IMAGE 8: This Koi looked dreadful during the outbreak, and we thought it would be the last one to die. But, after we stopped the virus, the Koi recovered to look like nothing was ever wrong. We had countless offers from people wishing to buy this Koi but, my reason for euthanising it, despite most people promising never to sell the Koi, is that someone might inherit and then decide to sell it.

IMAGE 9: The author running a blood sample through the centrifuge.

IMAGE 10: This Koi tested positive and was moved to another pond before the outbreak. We temperature-cycled it repeatedly with some naïve Koi, but it didn't trigger an outbreak. CEFAS also couldn't induce an outbreak with it.

To date, we haven't found any Koi that have shown an increase in antibody levels after cycling.


Image 8

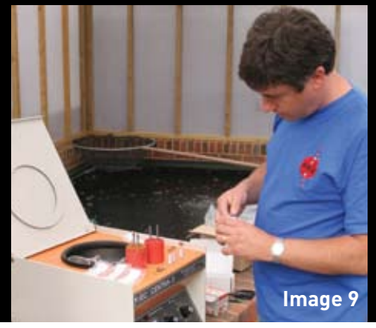
Image 9


Image 10

packed in water of 18°C (64.4°F) or 19°C (66.2°F) in Japan and will often arrive at much the same temperature. The shipment we had was via KLM and should have been kept at below 15°C (59°F) in the cargo hold. When the Koi arrived at our end, the water was around 15.5°C (60°F), and placed straight into water of just under 18°C (64.4°F), which we then ramped to 24°C (75.2°F). This wasn't enough to trigger an outbreak. When we went to the BKKS National Show in June 2006, we left Tosai in our two 1700UK/2041US gallon ponds. These ponds were maintained at around 18°C (64.4°F) whilst we were at the show. On our return, we reintroduced all of the Koi from the show to these two ponds and heated them back up to growing temperatures of 23.5°C (74.3°F). At this point, the Tosai caused our outbreak. It would appear that this somewhat later temperature cycle triggered the virus.

New Protocol

As a result of our outbreak, we now see things very differently. When we import Koi, we now blood test each and every one of them using the CEFAS ELISA test. This test is highly sensitive but, unfortunately, not incredibly selective. I believe this test is extremely good for finding safe Koi, but not good for finding dangerous ones. What I mean by this is that there does seem to be some reaction with Carp Pox antibodies. So, any positives we find are isolated then retested using Serology test. If these Koi come back positive again, they are destroyed. If they come back negative, the Koi are extensively temperature cycled. Any Koi with an antibody level anywhere close to the negative threshold is retested after temperature cycling to make certain that its antibody level hasn't risen. This confirms that the Koi isn't a risk, as a carrier will increase its antibody level after being temperature cycled.

To date, we haven't found any Koi that have shown an increase in antibody levels after cycling. This is extremely encouraging. Of course, this method of testing is expensive, but for us, it's easy, as the Koi are generally pretty valuable, and the number of Koi is low, so the cost is relatively insignificant. That said, since July 2006, we have had around 2000 Koi tested.

It's not all doom and gloom, however. Most dealers are now being extremely responsible with new shipments, and are double-cycling new shipments in the correct manner. Given that these shipments will have many Koi from one breeder, if there are issues, there will most likely be a number of carriers within one group of Koi, so an outbreak will most likely be induced in a controlled quarantine environment. For me, though, I have very low numbers of Koi from each source I buy from, so my own methods are more suited to my needs. If I buy three Koi from one breeder, there is a high chance that they are all unrelated, so there is no point in losing all three when only one may be a risk. A large number of Koi that are siblings of one another is another matter…

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An overall shot of the test system at the AES facilities in Apopka, FL.

test
BY MICHAEL D. COX

Consumer Report

Do different fittings really make a difference?

WE ALWAYS HEAR about the efficiencies of some pipe fittings over others, and most often see them in writings or in some graph. Writings and graphs are great, but we wanted to find out exactly what the graphs would look like in a real-world situation.

I contacted our friends at Aquatic Eco-Systems (AES) and spoke with Bob Heideman about putting together a comparison test. After a little back and forth on how the test would be done, AES came up with a test fixture that would show us exactly what happens in relation to our flow rates by using one 90º configuration over another.

Understanding It All

The name of the game is "low friction loss." When you select a low-head, high-efficiency Koi pond pump from one of the Koi dealers, you will probably get a state-of-the-art, quiet, very low amp draw pump that will last for many years. In order to get the most out of that low-head pump, you will need to have a low-head plumbing system.

Let's face it, with today's energy costs, we need to be concerned with conserving energy, and you can get that little bit extra just by selecting the right pipe fittings. By selecting the correct elbows when you build your piping system, you can use a smaller pump than you otherwise would, thereby saving energy. Even if you can't find a smaller pump with lower energy consumption, you will still benefit by getting more water flow from the same pump. And who doesn't want more water flowing over their waterfall?

Get This Through Your Head

The term "head" as it pertains to pumps has two parts to it. The one that most people know is the "actual head," or "vertical head." This is a measurement in inches, feet or meters that specifies how high the water is being lifted above the pond's water level. In the case of a Koi pond, "vertical head" is most likely going to be the distance from the surface of the pond water to the top of a waterfall.

Another part of the term "head" is commonly called "dynamic head." Dynamic head is a total of all the things that resist water flow in the piping system. It includes the friction loss from the pipes themselves, the loss due to the water changing direction, and the restriction of filter devices, ball valves and any other components in the plumbing system. "Total head" is the sum of both "actual head" and "dynamic head." You must use your "total head" as a guide when selecting a pump.

Water is heavy. That is why most pumps use more energy when pumping at low pressure than they do when

To illustrate this, just picture yourself carrying a heavy rock, moving in one direction, and then trying to change direction 90º in a short distance. You will almost have to stop, which takes energy, and then restart in the other direction, taking more energy.

THE DETAILS
CLOCKWISE, TOP LEFT: SHE 2.4; Bead Filter; The gauge for the bead filter at six psi.

pumping at high pressure. The weight of the water being moved is more of a burden on the motor than the pressure, or "head," it is being lifted to.

At a higher pressure, the pump is moving less water, so it is doing less work. It is also the weight of the water that causes so much head loss when it is forced to change directions. To illustrate this, just picture yourself carrying a heavy rock, moving in one direction, and then trying to change direction 90º in a short distance. You will almost have to stop, which takes energy, and then restart in the other direction, taking more energy. If you could make the turn over a longer distance, it would not take as much energy.

Where, What And How

The test took place at the Aquatic Eco-Systems facility in Apopka, FL. In the test, we compared 90º PVC elbows to two 45º elbows and 90º sweeps. Trying to keep the test as realistic as possible short of building an actual pond, a 500US/416UK gallon show tank was used as our pond.

For the plumbing, 3ft/91.4cm of 1.5in/40mm PVC pipe with two 90º elbows that lead from a 1/4hp SHE 2.4 pump to a bead filter running at 6psi was used. For the rest of the test 46ft/14m of 2in/50mm PVC pipe was used with eight 90º directional changes, as well as a 4ft/1.2m vertical rise to simulate a waterfall.

Bob did not want to rely strictly on a flow meter, so the flow was also measured by catching the pumped water in a 45US/37UK gallon tank over a timed period. Each test was run six times and then averaged to get the final numbers in gallons per minute.

Just a quick note here; do not get caught up in what equipment was used for the test. We are not testing equipment we are testing the turning options we have with different pipe configurations. The equipment used is just a means to an end.

Just Some Thoughts

I must be honest, I was expecting a larger difference between the pipes, as probably many of you were, and as Bob pointed out, "At first glance, that may not look like much of a difference—hardly enough to worry about. But when you realize that you can get as much as 12% improvement in your pump's output simply by using different elbows, you'd have to be crazy not to do it!"

THE RESULTS
THE SHORT, COMMON, 90º ELBOWS
35.5US/29.5UK gallons/min which is 2130US/1773UK gallons/hr.

TWO 45º ELBOWS NEXT TO EACH OTHER
38.5US/32UK gallons/min which is 2310US/1923UK gallons/hr.

THE 90º LONG SWEEP
39.8US/33UK gallons/min which is 2388US/1988UK gallons/hr.

Here are some points I would like to make as food for thought. The difference between the common 90 and the sweep 90 is 4.3US gallons/min, which works out to 258US/215UK gallons/hr. As Bob mentioned, it doesn't look like much, but let's go just a bit further with it. 258US gallons/hr is 6192US/5155UK gallons in a 24-hour period. If you have a pond that size, you will get one more pass through your filter each day. If your pond is half that size, you'll get two more passes through your filters per day. I think you can agree that is a pretty good trade off for just changing some elbows. Keep in mind we only used a few turns; in an actual pond you could have quite a few more than that hindering your flow even more.

Even if you think the 12% increase is not worth your time and a few extra pennies think about it this way: If you wanted a targeted gallon/hr flow, you could very easily get it from a bigger pump than needed, or you can plumb your system more efficiently and buy the smaller pump and get the same targeted flow rate. The bigger pump will get the job done; however, the smaller pump will cost you less to purchase and less in annual operating costs.

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Bob Heideman and Ryan Chatterson of Aquatic Eco-Systems, Inc. contributed to this article.