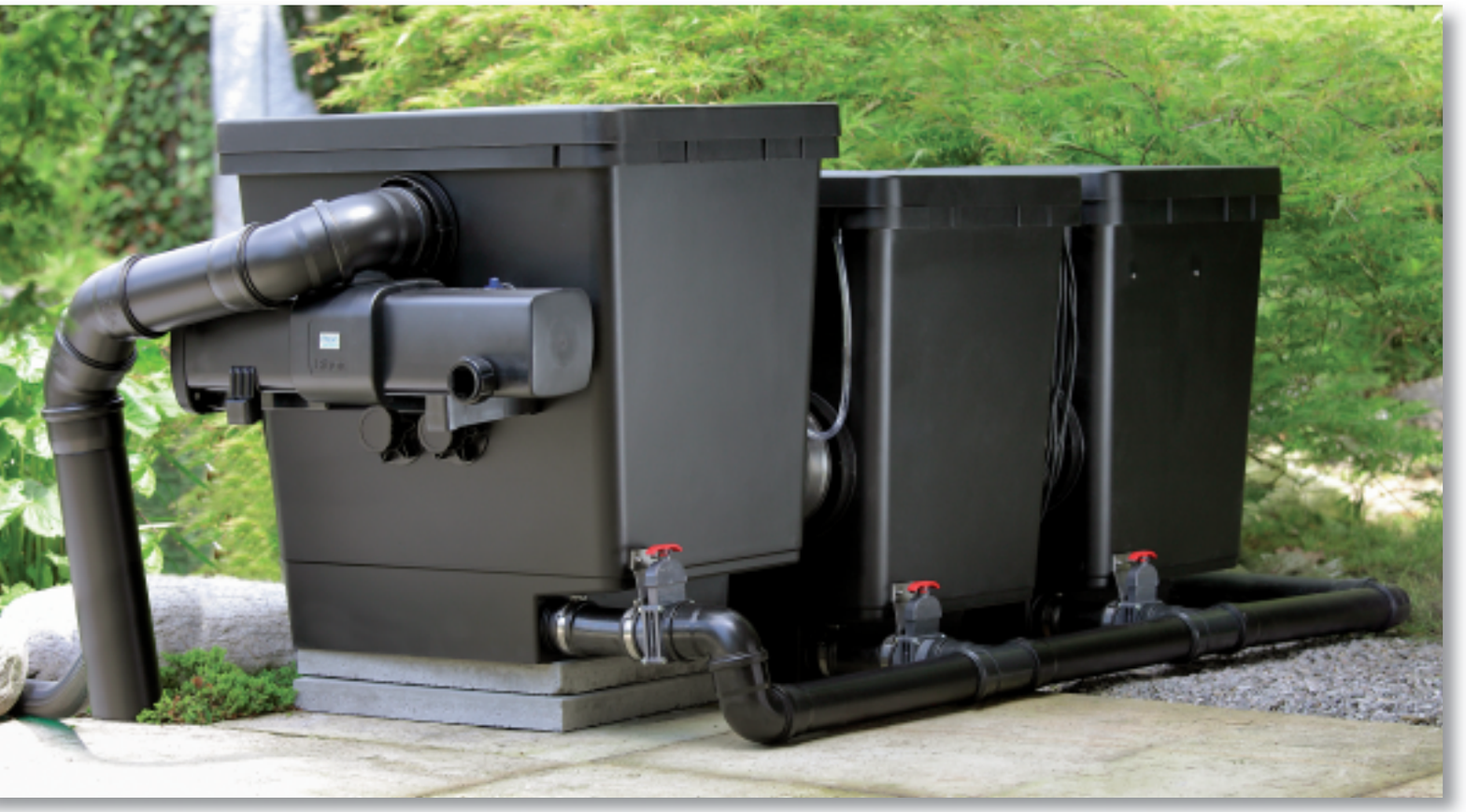


OASE ProfiClear Premium

IN TEST

A new entrant has recently entered the market for world class filter technology. This is a new development of a modular filter system from the German manufacturer OASE GmbH. The new ProfiClear Premium filter range relies completely on recognised and established technologies in the area of pond filtration. Biologically working filter stages with moving bed media exclusively supplement the drum filter as a pre-filter, so it is guaranteed to appeal to koi pond enthusiasts and those demanding ultra clean water.

text and photographs **Paul Bless**

above: drum filter modul

left side: drum filter pumping system

Filled moving bed modul

For years, in many areas it has been a matter of course that consumers can obtain information about products through independent tests on the Internet and in print media in a manner that goes beyond the information provided by the manufacturers. So why not for products that concern the koi and garden pond hobby, as well? This was the basic idea; and the result is that now and also in the future, in this area products will be appropriately tested and the results will be published. In the area of filter technology, in particular, the possibility of directly comparing different concepts is lacking. The visual differences between a drum filter and a continuous belt filter are easy to explain, but what advantages or disadvantages do these two systems offer in direct comparison? Thus the challenge was to create the possibility of classifying different systems based on specific parameters. What these are in detail, you can read below.

Function of the ProfiClear Premium filter in gravity mode

The water that must be cleaned reaches the drum of the pre-filter through three inlets. Water flows through the filter fabric from the inside to the outside, solids/particles that are larger than 60 µm (0.06 mm) are reliably retained and are deposited on the fabric. The more solids that are retained, the more impermeable becomes the fabric and the less water that can pass through. However, because the connected pump in the last chamber draws water out of the filter system at a constant rate, the water level in this clean area (= water that has already passed through the filter fabric), drops gradually. If a water level that is determined by the position of a float switch is underranged, the controller automatically triggers a flush process. In this cleaning process the cleaning pump delivers water with a pressure of approx. 5.5 bar from the clean water area onto the screen elements of the drum through nozzles that are simultaneously placed in rotary movement via an electric drive. The cleaning water together with the pollutant burden is routed into the waste water channel via the pollutant trough. The cleaned screen elements can again allow more water through so that the water flow between the polluted water area and clean water area again is increased and the water level in the clear water area increases accordingly to »normal level«. The cleaning cycle starts over as soon as the float switch again signals that the level set in the control electronics has been underranged. The flush process does not interrupt the overall filtration process at any time.

The pond water that has been mechanically cleaned in the drum filter then reaches the biological chambers that are filled with small plastic elements on which the bacteria settle and decompose pollutants. These plastic elements with settled bacteria that move continuously in the water flow (moving-bed principle), handle the biological cleaning of the pond water, primarily relative to nitrogen compounds, like ammonium, and nitrite.

Because the entire biological sequence is subject to a great number of influence factors and thus neither quality nor quantity can be meaningfully evaluated in a single test, this point will not be further considered.

Control unit

*Individual modul with 2 x Bitron-Gravity,
2 x Aquamax Gravity Eco 20.000 and pre installed stainless steel baskets for individual addition*

Operational setup of the filter in the pond environment

In terms of operational setup it is clear that the ProfiClear Premium filter system sets completely new standards. Overall setup and connection of the individual filter modules, incl. piping of the outlet connection on the tank base, took approximately 45 minutes. All parts necessary for setup and assembly are already included in the scope of delivery. Only the individual pipe pieces must be purchased, which is the usual situation. The arrangement of the three DN 110 inlet connections on the drum filter is ideal for establishing the pipe sections between pond and filter, because it is possible to work with off-the-shelf and inexpensive wastewater pipes. The outlets of the pump lines on the individual chambers on the end of the filter chain are designed in accordance with DIN 110 so that here as well pipework can be easily installed with little pressure loss to the pond. In addition, there are also two smaller fittings at this location with external hose adapters which the user can connect separate pumps, e.g. for water features. The cleaning water drain connection is also in DIN 110 wastewater pipe. Tasks for connecting the Ebara cleaning pump are completely dispensed with, as this pump is already completely assembled and connected with the nozzle assembly. This point is mentioned because, often with other manufacturers this has not been a matter of course, and this often causes additional installation effort and costs. All tanks are manufactured of fibre-reinforced Duroplast and thus have excellent material characteristics, similar to the material characteristics of tanks manufactured of GRP. All installed metal parts, e.g. the drums are made of stainless steel.

Fortunately there is not much to report about the electrical connection. The three plug connections between drum filter and control technology in a watertight cast enclosure, are protected against polarity reversal and they are watertight. Here as well the manufacturer has done exemplary work and has left nothing to chance. Room for error does not exist; this is a great plus point where safety is concerned. Plugging in and getting started.

Pumps, and also the new Bitron Gravity (55 W) UVC devices are housed in the individual chamber at the end of the filter chain, which offers ideal installation conditions in this regard. OASE kindly made the filter available completely populated, so that the new UVC devices could also be included in the performance measurement, relative to pressure loss.

The test setup

The drum filter was connected to a water tank with a holding volume of 1,000 l, via three DN 110 pipe sections, each approximately 1 m in length. Two Aquamax Gravity Eco 20,000 pumps, each with a net delivery capacity of 18 m³/h, served as the pumps that conveyed the filtered water from the individual chambers back into the water tank. For this the pumps were linked directly on the last chamber via a 45° T-piece to a single DN 110 pipe section. Volumetric flow was measured as usual with an ultrasonic flow meter, Portaflow C from Fuji Electric.

Test setup with ultrasonic flow meter and control unit

Test maximum flow rate

First we devoted ourselves to the task of determining the maximum possible flow rate with tap water. Tap water because the primary objective was to obtain reproducible results and simultaneously ensure compatibility between the former test candidates and the test candidates that will follow. To artificially produce a »pond water« that in its composition covers the variety of possible pond water qualities and at the same time can be restored in the same composition, seemed somewhat counter-productive relative to the purely mechanical test procedure. For one thing the solids content of pond water that is subject to high-quality technical filtration is frequently so low that it can almost be considered as tap water again. Moreover there are different manufacturer specifications relative to the maximum degree of solids pollution of the water (TSS) with which the manufacturer's information has been determined. Given these considerations, it seemed significantly easier to define the lowest common denominator with tap water.

The manufacturer indicates that the value for the maximum flow rate of the test object is 25 m³/h. The first measurement was executed with the two permanently installed Aquamax pumps, the two UVC units, and without bio-material at a volumetric flow of approx. 28.5 m³/h. Happily the entire filter setup proved to be totally unimpressed with the flow rate. The level difference between the first and last chamber was only 4.5 cm and the temporal intervals of the flush cycles (>15 min) also showed that the actual maximum volumetric flow apparently must be rated significantly above the manufacturer's specification of 25 m³/h, which is on the pessimistic side. A subsequent test run with a filled bio-module changed nothing relative to the preceding results. Only the level difference increased now by 5 mm to 5 cm. Because we were already able to confirm the manufacturer's information concerning the , maximum volumetric flow, the official part of this verification ended here as well.

However curiosity triumphed, thus an additional test followed to determine the actual maximum volumetric flow of the filter. For this a stationary Linn type 01 pump was installed instead of the two Aquamax Pumps. Because this pump has a net delivery capacity of 65 m³/h it was powered by a frequency controller so that the we could adjust the capacity of the pump appropriately. To make a long story short. The maximum flow rate of the filter chain was reached for this setup at a respectable 31 m³/h. An even higher value may have been achievable for the drum filter alone, however due to the high level differential of the water levels in the downstream chambers that occurred this would have no longer been usable in practice application with this setup. To remove any possibility of speculation the manufacturer's information concerning filter fineness of the filter elements (60 µm) was checked and confirmed with a thread counter. Since an additional fourth inflow can be optionally installed the drum filter (accessory) the measured +30 m³/h delivery capacity can most certainly be implemented in practice.

Test filtration capacity

The section that gave us the most headaches. How to make the filtration capacity of a filter comparable with other systems? The con-

solid concentrate in bucket

1000 litre tank before test run

siderations in this regard went in every direction. From the turbidity measurement to boiling down the water samples and weighing the remaining residues. Thanks to good contacts with a nearby municipal wastewater treatment plant and an extensive discussion with an employee in the laboratory the solution was actually quite simple. Ultimately we are interested in the solids in the water. These have a mass, thus they can also be weighed. However to this we needed an extremely precise scale with four decimal points in the gram range (0.0001 g = 0.1 g). As chance would have it, we were able to find such a device in the lab and we were offered the possibility of having the weights measured in the lab, which naturally we were pleased to accept. We were then able to also determine the solids content of a specific quantity of water.

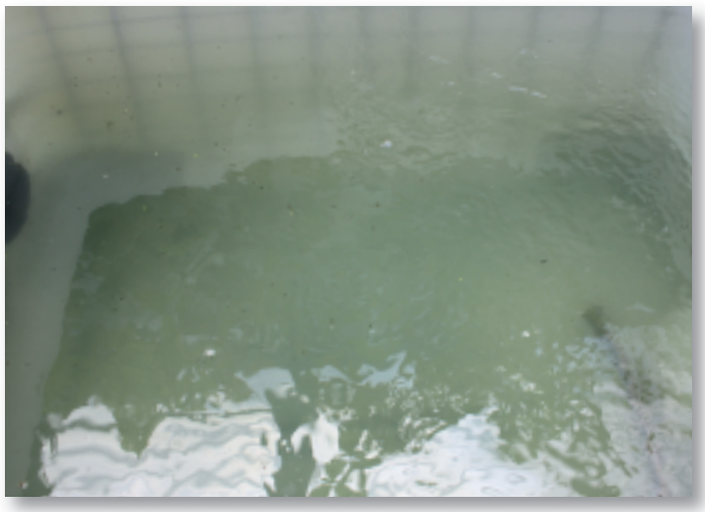
However the question then came up of which »solids« should be filtered, in order to determine the filtration capacity. Any artificially produced water pollution, for example with peat, or equivalent substances, somehow seemed too far removed from actual practice. After all the test should produce more than just theoretical lab values, which indeed can be properly compared, but cannot however establish any relationship whatsoever to pond practice. Thus we decided that we could only consider pollutants that occur in the broad day-to-day pond experience. But where to get them? In the end the solution to this puzzle was as simple as it was resourceful. We used that which a drum filter would filter out of a 60 m³ pond system with a sand floor over a period of at least 24 h, and simply collected its flush water before it disappeared into the sewer. It contains everything that should be removed from a pond. Lose parts of green string algae, feed remnants, leaves, fish excreta and much more. Actually it really doesn't get any closer to actual practice. In addition the solids in the wastewater of a drum filter are considerably finer than they are in the pond itself, because they have already been mechanically »crushed« through the filtration and the flush process. Moreover the composition varies in one and the same pond only insignificantly so that here as well sufficient reproducibility remains ensured for subsequent tests.

We were able to test. The procedure was now quite simple. First, from the fresh water of the water tank five unburdened 500 ml samples were taken and filtered via filter paper (coffee filters). These samples formed the reference value for the fresh water.

Then the test pollution was fed into the water tank and thoroughly mixed by hand so that another five 500 ml samples could be taken and filtered. These samples formed the reference value for the test pollution.

Subsequently the filtration process was started and we waited until the temporal interval between two cleaning processes was approx 20 minutes, so that we could assume that only an infinitesimal amount of solids would still be filtered. The water in the 1000 l tank was already astonishing clear at this time.

The wet filter papers were dried individually in the microwave and in the same degree to keep the influence of residual moisture in the filter paper to a minimum and then were taken directly to be weig-



1000 litre tank after test run

left: tap water
Rechts: polluted water before test run

left: tap water
Rechts: filtrated water after test run

hed. Here then are the results as the mean value from the samples:

Filter paper **»reference – fresh water«**
Weight: 2,7563 g => TSS = 0 (tap water)

Filter paper **»reference – polluted water«**
Weight: 2,8178 g => TSS = 123,0 mg/l

Filter paper **»ProfiClear-Premium«**
Weight: 2,7787 g => TSS = 44,8 mg/l

(TSS = Total Suspend Solids = content of undissolved solids in the water)

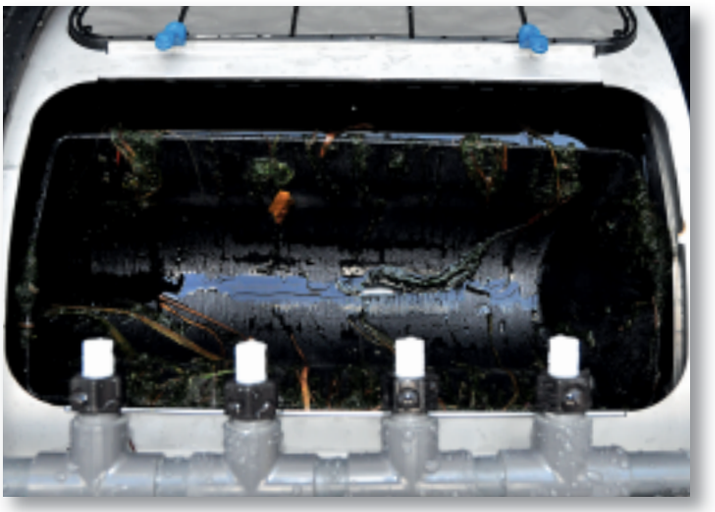
The numbers must now be read as follows. The sample from the fresh water is assumed at 0 mg/l, since this was non-polluted tap water. After adding the test pollution, the value for TSS increased to 123.0 mg/l. After filtration this value was in turn reduced to 44.8 mg/l. It follows that the filter system filtered out approximately 63.5% of the added solids.

With a high degree of probability it can be assumed that at continuous filtration even fine particles smaller than 60 µm will be filtered out of the water, since until the next filter process a »filter cake« builds up that also retains smaller particles. However this is not a long-term test, the exclusive concern is comparability of the results. Even if considered on its own the absolute TSS content does not have a direct influence on the test result, as only the difference in percent is decisive, we must nonetheless still note as supplemental information that according to the WHO standard the limit for drinking water relative to the TSS value has been fixed at less than 30 mg/l. Thus it becomes apparent how powerful the OASE filter system is in this respect.

Summary

The OASE ProfiClear Premium was convincing with no ifs ands or buts. In addition to many practical detail solutions, such as a manually rotating drum, easy to replace filter elements, pollution car-

Removed screen element



View into pollutant through

riers in the interior of the drum, easy to operate control electronics, etc., this is a mature product, that also does its work very quietly. Evidently OASE has been doing its homework. It is quite clear that the known disadvantages of several competitor models were specifically addressed and appropriately and constructively resolved. For example, drum filters in general have problems transporting elongated objects and even stringy green algae into the pollutant trough. Often straight plant remains and string algae lay on the edge of the pollutant trough and stay there until they are manually removed in the course of maintenance tasks. Just as frequently such pollutants do not even get into the area of the pollution trough and collect intensively in the interior of the drum. OASE has solved this problem in a technically proper manner. The screen elements have pollutant carriers that reliably take up the string algae and plant remains and transfer them into the area of the pollutant trough in the flush process.

Nevertheless for design reasons with any drum filter such elongated plant remains do not always reliably get into the pollutant trough. Apparently OASE was aware of this and consequently developed a system with which the user in a simple manner has access to the pollutant trough and also to the interior of the drum from the outside at any time.

The adjacent photos show just how easy it is to remove and reinsert the screen elements. In this regard the freewheeling of the drum plays a crucial role, with its help the user can turn the drum manually to any desired position.

Overall the filter showed no weaknesses whatsoever in handling various pollutants as they occur in ponds. Also because the string algae issue associated with a drum filter has been resolved faultlessly from the design perspective, we can only give the highest mark for this filter.

The control electronics are also worthy of mention. The user is not left to himself in obtaining the »optimal« adjustment values, but rather they are already stored in the electronics. You do not have to change to daylight savings time, or change between level-driven or time-driven flush cycles. The controller automation handles this on its own. Overall there are three adjustable parameters:

1. Duration of the actual **cleaning process** (10-30 s)
With this parameter the user can add more water if there are longer pipe sections of the wastewater pipe, to ensure transport of the particles to waste.

2. Setting for the **flush time** (10-60 s), that will be active at every 20th cleaning process.

3. Time span for **forced cleaning** (0-60 min, 0 = deactivated)
In the event that the level control does not trip before this time elapses; this means that the wastewater pipe can be cleaned of any deposits through more water.

For those who operate their pond in winter with a reduced pump capacity, does not need to communicate this to the filter, to prevent

The sreen elements are to remove and reinsert easily

frost damage. The integrated display of pond temperature is included as standard equipment. As are stored fault messages for the extreme cases. The user is informed of a malfunction of the drum filter unit even retroactively and can take preventative measures if necessary.

The bio-modules are genuine moving-bed chambers and are adequately dimensioned with a volume for up to 75 l of bio-medium (manufacturer information). Consequently based on experience, two of these modules usually suffice for koi ponds up to 50 m³ in volume. But there is nothing against filling more than 75 l of bio-medium. During the test, it was shown that there is certainly space available for this. Even if the movement of the individual media may be partially restricted with this extra volume, this should not reduce the biological decomposition capacity.

The »Bitron Gravity« UVC unit that has been specially designed for the ProfiClear Premium series, fits perfectly into the last chamber, (individual chamber) and makes a high-quality impression. At 55 W it is adequately dimensioned; a total of two units can be installed in the last chamber. The stainless steel housing is designed in such a manner that regardless of how you position yourself it is impossible to look directly into the bulb unintentionally. This is a great advantage over open immersion lamp systems.

Even if a few components of the available drum filter, such as the nozzle mount, were still experimental parts, this filter combination is already thoroughly convincing. OASE has succeeded in building a filter that also leaves nothing to be desired for koi keeping.

Individual evaluations

Removal of string algae	👍👍👍👍👍
Removal of floating particles	👍👍👍👍👍
Removal of pollutant particles in general	👍👍👍👍👍
Structure and handling in general	👍👍👍👍👍
User-friendliness	👍👍👍👍👍
Operational safety	👍👍👍👍👍
Loudness (cleaning process)	👍👍👍👍👍
Max. flow rate	👍👍👍👍👍
Filtration capacity	👍👍👍👍👍

Test evaluation **Absolutely recommended**