

**Malcolm Green** has been in the koi hobby for over 20 years and has spent 28 years involved with construction materials testing and water quality monitoring businesses in the UK and USA. He started Koi Water Garden Ltd in 1996 and has been visiting Japan from the early 90s to select koi initially for his private collection and then to meet the needs of the business.



In part three  
Malcolm Green  
finishes the tale of the  
filtration system on his own display pond...

# the finished article

**G**oing back to our koi pond construction project, we decided to use a Nexus Eazy 200 as they are easy to install, efficient mechanically and very efficient biologically. The jewel in the crown however, is the ease of maintenance and the ability to keep the filter system remarkably clean. We have always liked the simplicity of the Eazy system and much prefer this version of the Nexus over the version fitted with the Answer.

So, the next stage in our project was to position our filter, which was to be located on a decking platform, next to the pond. We had already decided to leave everything on view, which we knew would help to explain the mysteries of filtration and pond plumbing to all our customers who were contemplating a new or upgraded pond, so in this case we were not constructing a filter chamber as such with which to hide the filter. **(Photo F1)**

The filter was actually positioned to stand on three 100mm concrete blocks laid on their side, which make perfect pads for the Nexus as this itself has three large feet. The platform on which the filter was to stand was placed so that it would give exactly the right height of water in the filter, bearing in mind that with gravity filtration, the pond water level is exactly the same as the water level in the filter with the system at rest. It is vital to get this height right, as some filters are more critical than others in terms of tolerances for errors in height, and incorrect positioning can lead to filters being starved or overflowing when switched on. The Nexus is quite tolerant of height issues, and we aim to get the water level in the filter just under the broad external rim just under the lid which the reader will observe from the picture **(F1)**.

### overflows & water levels

To give more room for manoeuvre however, when constructing the pond, install an adjustable overflow (which we referred to in part one of this article). The overflow is normally placed lower down in the wall than



intended, but on the external side of the wall, fit a 90 degree bend and short piece of pipe upwards to the top of the pond wall. The length of this pipe can be adjusted once the filter has been positioned and is running to get the water level absolutely right – once the level is established, the pipe fittings can be glued in place. Overflows can of course also be fitted into a filter, but we did not want to cut any more holes in the Nexus!

On the inlet side of the filter, we would normally fit a 4in slide or ball valve to separate pond from filter and enable purging of the bottom drain pipework and filter. This is not practical on the Nexus however, as the filter is fitted with a simple weir plate to prevent water flow into or out of the filter when cleaning. However, because of the lack of head available between the bottom of the inlet port and the normal water level, it is better to fit the valve in a horizontal pipe running from a 4in T as shown in the picture **(F2)**. This enables a much greater head of water to be drained when the

valve is opened and facilitates much more effective purging of the bottom drain pipework. Regular purging of the inlet pipework from the bottom drain is important to prevent settlement of too much detritus in the pipe run, which can happen owing to the comparatively slow flow rate of incoming water through the large bore pipe run. With a conventional filter, this extra step is not necessary as the 4in valve can be positioned on the incoming pipe lower down in relation to the final water level to achieve the same result. ▶



Modern does not have to mean that the pond should be huge, overly complex or massively expensive



F3

**top tip – additional water features**

It is also worth mentioning here that if you are considering installing other water features such as a waterfall or other form of decorative water returns, these should normally always be completed using separate pumps. This is because once you achieve the correct flow rate through the filter, it should not be subjected to any substantial change, either up or down which could detrimentally affect water quality. In addition, waterfalls and other water features are normally required to be switched on and off, and waterfalls in particular normally will require much higher flows than the filter to look effective – so treat water features separately.

**UVs & pumps**

On the outlet side of the filter, be sure to use an appropriately sized ball or slide valve to separate the filter from the pond on the return side. Also fit single union connectors to the pump and UV (see pictures ) so that these can be removed for ease of maintenance and in combination with the ball valves fitted here, will ensure that there are no floods when the pump or UV are removed! Note that here the pump, in this case an Oase Aquamax 6000, is positioned on the floor and is tucked away close to the side of the filter so that it is less likely to be stepped on or damaged during access to the rest of the filter plumbing.

With any filter system, correct sizing of the pump and UV is very important. Aim for a

final pond turnover rate of between two and four hours when choosing pumps and allow for flow losses caused by friction in pipe runs and multiple bends. The longer the pipe runs, and more bends will mean a larger reduction in final flow rates – so it is difficult to give guidance as to how much to over spec the pump by to provide the correct final flow rate. Low pressure pumps, such as the Aquamax range will lose more flow than higher pressure pumps. It is also good practice never to use pipework less than 1.5in diameter for pressurised return pipework, as this will be too restrictive. In fact, when plumbing larger ponds, we often complete much of the return pipe work runs in 2in pipework. As a rough guide however, you should allow between a 20% and 30% flow loss from the claimed pump output.

**UV sizing**

When sizing the UV it is advisable to use the simple rule of 10 watts per thousand gallons, so a 3,000 gallon pond would require a minimum of a 30 watt UV to provide clear water in all conditions.

It is always a good idea to try to be neat and tidy with all the plumbing, here the two drains from the filter have been plumbed together into one manifold and then piped away to waste. This saves pipework, as well as keeping things neat. (See picture F3)

For the plumbing in this pond we used PVC class E pressure piping throughout. It is very strong, and whilst by no means the only option, is to be recommended. Pressure pipe now costs little more than ordinary solvent weld waste piping and most pumps, UVs and other pond fittings such as ball and slide valves are made to accept pressure pipe without modification.

In picture F5, the vertical pipe on the right of the picture leads into the UV from the main filter pump, just out of view here, but pictured clearly in picture F4. The water is pumped through the UV, exits the UV on the far left of the picture and is then pumped through a stainless steel heat exchanger. We will be heating this pond using oil as a fuel. Water then exits at the bottom right of the heat exchanger and here the pipework splits into two. One branch leads vertically down and then back to the far side of the pond. The shorter branch feeds through the ball valve



F4

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shown on the far bottom right in the picture to the pond return close to the filter. Note that a ball valve is always required on the shorter branch when using two or more pond returns in order to balance the water flow between the two returns. If this was not fitted, most of the water would exit from the shorter branch.

In this installation we have fitted a stainless steel UV. There are a number of good UVs on the market today, but the Cloverleaf stainless steel version that we have used here provides around 30% more power than a conventional UV for about the same cost, and the same running costs. Note that, once again, single union connectors have been used between pipework and the UV itself. This enables easy removal of the unit for bulb replacement and maintenance.

### electrics installation

The electrics for the pond were then installed. Here we used an IP rated five-way fused switch box to handle the various circuits required from one mains supply. This enables individual control over every element of the installation in safety. The mains supply was connected via an approved RCCB (residual current circuit breaker) unit.

Whatever kind of filter you choose remember that an air supply is a vital requirement for the biological stages. It provides the friendly filter bacteria with the considerable amount of oxygen required to convert harmful ammonia and nitrites and helps to keep the media clean by preventing minute solids from settling out. Air is most efficiently provided by a purpose-built pump. The air pump in our installation was mounted as high as possible and above the water level, close to the filter **F6**. In this position, should there be a mains power failure, there is no chance of water siphoning back up the piping into the air pump, which would irreparably damage the pump. This model, from the Secoh range is weather proof and very quiet, so needs no external protection from the elements.



F5

And finally, the picture **F7** below shows the completed pond, filled with water (and koi) and happily working as the design intended.

### the cost?

The costs to construct this pond, including pipework, electrics, filter, heating components and all construction materials were in the order of £3,000 – so definitely not cheap. This figure does not include labour. Please note that the larger the pond, generally the cheaper the cost per gallon.

We started by titling this article 'Building a modern koi pond'. In this case the pond itself is small and very simple, and plumbing minimal by some standards. The modern description really applies to the type of filter

installation, construction methods and plumbing used. Modern does not have to mean that the pond should be huge, overly complex or massively expensive and frankly, it's always best to keep things as simple as possible! If nothing else, we hope this article has given you food for thought... 鯉

### pond budgeting

If you decide to build a concrete pond yourself, supplying your own labour, allow between £1.20-£1.75 per gallon depending on your design, size and construction materials. If you decide to have the pond built for you, allow a minimum £2.50-£3 per gallon.



F6



F7

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Malcolm Green  
Koi Water Garden Ltd  
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