created wherever possible.

FIRM BASE

The filter needs to be mounted on a firm level base. The units are heavy when full of water and **must** be adequately supported for safety. Position the filter on a level, purpose made slabbed area or concrete plinth. The inlet on hydraulic valve units must be **above** the level of water in the adjacent pond for the valve to operate correctly.

FUTURE ACCESS

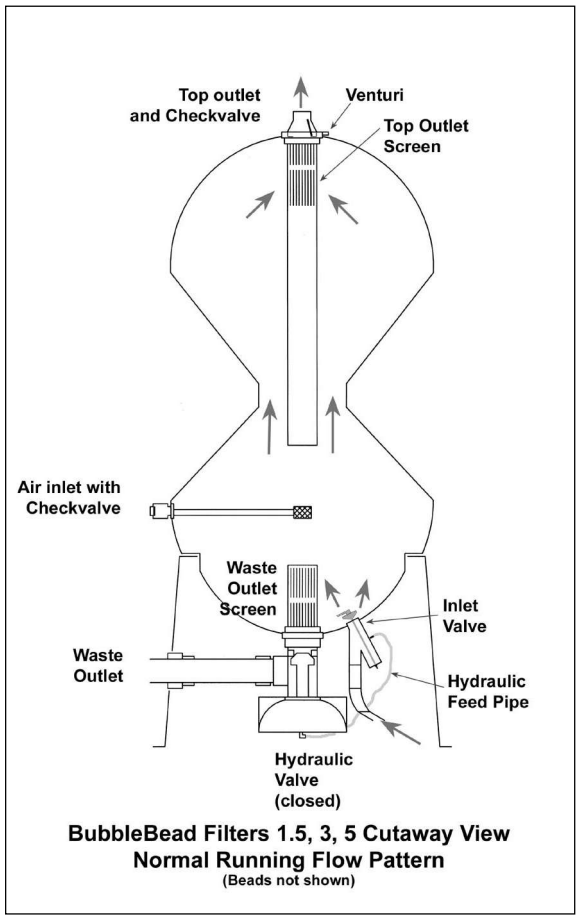
It may be necessary to access the inlet valve adjustment, or clean the hydraulic valve, or remove the strainers on an occasional basis. The fittings at the base and top of the filter should therefore be readily accessible and **not** permanently boxed in or buried.

OUTSIDE OR UNDER COVER?

The filters are suited to outdoor use but if sited in an outhouse, shed or garage, they will not only be out of sight from the pond but also better protected from severe frosts (see the Winter Running section – page 33).

STANDARD FLOW PATTERN

Water is pumped in, through the inlet valve and up through the unit. The floating beads pack down into the top of the unit, forming a filter-bed where both biological breakdown of wastes and mechanical filtering of solids takes place. Filtered water leaves through the outlet screen and outlet checkvalve.



BubbleBead Filters 1.5, 3, 5 Cutaway View
Normal Running Flow Pattern
(Beads not shown)

CUTTING EDGE TECHNOLOGY

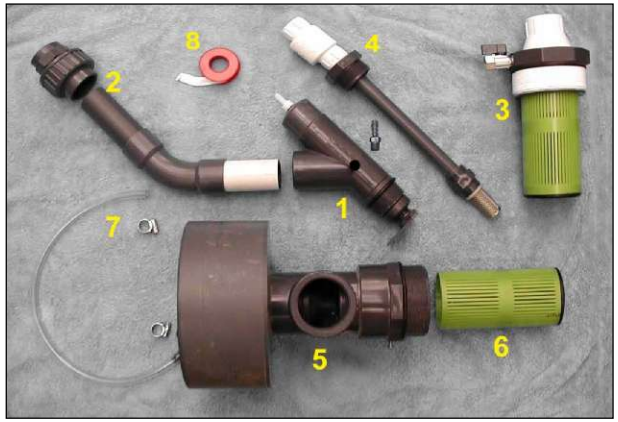
Bead filters have been in development since the 1970's leading to the design and patenting of the BubbleBead filter by Ronald F. Malone at Louisiana State University. The distinctive necked design and the bubble washing process are a key to its effectiveness; features which are missing from systems that seek to imitate the BubbleBead filter's success. The gentle bubble-wash, as the beads tumble through the washing throat, removes dirt whilst leaving just the right amount of biological film on the bead surface. Alternative means of cleaning the beads (e.g. propellers or water jets) can carry a risk of removing too much of the beneficial biological film, with a consequent drop in water quality. BubbleBeads avoid this risk. The recently patented integral valve system (allowing automatic backwash without the need for expensive solenoid valves) keeps BubbleBead filters at the cutting edge of filtration technology.

Assembling your BubbleBead Filter: Parts supplied

The filter is supplied with some parts assembled. Check that you have all the relevant parts before commencing. You would be wise to complete reading this guide before you start the final positioning of the filter.

The parts provided:
- Main filter body;
- Filter Stand;
- Bead media;
- Waste outlet extension pipe.

(above items not pictured)



1) Inlet Valve & small-bore hosetail;

2) Inlet extension pipe (or hose) & dismountable union;

3) Top-outlet strainer assembly (with extension on models 3-9) & venturi;

4) Air inlet assembly;

5) Hydraulic Valve assembly (waste outlet);

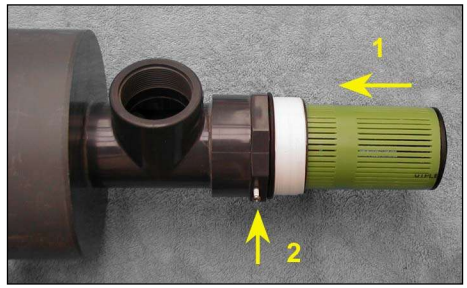
6) Waste Outlet Strainer;

7) Hydraulic Valve feed pipe and two hoseclips;

8) PTFE plumbing tape;

N.B. Items pictured are from the BBF 1.5. On the larger models the waste outlet strainer will appear longer, and the top outlet will have an extension piece. Ensure all parts are present before proceeding and contact your dealer immediately if anything is missing or damaged.

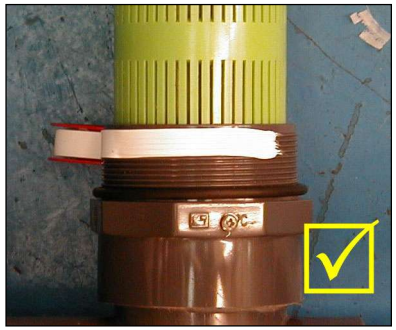
Assembling your BubbleBead Filter: Procedure

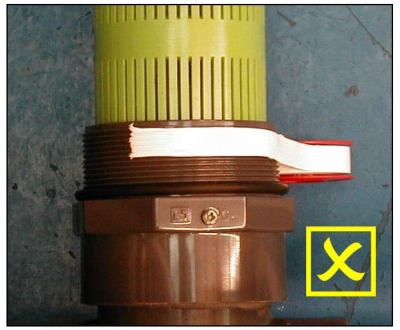


1) Hydraulic Valve Assembly: Remove the small locking screw and wrap with PTFE tape. Insert the open end of the outlet strainer into the opening on the assembly (◄ **1**). Insert and tighten the locking screw to hold the outlet strainer firmly in place (◄ **2**).

2) Threaded fittings: Wrap **all** threaded fittings (top-outlet assembly, hydraulic valve and air inlet assemblies), with PTFE plumbers tape.

Tips for using plumbers tape





With the insertion end of the male fitting facing you, tightly wrap ample P.T.F.E. tape on in a clockwise direction. If the tape is wound on in the wrong direction it will tend to peel off as the fitting is screwed in. Thinner brands of tape may require five+ winds depth to provide a sufficient seal.

3) Hydraulic Valve Feed Pipe: After wrapping the thread with PTFE, screw the small elbowed hose tail into the hole in the base of the hydraulic valve. Do **not** tighten fully at this stage. Fit on the clear hydraulic feed pipe, and clamp it with the hose clip provided. ►

◄ 4) Move (close) to final site:
If there is enough room to work, place the filter stand in its final position.

For models 3 - 9 it is safer to have **two people** to help handle and move the filter in this and the following stages. Rest the main filter body on its side on the filter stand with the lower (expansion) chamber over the centre of the filter stand (see picture).

For model 1.5, rest the filter on its head on a clean level surface, with the bottom facing upwards.

Tips for inserting threaded fittings

Gently brush out the threads on the female fitting, ensuring that they are clean and free from debris. Align the male and female threads carefully to avoid cross threading. Whilst exerting slight pressure, turn the assembly *counter-clockwise* a half turn or so, until the threads click into place. Now screw the male fitting clockwise by hand, continuing to take care to avoid cross-threading. If the fitting does not appear to be threading in correctly, carefully remove it and start again. Where there is a tight fit or the fitting is very difficult to turn, apply silicone lubricating spray to the female threads to make the threading process easier. (Do **not** use 'WD-40' or similar automotive lubricants which can prove toxic to fish.) **Take your time and do not rush this procedure.**

Only use tools (e.g. belt wrenches) to tighten fittings once they have started to thread in correctly. Do not use tools which might damage either the threads or the fittings and avoid using projecting pipework as a lever. **Never** overtighten or force fittings as this might damage them.

5) Fit the Inlet Valve: If the valve has a flapped insert, ensure that it is tightened. Then insert the valve into the 1½" hole to the side of the large hole in the base of the filter. (N.B. If this hole is not cut out, check with your dealer first!).

Some models have an additional 1½" drain hole which is sealed or plugged. This is for an optional sediment drain (see page 32).

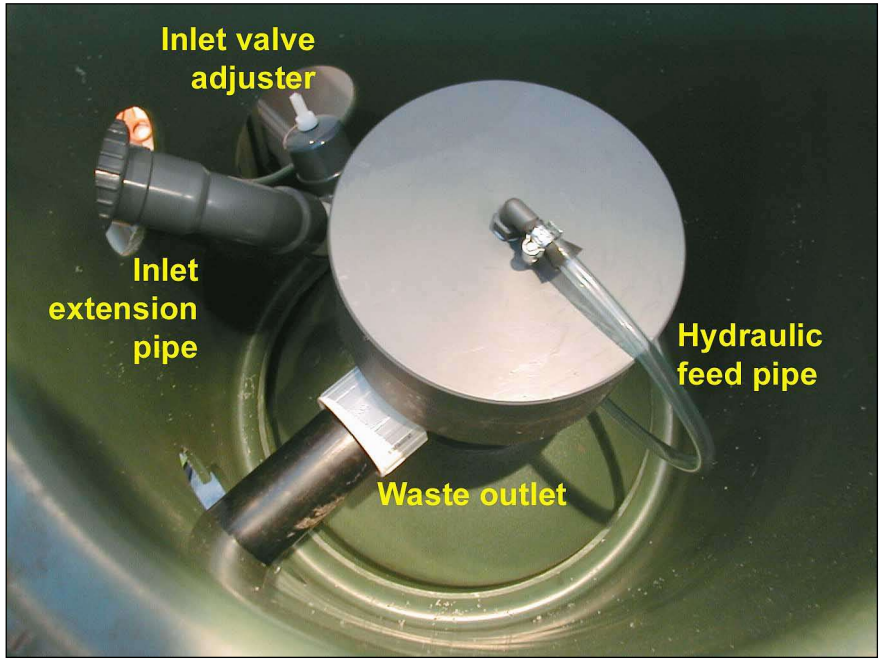
Carefully screw the inlet valve into place taking great care to avoid cross-threading. The PTFE tape is the main sealing agent for the threads. The 'O' ring is only a secondary seal for fittings that tighten easily by hand. Do **not** tighten fully at this stage.

6) Fit the Hydraulic Valve: Screw the hydraulic valve assembly into the base of the filter housing taking care to avoid cross-threading. The PTFE tape is the main sealing agent for the threads. The 'O' ring is only a secondary seal for fittings that tighten easily by hand. Do **not** tighten fully at this stage.

7) Trial fitting of the Filter Stand: With the model 1.5 on its head, and the 3 & 5 laid on their side and raised slightly off the ground, fit the filter stand over the pipe fittings and seat it on the rim around the filter body. (An extra pair of hands helps here).

8) Align the Filter Stand: The holes need to be aligned with the following fittings:

- The extension pipework and union on the inlet valve (1).
- The adjustable screw and locking nut at the end of the inlet valve (2).
- The waste outlet on the hydraulic valve (3), and
- The optional sediment drain if fitted (see page 32). In some cases it may be necessary to cut an extra hole in the stand for this pipe (see below).



Looking into the base of a model 1.5 filter, laid on its head to allow the stand to be fitted. The waste and inlet extensions have been loosely fitted to help with the aligning.

The extension pipework is loosely fitted to both the filter inlet valve and the waste outlet from the hydraulic valve. Turn the inlet fitting and the hydraulic valve to help align the parts correctly, tightening them in the process. If supplied unglued, do **not** glue fittings at this stage.

The extension pipework is kept as short as possible to make it easier to remove the filter from the stand at a later date.

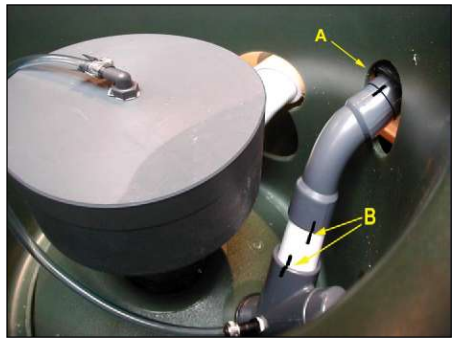
Although holes have been pre-cut in the filter stand, in some cases it may be necessary to cut extra holes. This is often necessary if access to the filter will be from one side only, in which case the inlet and outlet can be moved relatively close together. Use a suitable hole cutter rather than a saw. Perfectly round holes retain the strength of the stand much better than irregularly shaped holes.

- Avoid cutting more holes than absolutely necessary
- Avoid cutting a number of holes very close to each other
- For safety, chamfer the sharp edges left by hole cutters

9) Connect the Hydraulic Feed Pipe: Turn and tighten the hosetail elbow in the hydraulic valve if it helps with the alignment of the hydraulic feed pipe, then fit the loose end of this pipe to the hosetail on the inlet valve and clamp it into place. It is very important that the pipe is not kinked or trapped in any way. The length of this pipe has an important effect on the backwash process - see page 41.

10) Assemble the Inlet Pipework: If the inlet pipework (bend, extensions and union) have been supplied unglued - position them correctly before gluing them. Move them about and trim the extension pieces if necessary to obtain the best alignment with the hole in the stand.

To check that the filter can be successfully dissembled in the future: Temporarily remove the waste outlet extension and check that the stand can be parted from the filter body without being impeded by the inlet pipework (remove the dismountable section of the union If necessary).

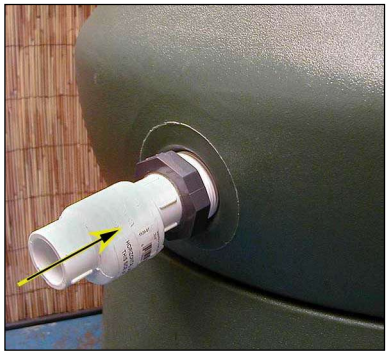


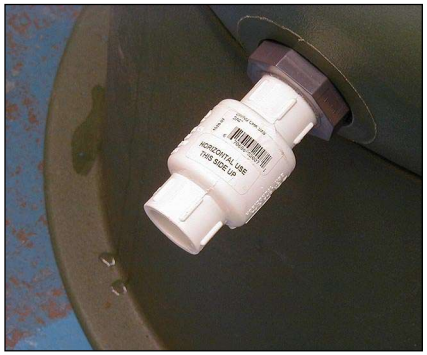
With the stand in place, double check that the inlet pipework is correctly aligned with the hole in the stand (A). Note the alignment with felt pen marks across each joint (B). Dissemble and clean the joints - taking care not to wipe off the pen marks. Glue the pipework back into place, using the pen marks as a guide to the alignment. Give the glue time to set.

11) Final Siting: Carefully turn the filter the correct way up on its stand and place it on a level surface. It should ideally be in its final site at this stage, though if access or headroom is very limited there, you may wish to carry out the trial run (outlined on page 22) in an alternative site. Fit the waste outlet extension pipework into the socket in the hydraulic valve. For threaded fittings, remember to firstly wrap the threads on the insertion with PTFE tape. For glued fittings, ensure that excess glue does not run into the hydraulic valve itself.

12) Fit the Air Inlet: Some units are supplied with brass/stainless fittings but filters for marine use should have the plastic strainer screen and plastic flapper valve option, ask your dealer. If a white flapper is supplied in your pack it will need to be glued onto the grey fitting. The direction is **into** the filter (so the flap can be lifted by pushing from the outside in).

Screw the fitting into the side of the filter body taking care to avoid cross threading. Hand tighten and leave the bulge on the white flapper valve uppermost, marked: HORIZONTAL USE - THIS SIDE UP.

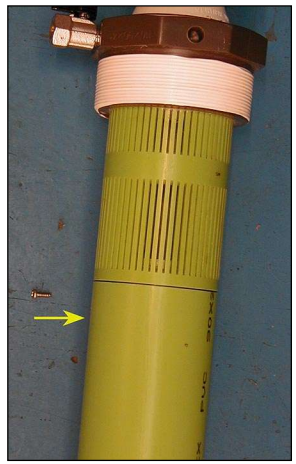




Ensure that the inlet/outlets at the base and top are readily accessible for maintenance, and that there is sufficient room left for connecting pipes. Although the filter could be filled with beads at this stage we strongly recommend a test run **without** beads. This 'wet' run points out leaks in the system, and any pipework modifications that are necessary will be much easier to carry out whilst the filter has no beads in it.

13) Top Outlet Assembly: If the top outlet assembly is not already pre-assembled, push the extension tube onto the spigot below the strainer, ensuring that there is no gap left. The extension is held in place with the stainless screw, which should be firmly screwed into place through the pre-drilled pilot hole (see diagrams).

N.B. Pre-assembled units are glued and do not require this screw. There is no extension on the Model 1.5 outlet assembly as one is not required.



The small metal venturi valve in the side of the top fitting should be removed, the threads wound with PTFE tape, and then screwed back in. Hand tighten, so as to leave the tap uppermost. In normal use the valve should be in the **closed** position. (Venturi use, page 42).

Wind PTFE tape generously onto the thread of the top-outlet assembly. On models with an 'O' ring, check that this is in place in the cut-out groove (arrowed). Lower the assembly into the filter taking great care to align it vertically so as to avoid cross threading (see p.9). Screw this fitting in by hand at first. Tighten using the hexagonal section as a grip, either with a belt wrench (as shown) or a specific tool that fits the hexagonal fitting. Do **not** use the venturi valve as a lever to tighten the assembly!

PTFE on the threads provides the **main** seal. Any 'O' ring (if fitted) is an **additional** seal. Only continue to tighten the fitting (to compress the 'O' ring) if the fitting turns easily. If it seals sufficiently when only threaded three-quarters of the way in, there is no need to tighten further!

Plumbing in

Do fit the inlet and outlet pipework in a way that allows it to be easily disconnected for maintenance.

Plumbing the top outlet: The socket in the top of the filter should be plumbed using solvent weld fittings. Optional fittings kits are available from your dealer to connect this top outlet to a 90° bend with a solvent union or a dismountable hosetail. One other option is shown here. Use wide bore bends. On the larger models it is preferable to use swept or 2 x 45° bends

to handle the high flows with minimal restriction. For ease of future maintenance it is **essential** to fit a dismountable union close to the filter.

The return to the pond can be in solvent pipe or via a hosetail (as shown), for connection to reinforced hose. Trim multi-fit hosetails to suit the largest hose possible. Narrow hoses reduce filter efficiency and create undesirable backpressure.

All pipework **must** be fully supported so that it does **not** put undue strain on the fittings. Also see the plumbing tips below.

Plumbing the filter inlet: The inlet has a dismountable union that ends with a 1¼" female BSP socket and this is provided with a 1½" / 1¼" hosetail. Larger filters are provided with an adaptor to 1½" BSP female which can be further adapted to suit solvent weld pipe if required.

If the hosetail is the stepped type, trim this to suit the hose used.

Plumbing the waste outlet: The extension to the waste outlet is fitted with a 2" male BSP adaptor. This can be adapted to a 2"/50mm dismountable hosetail or to 2" solvent weld or push-fit waste pipe.

It is particularly important to avoid restricting flow from the waste outlet. Avoid using excessive numbers of bends and use the largest practical bore of pipework. Some users install a sight-glass in the waste pipework so that they can easily see how much dirt there is in the waste water.

The very final section of pipe, whether a vertical or horizontal drop, can use slightly smaller pipe (e.g. 56mm i.d. reducing to 50mm). This slight restriction ensures that when the filter is drained, the entire pipe fills with water, driving out air and starting a siphon action, which helps to suck dirt from the filter. A relatively long horizontal outlet in solid pipe also encourages this siphon action and is an ideal alternative where raising the filter is not feasible. Avoid excessive lengths of undulating hose as this can encourage airlocks. Rapid draining of water from the waste outlet is essential for an efficient filter backwash.

The filter should ideally be relatively close to your drainage system or soak-away for ease of waste water disposal. If this is not possible, see the option shown on page 4.

Plumbing tips:

• To minimise pressure loss on the inlet and backpressure on the outlets:

- use larger bore pipe/hose wherever an option is possible
- all pipe fittings (including UVs) must be as large bore as possible
- avoid multiple fittings with internal restrictions
- avoid using valves on the top filter outlet! (see Appendix Three)
- consider swept rather than knuckle bends and keep bends to a minimum
- flexible hose should be heavy duty, crushproof, opaque, smooth bore, and suited to the pressures likely to be found in the system.

• To prevent strain on the filter inlet/outlet fittings:

- **support pipework** with pipe-clips etc., it is heavy when full of water!
- **avoid the weight of pumps or external UVs being carried by the inlet/outlet fittings.** Failure to do so, could void your guarantee.
- You may not want to fix the pipework permanently until after the test run has taken place.

• To prevent leaks of water out, or air in:

- use PTFE plumbers tape on **all** threaded fittings
- use solvent cleaner on any solvent-weld fittings before use and use ample amounts of an appropriate glue. Set up solvent fittings in a 'dry run' to check positionings **before** final gluing takes place. Glue needs time to set!
- use correctly sized hosetails and appropriate hose clips. If the hose is slightly loose on the hosetail, run a strip of silicone sealant (or 'Innotec' Adheseal) around the hosetail before fitting the hose and clamping down.

Clips can distort hose causing leaks if over-tightened.
TIP: To reduce this risk, wrap the end of the hose with a single layer strip of rubber liner before fitting the clip.

• To prevent excess pump vibration reaching the filter:

- use flexible hose in the outlet pipework from surface mounted pumps.

• To avoid corrosion or poisoning problems:

- avoid metal fittings
- if metal parts are used, choose quality materials e.g. (316) stainless steel.

Choosing the correct size of pump

Pump size is related both to the volume it pumps **and** the pressure with which it pumps. The maximum pump flows to aim for are listed on the table on page 19. It is possible to run the filter at lower flow rates when used on smaller systems or if 'ticking over' during winter months. For best results the filter should be run at no less than 30% of the rated maximum flow. This flow is required to supply the filter organisms with the necessary oxygenated water for efficient filtration.

THE MINIMUM HEAD:

There is some loss of pressure across the bead bed, especially as the filter approaches the time for backwash. Although pumps with a relatively low maximum head (2 metres) may be powerful enough to completely fill the filter when the pump is first switched on, there is a risk with such pumps of 'underpressure' (see page 20), which leads to poor filter performance. To avoid this we recommend using pumps with a rated head of at least 4.0 metres (13 feet) or at least 2 metres more than the 'working head' of the pump (see the table overleaf). The working head is the vertical distance between the water level in the originating pond/tank, and the highest point in the filter/pipework loop that returns to the pond. Flow rates should be calculated at the pump's working head, not the maximum pump flows quoted by some manufacturers, which are taken at zero head!

MAXIMUM PRESSURES:

The filter hull itself has a maximum pressure rating. On the Hydraulic Valve models this rating is 1.5 bar (20 psi) though we recommend that pumps should be chosen with heads not exceeding 10 metres (equivalent to 1 bar pressure) to allow for the higher surges in pressure when the pump is first turned on. If you are using a high pressure pump (e.g. a powerful swimming pool pump) these may exceed the pressure rating. For all pumps with a quoted head exceeding 10 metres we consider it **essential** to use a bypass tee before the filter inlet, with a pressure regulating spring-check-valve to prevent excess pressures building on the filter. (Appendix Three). A pressure gauge is also very useful in such situations.

Some swimming pool pumps are not designed to be run at low pressures or low heads. As the pressure through a BubbleBead filter may drop as low

as 0.15 – 0.20 bar (2 - 3 psi / 1.5 - 2.0 metre head equivalent) only use pumps whose recommended range drops this low.

WHICH PUMP?

The table below notes the maximum filter flow rates and the volumes that might be filtered at a two or three hour turnover rate. On heavily stocked commercial systems the required turnover rate might be once or more per hour, and the volume treated would need to be reduced accordingly.

Your dealer should be able to recommend suitable pump models from the brands available in your area, also see our website. Remember that a small pump may not suit longer pipe runs or high head situations. If in doubt, it is better to have a slightly larger pump and use a valve on the pump, or a bypass to control excess flow, rather than to have a small pump with no spare capacity. Surface mounted pumps should be of the self-priming type or installed in a way that ensures they cannot run dry.

Model Model number refers to cubic feet of media	**Max. Feed Rate per day** (Max. Koi load @1% feed rate)	**Max. Rec. FlowRate gph** *(lpm)*	**Maximum Pond Volume Gallons** *(Litres)* at maximum rec. flow rates 2 hour - turnover - 3 hour Standard Stock	Light Stock	**Suggested Pump Size** Pre-straining or pre-settlement is **essential** when using solids handling pumps	Recommended **UV** for algae control at standard stock volume in full sun #
BBF-1.5 1.5m high 0.59m dia. 70L backwash	**0.75 lbs.** *340 gm* (34 Kg)	**1,250** *95*	**2,500** *11,000*	**3,750** *17,000*	Maximum head of the pump should be at least 2.0 metres more than the working head or exceed 4.0 metres whichever is the higher figure *BBF-5, 7, 9 When operating at maximum flow rates, at least 10% of the flow should bypass the filter and be directed back to the pond for circulation and aeration	**30w** or 2 x 11w PL
BBF-3 1.70m high 0.79m dia. 210L backwash	**1.5 lbs.** *650 gm* (65 Kg)	**2,500** *190*	**5,000** *22,500*	**7,500** *34,000*		**55w** or 2 x 30w or 4 x 11w PL
BBF-5 1.95m high 0.79m dia. 280L backwash	**2.5 lbs.** *1.1 Kg* (110 Kg)	**4,000*** *300*	**8,000** *36,000*	**12,000** *55,000*		**2 x 55w** or 3 x 30w or 3 x 36w PL
BBF-7 2.25m high 0.79m dia. 340L backwash	**3.5 lbs.** *1.5 Kg* (150 Kg)	**5,600*** *425*	**11,000** *50,000*	**16,500** *75,000*		**3 x 55w** or 5 x 30w
BBF-9 2.5m high 0.79m dia. 400L backwash	**4.5 lbs.** *2.0 Kg* (200 Kg)	**7,200*** *550*	**14,500** *66,000*	**22,000** *100,000*		**4 x 55w** or 6 x 30w

N.B. A pressure release bypass is essential if using high pressure pumps rated with a combined suction & delivery head exceeding 10m (1 bar, See Appendix Three). Gallons are imperial, multiply by 1.2 for US Gallons. # For control of parasites etc., much higher levels of UV are required.

ELECTRICAL SAFETY

The pump should be installed according to its instructions, and fitted with a safety circuit breaker (RCD). The RCD should be of the latching type that does not require resetting after a powercut. Some types may be too sensitive to the power surges caused by turning the pump on and off. In these cases a less sensitive RCD may need to be fitted – contact your local electrician for advice.

STRAINERS

BubbleBead filters contain internal screens with slots of c. 1.5 mm spacing designed to prevent loss of beads. The rate of internal screen clogging will be reduced if solids of greater than 1.5 - 2 mm and strands of blanketweed are removed before being pumped to the filter. This greatly reduces the need for screen maintenance. Therefore **it is very important to fit an appropriate strainer before the inlet** (Also see Appendix Two). Very fine additional strainers (e.g. fine open-cell foam blocks) are neither necessary nor desirable, unless specified by pump manufacturers.

The correct size of ultra violet (UV) unit

UV units are a recommended option especially for pools positioned in sunlight. Their use is described in Appendix One, and the table on the previous page gives suggested wattage ratings.

Important points

AIR-BREAKS AND UNDERPRESSURE

If the filter return outlet beside the pond is below the level of the air inlet checkvalve on the filter, there is a slight risk of siphoning occurring. If siphoning occurs, air can be drawn into the filter through the air inlet during normal running. These bubbles can disrupt the filter media causing water cloudiness and also result in a dripping air inlet.

This is more prevalent on:

- new or very clean filters,
- filters with undersized or low pressure pumps,
- filters with long runs of wide bore piping on the return to the pond, and
- filters where the pump flow has been throttled back, either by a valve on the pump outlet, or because the pump inlet strainer is clogging.

You can tell if underpressure is the cause of a dripping air inlet by placing your hand temporarily over the return outlet to the pond. If the dripping stops within a minute, then underpressure is the likely cause.

Higher return outlets (e.g. to a cascade), reduce the risk of siphoning. Ideally, the return pipe to the pond should enter above water level to create an air-break. This also reduces the risk of siphoning and at the same time helps aerate the water returning to the pool. The venturi valve on the top filter outlet can also be used to provide aeration and overcome underpressure (see page 42).

AERATION OF FILTERED WATER RETURNED TO THE POND

System water **must** be aerated at some point as both the fish and the filter bacteria can consume high amounts of oxygen, especially in warm weather. Returns that encourage some re-aeration of the water are strongly recommended, e.g. cascades. Venturi devices in the pond are an option but some create a great deal of undesirable backpressure whilst others can encourage the underpressure symptoms noted above. Use the filter's integral venturi instead (see page 42).

NON-RETURN VALVES / FOOTVALVES

To prevent surface pumps from losing their prime, manufacturers may recommend that a non-return valve ('footvalve') is situated by the pump. As the filter inlet valve acts as a non-return valve, any additional foot-valve should **not** be used - it will prevent the correct operation of the hydraulic valve. The inlet valve may be sufficient to maintain prime following short periods when the pump is turned off, but to guarantee prime, site the pump at a level below that of the water in the adjacent pond.

Starting the filter for the first time - the test run

Start up the pump, do not turn on UVs at this stage. The waste outlet may dribble slightly until the hydraulic valve has completely closed; this usually takes 15-60 seconds. On this first time of running you may wish to direct the first few gallons of water from the top outlet to waste, as any dust from the pipework will be flushed out.

Check for leaks. If any of the threaded fittings leak, and gentle tightening does not help, the filter will need to be drained, the offending fitting removed and rewound with extra PTFE tape before refitting. Do not attempt to seal such leaks by smearing the outside of the filter with sealant, glue, mastic or repair compounds. This rarely solves the problem, it may make future dismantling difficult or impossible, and damage the filter body - voiding your guarantee. Leaks from solvent weld joints will need to be completely dried before attempting to reseal them.

STRETCHING THE HYDRAULIC MEMBRANE

On new filters the membrane in the hydraulic valve can be more stiff and may take longer to stretch and move the valve to the closed position. The seal in the valve seat may also take a few days of use to 'seat in' and seal perfectly. If the waste outlet continues to dribble after a minute or two, the membrane inside the hydraulic valve can be stretched further by temporarily placing your hand over the water return to the pond. This increases the pressure inside the filter, the filter inlet pipe, and the hydraulic valve feed pipe. This will close the valve over a period of a minute. This procedure is normally only necessary on new filters or where the hydraulic valve has not been used for some time. If it proves necessary to repeat this process to close the hydraulic valve, the inlet valve adjustment can be tightened using a flat bladed screwdriver. This increases the water pressure to the hydraulic valve. Also check that the hydraulic feed pipe is not clogged or kinked in any way & see page 42.

If there are no leaks and water output is flowing evenly, your BubbleBead filter is operating properly and is now ready to add beads.

Turn off the pump. The inlet valve will close immediately, the top-outlet checkvalve will close by itself and the hydraulic valve will begin to open, releasing water to the waste outlet. Allow the filter to drain completely.

ADDING THE BEADS

After the successful trial run, disconnect the pipework from the top outlet at a suitable dismount, and carefully unscrew and remove the top outlet assembly. Fill the filter with the supplied beads, through the top opening. Do not add more beads than the filter is designed to hold. It can be useful to use a wide funnel at this point to avoid losing beads. Only use genuine BubbleBead Media to prevent clogging of the strainers or valve assemblies. Use of inappropriate media will void your guarantee.

Once the beads have been added, the top outlet assembly can be reinserted and screwed into place. Use fresh PTFE tape if required and take care to avoid cross threading. Reconnect the outlet pipework.

Starting the filter for the first time - with beads

Restart the filter pump. As the filter fills, the beads will rattle against the side of the filter body but the noise will stop once the filter is full. The beads may be slightly dusty, so you may wish to direct the first few gallons of water to waste this first time.

It is a good idea to measure the flow rate of water returning to the pond. Use a graduated bucket and stopwatch to calculate the flow rate. Adjust the flow rate as required by using a flow regulator on the pump outlet. Do **not** fit flow regulators on the filter outlet (see AppendixThree).

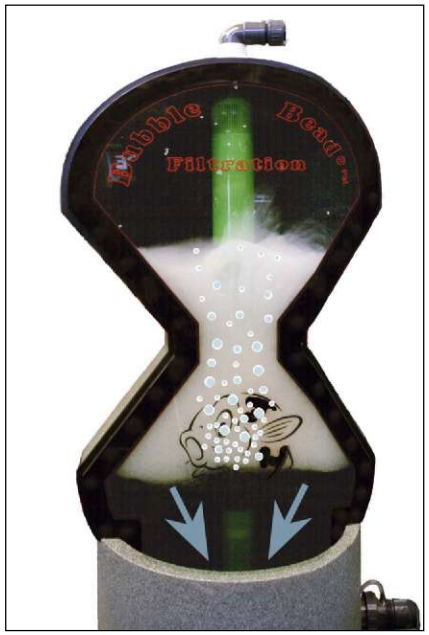
If a pressure gauge has been fitted, note the typical pressure on the dial and make a note of it in a space on page 51.

THE TRIAL BACKWASH

Now is a good time to carry out a **trial backwash cycle**.

1) There are no valves to open and there is no need to get your hands wet or dirty from cleaning media. Simply turn off the pump. The water inlet valve springs closed to prevent water or beads from flowing back into the pond through the pump. The top-outlet checkvalve will close and the hydraulic valve will gradually start to open, releasing water to the waste outlet.

2) Immediately, make a note of the time or use a stopwatch. Put your ear to the side of the filter and **listen**. Air is sucked into the filter through the air inlet check-valve. As beads tumble clean in the cascade of air bubbles they rattle against the side of the filter body. Allow the filter to drain down completely. This first time, the water from the waste valve should be no more dirty than the pond water itself. Listening to the unit lets you hear how a normal backwash should sound.



3) As soon as the flow from the waste outlet drops to a trickle, make a note of the time or turn off your stopwatch. The time taken to drain the filter is representative of the minimum time that your filter is likely to take for a backwash cycle and acts as a benchmark to compare with in future. Note this time in the space on page 51. This time also guides you on the very minimum amount of time that the filter pump should be turned off for the backwash to take place. Always allow time for the filter to drain down completely.

4) Restart the pump. Note the time taken for the filter to refill. This will also act as a benchmark for the future as it gives an indication of the cleanliness of the strainer on your pump. Note this time also in the space on page 51. Remember that the waste outlet may trickle for a short while until the hydraulic valve is fully closed.

Your filter is now tested and operating correctly. The floating bead media packs down in the top of the filter and will soon start to filter out particles. Filtration of finest particles and biological breakdown of wastes also takes place here once the filter has matured.

Running-in your filter

Apart from backwashes, your filter should run 24 hours a day to support the biological organisms that will colonise the filter media; just like your fish they need oxygen to survive.

Although mechanical filtration starts straight away, it can take up to three months for full biological activity to mature, especially in brand new ponds and in cold weather. Patience is necessary during this phase. If there are no fish in the pond, commercial additives are available that contain ammonium salts and nitrites that imitate fish waste and help the filter to mature. Otherwise, there are a number of steps that you can take to aid the maturing process:

1) Do not immediately introduce large numbers of fish. Build up fish stocks gradually using hardy fish of lower value to begin with.

2) Feed fish more lightly than normal in the first two months.

3) After the first few days of operation, add a commercial filter seeding agent that contains filter bacteria. Alternatively swill out the debris from an existing active pond filter and pour it into the pond near the pump intake.

4) Avoid the use of pond medications during the filter maturing period. Some medications can severely disrupt filter organisms and many medications can temporarily reduce filter activity, especially on the first time of use. If in doubt ask a specialist before using any treatments.

5) Avoid turning on UV units during the first month. The water may green temporarily but this is rarely harmful.

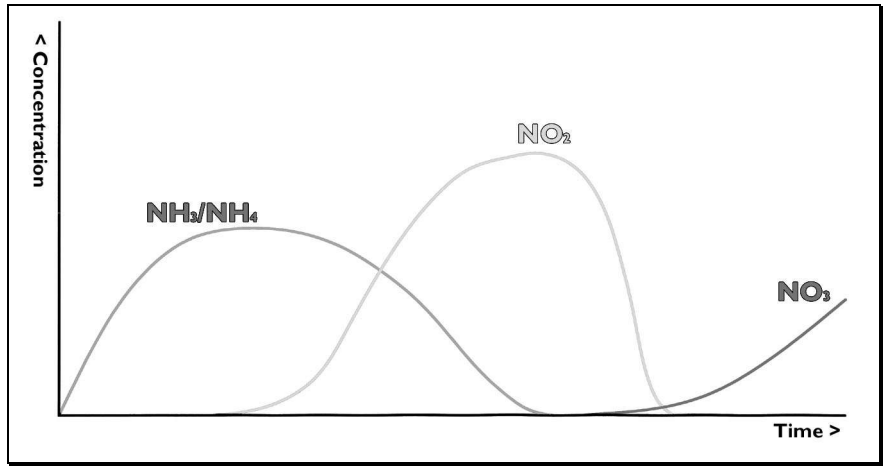
You can monitor the maturing process by using standard pond test kits. The most useful ones at this stage are pH, nitrite (NO_2), ammonia/ammonium (NH_3/NH_4) and nitrate (NO_3).

The pH should remain relatively stable and need only be checked occasionally at this stage. Typically, acceptable pond pH values range from 6.5 to 9.0 with the ideal range for pondfish being between 7.0 and 8.5.

ESTABLISHING NITRIFICATION

The major soluble waste product produced by fish is ammonia and its ammonium salts, and this is the first product to build up in the water. Bacteria that break down organic wastes and uneaten food also add to the levels of ammonia in the water. Within a week or two (in a few days in warm weather), specific bacteria that feed on ammonia start to build up on the surfaces of the beads in the filter, and they begin to break the ammonia down into nitrites. As the nitrite levels become more detectable in the water, the ammonia levels usually start to fall. Finally, other specific bacteria increase in numbers to feed on the nitrites converting them to nitrates. The whole process that results in the breakdown of these nitrogen containing products is known as **nitrification** and the fluctuations in these waste products typically follows the pattern illustrated in the adjacent graph.

TYPICAL WATER QUALITY DURING FILTER MATURATION



Ammonia (NH_3/NH_4) and nitrite (NO_2) are both stressful to fish, and whilst they are present in the water, new additions of fish should be avoided. Once the filter has matured sufficiently, these two waste products should be reduced to below detectable levels and only the more benign nitrate (NO_3) may be detectable. However, a sudden increase in loading at any stage (with fish or fish food) may overwhelm the filter resulting in a reappearance of ammonia and nitrite until the filter bacteria can increase in numbers to cope.

If ammonia or nitrite appear in the water after the maturing period it can suggest problems, and these are dealt with in the Troubleshooting section on Water Quality in this guide (p.36).

When to backwash the BubbleBead filter

During the maturing period, whilst new ponds are relatively free of waste, the filter will take some time to become dirty. The delicate film that supports the growing filter bacteria will also begin to form on the surface of the beads. In order to avoid disrupting the bacteria at this crucial early stage, avoid backwashing the filter for two to four weeks, especially in ponds with clean water. The major sign that a backwash is necessary is when there is a notable drop in the flow from the filter outlet. Check that this is not merely due to the strainer on the pump becoming clogged.

If the flow has dropped to around a half to two thirds of the initial rate, (or the inlet pressure gauge, where fitted, has risen to 1.4 psi / 0.1 bar above the typical level when clean) then the backwash procedure **must** be carried out.

MONITORING THE STANDARD BACKWASH

1) Turn off the pump. The water inlet valve springs closed to prevent water or beads from flowing back into the pond through the pump. The top-outlet checkvalve will close and the hydraulic valve will gradually start to open, releasing water to the waste outlet.

2) Air is sucked into the filter through the air inlet check-valve. Remember to listen for typical sounds as the filter empties. The beads drop through the washing throat and are tumbled clean in a cascade of foaming water and air bubbles. Observe the waste water. Dirt trapped by the beads will wash out near the end of the flush. For best results allow the filter to drain down completely.

3) As soon as the flow drops to a trickle from the drain, you can restart the pump. Remember that the waste outlet will continue to trickle for a short while until the hydraulic valve is fully closed. This helps to flush sediment from the pipework and waste outlet strainer.

4) It is quite normal for the first few gallons of water from the filter top-outlet to the pond to be a little cloudy. This is not harmful and the filter will soon remove these particles and maintain the clarity of the pool. It makes sense not to carry out a backwash immediately before any important viewing of the pond. (See page 41 for further comments).

After this first backwash the standard backwash frequencies **must** be implemented. Once established, the beneficial bacteria on the surface of the beads can withstand numerous backwash cycles without any major disruption of nitrification. Indeed, tests have shown that the gentle bubble-wash actually improves the efficiency of nitrification by the filter bacteria.

If in doubt …..backwash.

The Recommended minimum backwash cycles for your model:

MODEL	MINIMUM BACKWASH FREQUENCY			Typical Backwash Water Loss (approximate)
	Winter < 10 degC	Spring & Autumn	Summer	
BBF - 1.5	Once or Twice Weekly	Twice Weekly	Every One to Two Days	15 Gallons 70 Litres
BBF - 3	Once or Twice Weekly	Twice Weekly	Every One to Two Days	45 Gallons 210 Litres
BBF - 5	Once or Twice Weekly	Twice Weekly	Every One to Two Days	60 Gallons 280 Litres
BBF - 7	Twice Weekly	Two to three times a week	Once a Day	75 Gallons 340 Litres
BBF - 9	Twice Weekly	Two to three times a week	Once a Day	90 Gallons 400 Litres
On timer automated systems, a backwash once or twice a day gives the ultimate filter performance. Carry out a series of extra backwashes once per month to reduce the requirement for additional maintenance (see p30).				

Regular backwashing flushes out solid wastes **before** they break down and pollute the water. Also, by removing wastes at this stage, nutrients are removed from the water and the growth of algae can be reduced further. The process keeps the filter at maximum biological efficiency and minimises the need for any other maintenance. Regular backwashing is essential in

heavy loading situations. On aquaculture systems the filter can be set to backwash every few hours if required. You simply cannot backwash a BubbleBead filter too often.

The gentle, bubble-wash process is a key to the efficiency of the BubbleBead filter. It aids cleaning of the beads whilst maintaining a healthy thin film of biological organisms on the bead surface. Unlike static chamber filters where media can become coated in an excessively thick biofilm, the bubble-wash ensures that the maximum proportion of bead surface area is always available for biological filtration to take place.

Making the backwash fully automatic

Manual backwashing by turning off the pump is easy enough, but does not make full use of the automatic potential of the filter. Make the whole process **fully automatic** by wiring the pump through an appropriate timer, and ensuring that the pond is topped up e.g. through a float valve. In this case it is best to set the filter to backwash at least once per day.

FITTING A TIMER

The pump electrical supply is wired into a timer designed to turn the pump off for around 5-10 minutes at desired intervals. The timer should be capable of handling the start-up surge current of the pump. As a very rough guide allow for around eight times the normal running current of the pump, e.g. for a pump rated at 1 amp allow for a start-up surge of around 8 amps – Immersion heater timers are often suitable. For large pumps a special starter gear may be required, check with your electrician. The timer should ideally be able to be set for intervals in minutes, and have a battery backup to retain the time in the event of power cuts.

If there is a power cut, or you need to turn off the filter to carry out a short-term pool medication, a backwash cycle will take place leaving the filter hull empty of water. Filter bacteria will be able to survive for many hours (if not days) on the moist beads due to the relatively high oxygen levels in the empty filter. This gives BubbleBead filters a **major** advantage over typical submerged bed filters.

Check in normal running that pool water does not siphon from the pond during a filter backwash or power cut.

FITTING A TOP-UP VALVE

A standard cistern ballcock valve, 'Torbeck' valve or similar can be used to top up the pond automatically, to make up for water lost through the filter backwash and from normal evaporation. To prevent fouling of the valve, and disruption from small waves, it is common to place this in a separate cistern mounted at pond level and connected through the side of the pond with a link pipe. To meet water board requirements it is usually necessary to fit a double-check valve in the supply line, to prevent siphoning of pool water into the mains water supply in the event of pressure drop. Some authorities also require such water use to be metered.

Where only small quantities of water are being added in a day (1 to 2% of pond volume) the dangers from chlorine in the water are minimal. Where larger volumes are being added, or if there are particular worries regarding tap water quality (e.g. metals or chloramines) it may be wise to use an appropriate water conditioner or to fit a tap-water purifier in the feed pipe. This make-up water, following backwashes, can add up to a valuable portion of the water changes required in any system stocked with numbers of fish.

Long term maintenance

MONITORING

It is **very important** to periodically monitor the backwash operation:

- listen to the beads sloshing in the filter

- check the backwash time and the action of the valves.

Aim to monitor this operation at least once per week, especially if it is normally controlled by a timer rather than manually. This will show up any possible problems before they become serious.

ADDITIONAL MONTHLY MAINTENANCE

Once a month an additional series of backwashes should be carried out three to five times in a row. This dislodges any more persistent wastes that may have collected in the filter, and further reduces the risk of bead clumping. On heavily loaded aquaculture systems this procedure can be carried out every one to two weeks. If an optional sediment drain has been fitted also use this as directed (see p.32).

VALVE MAINTENANCE

The correct functioning of the valves in your filter is crucial for the safe running of the filter system. When necessary, valves should be inspected and cleaned. This procedure is only necessary infrequently, providing proper pre-straining has taken place on water being pumped to the filter.

CLEANING THE HYDRAULIC VALVE

To clean the hydraulic valve, turn off the pump immediately following the standard backwash cycle, whilst the filter is empty of water and the hydraulic valve is in the open, 'drain', position. Remove the extension pipe on the waste outlet, where possible, to reveal the hydraulic valve plunger. Clean off any debris or slime building in the pipework, or on the plunger or valve seat in the hydraulic valve (arrowed below). (The hydraulic valve control mechanism is a sealed unit and is not user repairable.)

The hydraulic valve feed pipe should be checked. It should be unkinked and free of debris, and the entry point to the pipe also kept clear of debris.

In the rare likelihood that the hydraulic valve action needs to be checked, the hydraulic valve feed pipe should be disconnected from the inlet pipe. Whilst **gently** blowing into this pipe, the movement of the hydraulic valve can be checked for (►).

Whilst the valve is in the raised position, use a jet of water from a hose to flush out any sediment that may have gathered around the valve piston. After cleaning, reconnect any pipework before restarting the pump.

If the valve does not close properly, see the section starting on page 39 for further information on the valve system.

CHECKVALVES

The top-outlet checkvalve and air inlet checkvalve are low maintenance items. Very occasionally the facing or seating may need cleaned. If the air

inlet drips, see the troubleshooting guide (page 39 onwards) and the section on air breaks and underpressure (page 20).

PUMP STRAINERS

Remember that the strainer on the pump will need to be cleaned from time to time. If this becomes clogged with debris or blanketweed, the filter may not fill or drain correctly, flow rates will be affected, the air inlet may drip, and water may seep past the hydraulic valve to the waste outlet.

WASTE AND TOP OUTLET SCREENS

Over time, the waste outlet screen (or very rarely the top outlet screen) may slowly clog with more persistent immoveable dirt, strands of algae, or snails. Periodic removal and cleaning of the screens may prove necessary in these cases, especially if too coarse a strainer is being used with the pump.

Using a suitable pre-strainer (page 20 & 45) and carrying out a regular series of extra backwashes (page 30) will minimise the need for maintenance to these screens. See the Filter Troubleshooting section for other details.

The optional sediment drain

BubbleBead filters' main waste outlet is positioned in the base (unlike some other filters), and this facilitates good removal of the particles loosened from the beads during backwash. Nevertheless, sediments from soil or sand drawn into the filter, and sludge residue, can build up on the filter base in long-term use, especially if backwashing has been carried out irregularly. Build-ups tend to be a more common problem on aquaculture and grow-on systems where there is a constant heavy loading, and on those watergarden ponds where there is soil seepage into the water.

Models 3 & 5 are now fitted, as standard, with an additional base outlet that can be used to assist removal of such sediments. This outlet is sealed when the filter is delivered. Carefully open the central section of the fitting using a hole cutter - taking care to avoid damaging the threads. Alternatively, remove any plug that has been fitted. Thread in the extension provided in the optional sediment drain kit, and direct this through a hole made in the support stand. The valve can then be threaded on the other end of this extension.

Waste from this outlet can be run into a bucket and poured away, or directed to waste through further hose. This outlet is an **unscreened drain,** and should only be turned on when the filter is running **full** of water, otherwise beads can be lost!!!

As a guide, this valve need only be turned on once a month for a few seconds. If very little sludge is apparent, you can reduce using the valve to once every two months. Conversely, if this valve releases noticeable amounts of sludge, increase the frequency of draining appropriately.

Winter Running

In the winter when temperatures are lower (below 8-10˚C), feeding rates for koi should be reduced and maintenance can be less frequent. To avoid chilling the fish in water currents, avoid drawing in water from the pool base and instead draw from 30-60 cm below the surface. Consider reducing the flow rate through the system – biological and filtering activity will still take place in the BubbleBead Filter even at only 30% of maximum recommended flows (though this can lead to underpressure).

Ice can damage your filter! Wherever penetrating frost may be a problem, insulate filter pipework; the filter; external UVs; and top-up valves and pipework. Take special care of pipes where there is little water movement e.g. the waste pipe, hydraulic valve and feed pipe, and any extensions to the air inlet pipe. Standard closed-cell pipe insulation wrap and hot-water-cylinder jackets can be used but make sure that they are kept **dry** for maximum insulation. As the filter is sealed, and produces no smells, it is often desirable to position it in a frost-free outhouse, garage or utility room. This gives additional protection from freezing even if the pump should stop due to power failure.

CLOSING THE FILTER DOWN AS AN OPTION

On smaller systems and in very cold climates, an option is to turn the filter off after the first severe frost and leave it clean and dry until the spring. To prepare it for winter carry out four backwashes in a row to leave the beads as clean as possible, and then leave the filter dry. Disconnect the pump from the inlet and leave the outlet completely open. Disconnect the hydraulic valve feed pipe. Blowing and sucking alternately on this pipe will

help to flush most of the water out of the hydraulic valve control mechanism.

If you wish keep the filter bacteria alive in the winter, some of the beads can be stored in an aerated tank of water indoors, with small amounts of ammonia added occasionally to feed the bacteria. To transfer some or all of your beads to a separate filter you can disconnect the filter outlet pipe and completely remove the top outlet system including the strainer, fit alternative piping and pump the floating beads to a separate filter or store.

Water Quality Maintenance

The filter may have passed its initial maturing period, but biological filters continue to mature over months and years as different micro-organisms establish on the filter media. This maturing process can be set back by long power cuts or when pool treatments are used, especially for the first time.

PARTIAL WATER CHANGING

The water quality also continues to change due to the gradual build up of products in the water e.g. nitrates (NO_3) & dissolved solids. Conversely, some minerals may become depleted in the water as they are used up by the fish, plants and filter organisms. In lakes this aging process in the water body is offset by streams and heavy rains which bring in fresh water and new supplies of minerals, and flush out wastes that are building to excess. In a closed system like a koi pond it is necessary to carry out regular **partial water changes** to mimic these natural refreshing processes.

The backwash process loses some water, which will need to be made up with new water added to the pond. This is most easily carried out with an automatic top-up valve. This waste removal and top-up acts as a partial water change. In a system running at close to maximum pool volume capacity, the lower recommended frequency of backwashing might only result in a water change of around 1% in a summer week. This level of water changing is much too low to maintain water quality in the long term and additional partial water changes will be necessary.

SET THE BACKWASH FREQUENCY TO WATER CHANGE FOR YOU

An easy option is to set the backwash frequency at a rate which will give the level of water change required per week, e.g. 5% per week in the

summer is the rate used by many koi-keepers. The table (page 28) gives typical water loss per backwash. A high frequency of backwashing does not upset the filter organisms but actually improves filter efficiency.

Adding water to make up for evaporation is **not** equivalent to a water change, as this does not remove any waste products. Water needs to be removed from the pond e.g. through the backwash cycle; from a bottom drain; or with a pool vacuum; **before** water is added. Use a tap water conditioner or appropriate tap water filter to make large quantities of chlorinated water safe to add to the pond. Take advice from local specialists if your source of water has chloramines, is direct from a borehole, or is high in metals such as iron.

MONITOR YOUR POND AND FISH TO AVOID PROBLEMS

Monitoring the general water appearance and the behaviour of fish is invaluable as a guide to water quality, but the only sure way to know is to carry out regular water quality checks. Use a range of good quality pond test kits as stocked by all major aquatic stores. Keep a record of changes in water quality in a logbook, noting dates and times. This is useful to keep an eye on the natural daily and seasonal fluctuations in water quality, and the affects of any treatments or water changes. It also allows problems to be dealt with before they take hold, and so helps maintain the overall health of the fish and pool system. The following troubleshooting guide to water quality is a summary to be used in conjunction with other sources of information on good fish husbandry. It is best to read through it **before** problems occur.

Water Quality Troubleshooting
Questions (?), Comments (▷), and Actions (▶)

▶ If **any** problems occur, carry out a full range of water quality tests.

? - Fish are hanging near, and/or mouthing at the water surface

▷ This can indicate a lack of oxygen entering the fish bloodstream. It may be due to low oxygen levels in the water or other problems with either water quality or the gills of the fish which are preventing the fish from extracting oxygen from the water. Less oxygen dissolves in the water in hot weather; in salty water; and at high altitude. Oxygen levels may also drop due to decaying waste; algae growths using up oxygen at night; or following the use of certain chemicals.

▶ Immediate: Increase oxygen levels by encouraging splashing at the water surface with cascades or fountains. Use air pumps and airstones in the pond. Temporarily reduce or cease feeding. Keep the water surface free from excess floating leaves. Examine fish gills for signs of damage or parasite infection. Carry out a partial water change taking care to remove decaying sediments.

▶ Long Term: Control excess algae growth. In heavily stocked systems, consider the permanent installation of additional aeration devices e.g. trickle towers.

? – The pH is rising unusually high (over 9.0) – alkaline conditions

▷ High pH values can directly irritate fish gills and mucous membranes as well as reducing the efficiency of nitrifying bacteria in the filter. Waste products such as ammonia are much more toxic to fish at high pH levels.

▶ Immediate: Reduce or cease feeding. Check ammonia levels. Carry out a series of partial water changes. Consider using pond pH buffers designed to lower pH.

▶ Long Term: Discover the source of the high pH. Uncured cement-work may need to be removed from the system or sealed in some way. If it is due to the replacement water source get advice from your local supplier. If it is due to strong photosynthetic activity by algae, carry out algae control measures.

? – The pH is unusually low (dropping to below 6.5) – acid conditions

▷ pH levels can fall due to the build up of nitrates or carbon dioxide (CO_2) in the water. Minerals in the water do buffer the pH preventing sudden drops but if these minerals have been exhausted, the pH may drop suddenly. Low pH water irritates fish gills and mucous membranes, reduces the efficiency of nitrifying bacteria in the filter, and makes some metals (e.g. copper) more toxic to fish.

▶ Immediate: Reduce or cease feeding. Check carbonate hardness (KH) levels (see below). Carry out partial water changes.

▶ Long term: Monitor KH levels; increase the rate of water changes.

? – The carbonate hardness (KH) is unusually low (below 3 degrees)

▷ Carbonates and bicarbonates (CO_3 + HCO_3) represent the alkalinity and buffering capacity of the water. These are used up by the filter bacteria in the process of nitrification. The problem is most notable in systems where the top-up water is naturally soft (KH 3°/50ppm or less) and where feeding rates are high.

▶ Immediate: Reduce or cease feeding. Carry out a series of partial water changes. Consider the cautious use of buffering compounds such as sodium bicarbonate ($NaHCO_3$) or powdered calcium carbonate ($CaCO_3$).

▶ Long term: Increase the frequency of partial water changes. Choose a replacement water source with naturally high carbonate levels. Add slow release buffers to the pool system e.g. tufa rock; crushed oystershell. In heavily loaded systems the regular addition of carbonate buffers may be necessary.

? – Ammonia/Ammonium levels (NH_3/NH_4) are high

▷ Outside the filter maturing period, high ammonia levels are usually caused by overloading or disruption to the filter organisms.

▶ Immediate: Reduce or cease feeding. Increase aeration. Check and remove causes of filter disruption. Carry out partial water changes.

▶ Longer term: Aim to avoid high pH values as ammonia is more toxic in these situations. Take steps to prevent future disruption/overloading of the filter. Add commercial cultures of nitrifying bacteria to the system.

? – Nitrite levels (NO_2) are high

▷ Outside the filter maturing period, high nitrite levels are usually caused by overloading or disruption to the filter organisms, or pockets of decaying material building up in anaerobic (low oxygen) areas in the system.

▶ Immediate: Reduce feeding. Increase aeration. For salt tolerant fish such as koi, add 1 gram per litre* (0.1%) of food-grade salt to the water as this reduces nitrite toxicity. (*may affect sensitive plants)

▶ Long term: Avoid disruption of the filter organisms by e.g. medications and other chemicals; ensure that the filter is being backwashed sufficiently; add commercial cultures of filter bacteria. Monitor the KH level too.

? – Nitrate levels (NO_3) are high (over 100 mg/L total nitrate)

▷ – Nitrates build gradually in most closed systems. They are not especially harmful to freshwater fish and immediate action is not called for unless levels exceed 300 mg/L. However, chronic, high levels of nitrate are considered to lower the immunity of fish to disease, and may reduce growth rates.

▶ Long term: Carry out more frequent backwashes and/or partial water changes. Consider using plants to reduce nitrate levels. Monitor KH levels.

? – There is a high level of suspended solids in the water

▷ Suspended solids can irritate fish gills. Organic solids reduce oxygen levels & increase levels of bacteria in the water & may lead to gill disease.

▶ Immediate: Find and remove the source of the solids e.g. poor quality or inappropriately sized food; run-off from surrounds following rain; air being drawn into the BubbleBead (see page 39 point 2).

▶ Long term: Increase circulation to draw particles into the filter more quickly. Use bottom drains to remove sediments. Use quality foods. Don't overfeed fish.

? – The water has a yellow tint

▷ In any closed system there is a gradual build up of complex waste compounds e.g. phenols, which cannot be easily broken down by the filter. These can eventually discolour the water but are not normally harmful.

▶ Long term: Increase the level of backwashes and/or partial water changes. Temporarily use activated carbon in the system. Use a protein skimmer (foam fractionator), especially in salted systems. Cautious use of ozone dosing devices can help. Changing food brands can sometimes help.

? – The water has excessive amounts of foam at the surface

▷ Foaming is caused by high levels of surfactants in the water, the most common being types of protein. Some foaming may be expected during the filter maturing process but this usually disappears once the filter has fully matured.

▶ Immediate: Carry out a partial water change taking care to remove uneaten food and excess sediments. Consider the use of pond anti-foaming treatments.

▶ Long Term: As for yellowed water (above). Check that any open cell foam products used in the pool are fish-grade quality. Consider a surface skimmer.

? - How can I control blanketweed in a pond?

- Avoid debris or soil washing into the pond. Provide shade from excess sunlight. Avoid limestone rocks. Avoid long shallow streams as these tend to encourage algae. Avoid overfeeding fish. Use plants to soak up nutrients.

- Physically removal algae using a stick, net, or plastic lawn-rake - fairly effective but time consuming. Remove the bulk of blanketweed growth **before** using any chemical or electronic controls, as dying algae can rapidly pollute a pond.

- Regularly remove sediments from the pool with a bottom drain or vacuum. Clean strainers and settlement areas in filters on a regular basis.

- Some algae are to be expected in all garden ponds. Mature ponds that are not overstocked with fish tend to have the fewest problems. Do remember to backwash the BubbleBead filter at suitable frequencies.

Filter Troubleshooting

? – The water has suddenly become green / milky grey

▶ Algae blooms (green water) and bacterial blooms (milky grey water) can sometimes occur, especially during the maturing period or following a sudden increase in dissolved nutrients. The problem will be controlled by an effective UV unit. If a UV does not appear to be working, check the lamp and clean the quartz sleeve if necessary. Water with high mineral content can sometimes coat the quartz sleeves and the filter beads in scale; use of magnetic/electromagnetic devices often alleviates this problem. Other sources of cloudiness include excess food and particles washed in from surrounding soils. Temporarily cease feeding and consider the very sparing use of flocculating agents (but not in very soft water).

? – The water has suddenly become very dirty

▶ If air is being drawn into the filter system during normal running, it will disturb the beads and prevent them from catching dirt properly. Check that there are no pipework leaks around the pump or filter inlet and that the pump is not clogged or drawing in air from e.g. airstones. Check that the filter return to the pool has not been moved to a lower position, or into the water itself, as siphoning at this point can draw air into the filter through the air inlet valve (see page 20 - air breaks).

? – There has been a powercut

▶ If the powercut has only been for a few hours, there should be no problems providing the filter has been maintained correctly. RCD devices on the system should be latching types that will restart automatically. The waste valve opens automatically following a powercut, leaving the filter beads moist but well oxygenated. Filter bacteria can survive for many hours, if not days, in this state. This is a major benefit over the deoxygenating conditions of typical submerged filter beds. However, if the filter has been particularly dirty; or feeding levels particularly high; or the weather particularly warm; then the filter organisms may run out of oxygen more rapidly. In these cases or where the powercut has been lengthy (over 18 hours), carry out a backwash as soon as the filter has refilled, to remove foul water and dying organisms. Avoid feeding for a few days and monitor the water for ammonia and nitrite.

? – The filter takes much longer to drain during a backwash

? – I can hear the bead bed dropping in one lump (with a 'thunk') during the backwash cycle

? – The filter sounds different during the backwash cycle

? – The pressure gauge reading does not drop to the normal level after cleaning

▶ Slow draining can be due to gradual clogging of the waste outlet and/or top outlet screens inside the filter, or 'gelling' of the bead bed. Screen clogging can be due to strands of algae; growths of sponge-like bryozoans within the filter; or tiny snails which have become wedged in the slots. Gelling of the bead bed is caused by beads sticking together due to an excessive growth of the biological film on the bead surfaces as a result of infrequent backwashing.

Regular backwashing of the BubbleBead filter can eliminate most of these problems before they occur.

If these problems occur, backwash your filter four or five times in a row and increase the frequency of the regular backwash. If problems persist:

Drain the filter. Check that the hydraulic valve control-hose is not blocked or kinked. Check that the main pump strainer is not clogged. If necessary, remove and clean the waste/top outlet screens on the BubbleBead filter. If the lower screen has clogged rapidly, improve the strainer on your pump inlet (p.20/45). (Consider fitting the optional sediment drain to models BBF-3/5 (page 32).

Take steps to improve the backwash strength e.g. increase the siphon action by increasing the waste pipe length or head (see page 5) and minimise restrictions on the waste outlet.

For persistent gelling of beads, either:

- Seal the waste outlet and turn off the pump leaving the filter full of water. Inject air into the air inlet valve with a blower or strong aquarium airpump for 30 to 60 minutes. The air accumulates under the bead bed eventually working its way upwards and breaking up the beads. Then carry out the backwash process 4 or 5 times in a row before restarting the filter.

- Partially drain the filter, remove the top outlet assembly, and break up the beads with a jet of water from a powerful hose or jet-washer. Reassemble the outlet and carry out a series of backwashes.

? – The air inlet drips water

▶ Check 'Underpressure' symptoms overleaf. If this, or cleaning the valve, does not help, fit a 90º bend to the exposed end of the valve and fix a 30 cm (12") long upright vertical pipe into this. This should stop the drip.

? – I don't like the plug of cloudy water that is sometimes seen in the filter output just after restarting the filter

▶ This is normal for all bead filters and does not harm the fish. Reduce the density of clouding by increasing backwash frequency, or set your timer to carry out a second backwash just as the filter has refilled. Increasing the length of the hydraulic valve feed pipe slows the rate at which the valve closes after a backwash, and allows incoming water to rinse more debris from the filter base. If you wish to eliminate clouding, fit a tee & valve, or a 3-way valve, on the filter outlet pipe and direct this plug of water to waste for a **few seconds**. Use a short piece of clear pipe/hose in the waste line to monitor clarity.

? – The backwash appears to stop before the filter has emptied

▶ This can happen if the filter is particularly low in relation to the pond water level. The inlet valve can start to allow water into the filter before it has fully drained. The main options are to tighten the adjustable spring in the inlet valve (to hold back the head of pool water), or to raise the filter. This will only work with smaller heads of pool water. See Appendix Three. Carry out routine maintenance (page 27, 30). Check that there are no airlocks in the waste outlet plumbing.

? – Turning off the pump gives little or no backwash from the waste outlet

▶ This can happen if:
- the hydraulic valve is sticking in the closed position. Check that the hydraulic valve feed tube is not clogged or kinked. If necessary, disconnect this tube and apply suction to remove water from the hydraulic valve controller. Carry out routine maintenance (see p.27, 30 onwards).
- the pump strainer or waste outlet strainer in the filter are becoming clogged.
See the section on page 32.
- a non-return valve (footvalve) is fitted to the pump (see page 21).
Also see overleaf:

? – Turning off the pump gives no backwash from the waste outlet and filter water appears to run back into the pond

▶ This can happen if the inlet valve is sticking in the 'run' position. This rare problem is more likely if large solids or blanketweed are being pumped into the filter. Allow the filter to drain down and carry out a full clean and examination of the valve. Avoid this problem by using an appropriate strainer on the pump.

? – The waste outlet continues to dribble water

▶ On new systems, carry out the valve membrane stretching described on page 22. Persistent dribbling can be a symptom of '**Underpressure**' (see the section on page 20). Test to see if this is the case by temporarily holding your hand partially over the return pipework to increase the pressure in the filter. If the valve then closes within a few minutes, underpressure is the problem. Solutions to underpressure include:
- cleaning the pump strainer or using a more powerful pump
- raising the end of the pipe where water returns to the pond so that it is higher than the filter inlet
- opening the small venturi inlet valve fitted to the top outlet (see below)
- tightening the adjustable spring in the filter inlet valve
- alternatively, placing a **small** restriction in the return pipework to the pond to increase pressure in the filter. (Larger restrictions and valves create excess backpressure which should be avoided (see p.48)).

Carry out routine maintenance (p27, 30 forward) taking care to clean the hydraulic valve seat, and check that the hydraulic feed pipe is not clogged or kinked. If the waste outlet extension can be removed (page 11) it will allow close examination of the hydraulic valve. If blowing into the hydraulic feed pipe does not completely close the valve, or if you can blow right through the membrane, contact your dealer.

? - What is the top venturi valve for? It sometimes leaks water?

▶ The venturi valve (p.14) helps to aerate water returning to the pond, and it can reduce or eliminate the issue of underpressure in the filter by breaking siphon action in the return flow. When open, this valve can leak a small amount of water at the start or end of the backwash cycle in some outlet pipe configurations. Ask your dealer about the one-way valve accessory for this, alternatively pipe the water to waste. Where restrictions are placed in the return pipework e.g. UV units or valves (N.B.

see page 48 on valve use), or you are pumping to a higher outlet, then the venturi valve will not function properly and must be kept closed.

? - A vibrating noise is coming from the inlet valve

▶ In certain circumstances the pressure from the pump and the tension in the inlet valve spring sets up resonances which cause the valve to vibrate in the water flow. If this is a problem try adjusting the spring tension in the inlet valve assembly.

? – I'm going away on summer holiday for two weeks

▶ In lightly stocked water garden ponds the fish will find some natural food. This can be supplemented by small amounts of food from an automatic fish feeder. Double check that all the valves in the system are working correctly. It is worth carrying out routine maintenance (page 27, 30 forward) some days before you go on holiday, to check that everything is in order. The automatic backwash can then take care of your pond providing you also have an automated top-up system.

Alternatively, as the reduced feeding will reduce the loading on the filter, it should be possible to leave the filter for the two weeks without a backwash. (Remember that very high pressure pumps must always be fitted with a pressure-release bypass, see page 48). Carry out a triple backwash before leaving and carry out a triple backwash on your return. Alternatively, where someone is coming in to feed the fish, they can be shown how to operate the simple backwash process.

? – Can I use my pump to drain the pond through the filter ?

Disable the hydraulic valve by disconnecting the valve feed-pipe and plugging the resulting opening on the main filter inlet pipe. The hydraulic valve membrane will then automatically go into the open position and remain in that position. Turning on the pump will then flush pond water through the filter to the waste outlet.

Further answers are on the website 'F.A.Q.' pages:

www.bubblebeadfilters.co.uk

If you experience other problems, not mentioned here, please seek further advice from your dealer (or the distributor - contact details on the inside back page). Unauthorised repairs or modifications may void the guarantee!

APPENDIX ONE

Installing UV units

Germicidal UV will effectively control free floating algae and blooms of bacteria that are too small (< 5 micron) to be readily captured by the filter. Despite design differences, the major factor in UV unit performance is the lamp wattage. (See the table p.19). In heavily shaded ponds, green water control may be achieved at 50% of the wattages listed, whereas in very shallow ponds and areas of intense sunlight, higher wattages will be required. Much higher wattages are required for full parasite control.

INSTALLATION

Closed chamber UVs (with a protective quartz sleeve for the lamp) are recommended. Plumb them into the return pipe which has clean water flow giving the best UV performance. Choose a unit with wide bore connections, rated for flows in excess of the maximum filter flow. The fittings on the unit should be at least as large as the return pipework used to prevent back-pressure across the UV. e.g. if 1½" hose is being used on the return pipework, the unit should be used with 1½" hosetails. A unit with 1" connections adapted up to 1½" hose would not be suitable unless a bypass was fitted. In some cases it may be necessary to use two or more external units **in parallel**. Support the UV and pipework sufficiently with brackets and pipe clips to avoid damage to the filter! Ensure that the unit is accessible for maintenance, dismountable for repair/replacement, and that electrics are suitably protected from water.

OPERATION

It is generally safe to leave the UV turned on for the few minutes it is left dry during the filter backwash. If it is likely to be left dry for longer, it should be turned off during the backwash. If it is connected to the same supply as the pump it will automatically switch off during the backwash, though excessive switching of the lamp can shorten its effective life. Follow the manufacturer's guidance on safety, maintenance and lamp changing.

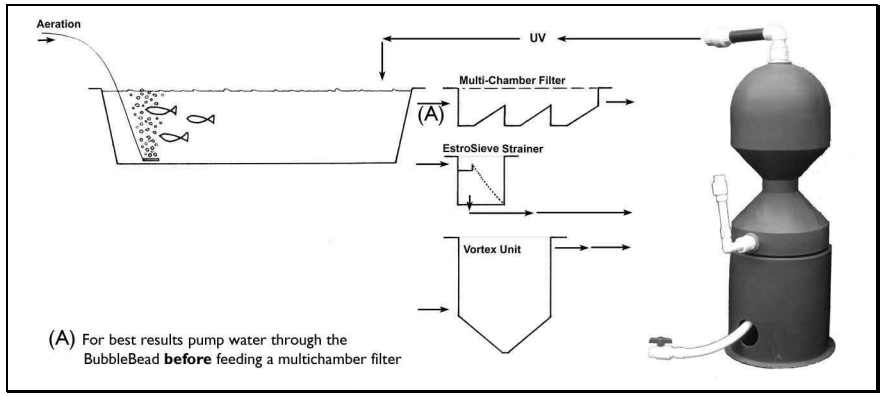
On new systems it is best to leave the UV turned off during the first two to four weeks of filter operation to minimise damage to beneficial bacteria present in the water flow whilst the filter beads are becoming colonised.

APPENDIX TWO

Combining BubbleBead Filters with other filter equipment

The BubbleBead filter is ideal to use alongside existing filter equipment and can boost the filtration capacity of any system. This is particularly useful if an increase in fish stocks is overloading the existing system. In particularly high loading situations the BubbleBead filter can be supplemented with ancillary equipment to give the best results.

Aeration is recommended in all cases. Where natural aeration from waterfalls or fountains is limited, the most convenient form of supplementary aeration is to use a high efficiency air pump with airstones in the pond. Ensure air bubbles do not get drawn into the BubbleBead filter.



Pre-Filtration can be achieved with **sieve devices (►), surface skimmer-boxes, in-line coarse strainers, vortex units** and existing gravity-fed settlement or **brush chambers.** Water can be pumped from these to the BubbleBead Filter as shown. However, it is important to clean these pre-filters very regularly to remove organic waste before it is broken down, otherwise blanketweed

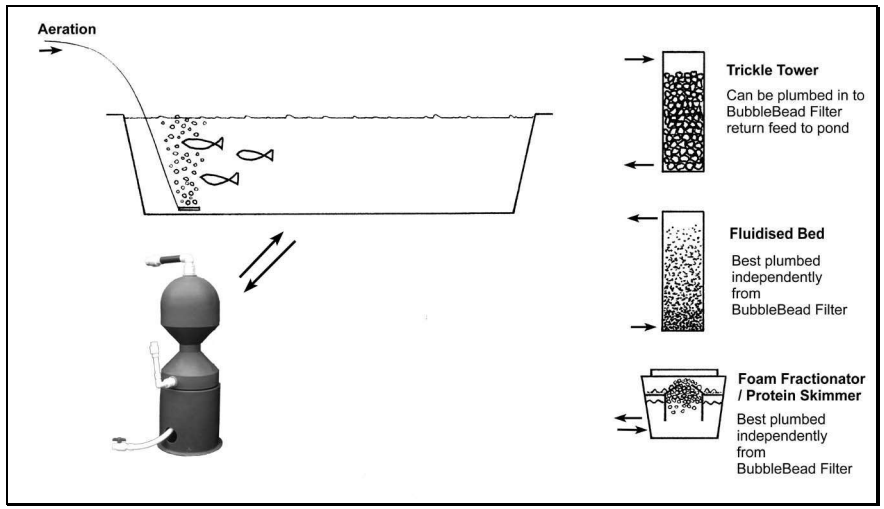
growth may be a more noticeable problem. Any pre-filter to the BubbleBead should aim to remove particles larger than 1.5 mm. This will prevent large solids from clogging the strainers of the BubbleBead Filter and also assist the main filter in removal of organic particles before they break down, so helping to **reduce algae growth**. Ask your dealer for further information on these options.

With existing **gravity-fed multichamber systems** the most straightforward option is to pump the water from the last chamber of the filter to the BubbleBead filter and then back to the pond through a UV unit. Alternatively, the existing pump can be throttled back and an additional pump can draw water from the middle chamber of the filter to the BubbleBead. The BubbleBead filter will give additional nitrification of fish wastes and will also help to 'polish' the water by removing the small particles that can get through multichamber systems. **However**, this arrangement does **not** make use of the BubbleBead filter's ability to remove the bulk of solids from the system before they break down, and unless excess solids are regularly removed from the multichamber filter there may be an increased tendency for blanketweed growth in the system. It is preferable to adapt the multichamber filter to pump fed operation.....

For existing **pump-fed multichamber systems**, the water should be pumped instead to the BubbleBead filter, through a UV unit and into the chamber filter before returning to the pond by gravity. When regular backwashes are carried out this will make the best use of the BubbleBead's ability to remove solids from the system before they are broken down. The multichamber filter will then remain cleaner and more able to function as a biological filter rather than a mechanical trap for sediments. It is important to use a suitable strainer on the pump feeding the BubbleBead filter to remove larger solids; and to ensure sufficient aeration in the chamber filter's transfer ports. This arrangement is not suited to pressurised chamber filters.

With **Vortex Units** and existing gravity-fed settlement or brush chambers, water can be pumped from these to the BubbleBead Filter as shown. However, it is important to clean these chambers very regularly to remove organic waste before it is broken down, otherwise blanketweed growth may be a more noticeable problem. The solids removal abilities of vortex units can be significantly improved by retrofitting commercial devices such as 'The Answer' and other types of **self cleaning strainer**.

Trickle Towers can be fed from the outflow of the BubbleBead filter, following UV treatment. The trickle tower greatly boosts oxygenation of the water and assists nitrification in heavily loaded commercial situations. Water then flows back to the pond from the trickle tower under gravity.



Fluidized Bed Filters boost nitrification capacity in heavily loaded systems but are unable to remove solids. They can be used alongside the BubbleBead Filter which will remove the solids from the system.

Foam Fractionators (Protein Skimmers) aid the removal of proteins and other surface active compounds from the water, reducing the load on other filter equipment and improving water clarity by removing staining compounds. Although foam fractionators show some benefits in freshwater, they work most efficiently on marine systems. They are not intended to remove solids from the water.

Certain foam fractionators can also be used with specialist ozone systems to control yellowing of the water and to reduce slime and algae growth.

Both fluidized beds and fractionators should be plumbed **independently** from the BubbleBead Filter.

APPENDIX THREE

- Using the filter with a high pressure pump

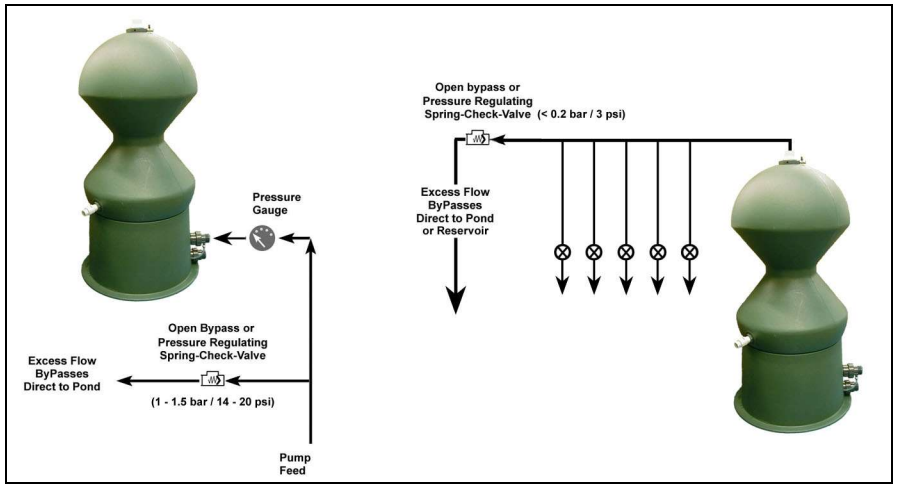
- Fitting manifolds to the outlet pipework for returns to multiple tanks (e.g. shop and aquaculture systems)

- Using flow control valves on the return pipework

When using high-pressure pumps on the inlet, a bypass is essential to prevent damage to the filter body and the membrane in the hydraulic valve. The filter is rated to 1.5 bar (15 metres head), but as some pumps can create pressure surges well in excess of this on start up (especially where there is air in the pipework) we consider it **essential** that a bypass/pressure release is used on systems with pumps rated with heads of over 10 metres. A pressure gauge is also recommended.

Using narrow pipe manifolds, small bore UV units, and/or valves on the filter outlet can create unwanted backpressure in the filter system, increasing the likelihood of weeping from the threads and hydraulic valve. In cases with high pressure pumps, the pressure in the filter system can also exceed rated limits. Fit a bypass or pressure release on the outlet manifold.

The diagram shows where a bypass or pressure release valve could be fitted in a system with a high pressure pump (left), or with a manifold on the outlet (right).



Pipe fitting sizes on inlet/outlets

These vary according to what your dealer has specified but typically the fittings are as follows:

Model	Inlet	Top Outlet/Return	Waste Outlet	Sediment Drain
BBF-1.5	1¼" fem.BSP [A]	1½" fem.solv. [B]	2" male BSP	-
BBF-3	1¼" fem.BSP [A]	1½" fem.solv. [B]	2" male BSP	1½" fem.BSP [C]
BBF-5	1¼" fem.BSP [A]	1½" fem.solv. [D]	2" male BSP	1½" fem.BSP [C]
BBF-7	1½" fem.BSP	2" fem.solv.	2" male BSP	-
BBF-9	1½" fem.BSP	2"/3" fem.solv. [E]	2" male BSP	-

Notes:
solv. = Solvent Weld (pressure); BSP = British Standard Pipethread
A - This dismountable union has adaptors to 40mm hose or 1½" female BSP.
B - An optional adaptor kit is available with a 90degree outlet to either a dismountable 40mm hosetail or a 1½" dismountable solvent union.
C - This outlet is plugged as standard. An optional valved sediment drain kit is available.
D - An optional adaptor kit is available with a swept 90degree outlet to either a dismountable 50mm hosetail or a 2" dismountable solvent union.
E - The top outlet size on the BBF-9 can be specified at the time of order.

Optional connectors are available for other outlets e.g. to adapt 2" male BSP to socket solvent or dismountable 50mm hose

References and Sources quoted:

AST technical literature, and:

[1] Malone, R.F., Beecher, L.E., 2000. Use of floating bead filters to recondition recirculating waters in warmwater aquaculture production systems. Aquacultural Engineering 22: 57-73.

[2] Malone, R.F., Rusch, K.A., 1998. Using the bead filter in your koi pond (Second Edition). Louisiana Sea Grant College Program. 50pp.

Drennan, D.G., Golz, W., Ahmed, H., Malone, R.F., 1995. Clarification abilities of floating bead filters used in recirculating aquaculture systems. In: Aquaculture Engineering and Waste Management, Proceedings from the Aquaculture Exposition VIII and Aquaculture Mid-Atlantic Conference, Washington, D.C., June 24-28, pp. 256-267.

If the filter should arrive damaged or with parts missing please contact your supplier immediately, and confirm losses in writing within seven days to allow the problem to be corrected.

FILTER GUARANTEE

The filter manufacturer guarantees that the filter material and workmanship are free of defects. The guarantee is valid for paid goods and runs for one (1) year from the date of delivery.

Any filter returned to the dealer or distributor carriage paid, which is proved to the manufacturer's satisfaction to be faulty by reason of defective material or workmanship will be replaced or repaired, at their option, free of charge, provided it has not, in the manufacturer's opinion, been subjected to misuse, neglect or accident. In particular:

1) The filter should have been installed and maintained in accordance with the instructions.

2) Excessive weight due to heavy pipes, valves, etc. should not be carried by the inlets or outlets.

3) The filter hull pressure is at no time to be allowed to exceed the maximum pressure rating as specified by the manufacturer.

The guarantee does not apply to filters used for other than the intended purpose; those altered, repaired or modified by other than an authorised repairer; or those used with other items where the integrity, performance or safety of these items is affected. Damage by natural forces such as storm, ice, or animal, is excluded from the guarantee.

The distributor and the filter manufacturer will not be liable for any direct or consequential loss. Any claim made under this guarantee must be accompanied by proof of purchase. This guarantee does not affect your statutory rights as a consumer.

If problems should arise, in the first instance contact your local dealer or your nearest distributor (see page 51)**.**

Typical measurements for your BubbleBead filter

(see page 23)

Time taken to *drain* the filter when relatively clean: _____

Time taken to *refill* the filter when relatively clean: _____

Troubleshooting

If you have problems with **water quality** please first read the guidelines starting on page 34.

If you are encountering difficulties in **maintaining your filter**, please firstly read the sections starting on page 27 & 39.

The BubbleBead Web-Site carries useful support information:
www.bubblebeadfilters.co.uk

If you require further assistance please contact your dealer or contact your local area Distributor. It is a help to have all the relevant information about the filter, model number; pump type; valves and hoses etc. to hand.

BubbleBead Filters undertake continuous product development may make technical modifications to current models. The information and pictures shown here are for guidance only.

Distributors:

Aquatica International, England
Tel: 020 8669 6643 *(Fax: 020 8773 2035)*
Email: info@bubblebeadfilters.co.uk

WATER GARDEN GEMS, Texas
Tel: 210-659-5841 *(Fax: 210-659-1528)*
Email: USinfo@bubblebeadfilters.com

Dealer Details: