

How Does Rob's Garden Grow?



Above: Spare basket row. *Directly below:* As the soil dries out the valve opens to irrigate the growing media. As the media becomes moist, water passes through the walls of the cone, reducing and ultimately turning off the irrigation. *Bottom:* Blumat valve in operation. Note the Hydroton expanded clay.

Well, with hydroponics, of course. But also with some problem solving and help from an amazing little valve



Text and photos by Rob Smith

For many years my garden has been predominantly hydroponic. I have several fiber glass garden bins filled with aggregate which are regularly irrigated on the flood and drain principle sequentially irrigated by a lawn irrigation controller time switch.

Nutrient is pumped out to each of the beds in turn until the bed is flooded. The bed then drains the nutrient into a catchment sump, where it is then pumped back to the main nutrient holding tank. Here it is automatically tested and readjusted for both conductivity and pH.

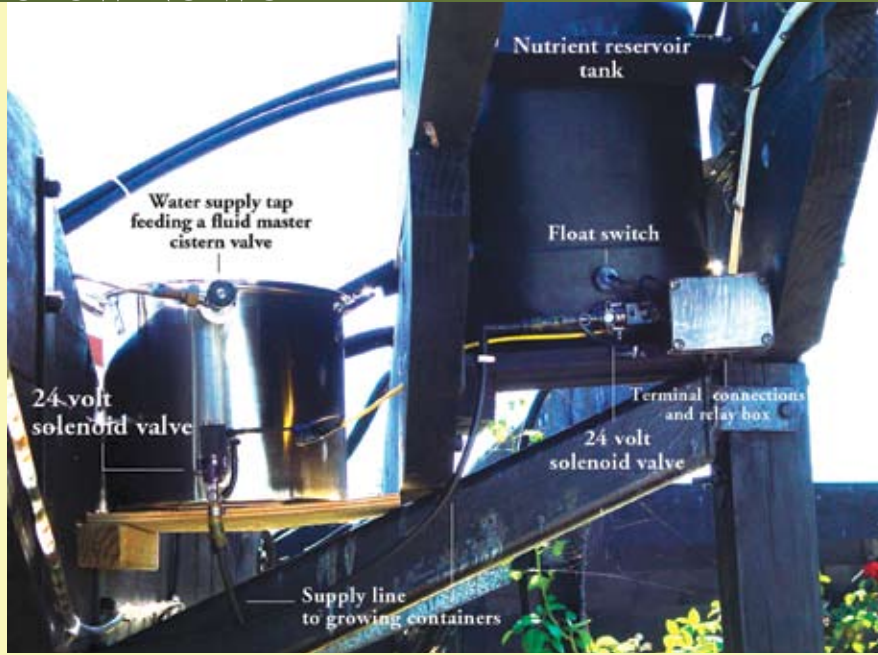
The system has been working very well for many years and requires a minimum of maintenance. The only problem is that the lush growth, great colors and longevity of the plants, particularly the flowers, made my other conventional soil-growing pots

and hanging baskets look a pretty poor second best.

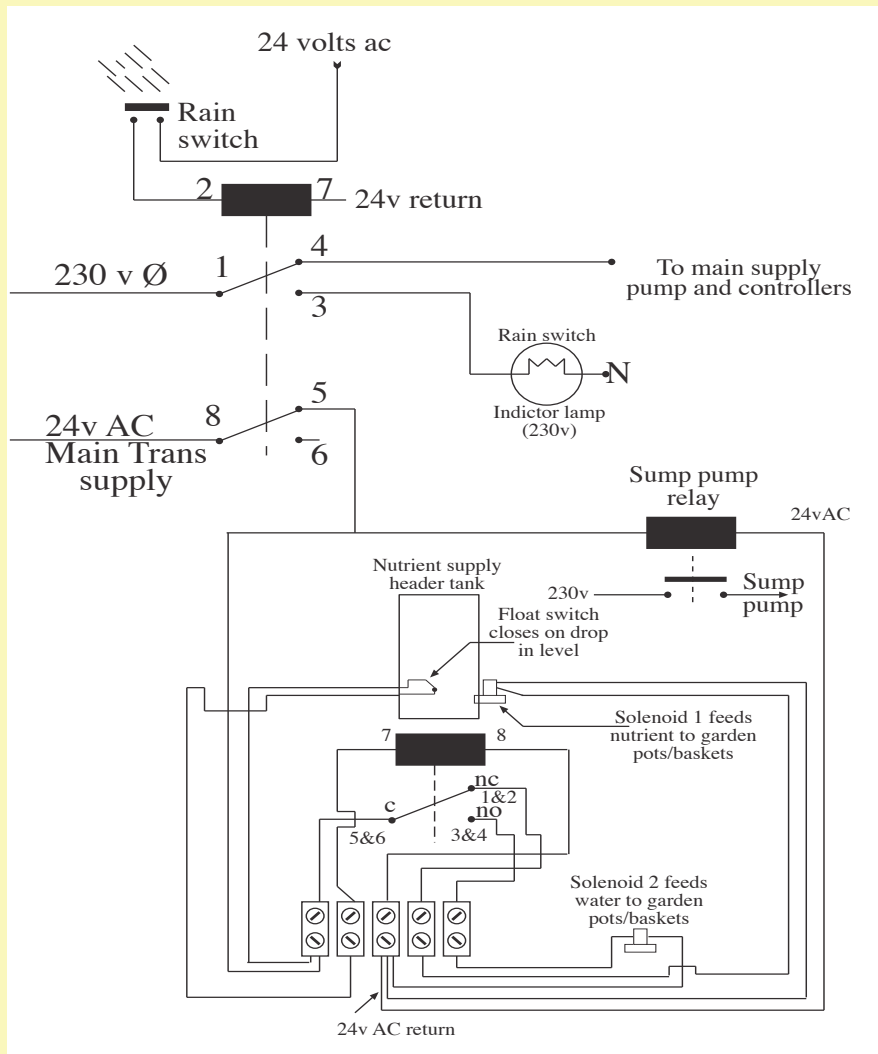
A few years ago I decided to do something about it and installed a drip irrigation system based upon Israeli Dan dripper stakes provided with water from the mains, controlled by a time switch and solenoid valve. The drippers were generally running for a half hour, early each morning. This system, which I still use for my wife's bonsai trees, was pretty good, but the soil-grown plants were still unable to reach the performance of the hydroponically grown plants.

Amazing Invention

I then stumbled across an invention manufactured in Austria by Weninger GmbH & Co.KG called Tropf Blumat valve. This device consists of a hollow, pottery cone which upon installation gets filled with fresh water. The cone then screws snugly



Above: Details of the supply tank setup. Below: This diagram shows the electrical circuit that controls my garden system. Wherever possible I use low voltage irrigation equipment which has an (International) voltage of 24 volts AC.



into the valve head to form an airtight seal. The cone is pushed into the soil. As the soil dries out the water from within the hollow cone moves through the semi-permeable walls by osmosis to the drier media outside. As the water moves out it draws a vacuum within the hollow cone. This vacuum pulls open the water valve and irrigation commences. As the soil now becomes wetter, water now travels back into the cone and the valve starts to close. Once the pre-set density of water in the soil is reached the valve will be turned right off.

Obviously, this method of water upon demand is great through the most punishing periods of a summer and inhibits any watering during rainy periods. I found it took a few days to get each Blumat valve adjusted to optimum and, of course, it is very important that there be good contact between the growing media and the outside of the cone for the movement of water molecules to and from the cone. This is pretty easy when growing in soil or a potting mix.

So I now had possibly the most technically efficient irrigation system available, and there is no doubt that the plants enjoyed this consistent provision of adequate irrigation. But I still did not match the hydroponic garden results.

For example, geranium plants growing in hydroponics have been flowering non-stop for several years. I'm not taking here about regularly replaced plants but the same old plants intermittently hacked back when growth gets too lank. Within days plenty of new flower spikes erupt. I also get an extended flowering season from all my other flowers, including my roses. I really needed to get these pots and baskets onto the hydroponic system. It was time to put on the thinking cap!

Figuring Things Out

To install return drains to all my pots and baskets would be nigh on impossible. It'd certainly be worth contemplating if you were just setting up your garden, but my garden was set up pretty close to what you see today some 20 years ago.

I pondered the whole garden design. Even the hydroponic gardens were not really well controlled because I had no system of turning off irrigation cycles

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Left: Unfortunately, when you retrofit a garden with irrigation lines you are going to occasionally see supply pipes. In my view this is well compensated in this case by the brilliance of these red geraniums. Also note the birds that continually work in my yard since we got rid of all cats. My garden has not been sprayed at all for the past five years, and hardly ever a bug to be seen! *Right:* Blumat irrigated basket in front, and to the right is a vertical growing tube also irrigated via a Blumat valve. On the wall at the rear is a 6-by-3-inch (150 mm x 75 mm) PVC gully on its side that gets a flood-and-drain irrigation 2-3 times a day. I have never been able to grow successful long-term flowers in these pots. These marigolds have been in bloom now for three months and are still flourishing!

when it rained and also had no system of preventing any rain water catchment from flowing back to my main holding tank which would then overflow, wasting good nutrient. After cogitating for several weeks I came to the conclusion that I had to control the outdoor hydroponic system to shut down when it rained. That was pretty easy with a rain activated switch of the type that they use in commercial outdoor irrigation systems. (This particular one, I think, is called a mini-click.)

The problem of rainwater puzzled me for a while until I saw the answer that had been screaming at me all along. You will remember that I said the gardens all drained back to a sump at the lowest point in the yard and then a sump pump would send that nutrient back to the main holding tank. All I actually had to do was to prevent this sump pump from running while it was raining and let the catchment sump overflow to waste. After all, most of the contents during rain were obviously going to be rainwater. The system works fine. Now what to do about feeding the pots and the baskets hydroponically?

The Blumat valves had proven that they were an ideal way to keep any container at optimum moisture, even through really hot and windy days when plant transpira-

tion was at a peak. The problem was that my existing hydroponic system only had the supply pump running for short periods during any 24-hour period, and the Blumat valves needed a constant supply to be effective.

The answer was to provide a reservoir tank that could supply by gravity outlets across the whole backyard. I had a good 5-gallon PVC (20 liter) container and was able to mount it up high on a timber pergola I had previously built to carry my swimming pool solar heater. This container would be filled to overflowing every time the hydroponic system came on for that area. The overflow was piped back to the catchment sump. This meant that during normal operation of the hydroponic system the tank would be large enough to provide for the 24 Blumat valves I presently have in operation. All I had to do was swap the existing fresh water supply to the Blumat valves over to this nutrient reservoir tank supply and I should be in business.

Nothing as Simple as It Seems

All worked well until it rained. The hydro system shut down as it should, meaning that the reservoir tank would not now be regularly replenished with nutrient from

the main supply. This should not have caused a problem, I had thought. But I did not allow for the fact that a rain shower can shut the hydro system down. Within a very short time, especially during warm weather, the pots can start drying out at a much faster rate than the irrigation rain switch which is designed to mimic outdoor growing conditions and only dries out at the same rate as an outdoor soil-grown crop. And I still had to wait for the irrigation controller to advance to the next on cycle.

Don't get me wrong. This system works perfectly for all the hydroponic gardens. However, all of a sudden I started to see my pot plants and baskets stressing and realized that the reservoir tank had run dry! So with heavy heart it was back to the drawing board. What I need, I thought, was to be able to simply turn on a solenoid valve as previously had been controlling the drip irrigation system. This I could achieve pretty easily by putting a float switch in the nutrient reservoir, so that if the reservoir ever ran dry, plain old water from the main could ensure that none of my pots would ever suffer from lack of moisture.

The system sounded OK in principle but, again, added another problem. My mains water pressure is better than 70 psi. The

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supply pressure from the nutrient reservoir is quite adequate to gravity-feed the whole yard area but that pressure is absolutely minimal. Even with a pressure-reduction valve I could not guarantee getting all the Blumat valves balanced to provide consistent operation under supply from either source. Back to the drawing board again!

The answer was pretty simple. I just added another reservoir tank beside the nutrient reservoir tank, but this one was kept full from the main water supply via an American Fluid Master cistern valve. Now when the nutrient reservoir ran dry and the float switch operated it simply closed the outlet valve on the nutrient reservoir

There are several advantages of a run-to-waste system such as this. First off, the worry about transferring soil-borne diseases does not apply. A problem in one pot is not going to be transferred to other growing areas. Because of this fact it is not overly important to remove all the soil from any seedlings or transplants. I have found this to be a great advantage since there is little or no stress on the plants. They just keep on growing once placed into the system.

My main media is again my favorite Hydroton expanded clay balls. You will remember that earlier I made the comment that the Blumat valve must be in good con-

exchange of oxygen.

I give each pot or basket a good wetting with the hose after initial planting and then check the Blumat valve each day until I achieve the optimum setting. The trick is to maintain the contents of the growing container in an evenly moist state without any runoff. I have found about a quarter turn at a time of the adjusting knob is enough. Any more and you could overrun the optimum setting.

Both flood and drain and drip systems work well outdoor under our weather conditions in New Zealand, because every couple of weeks we get some rain which flushes out any residual salts. Buildup of



Left: These geraniums have been flowering for several years grown in perlite. The system is a very basic wick garden drawing nutrient up into the top growing container from a nutrient tray base which is regularly replenished with nutrient pumped three times a day from the main holding tank. Right: This view demonstrates the lush growth and brilliant colors of mini roses, begonias, lobelia, petunias and marigolds. I was never able to achieve such results using conventional soil-growing techniques. I was never able to achieve such results using conventional soil-growing techniques. I was never able to achieve such results using conventional soil-growing techniques. I was never able to achieve such results using conventional soil-growing techniques. I was never able to achieve such results using conventional soil-growing techniques.

and opened the valve on the water reservoir, maintaining basically the same delivery pressure to the irrigation outlets. Now the system was working beautifully, and within a short time my pots and baskets now being fed regularly with hydroponic nutrient were looking great.

I have to say that I was a little concerned that I would maybe lose nutrient because all these outlets were in pots and baskets, with excess nutrient running out to waste. I need not have worried. The Blumat valves can be adjusted to provide adequate moisture without excess delivery running to waste.

tact with the media in order that there is a genuine response to the media moisture level. If you use just plain Hydroton, this is not going to happen. So it's important to add some media to the clay balls to ensure good contact with the pottery cone. Ordinary potting mix will do a job. However, the best material to use is vermiculite. This holds up to 5 times its own weight in water, so a small amount distributed throughout the Hydroton gives good contact and transmission properties to the Blumat valve as well as having very good water-retention properties, while the Hydroton maintains plenty of open areas for the free

residual salts can always be a problem with these types of hydro systems. If you adopt these systems in areas of minimal or irregular rainfall or when growing under cover, then a good flush with plain fresh water every two to three months is advised.

While there is a bit of work involved in both planning and then setting up such a system, I can assure you that the results speak for themselves. 🌿

Rob Smith is a regular contributor to Growing Edge. He lives in New Zealand.